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Online Education during the COVID-19 Pandemic: Issues, Benefits, Challenges, and Strategies

Editors

Dr. Stephen Jackowicz

Dr. Ismail Sahin



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Foreword

The COVID-19 Pandemic impacted world society in many ways. The virus rode our interconnected transit systems and exploited a globally connected world where a person can traverse the planet within a day; far shorter a time than the incubation period. The virus challenged our assumptions on communicability of disease and transmission vectors. It challenged our medical systems; in the treatment of the infected, and an evolving understanding of the protocols needed for preserving the health of the vulnerable, and defining who is most vulnerable. COVID-19 challenged our social behaviors, our trust of one another, and the belief we had in our scientific systems to combat such a pandemic. Further, it stalled our educational systems. Unable to hold in-person classes, all levels of education were forced to utilize online platforms. Educators worldwide in disparate disciplines from elementary education through post-graduate study, in every field imaginable were forced to redefine their approaches and learn to adapt the technology we possess to the demands of maintaining progress in education.

This pandemic has been no easy challenge. There is an old Chinese saying, “In the midst of adversity is opportunity.” So it has been in this pandemic. Scientists and medical providers around the globe have fought the virus and in record time produced protocols and vaccinations against it. Governments have shared information and pooled resources. Educators have developed new and impressive methods to not only maintain the education of students, but to ignite potentials and inspire the minds of learners despite having a “new normal.”

This volume is a collection from educators around the planet who adapted to the changed landscape of education during COVID-19. Each of the contributors refused to accept that education would be stalled, that students would flounder, and that the virus’ impact would dim the lamp of learning. Rather each chapter brings a new and powerful adaption, which was implemented during the pandemic. The authors bring lessons, pitfalls, success, and failure to inform the reader of what worked, what did not, and what holds promise for online education long after the COVID-19 Pandemic is resigned to the history books.

The range of topics in the chapters is vast, but groups around four major themes. First, the broad dynamics of the change under COVID-19 and the impact this has had on education. Diane Boothe provides a global overview in the first chapter, contextualizing the fundamental shift, which all the authors engaged. Then in the second chapter Fernando Almeida and Pedro Carneiro address the issue of privacy in the online environment as education redefined its standards. These two chapters help the reader get a sense of some of the issues, which defined this moment in history.

The second theme is one of educational demands that presented granular and specific difficulties in online education during the pandemic. In the third chapter, Ömer Bilen examines ubiquitous learning and the need for learning management systems. This type of examination is paralleled in the fourth chapter wherein Abdullatif Kaban explores specifics in learning management systems. Then Zaenal Mustakim, Siti Fatimah, and Umi Mahmudah in the fifth chapter examine student perceptions and motivations as they were transitioned to e-learning. The sixth chapter sees Amjad Almusaed, Asaad Almsad, and Marisol Rico Cortez tackle the issue of student engagement as the difference of virtual education and live education become apparent. Then in the seventh chapter, Derar Serhan examines student learning perceptions when classes are synchronous versus asynchronous. The eighth chapter by Halil İbrahim Akyüz and Güler Tuluk focuses specifically on preservice mathematics students and looks at their perceptions and motivations. The ninth chapter by Sanaa Shehayeb, Eman Shaaban, and Nina Haifa explores the construction of assessment instruments for better typifying both teacher and student perceptions of online learning. Next, Ibrahim Benek and Behiye Akcay report the effects of the COVID-19 pandemic on metacognitions, emotions and individual characteristics of candidate teachers preparing for national exam in Turkey. Finally, this second theme is rounded out in the eleventh chapter by Yasmeeen Saeed Alzhrani, Atheer Mutlaq Alotaibi, Marwa Yousef Al-Huwail, and Abeer Toson Ahmed Nasr who explore the satisfaction of teachers of students with learning disabilities about virtual class during the COVID-19 pandemic in Saudi Arabia.

The third theme in the volume is one of specific issues within national context. Chapter twelve by Nassima Kaid explores the dynamics at play in Algeria in pandemic online education. Basil C.E Oguguo, Christopher A. Ocheni, and Evangelista C. Oguguo in chapter thirteen focus on the structural demands in Nigeria for online education and the long ranging

impact. Chapter fourteen then has Poonam Sharma, Sufang Zhang, and Hirsh Diamant examine cross-cultural exchange among three different countries when the pandemic stalled study abroad programs. Finally, David Akombo in chapter fifteen examines musical education in Barbados, addressing both national issues as well as issues specific to music education online.

The fourth theme in the volume is that of subject specific challenges in online education during the pandemic. Steve Jackowicz in chapter sixteen addresses unique demands of clinical education in an online format where physical assessment and skills were reformatted for virtual education. Then in chapter seventeen, Emilio Williams, Julie Boldt, Arthur Kolat, and Renee Wehrle examine the complexities in literary education for complex works, focusing on a reading group for *Finnegans Wake*. Then in chapter eighteen, Awadhesh Kumar Shirotriya explores the interesting dynamic of physical education in a virtual format and the intrinsic value of physical activities to the student especially in a pandemic. Finally, in chapter nineteen, Maria Papadopoulou, Panagiota Argyri, and Zacharoula Smyrnaïou look at mathematical and historical modelling of epidemics as a unique way to both teach and contextualize the COVID-19 Pandemic to the benefit of those living through its challenges.

Each of the chapters provides a different angle from which to view education during the pandemic. However, their value goes further. They all point to larger educational issues and approaches, which can be implemented in a world, which is increasingly more connected through technology. This volume should serve as a snapshot of the educational community as it addressed COVID-19, as well as a template of techniques and approaches for implementation in varied contexts to come. The editors would like to thank all the contributors for their excellent chapters. It is our hope that the reader finds value in this volume as well as inspiration for future adaption and development of new and progressive online educational methods.

Steve Jackowicz & Ismail Sahin

SECTION I: GLOBAL VIEWS AND ISSUES

CHAPTER 1: THE GLOBAL IMPACT OF THE COVID-19 PANDEMIC AND ONLINE LEARNING: A MULTINATIONAL STUDY

Diane Boothe 

Chapter Highlights

- The formidable impact of the global COVID-19 pandemic has stretched educational systems throughout the world to reassess their goals.
- The demand for innovative learning and teaching across the globe must be stepped up and at the forefront of educational endeavors.
- Educational technology and online learning significantly contribute to accessible education and the opportunity to design support for students.
- We must embrace new insights and take advantage of educational approaches offered in the online setting so that students can explore and expand their acquisition of knowledge as we move face-to-face courses online.
- Knowledgeable educators capable of integrating complex roles and dispositions in the service of diverse communities of learners are tantamount to the success of students.

Introduction

After an unprecedented year of transformation to the educational landscape, schools are grappling with challenges and learning experiences that never could have been predicted. During times of global uncertainty, the demand for innovative learning and teaching across the globe must be stepped up and at the forefront of educational endeavors. The challenges and formidable impact of the global COVID-19 pandemic have stretched educational systems throughout the world to reassess their goals as students and educators are asked to teach and learn from home while distancing themselves from others. The opportunity to address the myriad challenges that we are faced with and provide a quality education for all students incorporating technology and innovative strategies for online learning in order to meet the multifaceted needs of our students requires us to revolutionize the learning experience and carefully address the numerous dimensions yielded by these profound changes. This chapter provides an overview of inputs from the field in the United States and a discussion of alternatives found globally. It focuses on the strategies and resources to reinvigorate education acknowledging that online learning is tantamount to helping our students learn. Interviews with educators, students and parents are presented to offer insight from various perspectives. Examples of research-based strategies are provided to strengthen lesson design, pedagogical input, and expand the knowledge of creative resources. By engaging students in innovative ways, educators are able to incorporate essential content and learning is achieved. Creative examples are provided focusing on:

- 1) Connecting with all students
- 2) Addressing the challenges of remote learning
- 3) Information Communication Technology (ICT) and web-based resources
- 4) Ways to keep students motivated and challenged to high ideals

As we commit to continuous improvement and redesign our lessons to meet the current needs of students, the opportunity is afforded to increase learning. This does not mean that students must feel isolated as if they are working in silos, and we can strengthen the curriculum by designing lessons that connect students online through discussions and group activities. The concern that many of us must address relates to the students and schools that do not have the technology required to serve students. Some students lack the resources to purchase the technology necessary for online learning. By engaging a community of learners in online teaching and learning that integrates content and language learning, students will be

motivated to continue their learning in an online format as they deal with the challenges of a global pandemic.

Review of the Literature

The uncertainty of a global pandemic that is constantly changing as we look for hope and answers impacts every citizen of our world. We are increasingly aware that education is at a critical juncture and vital for workforce development and economic prosperity (West, 2013). The COVID-19 numbers are skyrocketing and it is estimated that over 300 million students worldwide are experiencing an education disrupted by this pandemic (Pearson, 2020). In China, 260 million children began taking their classes online after the Lunar New Year 2020 and this type of disruption bridging geographic teaching quality and wealth disparities has an impact that schools and universities will grapple with for a considerable period of time (Yu, 2020). Online teaching experts offer advice on designing support for students and point out resources to assist in the transition to remote teaching (McMurtrie, 2020). We must embrace new insights and take advantage of educational approaches offered in the online setting when schools close and face-to-face instruction is no longer an option so that students can explore and expand their acquisition of knowledge as we move courses online. According to Darby, the design and sequence of content and learning activities in both realms should be methodical, systematic and purposeful (Darby, 2020). Innovative ICT curriculum takes on numerous dimensions with the ability to revolutionize the learning experience, captivate and empower learners and challenge them to excel. COVID-19 has created a digital divide that has left millions at a disadvantage and the internet is assuming a critical role in communicating with our students (Porumbescu, G. 2020).

Particular concern has been expressed for English Language Learners (ELLs) who are faced with the challenges of learning English and simultaneously shifting to online instruction. Not only do these students, but also their parents, need clear and specific guidelines regarding the information and opportunities to strengthen their English skills and fully participate in the educational experience. Often translation of written communication in a variety of languages is needed to guide students in accessing technology and participate in remote learning. There are systems in place that are designed to assist non-English speaking parents that will remain active when schools reopen (Zalaznick, M. (2020).

In the case of schools in Finland, many students in Finnish comprehensive schools have returned to their classrooms after a 3-week remote learning period that started on March 8, 2021. In contrast to March, 2020, when all schools were forced to transition to remote learning with just a few days' notice, in 2021, remote learning applied only to the students in the upper grades of comprehensive schools in 7th to 9th grades (Hatch, 2021). *Raisa Ahtiainen reports on a comprehensive research partnership in Finland between the Centre for Educational Assessment at the University of Helsinki and the Research Group for Education, Assessment, and Learning and the Research Group on Children's and Adolescents' Health Promotion at Tampere University. The members of this partnership have been documenting how teaching has been organized during the school closures in order to provide an overview of the situation for the Finnish Ministry of Education and Culture. (Ahtiainen, 2021). Their study aims to support the development of the practices of education organizers and schools. The data that they are gathering includes surveys with five different groups comprised of students, guardians, teachers, principals and school welfare group members that yielded almost 100,000 respondents. Additional data is being gathered by these researchers to follow up on education and the pandemic in Finland.*

Students in China were significantly impacted by COVID-19 and 270 million students in mainland China were unable to start their spring semester (February – August 2020) on campus as planned. In late January 2020, mainland China postponed all educational activities and the Chinese Ministry of Education (MoE) urged schools and higher education institutions to use online delivery as an alternative to face-to-face teaching. Of significance, this marks the first time online delivery has been permitted on such a great scale as part of formal education delivery in China (Chinese Ministry of Education, 2020). In China, plans were immediately made to transition students to virtual education. The MoE, together with the Ministry of Industry and Information Technology (MIIT), launched an online portal on the 17th February 2020 for primary and secondary school students in China. The platform provides digital materials for schools to conduct teaching online and is capable of supporting 50 million students using it simultaneously (Chinese Ministry of Education, 2020).

According to *EdTrends*, a recent report released regarding education in the state of Idaho, USA, the high school graduating class of 2020 was less prepared for the workforce than graduates from the previous year. Achievement tests were cancelled due to the pandemic. Average scores on the Scholastic Aptitude Test national college entrance exam declined for

the third year in a row. Only 38 percent of Idaho's 2020 high school graduates continued their education in the fall, a seven percent decline in the "Go-On-Rate" (EdTrends, 2021).

The list of U.S. colleges and universities requiring students to receive a COVID-19 vaccine before arriving on campus next fall is growing. Most of the institutions that have announced the new mandate are private and there are procedures in place to opt out of the requirement for medical or religious reasons. Options exist such as taking online courses for those students who do not choose to comply. Other universities, public and private, are waiting to determine the legality of such a mandate (Dennon, 2021). Over half of college-aged Americans were willing to get vaccinated against COVID-19 according to a December survey. A more recent sample poll of prospective college students found that 85% would attend a college that required the vaccine. Still, younger Americans, as well as Black Americans, are the least likely to want to be inoculated, raising questions about access and campus diversity (Dennon, 2021).

Methodology

For the purpose of gaining insight into the COVID-19 pandemic and the necessary transition to online learning, a case in field study was conducted. This research methodology is commonly used in social sciences and education. Case in field studies are based on an investigation of a single individual, group or event to explore the causes of underlying principles. A case study is a descriptive and exploratory analysis of a person, group or event. The important dimension of naturalistic and qualitative methodologies is that they are useful in their own right or as adjuncts to more traditional quantitative alternatives (Issac and Michael, 1995). Case in field research is bounded by the current literature referenced above.

Print literature and serious empirical or longitudinal studies lag behind the current online material because there is not adequate time for them to be conducted and evaluated, therefore less formal research such as case and field or action research is necessary to gain information on a current topic. Often cases in field studies have become the dominant research methodology in education research due to their broad spectrum of interest. In this case, experimental or quasi experimental research design does not work well due to the difficulty of obtaining data and measurements at this point. It is crucial to be cautious of material found online because there are cases where it is paid to be published and may not be accurate.

Discussion of Inputs from the Field

Dedicated educators are committed to reaching out and making connections with all students. Fortunately, during this technological age, we have the ability to incorporate a variety of online tools and strategies to continue providing a quality educational experience for students and to pursue best practices in the virtual environment. There are numerous learning experiences, resources and strategies for education that can occur remotely. This will require innovation and resourcefulness on behalf of all of those who are challenged with providing, supporting and receiving an education in the home environment. Educators at the university level are employing a variety of online strategies and tools i.e., Blackboard Collaborate and Canvas to provide a virtual classroom environment that will challenge students and offer opportunities for group activities and discussion. They follow up with announcements and email to strengthen course learning activities and assignments. For example, university biology professors utilize textbooks that include online versions such as *Mastering Biology*, a teaching and learning platform that empowers them to reach students virtually (M. Caspary, personal communication, May 5, 2020). In Georgia, by spring of 2021, universities have transitioned to hybrid and asynchronous learning, but professors are expected to be in the classroom to meet face-to-face on a part time basis. Lectures can be recorded and shared with students who are unable to attend in person for various reasons, yet some independent learners suffer because they need additional support to achieve.

At the high school or secondary level, various models exist from virtual and independent learning to face-to-face fulltime classroom learning. For example, a 16 year-old public high school sophomore chose to engage in fully online learning. He is a strong independent learner with an outstanding set of teachers and is enrolled in college preparatory coursework. On the other hand, some of the students who chose to work fully online aren't showing up for class, are not logging in, and are missing a year of school because they are not taking the virtual learning seriously. Students at the high school level described the challenges of virtual learning in a variety of ways. The school year ended early for these students and, because some students chose not to do their work online, grades were calculated based on the scores earned prior to school closures. One exception to this is the Advanced Placement Government class where the teacher has gone out of her way to ensure that students are well-prepared to take the high-stake exam that accompanies the course. The format has changed to open book essay questions since students must take the exam from home. The teacher has

provided notes and comprehensive information for students to learn and access during the exam including test preparation materials, court cases to learn, vocabulary, and government amendments to study. (E. Poucher, personal communication, May 5, 2020).

His cousin, who is also 16 years old, is a junior in high school is in a different school district and attends school in person full time. Students in this high school utilized “Its Learning” which has prepared a starter kit to support schools and teachers to transition smoothly to remote learning. These solutions have been compiled from best practices from schools that have already implemented online learning. (A. S. Caspary, personal communication, May 11, 2021). This student indicated that not much has changed significantly and he prefers to be at school with his friends and engaged in hands on learning activities that he could not accomplish online such as agriculture, shop classes and engineering. However there are limited after school activities or sports, and contact tracing methods are in place for any students exposed to COVID-19. Both of the students interviewed explained that they are also meeting the challenges of remote learning by taking Driver’s Education courses online and practicing driving with their parents. The concept of learning to drive online is a frightening thought.

The younger brother is a very precocious fifth grader who recently turned 11 years old and was anxious to be interviewed. During the height of the COVID-19 epidemic, he was in a fully online setting. His mother is a teacher and he had a classroom set up in his bedroom including a desk, computer and materials for learning. While he liked “the advantages of remaining in his own home, sleeping in and cooking his own lunch,” the academic advantages were missing. He indicated that the quality of his education was inferior to the traditional classroom setting. Often students can’t hear the teacher on their home microphone. In person, the masks muffle everyone’s voice. When asked if he was being challenged, he stated that it depended on the subject. He was definitely not being challenged in mathematics because the teacher was addressing easy topics and there were no lessons for gifted or advanced students. The same situation existed in social studies and science where websites were being used for coursework, and while virtual school may be easier or more efficient, he regretted not having more advanced and engaging coursework that required critical thinking. His father indicated that he is not receiving enough school work or rigorous learning activities and would be much better off if he was in school on a full time basis. He also needs exercise and is sitting around the house all day either at the computer or in front of a

television because his movement is restricted during the pandemic. (E. Caspary, personal communication, March, 2021).

Private School Arrangements

While the public schools often have protocols required by state and government entities, private schools have the autonomy to function as their constituents and leaders feel is in the best interest of the students. At a Catholic parochial school in New Mexico, students were released and classes were held virtually for a short period of time in the spring of 2020. However, classes resumed for the 2021 school year with significant restrictions regarding social distancing and seating arrangements that included shields and face masks. They were expected to wear masks at all times and were restricted to their own group of classmates on the playground without interacting with other students. Parents were provided with a questionnaire to provide input and vote on procedures for students to return to school on a fulltime basis. Additional requirements were mandated for students to be dropped off and picked up at school. Parents were not allowed to leave until their child's temperature had been taken and any symptoms or health concerns were immediately addressed. Overall, parents and students interviewed agreed that they were receiving a quality education under the circumstances. (H. Whitehorn, personal communication, March, 2021.)

At Athens Academy in Georgia, students remained in school fulltime as long as there were no COVID cases or exposures that required quarantine. During an interview with a seventh grade (age 12) student attending this private academy, she stated that the lessons were well-organized focusing on specific class meetings daily accompanied by homework assignments, video calls, group work and discussions. Teachers posted assignments in Google Classroom, a free service for schools, students and parents. The seventh grade student at Athens Academy felt that the quality of education was excellent and had not been dramatically impacted by COVID-19 and her parents agreed. She was surprised that sports hadn't been cancelled and indicated that they did not wear masks during activities but were required to stay farther apart when practicing for the soccer team. She is already expected to begin college preparation work and focus on research projects and vocational plans. Chromebook powered by Google was utilized and links to various web sites, videos and follow up questions were the expectation (S. Poucher, personal communication, May 10, 2021). Students in the private academy still had meeting times arranged for art and music. A favorite

is the TEDEd project – TED’s education initiative – makes short video lessons worth sharing, aimed at educators and students. Within TEDEd’s growing library of lessons, are carefully curated educational videos, many of which are collaborations between educators and animators nominated through the TEDEd platform (TEDEd, 2020). Throughout the series of interviews with educators and students, it became evident that the students at the private academy were expected to do far more comprehensive work than those students in the public-school setting.

The Challenges and Opportunities for Educators

The immediate demand for blended learning across the curriculum connects online and face-to-face classroom experiences, balances digital currency and fast forwards education. Incorporation of technology in various forms is at the forefront of best practices for 21st century learning coupled with accurate assessment that carefully measures student growth and achievement, yet there are definite constraints to these goals. In public schools in the United States, educators were often expected to move their entire curriculum to an online platform in two weeks. After almost a full year of virtual coursework, teachers in Clarke County, Georgia, and surrounding counties are moving back to in person classrooms and look forward to meeting their students face-to-face. (A. Caspary, personal communication, May11, 2021). Unfortunately, all students are not returning to school and some have left the area or are no longer attending school. Class sizes are small and virtual classes are still offered to families who are not comfortable with the physical school setting. Teachers who choose not to return to the school site, but stay at home and teach may do so, but receive a reduced salary. Parents have also been pushed to the edge and are tired of working at home or may be experiencing financial stress, and have become less responsive to the requests from the school and the technology needs of young children. Often young children are left alone at home in the care of older siblings. Some parents have formed pods within their neighborhoods, creating study groups and switching houses periodically to give parents a break and provide socialization among students. Teachers are making every effort to reach out to students and engage them in the classrooms as well as the online setting. COVID-19 is reshaping the education industry and examples of virtual teaching include the Zoom video communication platform used with students to support extended school closures. This enables them to meet virtually and keep up, particularly with reading and mathematics programs. Another program called i-Ready, an online assessment and instruction program, is utilized

that helps teachers provide all students a path to proficiency and growth in reading and mathematics (i-Ready Family Center, 2020). This program is available in both English and Spanish to assist young learners. Teachers are also incorporating Google Meet to collaborate and reach students to share and read aloud. There is a concern for those students who may not have the online resources and capability to participate. In Clarke County, Georgia, these concerns are addressed by ensuring that students have access to internet providers and free hotspots to connect. The school website is active and distance learning links are available. To further address access issues, paper packets were designed for students and placed in bins so that they could be picked up by parents without exposure and within the confines of social distancing regulations. Furthermore, meal services continued and opportunities were made available for disadvantaged students to access the breakfast and lunch service that the schools were providing. (A. Pierson, personal communication, May 6, 2020). Tremendous challenges exist with the younger students who may have roadblocks to completing their work and submitting it. They have difficulty participating online, and socialization and interaction are significant parts of early childhood education. Too much screen time leads to restlessness and frustration.

Disadvantaged students living in poverty are at an increased risk and often do not have the means to access the digital resources that other students take for granted. To be effective, educators have a responsibility to explore and incorporate digital tools in ICT yet the COVID 19 pandemic caught many well-intentioned educators off guard with little time for planning and development of online curriculum materials. As unprecedented experiences abound in the realm of online education, many teachers are unprepared to transition their classes to meet with the expectations of the digital age.

At Boise State University, procedures are in place and assistance is provided by the Division of Extended Studies to assist professors to leverage their expertise and transition their courses to an online format. In this way they can expand their boundaries and ensure that students are connected to the university and their academic endeavors. The university “Help Desk” is available to professors and students who need assistance or guidance tackling the challenges of online learning. Depending on the grade and ability level, numerous web-based resources are contributing to the remote educational experiences that are facing us during this pandemic. The most common platforms that were mentioned were Google Meet, Zoom, Canvas and Blackboard.

Dedicated educators are sincerely making every effort to engage and challenge their students. They genuinely want to stay connected being available and responsive to the needs of their students encouraging and supporting them as education is making a rapid transformation to never imagined lengths. Student learning at home within the confines of social distancing is a new experience for all of us and the COVID-19 pandemic has sent us reeling to be connected, flexible and collaborative in the face of adversity.

In an interview with a student in the fourth grade (age 10), he explained that his teacher made an effort to call on the phone and email him personally. She sent links to engaging material and games such as the Wizard Prodigy math game. He explained that websites allow you to see your score and his teacher lets him know his progress. However, a concern is that the work being assigned is too easy and the advanced students are not receiving the extra work that they prefer. Only English Language Arts (ELA) and mathematics are being covered online and other courses are not addressed (E. Caspary, personal communication, May 5, 2020).

Discussion of Alternatives Found in Other Countries

In Finland and Denmark, the central government together with the Parliament determined the timing and procedures for reopening schools. Municipal councils developed plans with input from school leaders and teachers in order to achieve a quality education for all students. Finland Minister of Education Li Andersson preferred not to extend the school closures unless the government could prove that opening schools would be unavoidable in the current situation (Vegas, 2020).

In Denmark, secondary students spent much of the term learning remotely, and end-of-year assessments were suspended for the school year. The main reason provided for suspending these assessments was to avoid increasing inequality between those students (many of whom are immigrants) who have not been able to receive help from school or at home (Vegas, 2020).

School leaders are recognized for their ability to showcase expanded and creative technology building momentum to support educators who recognize that the power of technology implementation goes beyond use to enhance instruction and holds the potential to change

education. Educational technology significantly contributes to accessible education and the opportunity to design support for students. Ning and Corcoran researched education in China and found that when China's Ministry of Education (MoE) issued school closure policies for the entire country in January 2020 affecting China's 278 million students across primary and postsecondary grades, the government immediately employed virtual school opportunities and strengthened the two existing virtual platforms.

Empower Learning was built by the government in collaboration with China's largest education technology companies and offered digital K-12 curriculum. This platform provides live streaming courses that students can tap into from their phone or computer at home. The MoE also created its own site: Educloud. This site features videos, teaching plans and communities of outstanding teachers' lessons recorded over the past eight years (Ning and Corcoran, 2020). China also cancelled end of year exams due to the constraints of COVID-19. However, some Chinese students are objecting to the reliance of online platforms as a substitute for more concrete learning experiences.

In India, the plan to return students to physical classrooms has suffered a major setback during April and May 2021. Meanwhile, according to the *India News Agency*, the government of India and educational institutions want to facilitate a return to offline pedagogy and formulate a roadmap to transition back to school-based learning. There is a tremendous digital divide focusing on equitable access, between rich and poor and rural and urban students. This disparity is growing as India grapples with a second wave of COVID-19 and educators seek prospective solutions for a return to physical classrooms (*India News Agency*, 2021).

Experienced educators in Hong Kong and Italy who faced the challenges of this epidemic before it strongly impacted the United States suggested that reduced assignments were beneficial and urged everyone to be flexible and optimistic (Merrill, 2020). As the challenges continue to mount, expert educators across the globe are rising to the occasion by employing innovative strategies expanded to connect their students as they make a concerted effort to provide quality activities, resources and educational experiences designed to positively impact students. Emerging technologies offer the promise of integrating new approaches into the education environment to stimulate learning. Recent developments are increasing the demand and opportunity to employ new strategies rooted in an online platform. While this

modality of connection with students offers immeasurable value, it also presents new challenges for more hands-on, active learning.

Results and Discussion

The impact of COVID-19 has yielded profound changes, including substantive advances in global communication and ultra-high-speed information access and retrieval in classrooms. The immediate demand for blended learning across the curriculum connects online and face-to-face classroom experiences, balances digital currency and fast forwards education. Content area instruction, particularly in science, technology, engineering and math (STEM) fields, that incorporates a variety of platforms clearly sets the stage for successful growth. The unforeseen impact of the COVID-19 pandemic on classrooms has resulted in a rapid transformation into innovative virtual learning environments that are connected, flexible, and collaborative. However, diverse student backgrounds and preparedness are significant considerations as we articulate the objectives and outcomes of online education.

For the past 15 months, U.S. K-12 educators have been faced with one of the biggest challenges in many years. The COVID-19 pandemic has exposed many of the flaws in the K-12 system at every level. These flaws are largely centered in the administrative and delivery aspects of the system. University professor Clifton Wickstrom points out administrative issues that have become very pronounced. One of the most significant is maintaining accurate attendance records. With many, if not most students learning online, the ability to establish and record accurate “seat time” has become a struggle for administrators. Even when students return to regular attendance, flawed record systems are frequently not capturing attendance accurately (C. Wickstrom, personal communication, May 10, 2021).

A recent TV broadcast in Texas (KXAN-TV, Austin, May 3, 2021) commented on a parent’s struggle to get her son’s middle school attendance record corrected. The record noted 49 absences from class, for a student who was brought to school by the parent every day. The administrator’s explanation was that mask wearing was making an accurate count difficult, and some teachers were simply not taking the time to record who was in class. While this may not seem to be a big thing, in Texas daily attendance has a direct impact on State school

fund subventions, which have major impact for local administrators (C. Wickstrom, personal communication, May 10, 2021).

Yet another issue is one of assuring that online students actually attend classes as scheduled. A recent NBC Nightly News segment (May 4, 2021) commented on the struggle that an inner-city secondary English teacher had in maintaining contact with her students. She discovered that many of her students were unwilling to participate in Zoom class sessions because of reluctance to disclose their living conditions to classmates online. Teachers who have had to engage inner-city youth in the traditional classroom know how critical image is to adolescents, both boys and girls. This is but one example of the social impediments that have stood in the way of the effective use of technology to deal with the impacts of COVID-19 pandemic actions on delivery of K-12 content to students.

Conclusion

Education has experienced nonstop, rapidly deployed strategies and methodologies focused on the COVID-19 events of the moment. There has been a significant proliferation of virtual activities in response to the impact of COVID-19. The use of educational technology has been and continues to be at the forefront of best practices as educators strive to build a culture that fosters innovation and revolutionizes the classroom experience.

Emerging technologies offer the promise of integrating new approaches into the education environment to stimulate learning. Educators are hopeful that by engaging a community of learners in online teaching and learning that integrates content and substance, students will be motivated to continue their learning in an online format as they deal with the challenges of this global pandemic. New developments are increasing the demand and opportunity to employ innovative strategies rooted in an online platform. These applications and technologies are essential for our evolving education systems, yet there are crucial aspects that are missing and need to be included to bring us together. Although virtual learning and ICT have become the foundation of success for learning, and incorporation of technology and a strong commitment to sustainable strategies is a goal positively impacting students and educators, it is crucial to ask further questions regarding the impact of ICT globally that hold a number of opportunities for specific and practical academic pursuits.

This chapter follows up on the crucial questions that relate to the impact of COVID-19 on virtual educational activities globally and provides a preliminary round of discussion for subsequent expansive international, empirical research. This initial investigation provides a framework for further rigorous research and adds inspiration to the quest for success in the online learning environment. Knowledgeable educators capable of integrating complex roles and dispositions in the service of diverse communities of learners are tantamount to the success of students. These reflective practitioners are instrumental in transforming the classroom in complex settings and boosting learning outcomes. Viable solutions to contemporary education in the face of the numerous challenges that the COVID-19 pandemic has presented will depend on the concerted efforts of educators worldwide whose primary concern is the wellbeing of students and society.

Recommendations

The impact of COVID-19 has yielded profound changes, including substantive advances in global communication and ultra-high speed information access and retrieval in classrooms. There are numerous impacts for further investigation that could be recommended; access to adequate instructional technology capability in the home, training of K-12 teachers to use instructional technology to deliver content in accordance with curriculum, classroom and school district infrastructure to provide online content effectively, socialization of the students in K-12 to see instructional technology as more than a social media tool, and more. Education researchers will likely focus on many topics in the future just addressing the impacts of the pandemic on standardized testing in its various venues, for example.

The most obvious research topic would be variance in standardized testing results among in classroom and online taught students. Another might be analysis of the variance among online students' standardized results. There are many other opportunities for investigation that will spring to mind from the education research community. The fast-changing educational environment of the COVID-19 global pandemic is an unprecedented experience for educators and students. As we face the numerous dimensions of this pandemic and its impact on all levels of education, we must rise to the challenge and incorporate technology in various forms coupled with the human factors that affect student growth and achievement.

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CHAPTER 2: CHALLENGES OF PRIVACY IN E-LEARNING IN THE CONTEXT OF COVID-19

Fernando Almeida , Pedro Carneiro 

Chapter Highlights

- The emergence of the COVID-19 pandemic posed a huge challenge for schools to adapt their teaching practices to distance learning.
- Many of these institutions had no previous experience in this area and had to handle this process abruptly and immediately.
- Protection of privacy is a key area of concern for educational agents, and the success of these new distance learning platforms depends heavily on the confidence of their users.
- In this sense, this chapter aims to explore how migration to an e-learning environment can be carried out without compromising good cybersecurity practices and the data protection principles enshrined in EU GDPR.
- This chapter is relevant from a concurrent perspective by identifying and exploring the greatest security risks and vulnerabilities in the multiple dimensions of teaching and learning using distance learning platforms.
- In the practical dimension, the results of this study can be used by education institutions to better address the privacy challenges posed by this migration.

Introduction

The state of emergency recently imposed in several countries has made the traditional classroom model unfeasible, forcing the various educational agents (e.g., schools, teachers, students, parents) to migrate to distance education through technological resources. E-learning has become part of the daily life of the educational community in an abrupt and unplanned way. Despite the clear advantages associated with the e-learning model, like access to remote information at any time and from anywhere, several challenges have also arisen, particularly in the cybersecurity field (Bandara et al., 2014; Chen & He, 2013; Luminita & Magdalena, 2012). With the massive use of remote means of communication, namely through platforms and applications that provide interaction with video, the protection of personal data emerges as a topic of great relevance. Associated with this, Whitman (2018) refers that cybersecurity has not been seen as a priority topic in the school context and there is no culture of data protection.

Most of the schools that migrated to e-learning during the COVID-19 pandemic did it in an uncontrolled way and without the proper legal framework to protect the privacy of educational agents. Several e-learning platforms have received criticism for allegedly unlawfully collecting personal data from pupils (Dhawan, 2020; Li & Lalani, 2020). The privacy rights of the data subject incorporated in the General Data Protection Regulation (EU GDPR), such as access to personal data, rectification, erasure, portability, and opposition to withdrawing prior consent have been left in the background, given the urgency of finding educational alternatives in the short term (Zwitter & Gstrein, 2020).

We consider that the efforts made by educational institutions to migrate to e-learning are not incompatible with good cybersecurity practices and the principles of personal data privacy enshrined in EU GDPR. In this sense, this study seeks to discuss how these two concepts can be reconciled and intends to identify the main security and privacy risks that are posed. Moreover, it is also the objective of this work to identify good practices and propose measures to mitigate these risks, making the use of e-learning safer for all educational agents. This manuscript is organized as follows: Initially, a theoretical contextualization is performed on the relevance of the privacy theme and the EU GDPR. Also, in the literature review, the importance of information security is explored. After that, the methodology of the study is described, and the results of the study are presented and discussed considering the various

areas of teaching and learning in e-learning environments. Here the authors seek to explore the impact of COVID-19 on the privacy challenges that are posed by the adoption of distance learning platforms, particularly with schools where there are no significant levels of maturity on the adoption of e-learning platforms. Finally, the main conclusions of the study are presented. Also, in this section, the theoretical and practical impacts of this study are addressed, its limitations, and future work topics are suggested.

Literature Review

Privacy and the EU GDPR

The technological development observed in recent years, essentially marked by the evolution of the global digital market, has profoundly changed the way people and organizations communicate with each other and share information. The increase in the volume of information that has come to circulate in networks, together with emerging issues related to security of access, processing and storage of information, has led to a progressive need to reform the regulations applicable to the protection of personal data that culminated in the EU GDPR.

The EU GDPR entered into effect on May 25, 2018 and is applicable in all EU member states and aims primarily to enhance the level of protection of individuals' personal data. Garber (2018) states that EU GDPR has also increased business opportunities in the digital market and reduced the administrative burden currently existing in their respective legal systems, thus strengthening the competitiveness of the European economy. However, there are also several challenges faced by companies in the most diverse sectors of activity (Li et al., 2019; Poritskiy et al., 2019). EU GDPR has substantially changed the way personal data is treated by organizations. Accordingly, and as stated by Nadeau (2020), EU GDPR aimed to provide organizations and individuals with a legislative framework that protects the processing of personal data.

Although the EU GDPR contains many principles, general rules, rights and obligations that were already contained in national personal data protection laws, a number of relevant changes are summarized (De Groot, 2020; Hoofnagle et al., 2019): (i) information to data subjects; (ii) consent of data subjects; (iii) documentation and recording of personal data activities; (iv) subcontracting with knowledge of data owners; (v) data protection from

conception; (vi) notification of security breaches; and (vii) appointment of a data protection officer (DPO).

The concept of personal data protection, which until recently was not considered imperative by organizations, has become a primary issue. Lord (2020) points out that a DPO is fundamental in this process of implementing the GDPR. The DPO takes on the role of receiving requests from data subjects about the misuse of data, providing clarification on the processing of personal data, and guiding employees on legal ways of manipulating data from third parties (Lord, 2020). The protection of personal data, whether in its physical or digital dimension, will unequivocally require organizations to reinforce protection measures. This is an effort that will be put to organizations regardless of their size in monitoring and controlling the flows of personal data. Likewise, teaching institutions need to be prepared for this challenge, so it is essential to guide students, parents, teachers, and educational managers in the process of learning good digital security practices, ensuring safer and more effective interactions with students through e-learning platforms. Furthermore, the current COVID-19 pandemic enhances the risks of cybersecurity in schools. During the initial phase of the period of confinement and social isolation, we noticed that many educational institutions suddenly migrated their classes to the digital form. Barth (2020) notes that this situation can generate a great opportunity for cybercriminals to invade networks and systems through data theft, putting at risk not only the management of institutions but also the lives of people.

Information Security and Cybersecurity

Several scientific studies show that the performance and competitive advantages of organizations are increasingly linked to intangible elements like the wealth of information, and the development and sharing of knowledge (Abili et al., 2011; Al Kashari & Al Taheri, 2019; Yoon et al., 2019). Currently, information is one of the most precious assets for organizations. Also, in the education field, knowledge is fundamental both in the perspective of the offer and in its management. The pedagogical quality is addressed in several studies such as Dakowska (2017) and Mykhailyshyn et al. (2018) and is understood as a differentiating factor in attracting students on a global scale. Furthermore, Almeida & Amaral (2019) state that knowledge management is also fundamental for generating competitive advantages for educational institutions, namely through the development of maturity programs in the area of innovation and entrepreneurship. Therefore, in multiple domains,

society has become increasingly dependent on information and communication technologies and information management, both in physical and virtual environments. In this sense, and as Mukherjee (2019) states, the high dependence on technologies and information systems, information security is positioned as a key element in the agenda of information systems managers.

In general, security seeks to guarantee protection against adversities, whether they occur intentionally or not. Shedden et al. (2016) expand this vision by stating that information security establishes that the focus of this protection is on the information and its most critical elements that use and store that information. The Information Systems Audit and Control Associations (ISACA) establishes that information security should include three dimensions (Brotby, 2008): (i) confidentiality to preserve access and disclosure authorization restrictions, including means to protect the privacy and confidential information; (ii) integrity to avoid the modification or destruction of information ensuring that these acts are only performed by authorized persons to guarantee the authenticity of the information; and (iii) availability to ensure that access and use of information must be timely and reliable.

According to Hanus & Wu (2016), Chief Information Officers (CIOs) are essential to ensure that the information systems are always available and guarantee the integrity and confidentiality of the information they collect, process, store, and distribute. This means that if CIOs do not have a set of practices and rules in the use of information systems and technologies, they run the risk of generating incoherent information and out of step with reality. This situation may consequently lead to incorrect decision making. Furthermore, users also assume a key role. Spears & Barki (2010) advocate that users should be made aware of security issues, namely the negative effects that a security breach or failure may cause. Therefore, it is necessary to promote within the organization a culture of security and ensure that good practices are a natural component of user behavior.

The progressive and exponential growth of the Internet, which at the geographical level, both in the number of users and services made available, has launched several challenges and has encouraged the emergence of a wide range of threats in cyberspace. Organizations operate with a large volume of data, which previously did not exist or were not obtained and stored. To accentuate this situation, Maple (2017) refers to the great ease of communication between devices that greatly increases the volume of transactions and the risk of fraud.

Cybersecurity covers everything to protect organizations and individuals from intentional attacks, violations and incidents, and their consequences. Brooks et al. (2018) state that the main focus of cybersecurity is on advanced persistent threats and their impact on organizations and individuals. Ditsik (2019) complements this view by arguing that cybersecurity should be aligned with all other aspects of information security in the context of the organization, including governance and process management. In this sense, the general concept of security is systemic and not linear, considering that being secure is a transitory state that requires maintenance and continuous improvement to meet the needs and requirements of organizations and their external players.

Security Management

Information security is a complex, dynamic, and a multifaceted area whose effective management is essential for any organization wishing to survive in the information age. Zwolski (2012) argues that security problems must be solved with a holistic approach that combines technological and economic factors with legal and political factors. Several other authors refer that information security includes organizational, legal, and technological aspects (Cram et al., 2017; Nagaraja, 2018).

The first and most important step for an institution to be prepared for attacks on the security of its information, whether they originate internally or externally, is to develop a set of information security policies. For Niemimaa & Niemimaa (2017), the effective implementation of security controls in an organization depends on the creation and dissemination of a set of good practices and behaviors that are perceived and adopted by all its employees. Organizations, besides defining the information security procedures to adopt, must also motivate their users to apply them, showing them through simulations that their actions can cause vulnerabilities in the organization and, consequently, attacks on their information systems (Choi et al., 2018; Ismail, 2017).

The appearance of incidents is inevitable and, consequently, it is fundamental that organizations are properly prepared to minimize damages that may occur, preventing and reducing their impacts. Generally, when it is suspected or confirmed that an information asset has had its integrity, confidentiality or availability compromised, we have an information security incident. Security incidents such as the denial of service, unauthorized access, loss or

theft of data, receipt of malicious codes, and social engineering can easily be identified (Humayun et al., 2020; Jang-Jaccard, 2014; Woldemichael, 2020).

For an institution to minimize the impacts caused by information security incidents, it is important to have a structured process in place. For this purpose, and as Alkalbani (2017) advocates, the procedures involved in the notification, registration, monitoring and resolution of incidents, as well as those responsible for these procedures, are described in a document formed approved by top management. The plan should define the prioritization of actions in case of an incident, which varies greatly according to the type of business of the organization. However, as Alqahtani (2017) argues, the important aspect is that the order of execution of these actions is adjusted to a problem resolution that is more efficient and occurs in the shortest time possible. Finally, Sabillon et al. (2017) recommend that the information security incident management plan defines the audit controls, used both in incident investigation and in determining the causes.

Methodology

This study performs a qualitative exploratory study that intends to explore the main security and privacy risks that are placed on the various levels of the teaching-learning process in e-learning considering the context of COVID-19. According to Yin (2015), qualitative research is carried out when the objective of the study is to understand the causes of certain behaviors. Moreover, this approach is appropriate for problems of high complexity and in which the context in which it occurs is of great importance to understand the phenomenon (Queirós et al., 2017). Finally, the qualitative exploration of this phenomenon also allows us to identify a set of good practices and measures to mitigate the previously identified security risks. With this, it is intended to highlight the practical contributions of this study for educational institutions.

One of the key factors in conducting this study was the identification of the security and privacy challenges posed in each e-learning level that were potentiated with the emergence of COVID-19. For this purpose, it was sought through the analysis of several research studies to identify the various security challenges as presented in Table 1. A wide range of security risks related to the authentication process, availability, privilege settings, reliability, scalability, among others. Also, there are risks related to improper access or loss of personal

data related to learning and evaluation processes. Finally, the security management policy is a central element that schools must implement.

Table 1. Privacy and Security Risks in e-Learning

Process	Challenge	Authors
Authentication	Unauthorized access	Adetoba et al. (2016) Luminita & Magdalena (2012) Serb et al. (2013)
	Steal user's credentials	Dai et al. (2016) Luminita & Magdalena (2012)
	Sharing access credentials	Salimovna et al. (2019)
Availability	Denial of Service (DoS/DDoS) attacks	Ali & Zafar (2017) Mahjabin et al. (2017) Serb et al. (2013) Adetoba et al. (2016)
	Technical hardware and software failures	Shersad & Salam (2020)
Collaboration data	Data loss	Chen & He (2013)
	Unreliable transmission	Rana et al. (2014)
	Cyberbullying	König et al. (2020) Myers & Cowie (2019)
Course data	Access control mechanisms	Chen & He (2013)
	Data manipulation	Bandara et al. (2014)
	API integrity	Durairaj & Manimaran (2015)
Learning contents	Intellectual property	Bandara et al. (2014) Mehrpuoyan & Razavi (2014)
	Unauthorized disclosure	Saleh & Wahid (2015)
	Unauthorized distribution	Salimovna et al. (2019) Shersad & Salam (2020)
Learning evaluation	Attacks to storage media	Chen & He (2013)
	Data manipulation	Chen & He (2013)
	Identity theft	Ahmad & Elhossiny (2012) Chen & He (2013)

	Academic fraud	Malesky et al. (2016) Perry (2010) Shersad & Salam (2020)
Legislation and regulation	Lack of available information	Almaiah et al. (2020) Mehrpouyan & Razavi (2014)
	Lack of standards	Esfijani (2018)
	Discontinued data	Islam et al. (2015)
Personal data	Access control mechanisms	Bandara et al. (2014) Chen & He (2013)
	Data loss	Bandara et al. (2014) Chen & He (2013)
	Tracking process	May & George (2011)
Policies	Access mechanisms	Shersad & Salam (2020)
	Phishing risks	Ahmad & Elhossiny (2012) Broadhurst et al. (2018)
	Lack of training	Reyes-Chua et al. (2020) Shersad & Salam (2020)
Privilege settings	Incorrect privilege settings	Luminita & Magdalena (2012)
	Improper access	Luminita & Magdalena (2012)
Reliability	Human errors	Bandara et al. (2014)
	Instability and complexity of software components	Luminita & Magdalena (2012)
	Inappropriate maintenance	Nawaz & Khan (2012) Sharma & Karforma (2012)
Scalability	Low performance	Wang et al. (2020)
	Service interruption	Dai et al. (2016) Shersad & Salam (2020)
	Integration issues	Pierazzi et al. (2017) Rana et al. (2014)

Analysis and Discussion of Results

The results obtained allow us to discuss the aspects most analyzed in this study on which we will address those related to the area of authentication, availability, cyberbullying,

inconsistency and redundancy of information, risks associated with content and evaluation in the teaching-learning process, impact of legislation, privileges, among others. Ensuring adequate privacy and security in the e-learning process in the context of COVID-19 is a very demanding challenge.

Authentication is a key area in accessing a distance learning platform. Unauthorized access is one of the most obvious risks if there is no authentication mechanism associated with each student and teacher. As Jagadamba et al. (2020) point out, security in terms of verifying the genuine user and continuous proctoring in e-learning platforms are a big challenge. The theft of access credentials is another risk that arises and that may be the responsibility of the user or the teaching institution. The sharing of access credentials should not be allowed. Therefore, users should not share passwords, links or other data and information with third parties. It is also recommended to adopt a policy of using different passwords for different applications and to change these passwords periodically (Ventrella, 2020; Yildirim & Mackie, 2019). These practices are now gaining more preponderance in the face of the massification of online education.

For authentication to be possible, the availability of the systems must be ensured. These systems may be the target of Denial of Service (DoS) or Distributed Denial of Service (DDoS) attacks. The purpose of this type of attacks is to overload the server where the distance learning platform is hosted so that the resources of that machine are unavailable to its users (Mahjabin et al., 2017). Another risk that makes the availability of the systems impossible is a failure of both hardware and software. This may occur because the school servers may not be prepared for a traffic overload in such a short period.

Distance learning tools encourage data sharing and communication among stakeholders. The loss of this information can occur intentionally or unintentionally. Cyberbullying is another concern that has become more notorious and has reached worrying levels in this new educational paradigm. According to Grigg (2010), cyberbullying consists of using technology to harass, threaten or humiliate students, teachers or strangers, repeatedly and intentionally. This type of attack can happen anywhere and at any time systematically. Preliminary data from Portugal (Pimenta, 2020) and India (Jain et al., 2020) reveal a very significant increase in the number of victims of cyberbullying through insults, intimate photo sharing, and suicide incitements. New cases arose with the abusive use of screen captures in synchronous sessions

in classes taught in remote environments. As Sheikh et al. (2020) point out, there is also a state of depression present in young teachers who are giving lectures online because of this pandemic situation.

Before the migration process to distance learning, the information relating to each course was essentially centralized on the intranet and institutional website. With the pandemic, it became necessary also to replicate this information for the e-learning platform. This process may suffer from problems of inconsistency and redundancy of information. To minimize these problems, the existence of an Application Programming Interface (API) is important as mentioned in Durairaj & Manimaran (2015). With this, it is intended that the process of synchronization of this information be automated. There are security risks related to the API integrity to ensure that this synchronism occurs without failure.

The learning process is the one that suffers the greatest number of risks when we consider the dimensions of contents and evaluation. In terms of contents, intellectual property is a central element in this process, namely when there are risks inherent to sharing classes in public access channels. This sharing can occur voluntarily by the teachers or involuntarily by the students. A recommendation at this level is the inclusion of watermarking of lecture notes (Shersad & Salam, 2020). In the evaluation process, there are risks related to the alteration of stored data and identity theft. This last challenge is also related to academic fraud processes, namely by performing tests by people outside the institution or sharing information between students through alternative channels. For example, at this level, students can use their smartphones or other devices to access the Internet in tests without consultation or exchange information among themselves. The use of examination software and lockdown browsers are two ways to mitigate these risks (Shersad & Salam, 2020).

Current legislation focuses excessively on the dichotomy between face-to-face and distance learning. However, the pandemic has caused a migration from face-to-face education to the distance model without an adequacy of the legislation. The recommendations issued by governments were contradictory and constantly updated, making it extremely difficult to define a coherent and stable policy in this area. The absence of standards on this migration process was a great difficulty that schools had to deal with.

The definition of privileges in the system access was also an area where challenges emerged.

The most obvious risks in this field are improper access and incorrect privilege settings. The management of users' personal data on these platforms is also another area where risks associated with the definition of information access mechanisms and data loss arise. The risk of data stored on each student is used to generate automatic profiles containing information on intellectual skills and health data. The management of personal data is a very important element in this whole process. Therefore, all persons who have access to personal data in the exercise of their duties are bound to secrecy about them, as well as to comply with all the rules of the GDPR in place in the educational establishment, especially those concerning the processing and protection of such data. The protection obligations must ensure that data is stored in protected equipment and is not stored in unprotected files.

A central element in the migration to distance learning is the existence of a security and data protection policy. This policy must comply with GDPR rules and implement phishing risk control and mitigation practices. Stakeholder training in this area is essential if personal data management rules and best practices are to be widely known and adopted by the community as highlighted by Reyes-Chua et al. (2020). The tools used to access these platforms are also of decisive importance. Ideally, the school should provide teachers with the necessary equipment for distance learning. However, given the limited budgets in the education sector, it will be difficult not to authorize the use of personal equipment in these accesses. In this case, the teacher should create a different profile on his computer to separate personal files from school files. Furthermore, this approach will mitigate the effects of several family members sharing the same computer (Britnell, 2020). Equally important is that secure access and transmission protocols based on virtual private networks (VPNs) are implemented and multi-factor authentication mechanisms are implemented (Heitz et al., 2020). Distance learning platforms also have some security vulnerabilities that have been addressed by the companies owning these platforms over the past months. However, this does not detract from the fact that specific security measures are proposed for the use of these platforms (e.g. Moodle, Microsoft Teams, Zoom, Google Classroom). A good practice implemented in several educational institutions is to prohibit the recording of conversations, images or sound from teaching sessions promoted by educational institutions. It should also be avoided the capture of images or video of family environment or sounds from other actors than the users of the platform.

Robustness is an essential element in the implementation of distance learning and has an

impact on users' perception of security in the system. At this level, challenges arise from human errors, the integration of software using different technologies and in constant evolution, and the inexistence or inappropriate maintenance practices. Scalability is another relevant element since distance learning platforms were only prepared to deal with a small number of users. The migration to these platforms brought new risks such as low performance, service disruption, and integration issues.

Conclusion

Many schools are still adapting to the new reality of teaching from a distance as a measure to contain the spread of the pandemic. Abruptly, the face-to-face classes have needed to be replaced for distance learning and the challenges of this temporary transition are immense. Educational institutions have several gaps related to the lack of information technology structures and resistance to the use of virtual tools for teaching both teachers and students. One of the reasons for this resistance is the fears associated with the protection of personal data. Indeed, this transition to digital media has been made in many cases without due care for security and privacy standards. However, security is essential to gain users' confidence in this distance learning environment since any risk can have negative effects on the perception of educational agents regarding the reliability of the system.

This study revealed that a key point in this process is the existence of a culture of data protection by educational institutions. Accordingly, privacy policies and codes of conduct should be developed that comply with the GDPR and should be accessible and known by all stakeholders (e.g., teachers, students, parents). These documents should contain the identification of the data controller, the type of information he or she collects and stores, the condition of lawfulness for such processing, and the rights of the data subjects (e.g., rectification, erasure, portability, opposition). Furthermore, practices should be implemented to mitigate security risks in a wide range of areas such as authentication, collaboration data, learning contents, learning evaluation, robustness, or scalability.

This study offers both theoretical and practical contributions. From a conceptual perspective, it is possible to identify a set of security challenges that have been enhanced by the emergence of the pandemic and migration to large-scale distance learning. In total 35 security challenges were identified distributed over 12 processes related to teaching and learning

processes supported on e-learning platforms. In the practical dimension, this study is relevant for schools to be able to identify security risks and establish a policy for the secure management of information and personal data that enables them to maintain their activities and reduce the risks of non-compliance with the GDPR and possible internal and external attacks that could lead to data breaches. It is also important to highlight that this study has some limitations. Firstly, this study does not seek to make a comparative analysis of the relevance of these risks. Likewise, mitigation measures must be specific to each educational establishment and their generalization to different cultural contexts becomes complicated. Finally, and as future work, it is suggested that an empirical study be carried out to highlight and explore security and privacy risks considering several educational institutions with different profiles (e.g., several levels of education, adoption by underdeveloped communities, both public and private).

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SECTION II: EDUCATIONAL ISSUES

CHAPTER 3: UBIQUITOUS LEARNING IN THE COVID-19 PANDEMIC

Ömer Bilen 

Chapter Highlights

- As the COVID-19 epidemic started and accelerated its spread, a panic started in all areas of human life and as a result, daily life could not continue at its normal pace and some restrictions were encountered. In this epidemic, which spreads from person to person, face-to-face education has been suspended almost all over the world, as education activities are carried out face-to-face by nature. Previously considered mostly within the scope of adult education, “ubiquitous learning” suddenly spread to all levels of education.
- In this section, ubiquitous learning has been examined in terms of its background, concepts, definitions and usage patterns.
- In this section, the importance of structuring Learning Management Systems, which is one of the vital elements for Ubiquitous learning, is emphasized.
- It is considered that Ubiquitous learning will be a more prominent type of learning both during the COVID-19 epidemic and in the post-epidemic period.
- It is thought that the information provided in this section will be useful for all partners in education/training levels.

Introduction

Human beings have been going through tough tests since the day they existed. One of these exams is the globally effective epidemic diseases. The most known of these diseases called pandemic (an epidemic disease affecting wide geography) are the plague, Spanish flu and COVID-19. Considering some of the major epidemics caused by epidemic diseases historically; the plague (black death) epidemic that was effective in 1347-1351 (it is noted that this epidemic destroyed approximately 30% to 50% of the European population), the Spanish flu, which was effective between 1918 and 1920 (it is estimated that it caused the deaths of approximately 50 million people) and the COVID-19 epidemic, which started in Wuhan, China in December 2019 and spread around the world and still sustains while the study was being prepared, has caused the death of more than 1.5 million people and continues to be the last active disease in the history of epidemics (Üstün & Özçiftçi, 2020).

Since the COVID-19 pandemic was transmitted by respiration, its spread was very rapid, and with the panic, it caused in the beginning, it brought life to a halt, changed the harmony and flow of life, interrupted all processes that need to be done together, such as production, distribution, education, transportation (Zhao, 2020). Since life continues by nature, all countries have started to find ways to develop solutions suitable for the new situation. In this context, the primary thing to do is to find solutions that can prevent the spread of the pandemic. Practices have been introduced, such as people's running their jobs from home, flexible working, and rearrangement of working hours. Besides, measures such as partial or full-time curfews, quarantine processes for sick or contacts, self-isolation of individuals and preserving physical distance between individuals, which are some of the most effective measures to prevent the spread of the epidemic, have been implemented all over the world. In line with these precautions, places where human-to-human contact could be possible, including all schools and universities, were closed in the first place (Bozkurt & Sharma, 2020; Gupta & Goplani, 2020). As a result of the closure of education/training institutions (Yucesoy-Ozkan, Rock, Gulboy, Altun, & Öncül, 2020), the education of approximately 1.6 billion students in the world and 25 million students in Turkey was interrupted (UNESCO, 2020). In today's world, where the production, distribution and accessibility of knowledge are very important, in the current technological conditions, the solution to the interruption of education/training for a long time, has soon been revealed and started to be implemented. To compensate for education interrupted by the pandemic and to eliminate uncertainties

regarding education/training during the pandemic, almost all countries have been put to work to solve education problems with distance education (in the form of e-learning) (Bozkurt, 2020).

With the emergence of computer networks, e-learning; and with the emergence of mobile devices and wireless communication technology, the concept of m-learning has entered the field of education (Liu & Hwang, 2010). Besides all these, with the development of mobile technologies, wireless communication and sensor technologies, the concept of ubiquitous learning has emerged. Due to the pandemic, students can follow their classes online or offline from their homes during this period. Today, with the development of computer and internet technologies and using them in the field of education, the widespread use of mobile devices, students have become flexible in their dependence on the device, place and time for learning.

Ubiquitous Learning

Aristotle, one of the greatest philosophers in the history of philosophy, begins his famous book *Metaphysics* with the phrase "All people naturally want to know" (Aristoteles, 2010). It is known that in the modern period, human beings potentially have many abilities. Among these abilities, knowing, learning and curiosity emerge during the development of human being and begins to gain direction with the influence of the environment. We derive our learning from the world of sensations. Aristotle uses the expression "who loses a sense loses a world" while talking about the importance of the senses in the same book. While saying that the senses are an important aid in understanding the universe and what is happening, he emphasizes the importance of the senses in learning by saying "science is based on the senses but senses are not science", not forgetting that the senses can be misleading from time to time.

Learning is a lifelong process defined as permanent changes in behavior as a result of an individual's life (Senemoğlu, 2005). Whether the learning is associated with structured, semi-structured or unstructured environments, in short, it can occur in all environments, in this aspect it is mostly separated from education and training which related to structured environments (Toprak & Erdoğan, 2012). As a social being, a human can realize learning anytime and anywhere by his/her nature. However, based on the fact that we live in a universe surrounded by technology today, learning has also gone beyond its classical

meaning. Improving network infrastructures, widening the coverage areas, spreading internet services to wide geographical areas, the use of mobile devices and the widespread use of sensor technologies have led to the emergence of the concept of “Ubiquitous learning”, a new learning approach. The change caused by technological advances in learning tendencies is shown in Figure 1.

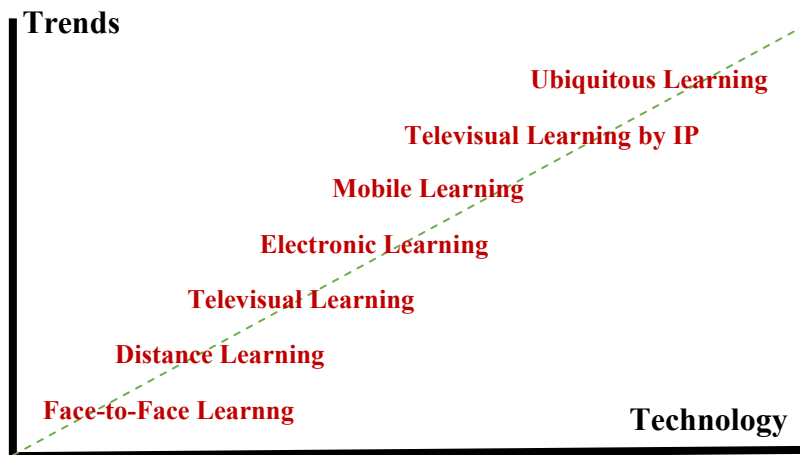


Figure 1. Technology and Learning Tendencies (Özarlan, 2010)

As can be seen in Figure 1, advances in technology have become one of the most important helpers of educators in learning environments and have played a role that increases options in learning tendencies. Before the Covid19 epidemic, all of the learners at all levels of education were performing their learning in certain physical places depending on the place and time. With the Covid-19 epidemic, education has been started to be carried out by all parties (teaching-learning) from homes or study rooms. In this case, it can be mentioned that the learning (which its calculation will arise as a result of other studies) has a decreasing effect on the parties. As it is known, expenditure items such as the construction of new classrooms, equipping these classrooms with new generation learning tools, heating/cooling, personnel expenses, maintenance and repairs put is educational environments under serious pressure on costs. In the current situation, a digital infrastructure system for learning has been established, tested and the necessary updates are made to eliminate the deficiencies. It is considered that the rapid changes in information and communication technologies will significantly reduce the pressures on learning costs in the coming years, and will take learning out of its classical meaning and make learning freer in more independent environments. In this context, it will be possible to talk about the fact that learning will spread everywhere and every time. “Ubiquitous learning” is an important and up-to-date learning type that eliminates the effect

of the “place” component, which has a limiting and determinative effect on learning. Here, the expansion of the boundaries of the word “place” means the expansion of the boundaries of the word “time”. Today, technology advancing rapidly and unpredictably has the power to affect and transform almost all areas of life. One of the environments transformed by technology is educational environment. Learning, which was previously limited to a certain time and place, is now free from these addictions thanks to the developing technology. Rapid changes in technology first led to the transition from traditional learning to e-learning and from e-learning to m-learning paradigms. Today, learning has evolved into u-learning, including e-learning and m-learning, as a result of the widespread use of mobile devices.

Learning environments supported by current technologies offer opportunities for all parties in the education field to provide new learning opportunities, to test new teaching methods and to apply innovative approaches. It is possible to say that the rapid change in information and communication technologies transformed learning. With the widespread use of the Internet, the opportunity to benefit more from computer networks has arisen. This has led to the birth of the e-learning type. Wireless networks, which are limited to use with computers, have been effective in the emergence of a new learning type, mobile learning, with the spread of mobile devices. Ubiquitous learning is a concept based on sensor technologies and also mobile and wireless communication technologies. Besides, it is known that ubiquitous learning is more advanced than e-learning in terms of instant access to information and interactivity (Boyinbode & Akintola, 2009).

The concept of ubiquitous learning is a wider learning type that emerges after the concepts of e-learning and m-learning and includes these two types of learning. The most important feature that makes ubiquitous learning different from other types of learning is that its perceptron technologies create context-awareness (Huang, Chiu, Liu, & Chen). Context-awareness means that learners know the environment and conditions (location, movement, weather, time, etc.) where learning takes place (Shih, Tseng, Yang, Lin, & Liang, 2012). Thus, in ubiquitous learning, learners learn by taking the information from the environment they are in (Shih et al. 2012).

Ubiquitous learning has an important potential in education in terms of its expressed characteristics. Ubiquitous learning has positive effects in terms of various educational variables. This system not only increases academic achievement (Lin & Tsai, 2011) but also

helps the positive progress of learners' motivation and satisfaction (Liaw, 2008; Tseng, Chu, Hwang, & Tsai, 2008; Chu, Hwang, & Tsai, 2010; Hwang, Chu, Lin, & Tsai, 2011). Besides, learners' ability to access information directly from the context positively affects their problem-solving skills (Shih et al., 2012). Hwang et al. (2011) reached the conclusion that students' positive attitudes and perceptions towards the lesson increase in lessons where ubiquitous learning technology is applied. Besides, Chen and Huang (2012) concluded in their research that ubiquitous learning technologies also have a positive effect on learning time.

Ubiquitous learning is based on ubiquitous technology and ubiquitous computers (Weiser, 1991). It enables studying and learning anywhere and anytime (Hwang et al., 2008; Sakamura & Koshizuka, 2005). By using mobile devices, embedded digital and functional objects and perception technologies, it enables the learner to immerse himself in the learning process smoothly (Huang et al., 2008, 2011).

Usage Types of Ubiquitous Learning

E-learning is a concept included in the concept of distance education. Therefore, it will be useful to define the concept of distance education before defining the concept of e-learning. Distance education is an institutional education activity where students, teachers and teaching materials in different locations are brought together through communication technologies (Gülbahar, 2012). The use of computers in education first led to the emergence of computer-aided education/training, and later, with the advances in information and communication technologies, the establishment of internet infrastructure and communication of computers over the network, the use of internet technologies in education, resulted in the e-learning concept, which is the digital version of distance education. E-learning has made a great breakthrough in education with its features such as providing independence from time and place, being economical, allowing each student to learn at their own pace, reducing education costs, and providing the opportunity to repeat as much as desired. With the introduction of the e-learning approach, the boundaries of traditional education have been expanded (Boyinbode & Akintola, 2009).

It is seen that there is more than one definition of e-learning in the literature. Belcher and Vonderhaar (2005) defined e-learning as a dynamic, innovative and rich method that provides

learning opportunities. According to Karim and Hashim (2004), e-learning is a type of learning supported by electronic hardware and software, either synchronously or asynchronously. The difference of e-learning from traditional education is that it offers students the opportunity to realize individual learning by giving more freedom without limitation of time and place -regardless of place. According to Cook, Levinson and Garside (2010) e-learning enable the student to control the learning content, place and time alone. Besides, in cases where there is a distance between teacher and student, e-learning can be performed with the internet, computers, network and multimedia technologies (Luaran, Samsuri, Nadzri, & Rom, 2014). In addition, in the e-learning environment, students can obtain knowledge and skills faster than traditional methods, depending on the situation. Smith (2005) listed other advantages of e-learning as follows:

- Flexibility: It has many flexibilities, especially time and place. It is not limited by a certain place, time and program constraints as in traditional education.
- Accessibility: It has easy and flexible access possibilities. Information is always available when students need to use it.
- Satisfaction: Thanks to its features such as teacher-learner interaction, improving students' computer usage levels, traceability of personal development, providing students with the opportunity to progress at their learning speed, providing ease of use, it creates satisfaction for the parties.
- Low cost: High fixed costs for formal education are not available for e-learning. In e-learning, users only need computers and the internet.

Besides the features listed above, e-learning compared to traditional learning; has many other advantages such as being a modern model, being student-centered, supporting equal opportunities in education, supporting lifelong learning.

Gordon E. Moore (1965) observed that the total number of transistors that could be fitted in an integrated circuit doubles each year, and predicted that this exponential evolution will continue. In fact, by this prediction, Moore meant that computers would increase their information processing capacity. However, the smaller size of integrated circuits also provided an opportunity for the design of mobile devices. As a result of the rapid advances in information and communication technologies and the gradual reduction of the size of integrated circuits, the use of wireless communication devices such as smartphones and tablets has become widespread. As a result, fast and inexpensive models have become

accessible to individuals and mobile devices have started to be adopted and used at large rates in all countries (Wu, Hwang, & Tsai, 2013). The rapid development of mobile technologies, the operation of mobile devices with more powerful functions in even smaller screens/sizes, and the widespread use and popularity made e-learning environments more independent, in short, e-learning gained mobility (Lan & Sie , 2010; Koparan & Yılmaz, 2020). Easy portability and potential communication functions of mobile devices have transformed these devices into more flexible and effective learning tools. With the development of mobile technologies (PDA, mobile phone, tablet, etc.), it is seen that mobile learning has also emerged in education. Thus, interest in e-learning environments has started to shift towards mobile learning (m-learning) environments. M-learning is frequently used as the next step of e-learning, a natural development of e-learning. However, Georgiev (2004) find it more correct to define m-learning as a part of e-learning, its lower level. They stated that m-learning is a new stage in the e-learning process, that is, it remains within the boundaries of e-learning.

When the literature is examined, it is possible to come across many definitions of mobile learning. According to Lan and Sie (2010), mobile learning means that the student can access teaching material using mobile technologies and the internet at any time and place. While Seppala and Alamaki (2003) defined mobile learning as providing educational opportunities to learners outside the classroom without being dependent on the classroom, Trifonova (2003) define mobile learning as all kinds of knowledge, skills, learning and teaching activities performed through mobile devices or mobile environments. Crompton (2017) stated that mobile learning is a type of learning that takes place by using personal electronic devices through social interactions.

This type of learning also removes the geographical barriers between students (Özdamlı & Çavuş, 2011). Because the portable feature of the devices used in mobile learning has enabled the student to have a more flexible structure by offering more place independence than e-learning. Besides, mobile learning has also:

- Independence from a place and time
- Flexibility
- Easy to update
- Easy feedback (Issac & Jacob, 2008) advantages.

When we look at the features and definitions of e-learning and m-learning mentioned above, it is seen that they have similar aspects as well as different aspects. While there is a little more independence from the place in m-learning compared to traditional education, there is more place dependency in e-learning than mobile learning. It is seen that the reason for this is the mobility that mobile devices bring, namely the flexibility feature. One of the most important features of m-learning is the need to access information while on the move. Many studies show that e-learning and m-learning, which include all these features, make various contributions to education.

E-learning with the widespread use of internet technologies; and m-learning with the advent of mobile technologies; unexpected opportunities in education have emerged to implement new learning strategies with the widespread use of sensor technologies as well as developments in wireless communication and mobile technologies (Huang et al., 2011; Chen & Huang, 2012; Shih et al., 2012). The name of this development is u-learning, which the learning behaviors of learners can be discovered and recorded both in the real world and in the digital world through sensor technologies in the learning system device, without place and time dependency (Chu, Hwang, & Tsai, 2009).

Ubiquitous learning means that any person can access information instantly from everywhere, at any time (Jungi, Yumei, & Zhibin, 2010). Also, when the literature is examined, we come across different definitions of ubiquitous learning. Another definition is to be expressed as learning at the right time, in the right place and with the right content (Shih, Kuo, & Liu, 2012).

Ubiquitous learning is a kind of learning based on the concept of "informatics everywhere" introduced by Mark Weiser (1991). Informatics everywhere means that technology is embedded in daily life and that technology works quietly (Ng, Nicholas, Loke, & Torabi, 2010). Computers at bus stops that show the route of the bus, and in how many minutes, at which stop; and sensing technologies that we can access information about objects in museums with our mobile devices, are examples that show that technology is embedded in our daily lives. These technologies, which are also described as invisible technologies, are called ubiquitous learning technologies that work without attracting the attention of learners and disrupting the natural learning environment (Ng et al., 2010). For example, sensor technologies such as RFID tags, GPS, QR code tags, etc. are among the technologies that

enable learning to perform anywhere (Chen & Huang, 2012). In the environment where these technologies exist, the individual can access the information he/she wants to obtain by using mobile devices and internet technology instantly, without disturbing their natural behavior, in short, effortlessly.

Innovations and benefits of ubiquitous learning to the teaching environment; continuity, accessibility, instantness, placement of instructional activities and adaptability (Boyinbode & Akintola, 2009). Boyinbode and Akintola (2009) explain these features of ubiquitous learning as follows:

- Continuity: Continuous recording of all learning processes.
- Accessibility: Learners can access documents, information and videos from everywhere.
- Instantness: Learners can access information instantly and solve problems quickly, regardless of where they are.
- Interaction: Learners can interact with experts, teachers and friends synchronously and asynchronously manner.
- Settlement of Teaching Activities: Learning can be integrated into our daily life. Besides the necessary information, all the problems encountered are presented in their natural and original forms. This feature helps students recognize problem situations.
- Adaptability: It means that learners can access the right information from the right place.

Huang et al. (2011) state that one of the most important characteristics of ubiquitous learning is context-awareness. Context-awareness is expressed as learners' determination of learning conditions (location, movement, weather, time, pH etc.) in the learning environment (Shih et al., 2012). At this point, what is important in ubiquitous learning is that the student realizes the learning about the environment he/she is in (Shih et al, 2012). For example, students can instantly and easily access information about their environment or objects around them thanks to sensor technologies such as RFID, QR codes, GPS.

RFID and QR code sensors are mostly used in small and closed areas, while GPS technology is used to detect students' movements in large and open areas (Hwang, Wu, Tseng, & Huang,

2011). But for indoor and small spaces, the use of QR code technology is supported by all commonly used smartphones or tablets. Besides, QR code reader software can be installed on these devices free of charge (Hwang, Shi, & Chu, 2011). Because of these advantages, QR code sensor technology was used in this research.

Figure 2 summarizes the new trends emerging in education with the development of information technologies. E-learning is a type of learning based on computer and internet technologies. But m-learning is a type of digital learning that emerged based on mobile and wireless communication technologies. ubiquitous learning is a concept based on sensor technologies in addition to mobile and wireless communication technologies.

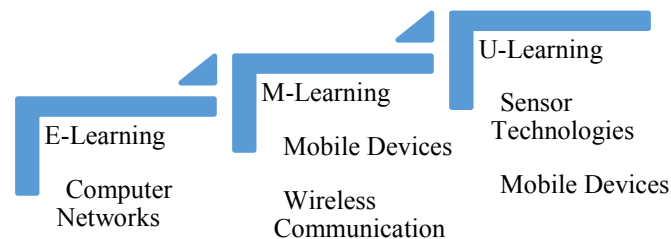


Figure 2. Differences between Types of Digital Learning (Liu & Hwang, 2010)

When we look at Table 1, it is seen that ubiquitous learning and e-learning system have features which differ from each other, not only in terms of technological developments but also in many different aspects. When we look at these differences, it is seen that ubiquitous learning is more advanced than e-learning in terms of features such as instant access to information, access from everywhere, interaction. Also, while students in e-learning systems may lose their knowledge, learners' work is never lost in ubiquitous learning systems.

To better understand U-learning and to see its position among other learning styles more clearly, Hsieh, Chen, and Hong (2007) studied and compared computer-assisted learning, E-learning, M-learning and U-learning in two dimensions according to their level of mobility and embeddedness (Figure 3).

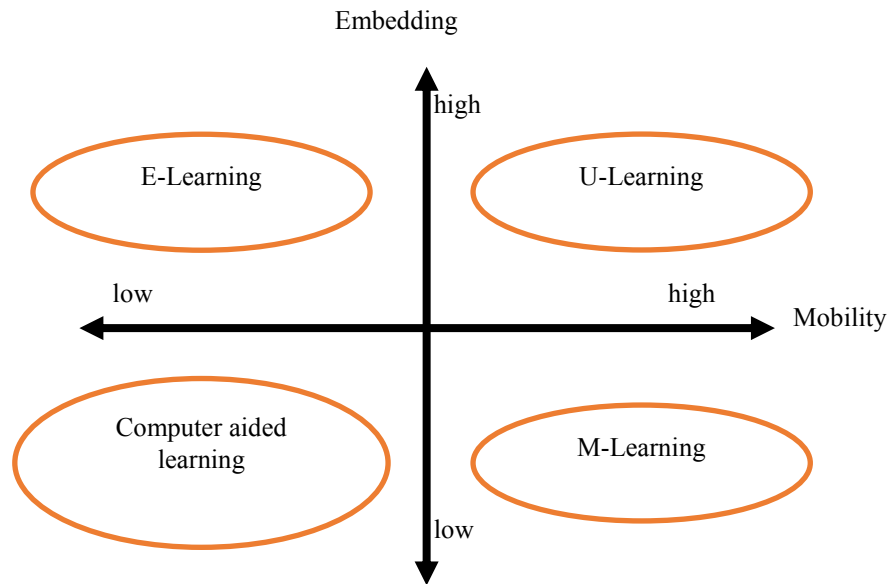


Figure 3. Comparison of Computer-assisted Learning, E-learning, M-learning and U-learning (Ogata and Yano, 2003)

In Figure 3, learning environments are compared in terms of mobility (low-high) and embeddedness (low-high) features. Here mobility; the level of easy transportation, and embeddedness; is a feature that emphasizes the width of the memory and storage spaces used. Accordingly, it is seen that computer-assisted learning is at a low level compared to both features; e-learning is low in mobility, high in embeddedness; m-learning is high in mobility and low in embeddedness. On the other hand, it is seen that u-learning has a high level of mobility in terms of easy transportation, and high embeddedness in terms of storage capacity.

LMS Configuration for Ubiquitous Learning

Ubiquitous learning can be thought of as an expanded form of e-learning in a sense. A u-learning environment can be created by expanding distance education activities with limited applications. In doing so, the features of u-learning can be taken into account. The Learning Management System has been designed as a technical infrastructure for the organization of all kinds of events. Most distance education activities can be added to the system afterward as a module.

One of the main features of ubiquitous learning is meeting the urgent need for learning. To meet the need for immediate answers to students about the topics covered in the course or while doing homework, education management systems should include search boxes where relevant keywords can be searched. Thanks to these search boxes, while searching for a solution to the problem, the student can search among the contents offered during the semester and reach the relevant parts quickly.

The online presentation of course materials, which is a part of distance education, is also one of the main functions of u-learning. Here, the content presentation modules of the Learning Management System can be easily used for this purpose. Apart from text, since the content is a video and interactive materials that will increase meaningful learning, should be given importance in the diversity of content presentation. Guidance services on how to use these contents or how students can benefit from these contents on their own should also be provided through the Learning Management System.

Another feature of ubiquitous learning is communication and interaction. Besides the interaction with the contents in the learning process, effective communication with the course instructors and other students is one of the main objectives of u-learning. This interaction can be done using the Learning Management System's modules. Among these modules, messaging and forum activities are already widely used in distance education applications.

To increase diversity within the scope of U-learning, by adding the feature of connecting to external communication tools (integration) to the Learning Management System, students can also communicate among themselves and with the course instructor via tools such as e-mail, MSN or Skype. By connecting to social media tools commonly used by students other than the Learning Management System, reading or sending messages can be performed through the Learning Management System. Besides interpersonal communication, an example of the interactions with the contents can be the activity of writing your thoughts on the subject as a comment under the content. In this way, the student will both share his/her understanding and learn what others understand. Thanks to the comments made on the content, the students also have the opportunity to receive feedback about their learning.

One of the main features that distinguish ubiquitous learning from distance education is contextual awareness. U-learning environments are defined by contextual awareness based on

students' educational situations or by the capacity to provide an authentic environment for students' relevant information. Contextual awareness is used in the sense that the student can obtain information from the environment he / she is in and receive data from outside through some sensors. Today, these operations can be done much more easily thanks to the technology of some mobile devices such as mobile phones or tablets that everyone has. With RFID and GPS sensors in mobile devices, information easily interacts with transceiver devices identified to the outside world. However, altitude, pressure, temperature, direction etc. sensors found in mobile devices allow the student to obtain information anytime, anywhere. With the sensor reading features to be added to the mobile versions of the Learning Management System, it can be provided that the student obtains information from his/her environment.

An individualized learning environment can be provided to enable students to learn everywhere. For this, a database structure in which personal data is recorded can be designed. Artificial intelligence and data mining methods come into play here. By recording the behaviors of the students on the system, a profile can be made about the individuals and individualized guidance services can be provided to students according to this profile. The lecture screen of the student can be redesigned, taking into account the keywords most searched by students or the content they emphasize the most. Special course screens can be presented to students with dynamic structures where other materials related to this content are brought under the contents.

Designed for ubiquitous learning, Instruction Management Systems offer functions that help students actively control their learning progress on their own. Calendar applications and task lists that students can define and follow their activities are among the modules of the Instruction Management System. Reminding the events as notifications when the time comes will keep the student active on the system. Students will feel the need to interact with online communities related to their field of study to improve themselves. Thanks to forum, blog, news and chat rooms modules to Learning Management System, students can easily make these interactions.

Huang et al. (2011) summarized the features of u-learning, the definitions of these features and sample functions that can be applied to the Learning Management System in Table 1 as follows:

Table 1. Features, Definitions and Functions of U-learning

Features	Definitions	Sample Functions
The urgency of the need to learn	U-environment learning can be used for immediate learning issues.	<ul style="list-style-type: none"> • Keyword searches • Online problem diagnosis
Information initiative	U-learning systems provide information and shorten students' request times.	<ul style="list-style-type: none"> • Material presentations • Education guidance
Interaction of the learning process	Students can communicate effectively with peers, teachers and experts through the interfaces of u-learning systems.	<ul style="list-style-type: none"> • Emails • Using MSN or Skype • Reviews about courses, websites etc.
The situation of the teaching activity	In the U-learning environment, learning processes are included in daily life and information needs are presented in an authentic context.	<ul style="list-style-type: none"> • Connecting to relevant learning materials • Students' feedback on learning materials
Context-awareness	U-learning environments are defined by contextual awareness based on students' situations or by the capacity of an authentic environment to provide students with relevant information.	<ul style="list-style-type: none"> • RFIDs • GPSs • Sensors • Bio-feedback
Provides active customization	U-learning provides personal support to students based on the student's specific context.	<ul style="list-style-type: none"> • Individualized learning database • User guidance
Self-regulated learning,	U-learning systems offer functions that help students actively control their learning progress on their own.	<ul style="list-style-type: none"> • Calendars • Task lists
Learning community	U-learning facilitates online community interactions by providing space experience over the Internet to enrich learning interactions between community members.	<ul style="list-style-type: none"> • Blogs or forums • Messengers • Chat rooms

Adaptive learning	U-learning adjusts to each student's situation to adapt to each student's learning.	<ul style="list-style-type: none">• Recommended system• Agent-based model
Constructivist learning	U-learning activities should be based on students' prior knowledge or experience and further expand the learning of new knowledge.	<ul style="list-style-type: none">• Test System• Diagnostic System

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CHAPTER 4: STUDENTS' PERCEPTION AND MOTIVATION ON E-LEARNING DURING THE COVID-19 PANDEMIC

Zaenal Mustakim , Siti Fatimah , Umi Mahmudah 

Chapter Highlights

- Students faced a radical learning style change due to the spread of the coronavirus disease (COVID-19).
- This study aims to analyze students' perceptions and motivations towards online learning (e-learning) on science materials during the pandemic.
- This study also provides an in-depth explanation of students' perceptions and motivations by using empirical evidence.
- This study is a survey research that involved 265 students in Indonesia.
- This study shows that good interactions between lecturers and students could cause the students to feel comfortable during online learning.
- Well-prepared learning designs should be considered while using e-learning.
- The attitudes of lecturers and students also greatly contribute to the success in the learning process.
- The analysis results reveal that students' perception and motivation towards science through e-learning indicate a high category where their percentages are 74.49% and 84.49%, respectively.
- The regression estimation results provide empirical evidence that there is a positive and statistically significant relationship between students' perception and motivation towards science.

Introduction

E-learning is an online-based learning that is growing rapidly. It provides a convenience in accessing the material of education. In addition, it also saves time and money. Yılmaz İnce et al. (2020) state that students can learn from everywhere and at anytime independently through e-learning. Jethro et al. (2012) state that by implementing a good e-learning design student will be more motivated and involved in the entire learning process. It should be well-prepared and structured in order to conduct the teaching and learning process in a fun and meaningful way for students. Hebebcı et al. (2002) report a positive opinion from teachers and students about learning through e-learning which is carried out in a planned and scheduled manner. Although e-learning is not a new system, it is one of the best solutions to provide a sustainable learning system since the emergence of the coronavirus disease (COVID-19) pandemic (Atabey, 2021; Atilgan & Tukul, 2021; Batmang, Sultan, Azis, & Gunawan, 2021; Kara, 2021; Kibici & Sarıkaya, 2021; Maani, 2020).

However, a sudden change in learning styles from face-to-face to e-learning methods issues a difficulty for students to adapt, especially on the science materials that generally require direct guidance from the lecturer. A radical change could affect students' perceptions and motivations in the learning process. The students who are getting science materials for the first time through a distance system by using e-learning tend to be shocked and have some difficulties to adapt. This study provides an in-depth explanation of students' perceptions and motivations in learning science materials during the spread of this deadly virus.

E-learning systems could be applied properly to all subjects when it has a structured design. It provides many benefits. A study conducted by El-Seoud et al. (2014) states that e-learning was proven to raise a significant effect in the learning process by providing interactive multimedia content. E-learning is more efficient because the students can obtain knowledge, skills, and attitudes faster than through face-to-face learning. Jethro et al. (2012) state that the efficiency referred is closely related to the raising of motivation and better performance. E-learning has a great contribution in developing skills, knowledge, and attitudes quickly therefore students can use the time more effectively and efficiently. This allows the learning science materials which cover four dimensions namely products, processes, attitudes, and technology can be taught through e-learning. However, in order to achieve the good result it needs a good motivation and self-discipline (Cevik & Duman, 2018).

The e-learning on science materials could achieve success depending on several aspects. Student motivation and discipline in understanding concepts and doing practical exercises related to the materials determines the outcome of learning. A good collaboration between educators and students also greatly influences the result of the learning process. In addition, the teaching style and media utilization can raise an impact on the learning process and outcomes. El-Seoud et al. (2014) describe several strategies that can be carried out by the educators based on student learning styles and the achievement of learning objectives. First, providing comprehensive explanations to students about the benefits of the materials to be delivered and add experimental/practical activities that are useful for adding skills. Second, defining the learning objectives to identify performance standards that students must meet. Third, providing the advice and assistance for students in managing time so that each activity can be carried out properly. Fourth, providing exercises for students to build student confidence and motivation. Figure 1 illustrates the stages of e-learning success based on Noesgaard & Ørngreen (2015).

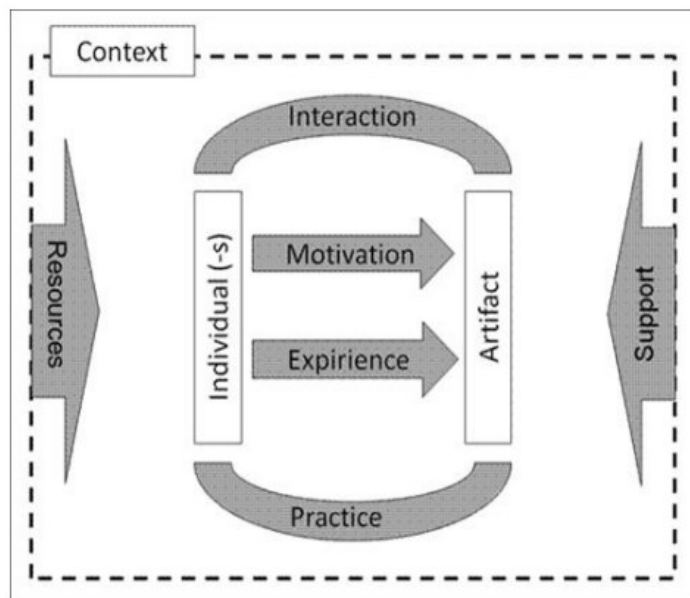


Figure 1. Key Factors Influencing E-learning Effectiveness

Figure 1 illustrates that a supportive learning environment, level of motivation, and user experience (students) have a great impact on e-learning effectiveness. Additionally, a good e-learning design is known to be able to improve the effectiveness of e-learning. This design is required to be able to provide several important things, such as (1) can accommodate the interactions between instructors (teachers) and users (students), (2) shall provide the

opportunities for students to interact among them, and (3) can motivate the students to practice learning material into real situations. All of these things are the objectives of science learning based on the National Research Council (NRC, 1996), which are improving students' scientific literacy, helping students to understand essential science concepts, providing an in-depth understanding of the nature of science, and realizing the relevance of science and technology to real life. Consequently, the important keys to the success of e-learning as shown in Figure 1 need to be emphasized in learning science to get the optimal output.

Based on the explanation above then knowing, understanding, and analyzing students' perceptions of science materials that are presented through e-learning is important. It is well known that perception is closely related to motivation. Perception is the process of absorbing the experience of objects and events, which are usually in the form of messages or information into the human brain to produce a reasoning process (Kurniawan, et al. 2019). Science learning provides various perceptions for students. If students have a good perception of a science lesson then they will tend to be more enthusiastic about taking lessons. Otherwise, if their perception is deficient then students will tend to be reluctant and even lazy to take part during the learning process. Similarly, research by Kurniawan et al. (2019) reveals that positive perceptions raise students' enthusiasm in learning science materials and positively influence their learning outcomes. Ganeb and Montebon (2018) report that perception has a positive influence on academic achievement in learning science, which students' perceptions of science is an important role in their achievement. El-Seoud et al. (2014) also reveals that the success and failure of e-learning depend largely on student motivation. Radovan and Makovec (2015) state that students' perceptions of a positive learning environment also affect students' motivation and learning satisfaction. Zainal et al. (2012) reveals that there is a significant relationship between the students' perception of science and their motivation and skills. Students who have high perceptions also have higher skill levels. Likewise, students who have high motivation produce high skills as well.

Therefore, when using the e-learning system, especially during the COVID-19 pandemic, teachers need to understand how to raise students' perceptions and motivations on science materials. This difficult situation drains the energy and emotions of both educators and students; appropriate teaching and learning design is required to minimize mental disorders and also obtain optimal learning outcomes. Some techniques need to be provided by teachers to stimulate student motivation in using e-learning: (1) keeping in mind that motivation must

be experienced by students themselves, (2) explaining to the students how to use e-learning, (3) creating a learning environment then the students do not feel learning alone, (4) encouraging students to collaborate, (5) helping students to be able to interact with fellow students more effectively, and (6) always interacting with the students, monitor student attendance, and provide ongoing feedback.

Method

This study is a survey research that involved a number of students at three universities in Central Java Province, Indonesia. The survey was conducted from the 10th until the 20th of February 2020 by distributing internet-based questionnaires. As many as 357 students have participated, but 265 students had completed the questionnaires. To produce the analysis results with high accuracy requires valid and relevant data therefore this study uses 265 samples that are selected randomly. The results of the analysis in this study are carried out in two stages; (1) an in-depth elaboration on students' perceptions and motivations by using description analysis and (2) analyzing the relationship between students' perceptions and motivation in learning science materials through e-learning by applying an ordinary least square (OLS) method on the regression model. This method is a popular statistical tool in analyzing relationships between variables because of the simplicity of the analysis.

In order to measure the variable of students' perceptions in science materials by using e-learning, this study adopts an instrument by Kurniawan et al. (2015). The students' perceptions of science can be measured using as many as 25 statement items, where students' scientific perceptions are divided into three parts, namely observation, understanding, and assessment. Meanwhile, in measuring scientific motivation, this study adopts the Students' Motivation towards Science Learning Scale (SMTSL) developed by Tuan et al. (2013). The science motivation instrument consists of 36 statement items, which are divided into six parts, namely self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation.

Results and Discussion

This research examines the description and analysis of students' perceptions and motivations towards the teaching and learning process on science materials using e-learning. Furthermore,

this study also analyzes the relationship between these perceptions and motivations of science materials. Figure 2 shows a description of the characteristics of respondents by gender.

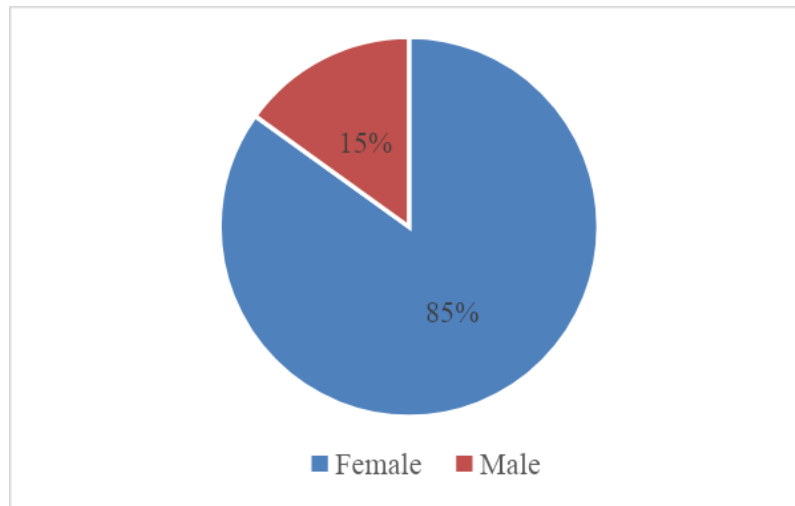


Figure 2. Respondents' Characteristics by Gender

In general, respondents in this study are dominated by female students by 85%, while male respondents are only 15%. Overall, the perception and motivation of students based on e-learning can be seen in Figure 3.

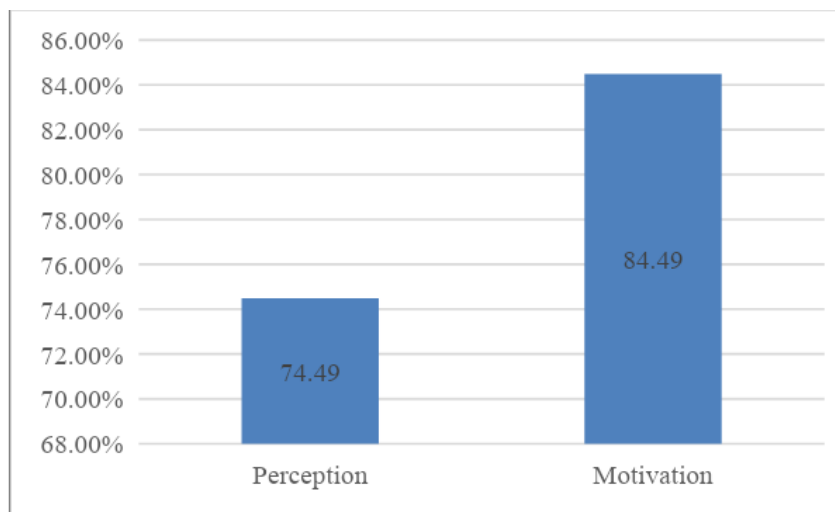


Figure 3. Description of Students' Perceptions and Motivations on Science

Based on Figure 3 it is apparent that students' scientific motivation towards e-learning is better than students' scientific perceptions where its percentages are 84.49% and 74.49%, respectively. However, it is important to note that these numbers also indicate that there is a decrease in students' motivation and perception in dealing with science materials through e-

learning during the COVID-19 pandemic. The highest decrease is in students' perceptions, which are 25.51%. Meanwhile, the level of students' motivation in learning science materials independently decreases by only 15.51%. A more in-depth analysis of the questionnaire reveals that students' perceptions and motivations tend to decrease in science materials while studying at home due to boredom and anxiety. These two factors then cause them to be lazy and reluctant to study regularly. However, students' perceptions and motivations on science materials towards e-learning indicate a good category. Figure 4 shows the general classification of students' perception of science materials.

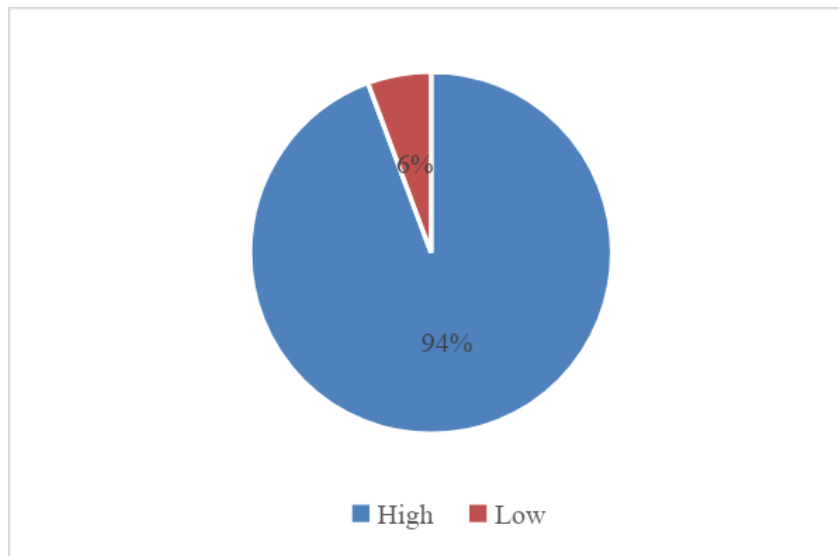


Figure 4. Classification of Students' Perceptions of Science

In Figure 4, it is seen that students' perception of science learning can be said to be in the high category, which is 94%. Whereas, only 6% of students have a low perception of science in e-learning. Table 1 shows that students' motivation in learning science materials through e-learning is high, which is 99.62% while only 0.38% of students have a low motivation for science.

Table 1. Classification of Students' Motivations on Science

Classification	Percentages
High	99.62%
Low	0.38%

Description of Students' Perceptions towards E-Learning Based on Each Indicator

As mentioned earlier, students' perceptions of science materials are divided into three indicators, namely observation, understanding, and assessment. The results of the analysis of each indicator are given in Figure 5.

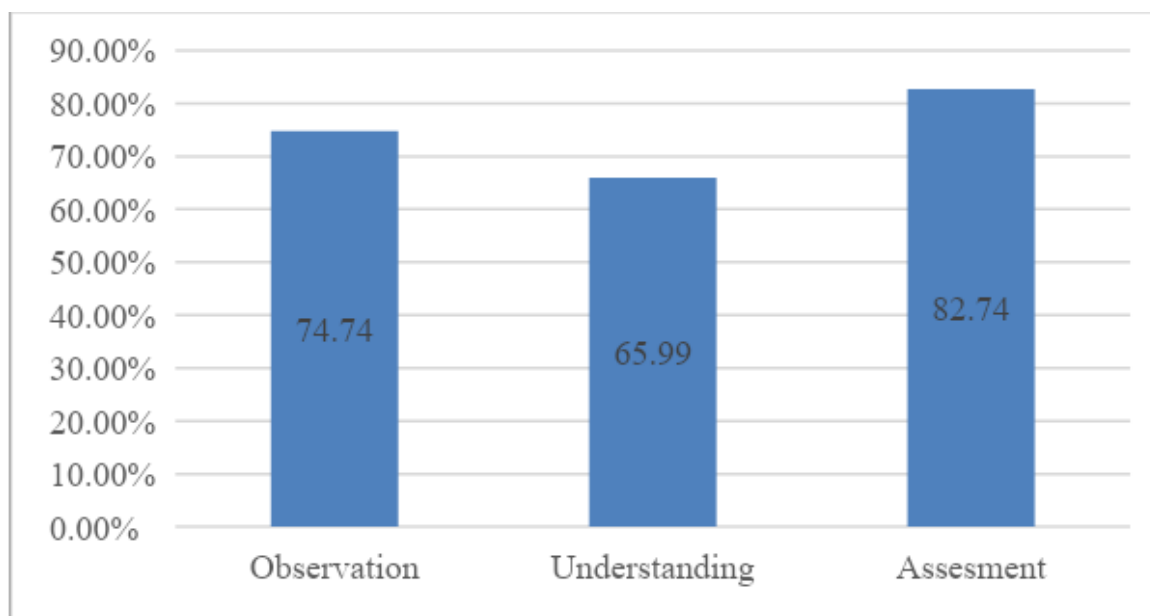


Figure 5. Students' Perceptions of Science by Each Indicator

Figure 5 reveals that students' perceptions of science materials that are carried out by using e-learning in the sub-indicator of the assessment show the highest percentage (82.74%) compared to other sub-indicators. Meanwhile, the sub-indicator of understanding shows the lowest percentage, which is 65.99%. These results indicate that students' perception of science in the sub-indicator of understanding needs to be improved. However, students' perceptions of science materials based on e-learning show a good category generally.

Observation of Discipline of Science Lecturers, Materials, and Media

The results of the analysis of the observational indicators can be seen in Figure 6. The observational indicators are divided into three, namely observations on science lecturers, observations on materials, and observations on science learning media.

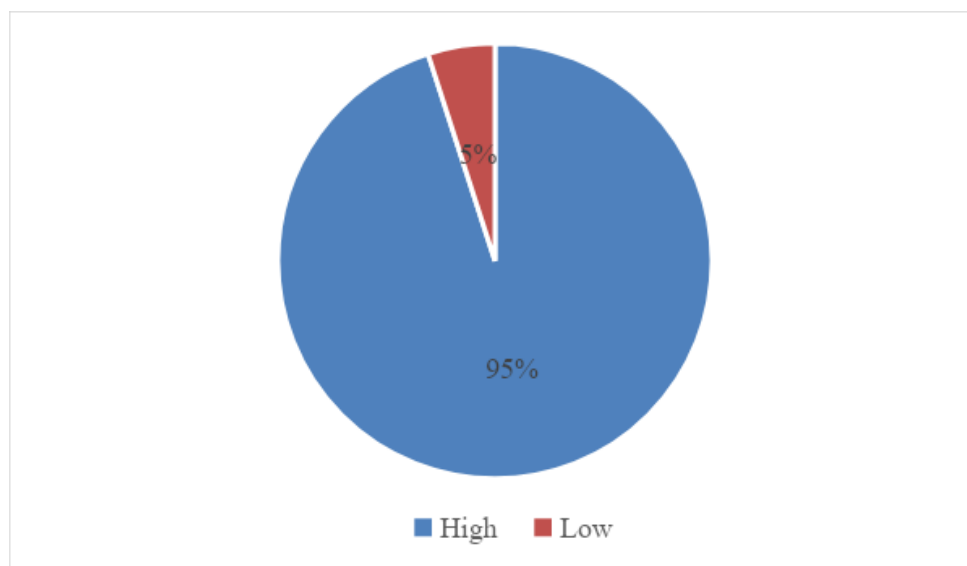


Figure 6. Classification of Observation Indicators

Figure 6 shows that students' scientific perceptions of the three observational indicators can be said to be in the high category at 95%. Based on the results of the questionnaire analysis, half of the respondents (50%) express pleasure in learning science materials by using e-learning. The majority of respondents (83.83%) state that they are happy and enthusiastic to see and observe science learning videos. More than half of the respondents (51.51%) are known to be happy to read and study the science materials that exist in e-learning. Then, the questionnaire analysis also reveals that most respondents (90.22%) state that the lecturers are always disciplined, on time, and always encourages students to actively participate in e-learning classes. Besides, the results also reveal that 76.76% of respondents state that lecturers always provide a reward for students' success. These results indicate that the attitude of the lecturers when delivering and explaining the materials to students affects their psychology in receiving these materials. The lecturers' discipline in preparing well-structured materials and media during the internet-based learning process causes students to have positive emotions so that it is expected to produce good output as well. The discipline of lecturers can also be transmitted to students. Positive emotions are very important for students to be able to absorb various materials during the COVID-19 pandemic.

Understanding How Lecturers Teach, Materials, and Media

A general overview of the analysis results of the understanding indicators can be seen in Figure 7. The understanding indicators are divided into three, namely understanding of how

science lecturers deliver and explain the material to students, understanding of science materials, and understanding of media for learning sciences.

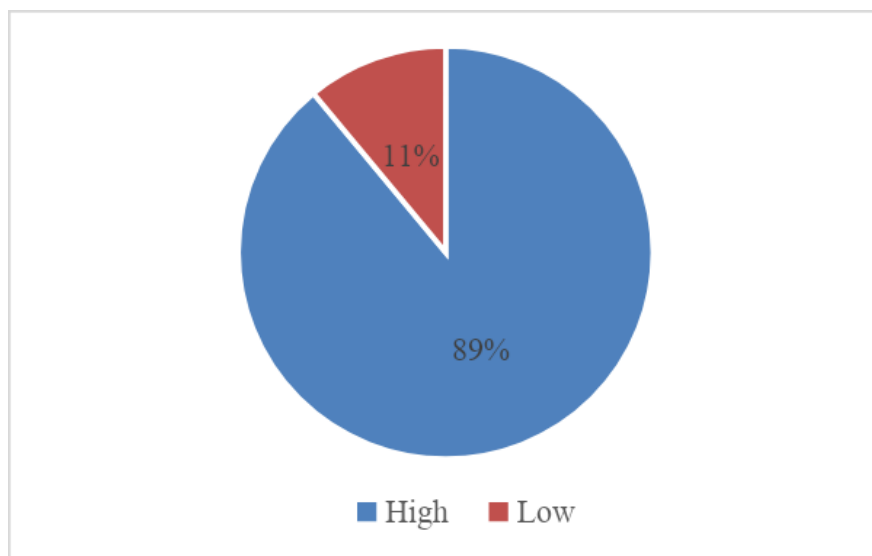


Figure 7. Classification of Understanding Indicators

Figure 7 shows students' perceptions of science materials based on the three categories of understanding indicators are high (89%). A deeper analysis finds that the majority of respondents (89.89%) state that the lecturers always provide the latest information that may help students to increase their understanding. Most respondents (87.87%) also state that lecturers always accompany students when they face difficulties in understanding the materials. Furthermore, 86.86% of respondents state learning science materials through e-learning is important for self-development in the future. Then, the majority of respondents (80.80%) also state that they can understand science materials properly and precisely through e-learning. One important key for students to be able to understand science materials is by increasing interaction between lecturers and students. Besides that, the interaction between students cannot be ignored. This interaction is closely related to discussion and good communication related to the whole learning process. Not only when giving assignments but also when explaining the materials using video.

Then, the discussion between students is not only focused on completing assignments but also on efforts to be able to understand the material properly and quickly. It is important to be informed that students tend to spend more time understanding the science materials when learning independently using e-learning. Therefore, lecturers need to prepare appropriately

related to the way they teach, the media, and the facilities to produce the best learning output. Learning design that is well organized according to the needs of students can facilitate the learning process while providing good results.

Assessing How Lecturers Teach and the Materials, Media, and Facilities

Figure 8 illustrates a general picture of the analysis results of the assessment indicators. Assessment indicators are divided into three, namely assessment of how lecturers teach science materials, assessment of materials, and assessment of media and facilities. Figure 8 shows that students' perceptions of science materials based on assessment indicators are in the high category at 98%. Questionnaire analysis reveals most students (73.73%) understand that e-learning can be used in science learning. Then, 93.93% of respondents state that the e-learning system is very important in science learning during the COVID-19 pandemic. Almost all respondents (96.96%) state that they can complete science assignments on time. An interesting analysis reveals that 71.71% of respondents state they feel challenged by online assignments, which makes them render more effort to be able to complete these assignments. These results indicate that online learning can teach students to be more responsible in completing assignments on time based on the schedule determined by the lecturers. Besides, students' awareness of the importance of e-learning during the COVID-19 pandemic also causes them to provide more effort in learning science materials independently.

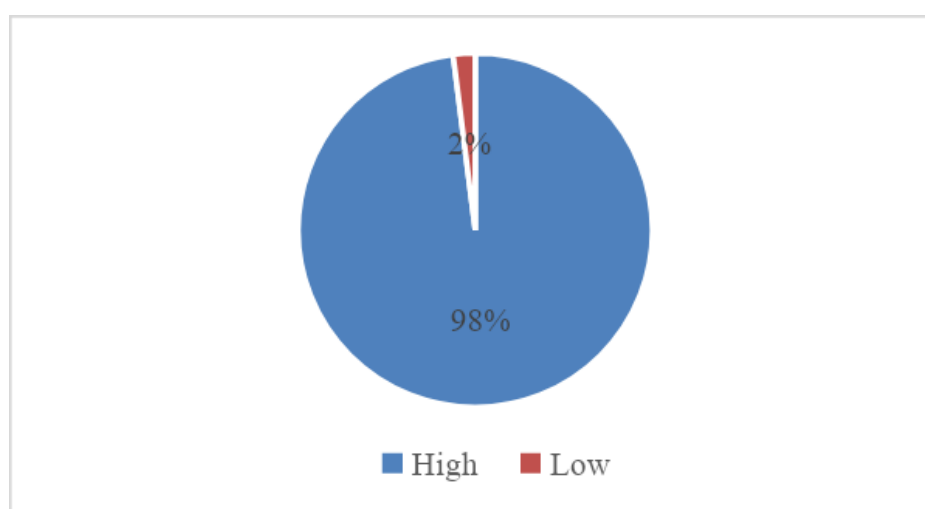


Figure 8. Classification of Assessment Indicators

Additionally, another interesting finding shows that 62.63% of respondents are more confident in learning science materials by using e-learning rather than face-to-face learning. This indicates that e-learning can make students have a higher sense of self-confidence. Based on observations during the learning process, students are more comfortable expressing opinions or ideas if they feel no one is paying attention. Students tend to feel safer when there is no direct interaction with the lecturers. Despite the fact, lecturers always pay attention to all student activities and developments. It is interesting because the ideas and opinions expressed by students are more scientific and more in-depth when using e-learning. These results indicate that the system causes students to be faster and freer in finding sources of information. Thus, they can more easily understand science materials, complete assignments, or do case studies provided by lecturers.

On the other hand, there are some findings which indicate that students feel better in every type of learning method when they see progress, wherein there is an observed increase in satisfaction of 10%. However, it should also be noted that at the beginning of learning, students express their anxiety and difficulties in learning science materials through e-learning. This result is expected and understandable because of the drastic and unprepared changes in learning styles. This result is also consistent with previous research by Unger and Meiran (2020) which reports there is evidence that students experience anxiety during the e-learning process. Similar results are also reported by other studies (see Paudel, 2020; Fatimah & Mahmudah, 2020). Apart from sudden changes in learning styles, this is also because they are not familiar with the new learning system. Another result finds that respondents' happiness when participating in e-learning tends to remain constant at 30%. However, there is a possibility of decreased happiness felt by students, which is usually closely related to the level of material difficulty. There is a negative relationship between the level of difficulty and student happiness. A low level of difficulty makes students happier. Conversely, science materials with a high degree of difficulty can reduce their happiness. Difficulties experienced by students directly affect their happiness in learning science materials and this may also affect the understanding and achievement of learning outcomes. This result is in line with research conducted by Otaghi et al. (2019) that happiness can increase student academic achievement. Students who are happy and have good mental health can improve student achievement and academic performance. Research by Hwang et al. (2019) also states that the happiness level of individuals influences the development of their mindset. Furthermore, Khramtsova et al. (2007) reveal that the level of happiness and satisfaction greatly affects the

mental health level of students. Students with positive mental health tend to produce academic success. These findings indicate the importance of student psychology in learning science materials through e-learning.

Description of Students' Motivations towards E-Learning Based on Each Indicator

As already mentioned, student motivation towards science is divided into six indicators, namely self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation. Figure 9 shows the analysis results of each student motivation indicator. Based on Figure 9, it is very clear that students' motivation for science towards e-learning in the sub-indicator of science learning value shows the highest percentage (95.95%) compared to other sub-indicators. Figure 9 also shows that the sub-indicator of performance goals shows the lowest percentage (64.14%). This result indicates that student motivation on science based on the sub-indicator of performance goals needs to be improved. However, students' motivation for science towards e-learning shows a high category generally.

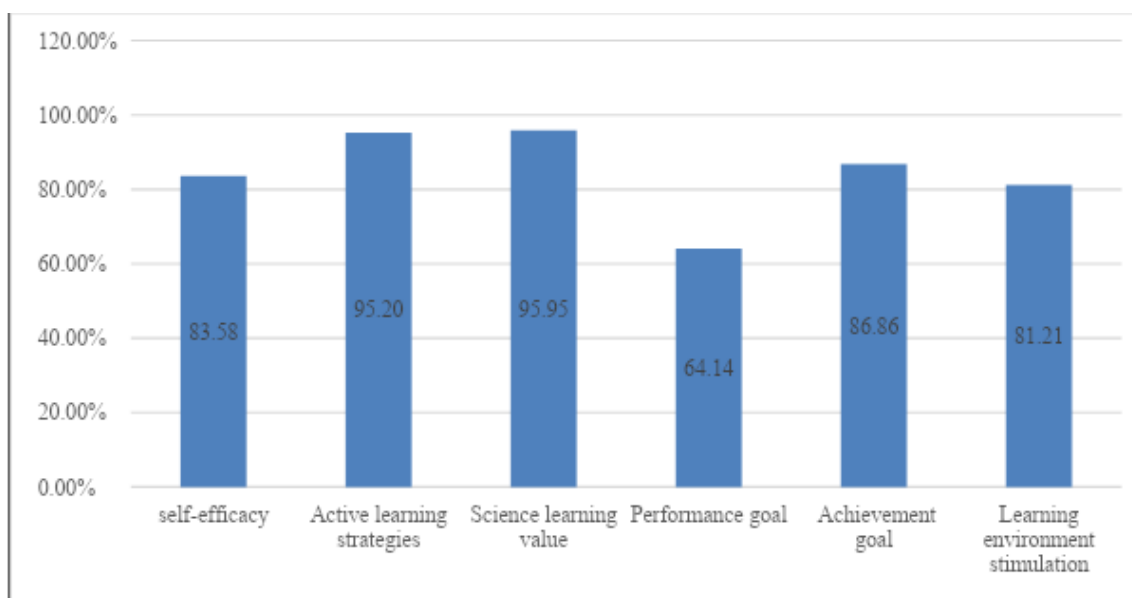


Figure 9. Student Motivation on Science by Each Indicator

In-depth questionnaire analysis finds that respondents have a high level of confidence by 97.97%. They feel confident that they can understand science materials even though these materials are notoriously difficult. Then, the majority of students (94.94%) also believe they can complete the assignments and do the tests properly. These results provide evidence that

e-learning systems create high self-efficacy, which directly influences the science learning process. This is consistent with a study by Ichsan et al. (2020) which states that self-efficacy has a high influence on learning, motivation, and performance. Students who have high self-efficacy always try to learn as much as possible and at the same time they have high confidence to succeed. A good level of confidence simplifies students to make decisions, build relationships, and maintain success. These results also indicate that the e-learning system can be used as a powerful tool to increase student confidence in learning science materials.

Active learning strategies are one indicator of motivation in which students play an active role in building new knowledge based on their previous understanding. The questionnaire analysis shows that the percentage of active learning strategies in science materials through e-learning is very high at 95.20%. Almost all students (97.97%) state that they will try their best to understand new concepts in science materials. Then, as many as 90.90% of respondents state when getting a new concept, they also try to relate it to previous experiences.

The majority of students also have a good attitude, in which as many as 97.97% of respondents state that if they have difficulty understanding the concept, they will ask questions and be willing to discuss with the lecturers or peers. Thus, linking new concepts with previous experiences facilitates students in understanding these concepts. This is also following a study conducted by Shinde (2020) which states that constructivists are building new knowledge based on prior knowledge. This constructivist is also proven to be able to effectively develop students' scientific attitudes, students' thinking, and students' reasoning. There are several ways to build student constructivists, including (1) actively involving students in various activities, (2) establishing a democratic learning environment, and (3) creating interactive activities by using student-centered strategy. Based on observations during e-learning on science materials, students play an active role while lecturers give students the freedom to express their ideas and opinions. These results show the importance of e-learning designs that accommodate students to be able to play an active role during the science learning process so that they do not feel bored and anxious.

Figure 9 shows that science learning value has the highest category than the other sub-indicators. The results of the analysis of the questionnaire reveal that the majority of

respondents (95.95%) state that e-learning on science materials can stimulate students' thinking and develop problem-solving skills. Then, 93.93% of students state that the application of this system in science learning activities can stimulate student curiosity. Besides, as much as 96.96% of students state that lecturers always provide opportunities for students to carry out the process of inquiry in developing science concepts. Although using the e-learning system, lecturers need to provide broad opportunities for students to carry out investigations or make projects independently so that they can build their knowledge. For example, students can create an ideal water rocket design independently, in which a water rocket can produce its maximum launch distance.

The review results from the lecturers can make students feel happy and challenged to make the most ideal water rocket design. This activity provides an opportunity for students to think critically and creatively. Based on Figure 9, the sub-indicator of performance goals is the lowest category. The results of the questionnaire analysis provide a deeper explanation. 28.28% of students state that the activeness they carry out during e-learning is only to get good grades. The majority of students (95.95%) play an active role during the e-learning process on science materials to make them look smart in front of other friends. Furthermore, the results of the analysis also show that the majority of students actively participated in e-learning to get attention from lecturers by 91.91%. These results indicate that students have a high tendency to play an active role in science e-learning to get the attention of both peers and lecturers. Unfortunately, the results of the analysis also show that students have less desire to get good grades. These results provide clear evidence of the need for improvement in developing high competitiveness for students to produce better performance while using e-learning on science materials.

Achievement goals are motivational sub-indicators that indicate the level of student satisfaction on competency achievement. Besides, it is also closely related to increasing student achievement during the process of science learning. Based on the results of the questionnaire analysis, student achievement goals show a high category that is 86.86%. 91.91% of students express satisfaction when they can solve the difficult problems given by the lecturers. 97.97% of students are happy when peers agree with their opinions or ideas. Almost all students express their joy when the lecturers agree with their opinions or ideas. These results indicate that students have high achievement goals. Peer and lecturer recognition influence greatly on their level of satisfaction, which may lead to an increase in

student academic performance. Research by Arifin (2015) states the satisfaction level affects individual performance positively and significantly. Redhana et al. (2019) stated that satisfaction is one of the important factors that must be considered in the learning process. Then, Larance and Eagavalli (2019) also mention that the level of satisfaction and dissatisfaction causes success and failure. The importance of student satisfaction during the e-learning process on science materials, especially during crises, needs to be given the greatest attention from all lecturers. By using a good management system, e-learning becomes more unique, interesting, and fun so that it increases user satisfaction (Lee, 2009). The high level of interaction between lecturers and students or fellow students has a strong effect on student satisfaction.

Learning environment stimulation is one of the sub-indicators of science motivation that emphasizes the stimulation of student learning environments. This includes lecturers' teaching patterns, interactions between lecturers and students or fellow students, and science learning curriculum/material. Based on the results of the questionnaire analysis, 81.21% of respondents have a positive response to this sub-indicator. 92.92% of respondents express their interest to be active during e-learning because of the uniqueness of science materials and they can be viewed from various perspectives. Meanwhile, 89.89% of respondents express their pleasure in learning science because the materials are challenging. Then, 91.91% of students express an interest in science-based e-learning because the lecturers use interesting and innovative methods. Furthermore, 90.90% of respondents express their pleasure in learning sciences because the lecturers direct all students to take an active role. These results indicate the importance of the lecturers' role in providing a pleasant learning environment for students in learning science during the COVID-19 pandemic. Giving the right stimulation can make students feel more comfortable and make them happy, which directly affects their performance.

The Relationship between Students' Perceptions and Motivations on Science through E-Learning

To analyze the relationship between students' perceptions (X) and motivations (Y) in learning science materials amid the COVID-19 pandemic this study uses a regression model. Table 2 shows the SPSS (Statistical Package for the Social Sciences) output illustrating the summary model from the regression analysis.

Table 2. Model Summary

Model	<i>R</i>	<i>R</i> Square	Adjusted <i>R</i> Square	Std. Error of the Estimate
1	0.409	0.167	0.164	2.801

a. Predictors: (Constant), Perception; b. Dependent Variable: Motivation

Table 2 indicates that the independent variable, namely students' perception (*X*) is known to be correlated positively with the dependent variable, which is students' motivation (*Y*). The analysis results provide the correlation coefficient between the observed and the predicted variables is equal to 0.409. Meanwhile, Table 3 shows the results of the analysis of variance (ANOVA) in the estimation of the regression model.

Table 3. ANOVA Results

Model	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>Sig.</i>
1 Regression	414.990	1	414.990	52.891	0.000
Residual	2063.516	263	7.846		
Total	2478.506	264			

a. Predictors: (Constant), Perception; b. Dependent Variable: Motivation

Based on Table 3, it can be seen that the significance value (*p*-value) of the ANOVA test in the estimated regression is 0.000 which is smaller than 0.05. The result indicates that at the 5% significance level, the independent variable (perception) can be trusted and relied upon to predict the dependent variable (motivation). Table 4 shows the regression coefficient of the estimation results.

Table 4. Coefficients

Model		Unstand. Coefficients		Stand. Coefficients	<i>t</i>	<i>Sig.</i>
		<i>B</i>	Std. Error	Beta		
1	(Constant)	23.913	0.911		26.250	0.000
	Perception	0.349	0.048	0.409	7.273	0.000

a. Dependent Variable: Motivation

Based on the results of the regression estimation analysis in Table 4 a simple linear regression model can be built, which is $Y = 23,913 + 0.349X + e$. Figure 10 illustrates the linearity of the independent (X) and the dependent variables (Y).

Normal P-P Plot of Regression Standardized Residual

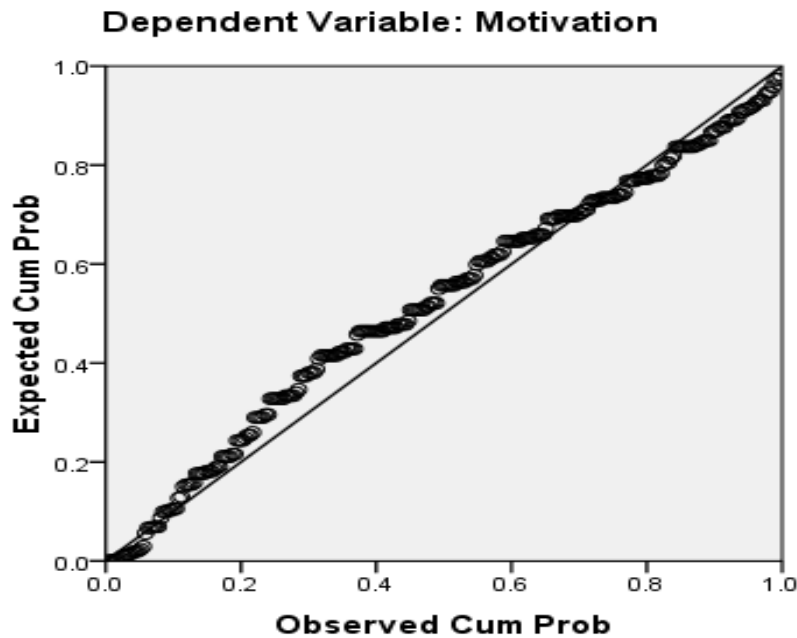


Figure 10. Linear Regression Fitted

Both the formula of model regression and the fitted linear line shows a linear relationship between the independent variable (perception) and the dependent variable (motivation). Regression estimation results provide the regression coefficient and p -value of 0.349 and 0.000, respectively. These numbers indicate there is a positive and statistically significant relationship between students' perceptions and motivations on science materials through e-learning. The result is consistent with research conducted by Tuan et al. (2013) which state students' perceptions of science learning are an important domain in students' motivation to learn science materials. A similar result is also expressed by Kurniawan et al. (2019) who explain that students who have a good perception of a learning process, they tend to be more enthusiastic in understanding the materials. Conversely, if students' perspectives are not good then they feel lazy and reluctant to study science materials. Students who have a positive perception of science may bring enthusiasm in studying science so that it affects student learning outcomes. Rana et al. (2015) produce finding that reveals that students' interest in

science has a significant effect on motivation in learning science materials. Chua and Karpudewan (2017) find a positive and statistically significant impact of attitudes, motivation, and perceptions on the learning environment of science. Students who have the motivation and experience the learning environment of science positively tend to have more positive perceptions and attitudes.

Conclusions

This study provides an in-depth explanation of the perceptions and motivations of students in learning science materials during the COVID-19 pandemic. A sudden change in learning style makes it difficult for students to adapt, especially when they are experiencing anxiety due to the crisis. However, the design of e-learning on science materials is very important to provide a comfortable environment therefore students can produce the best performance. The attitude of lecturers and students also has a big influence on the success of this science e-learning. Both the positive and active interaction between lecturers and students, as well as the interaction between students, contribute greatly to producing quality output. The results of the empirical analysis reveal students' perceptions and motivations on science materials through e-learning show a high category. Regression analysis also provides empirical evidence of a positive and statistically significant relationship between students' perceptions and motivations on science materials in e-learning.

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CHAPTER 5: USE OF LEARNING MANAGEMENT SYSTEMS IN THE COVID-19 PANDEMIC

Abdullatif Kaban 

Chapter Highlights

- As a result of the COVID-19 epidemic, which became a pandemic in the first quarter of 2020, a mandatory transition occurred to distance education, at all levels of education. The importance and usage rate of Learning Management System, where instructors, students, and content come together in distance education, has increased.
- In this section, the general features and capabilities of the Learning Management System are mentioned. User management, content sharing, and assessment and evaluation are the main capabilities of Learning Management System.
- In this section, it is also mentioned the important things to be done before, during, and at the end of the educational activities to use Learning Management System effectively during and after the pandemic. Conducting these procedures in a planned manner will positively affect the quality of distance education.
- In this section, which is mentioned the authority of instructors and students on the system, who are the most basic users of Learning Management System, integration, which is one of the busiest duties for users in an administrative role, has also been mentioned.
- It is thought that the information provided in this section will benefit users who take part in different levels of distance education.

Introduction

Education is one of the sectors affected by the coronavirus epidemic that started in Wuhan-China itself and spread all over the world. The closure of schools for reducing social contact was the first intervention to slow down the spread of the virus and when 143 countries carried out country-wide school closures, some other countries implemented localized closures (Yucesoy-Ozkan, Kaya, Gulboy, Altun, & Oncul, 2020). After the outbreak was reported in Turkey in March 2020, all social activities in schools were canceled by the Ministry of National Education (MNE) within the scope of the new Covid-19 measures. When it is understood that the epidemic cannot be brought under control in a short time, MNE decided to make distance learning courses by using electronic resources, Education Information Network (EIN) platform, and Turkey Radio, and Television Institution EIN Channel (EIN-TV). In the same month, it was decided that education would be given remotely, by all university senates.

It seems unlikely to restore the global economy and return to a normal education process without developing a low-cost or free vaccine (Sahin & Shelley, 2020). This situation forced educators to be adapted to online learning systems and platforms, at all levels of education, in a very short time. In this case, in this and similar situations, educators should develop digital literacy skills and should gather more information about different learning management systems, online collaboration platforms, online learning content design tools, etc., that can keep them up with the innovations to be made in educational applications to prevent the interruption of education (Korkmaz & Toraman, 2020).

The distance education model, which has many positive and negative opinions and many pieces of research on it, had to be used in all education levels after the coronavirus epidemic. This obligation has been forced to ignore many of the conditions required for quality distance education. For example; since the face-to-face courses continued to be taught in live class environments; there was not enough time to develop and share the contents for distance education on the Learning Management System. The pandemic led educators to the conclusion that previous studies on distance education should be reconsidered. Although there were problems such as limited interaction, infrastructure problems, and lack of equipment, it was seen that education could be carried out owing to distance education in

some way, even under extraordinary conditions such as a pandemic (Hebebcı, Bertiz, & Alan, 2020).

One of the new forms of 21st-century learning organizations is e-learning (Seok, 2008). E-learning is the use of information communication devices such as the Internet, computers and mobile phones, and software such as Learning Management System to improve teaching and learning activities. Learning Management System includes a digital learning environment where the add-ons needed for teaching and assessment are provided (Hijón-Neira & Velázquez-Iturbide, 2010). Using Learning Management System helps to facilitate e-learning in the learning process as it provides educational material without time or place restrictions (Ain, Kaur, & Waheed, 2016), enables students and instructors to interact over the internet, and facilitates the sharing of course-related information and resources (Al-Busaidi & Al-Shihi, 2010; Lonn, Teasley, & Krumm, 2011).

Effective use of Learning Management System, which is one of the indispensable elements of distance education management that is passed necessarily during the pandemic, has become very important. The student's quality of interaction within the Learning Management System is a strong indicator of the design and ability to maintain online learning communities. (Kidd, 2005). Social isolation experienced during the COVID-19 pandemic has changed students' perspectives on the use of Learning Management System.

In this period, it is thought that students will use Learning Management System willingly to complete their courses successfully, as they perceive the benefits of the e-learning system, although they are separate from each other (Raza, Qazi, Khan, & Salam, 2020). It is necessary to be aware of the capabilities of these systems in order to get the expected efficiency from Learning Management System, which is the meeting point of instructors, students, and course contents. Since the instructor is in the position of an instructor and the student is a learner, there are differences in the use of these systems according to roles.

Learning Management System

With the widespread use of distance education (Kaya, 2002), which eliminates the obligation of students, instructors, and content to be in the same physical environment, systems that do not require going to school have been started to use for many educational activities in formal

education. In the years when distance education started to be used for the first time, the one-way communication model in the form of delivering the contents to the students has reached the systems which the student can communicate with the instructor and the content mutually with developments in information and communication technologies (İşman, 2008). Learning Management System comes first among these systems. It is possible to conduct distance education courses and to organize activities for blended learning through these systems, which have the tools that may be needed for all kinds of learning and teaching activities.

Learning Management System, which needs computer networks and internet infrastructure, enables students and instructors to access the system over the internet and share content and to access shared content. Learning Management System is defined as a web-based technology that helps to plan, distribute, and evaluate a specific learning process (Alias & Zainuddin, 2005). In another definition, Learning Management System is defined as management programs that allow students to select courses and record courses, share course content, conduct assessment, and evaluation activities, and monitor user movements in institutions that offer distance or blended education (Tekerek, İsmailova, & Nurakunkızı, 2013). Based on these definitions, it can be concluded that there are web-based tools in a Learning Management System that will support all activities carried out in an educational semester. These activities may include all processes during the execution of a course, such as sharing and communicating content between the instructor and student during the semester, evaluating the process during the semester, or making a general assessment at the end of the semester.

Many Learning Management Systems are used around the world. Moodle, WebCT, Blackboard, and Desire2Learn can be given as examples for Learning Management System used in educational institutions (Iqbal & Qureshi, 2011; Waheed, Kaur, Ain, & Hussain, 2016). With its open-source code and many modules, Moodle is the most preferred Learning Management System among them (Tekinarslan & Güler, 2018). When it is necessary to choose one of these systems, it can be checked which of the features of the Learning Management System described above included. Among the criteria for preference, there are titles such as cost, to get technical support, and being in a modular structure (Yıldırım, Karaman, Gülsoy, & Kaban, 2010).

If an open-source Learning Management System is preferred, it is necessary to employ specialized information-processing staff for the installation and management of the system. All processes such as setting up the system, introducing the modules, and making them functional, updating them in the future, and maintenance work should be done by the institution that provides distance education. If a paid Learning Management System is preferred, for all these transactions, technical support may be requested by the company from whom the system was purchased. In addition, in case of purchase, there are alternatives such as purchasing only the required modules instead of the entire system.

In both cases, it is important that the Learning Management System provided can work in harmony with the existing Student Information System. It will be much easier for systems to communicate with each other when compatibility is provided in terms of software that concerns the infrastructure, such as the operating system and database system used. Otherwise, the data generated in both systems will have to be converted according to the other. When choosing the Learning Management System, the integration of systems with each other should be among the issues to be considered.

Capabilities of the Learning Management System

Considering all the activities of formal education during an academic year or a semester, the features that should be found in an Learning Management System are given below, according to the activities.

Planning Activities on Learning Management System

On the Learning Management System, it is possible to pre-define the required semesters to be included in an academic year. For example, for an associate degree or undergraduate program, it may be necessary to open courses in the summer semester in addition to the spring and fall semesters. It should be flexible enough to be defined new semester, even in emergencies, such as providing distance education instead of face-to-face training, which was stopped during the COVID-19 pandemic. In this respect, Learning Management System enables multi-term opening transactions within one semester. After the terms that will be opened in the academic year are determined, the starting dates of each term and how many weeks they will continue can be adjusted through the system.

Alternatives are also allowed by the system such as, to be seen all of the content to be presented each week during the semester by students from the beginning of the semester or remaining hidden or inactive until the day of the relevant week comes. The relevant educational institution can make a choice within the framework of its own policies. If the institution wishes can make all of the contents accessible to students from the beginning of the semester or can keep the units inaccessible until the relevant week comes.

Content Distribution Activities on Learning Management System

Learning Management System allows the sharing of different types of content. One of these types is text-based content, mostly in PDF format. In addition to text-based content, course videos and interactive exercise applications are among the frequently used content types. Learning Management System also allows the sharing of materials that comply with the content standards called the Shareable Content Object Reference Model (SCORM). This type of content provides information to the system about user actions. For example, SCORM type content makes it possible to store and monitor the information about how long the student stayed on which pages and what kind of answers the student gave to which questions, (Gonzalez-Barbone & Anido-Rifon, 2008). Besides, in such content, the student can continue again another time from where he left off.

Learning Management System is not only content sharing, but also provides an environment for in-class and web-based activities. The forum activity, which can be used by students in discussions about the content of the week among themselves or with the instructor, is at the top of these applications. Besides, surveys or workshop activities to be applied in or out of the class are also shown as examples of activities within the Learning Management System. The instructor can assign homework to students through the system, collect the files created by the students as a result of the work required by the given homework, and give grades. The instructor of the course can change settings such as the deadline for homework, permission to reload the homework, through the system.

The contents on a Learning Management System can be uploaded from outsource by the instructor in new courses opened each semester, and also the contents can be uploaded from the contents of the previous years by copying them from inside. During the planning of an academic year, if a course is reopened which belongs to previous years, the course contents

and activities are copied from the old course to the new one. Thus, the student records of the previous course are kept confidential and a separate class is opened for students who will take this course for the first time when the course is reopened.

Assessment and Evaluation Activities on Learning Management System

Assessment and evaluation activities on the Learning Management System can vary. Different types of exams can be defined for the process evaluations to be made during the term or the general evaluations to be made at the end of the term. The questions to be asked in these exams can be multiple-choice, open-ended, blank-filling, short-answer, and matching types. In the exams, each student is asked either the same questions or randomly selected questions which previously determined difficulty levels, are asked for each student among the question sets in a pool. In case the same questions or randomly selected questions from a pool are asked, the questions can be displayed in a different order for each student. Even in exams consisting of multiple-choice questions, the options in the questions can be presented in random order for each student.

Learning Management System allows exams to be indefinite as well as can provide a definite time. The time to be given for the exams also can be defined in two ways. The first of these is to give time for the entire exam. For example, when 30 minutes is given for the entire exam, this time starts from the moment the student starts the exam and the exam screen automatically closes when the time is over. During this period, the student can stay in any question as long as he/she wants. The second form of the definition of the time to be given to the exams is to give a separate time for each question. Each question has duration according to the difficulty level and the student has to solve the questions that come to the screen, in the given time. In these types of exams, the questions are usually displayed in sequence, and returning to the previous question is not allowed. Since the time allocated to the question has expired, the system will automatically switch to the next question and the other question's time starts.

Another adjustment made on the Learning Management System regarding the duration is the exam time setting. Thanks to this setting, students can enter the exam at any time within the specified date or time range. The determination of these durations in programs with a large number of students is made by considering the density of the number of students who will

take the exam at the same time. Since students will take the exam at different times, as mentioned above, the method of creating a dynamic exam is preferred by randomly selecting questions from a question pool that have the same subject and level. The announcement of the exam results can also be in two ways. These are; announcing the grade of the student right after the exam or announcing the results collectively at a predetermined future date.

It is possible to make an assessment and evaluation on the Learning Management System apart from the exams. If the instructor wishes, he/she can also give grades to the participation of students in other activities. For example, a forum activity defined in any week of the course can be graded over a certain point according to the student's participation status. Besides, the instructor can give individual or group homework to the students and also add this homework sent by the students to the evaluation.

On the Learning Management System, the instructor can determine an assessment scale specific to him or the nature of the course, taking into account the activities carried out during the semester. According to this scale, at the beginning of the semester instructor can determine which exams will affect the average to what extent, which homework or activities will affect the average, and student achievements can be calculated by the system according to the scores obtained from these exams and homework.

Learning Management System allows defining digital badges at different levels to show student achievement and level. When used in conjunction with scores and leader boards, a badge becomes an element of gamification that allows students to compete with themselves or with others and know how close they are to achieving a goal and gaining its accompanying reputation (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2015). Digital badges; considering that it increases students' academic success, learning motivation, participation level, and student satisfaction, digital badges can be used to better organize the learning process and to make learners more active (Yıldırım, Çelik, Kaban, & Yıldırım, 2017).

User Following Activities on Learning Management System

All actions of the users are recorded on the Learning Management System. Depending on the user role, many user actions such as entry-exit times, participation in events or exams, responses to questions in the course materials containing questions, and student behavior in

interactive course materials are recorded. These actions can be taken from the system as a report depending on the user role. While the system administrator can access the report of all records, the instructor can only access the reports of the course defined for him. By using these reports and applying some artificial intelligence and text mining analysis methods, students' movements can be interpreted and predicted about students.

As an unprecedented amount of digital data on students' activities and interests are obtained through these processes called learning analytics, it is possible to benefit from this data to improve learning outcomes (Shum & Ferguson, 2012). Thus, students who are likely to fail or drop out of school can be identified in advance and necessary measures can be taken. Among the measures that can be taken, there are methods such as sending a message to the student and making some reminders or notifications or getting the student to take care of the student by assigning a consultant.

Live Class Activities on the Learning Management System

Learning Management System also has environments where the instructor and the student can communicate simultaneously. Live class applications are at the top of these environments. Although there is no internal live class activity on the Learning Management System, it can be used by integrating with externally installed systems. Thanks to this integration, the live class activity can be defined via Learning Management System and records can be accessed after the course. Online meeting tools are used generally as a live class system application. Adobe Connect, Microsoft Teams, Zoom, and Big Blue Button can be given as examples. These include paid ones as well as free ones with open source code.

Depending on the number of students, distance education institutions add live class activities to the execution of some courses in addition to the sharing of content. Since a large number of students enrolled in a course in massive online open courses especially called MOOC (Massive Open Online Courses), there are no live course activities in them. However, since the number of students in graduate-level programs is relatively low, live course activities can be held for almost every course on certain weeks. Since the number of students enrolled in a course in associate degree or undergraduate degree education institutions is too high to be able to conduct live courses in a single session, by dividing these classes into branches, the students are given the opportunity to listen to the instructor with live course activities held on

different days and hours. During the COVID-19 pandemic, the number of students in the primary and secondary classes that switched to distance education is available for live class activities, so the majority of the courses are conducted as live class activities.

Students and instructors can come together with live class activities, on the web, or via mobile devices. In the live class module of Learning Management System, the instructor is in the position of administrator. While the instructor lectures live, the students follow the lecture. During the lecture, the instructor can share content such as presentations, pictures, or text on the screen or enable students to watch what they have done on their desktop.

In addition to content sharing or presentation, the instructor can explain the course by writing and drawing with the whiteboard feature in the live class environment. While doing this, the instructor can open his / her camera and publish his / her own image. The instructor, who addresses the students visually and audibly, can allow students to ask questions or send messages among themselves through another panel on the screen. If the instructor gives permission on the screen, the student can ask the question visually or only by voice or answer the questions by voice. Camera or audio usage of both the instructor and the students will perform according to the bandwidth allowed by the existing computer network infrastructure. Since the images may freeze if the bandwidth is low, such problems are tried to be prevented by allowing only the speaker to open the camera. If the bandwidth is much less, only voice communication is allowed. In such cases, only the instructor lectures aloud and answers the questions asked by the students in writing.

In the live class applications on the Learning Management System, the live class application is recorded so that the students who do not attend the course can watch or the students who attend the course can listen to the course again. The instructor starts the recording of the live broadcast at the beginning of the course and ends it at the end of the course. Thus, the course is recorded in video format. Recorded live class course videos are broadcast as content in the relevant week of the Learning Management System. Every student who attends or does not attend the course can open the video recording of this course later and watch it as much as they want.

Using the Learning Management System

There are various roles in the Learning Management System. These can be listed as administrator, instructor, and student. Apart from these, roles can be defined according to the needs and authorities can be given in different ways. Details of the role of instructor and student and the use of Learning Management System are given below.

Use of Learning Management System by the Instructor

The instructors are defined with this role authority in the system, who will conduct the course opened in the fall or spring semesters of an academic year. When the course instructor logs into the system, a list of the courses he has been conducting in that semester appears. By selecting the course, they want to operate from the list, they can access the course screen and perform transactions related to the course from there. User with the educator role can do the following on a Learning Management System:

- **Sharing Content:** Instructor shares the course materials and mostly text-based pictures, videos, external resources on another webpage, SCORM compatible content, etc., with the students by uploading week by week during the active period
- **Managing Live Class:** The instructor can perform many operations in a live class environment, such as presenting documents in text or presentation format, screen sharing, whiteboard use, video or audio narration, allowing students to ask questions by message, audio, or video
- **Defining Activity:** The instructor can enable students to take an active role in the course, apart from teaching, with a general course forum or a weekly forum activity, assigning homework and grading homework, surveys, and messaging activities.
- **Assessment and Evaluation:** The instructor can assess the academic achievement of the students with the midterm exam, final exam, or quizzes, as well as monitor the success of students with various reports that they will receive on the basis of the course or weekly.

Use of Learning Management System by Student

The most crowded user role on Learning Management System is undoubtedly the student role. Users with this role can take the courses defined in the curriculum of the program they are enrolled in on the Learning Management System, in the fall or spring semesters of the academic year. Before the academic term begins, students do all of the processes such as choosing, adding, and dropping courses through the Student Information System, between the dates specified in the academic calendar of the distance education institution. The student lists that become clear after the course selection and registration period are integrated into the Learning Management System and the courses in which students are registered are activated. When students log in to the Student Information System, they see a list of courses defined for them. They start learning activities by clicking on the course they want to access. Students can do the following on a Learning Management System:

- **Accessing to Content:** Starting the date of the semester specified in the academic calendar, students can access the content offered week by week and use any content whenever they wish. Text, image, video, and SCORM compatible content can be viewed on the browser without downloading if the content types supported by the browser. The student can download the types allowed by the system to his/her computer or print them out. Students who cannot complete all SCORM compatible content at once can continue from where they left off at another time.
- **Participation in a Live Class:** Students can participate in live class activities that are active at that moment by logging into the Student Information System on the appointment time which has been announced previously. Students can download the documents shared by the instructor, follow the presentation on the screen, ask questions, or answer questions using the message board on the screen if allowed. By using some symbols on the message board, a student can address his feelings to the instructor. Among these symbols, there are signs such as confirming an idea, opposing the idea, laughing, and raising hands. As long as the bandwidth of the computer network infrastructure of the system allows, students can participate in the course visually or audibly by turning on their camera or microphone. Students who cannot attend the live class activities can watch the video of the recorded lecture later.

- **Participation in Activities:** Students can participate in various activities defined on the Learning Management System of the course instructor and fulfill their duties in accordance with the instructions specified there. Among these, they have the authority to reply to the topic titles opened in forum activities and to send the file they prepared in homework activities over the system.
- **Taking the Exam:** Students can take a midterm exam, quiz, and final exams on the Student Information System on the dates specified in the academic calendar. When a student enters the exam screen for the first time, he/she sees the necessary information about the use of the exam module, and then enters the exam, solves the questions, and sends the answers. If the system permits, students can see their success on the screen as soon as they complete the exam. Otherwise, the exam results can be seen on the system when they are announced at a specified future date.

Learning Management System and Student Information System Integration in Higher Education

Education and training activities and student affairs are carried out through different systems in institutions providing distance education. Especially, in both formal education and distance education institutions, student affairs at the beginning of the term such as course registration, course selection, etc. transactions are carried out through systems called Student Information System. Previously, it was developed and used as a desktop application/program that needed to be installed on the computers of each academic staff separately.

With the development of internet and computer network infrastructures and the increase in internet bandwidth, these applications were transferred to the web environment and the need for installation on users' computers was eliminated. Today, mobile applications of these systems are also encountered. The academic and administrative staff of the university using the Student Information System and students can find the opportunity to perform all activities called student affairs through the internet.

It is possible to summarize the student affairs activities of the students through the Student Information System as follows:

- Before the semester, course registration, adding and removing courses, and following the course registration process
- During the semester, following the course schedule and learning exam results
- Obtaining some documents, transcripts, etc.

Distance education institutions perform many procedures such as opening a semester, setting the semester, determining and activating the courses to be given during the semester through the Student Information System. In this case, the data generated on Student Information Systems should be reflected in the Learning Management System. For this purpose, an integration process which means information exchange is required on both systems.

Learning Management System and Student Information System integration means reflecting the data generated in both systems to the other. Integration is done in different ways. Integration between the two systems is achieved by choosing a method suitable for the infrastructure of both systems. When the infrastructure of both systems is similar, data can be transferred between databases through some queries.

In case the systems have different infrastructures, server-client architecture is preferred so that one is in the position of presenting the information and the other being the requesting. If the information will be bi-directional, that is, not only reflecting the data generated in the Student Information System to the Learning Management System but also mutual, then both systems will have to work in both server and client positions. For this, necessary adjustments should be made to both systems.

If the systems cannot exchange data by communicating with each other, then the method of transferring the listed data from one system to another by carrying is used. With this method, data in Microsoft Excel or CSV format received from one system is loaded to the other system after adapted and data flow is provided. Due to the incompatibility between the systems, this process is repeated for each integration, starting from the very beginning. This method requires a lot of time and effort and carries the risk of making some mistakes in the process. Therefore, automatic integration methods to be realized between systems should be preferred.

Student Information System - Learning Management System integration is carried out at different stages. The first stage is reflecting the academic year, term, and course hierarchy created in the Student Information System to the Learning Management System. At this stage, periodic transactions are made on the Student Information System first on the dates specified in the academic calendar. When the whole process is completed, the structure formed is transferred to the Learning Management System through integration. In the second stage, user integration is carried out. At this stage, users in the instructor role are transferred to Learning Management System firstly.

New accounts are opened for users who were not in the system before, and the information of old users is updated. After updating the user information, instructor-course matching is made regarding which instructor will carry out the courses that were previously transferred to the system during the course integration process. Thus, instructors who log in to Learning Management System can only see the list of courses they have conducted on their screen. All the course and user integration must be carried out before the start of each academic semester.

A user account for instructors and students is required on both the Student Information System and the Learning Management System at the same time. However, in the case of a user account update in one of the communicating systems, the updated information is also transferred to the other. Thus, when a student changes his password on the Student Information System, he can log into the Learning Management System with the same current password.

At the beginning of the semester, the course registration information of students who leave their courses and enroll in other courses, especially during add and drop weeks specified in the academic calendar must be updated on the Learning Management System too. Otherwise, the student will continue to see the course on his screen that he has taken and dropped before. In the third and last stage, the integration process is completed by reflecting the academic achievements (homework or exam grades, etc.) of students as a result of the educational activities on the Learning Management System to the Student Information System.


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CHAPTER 6: IMPROVEMENT OF STUDENT ENGAGEMENT IN A DIGITAL HIGH EDUCATION ENVIRONMENT DURING THE COVID-19 OUTBREAK

Amjad Almusaed , Asaad Almssad , Marisol Rico Cortez 

Chapter Highlights

- The relevance and significance of digitalization of the professional educational process are caused by the need to adapt the classical education and training system to completing the education in a pandemic COVID-19 crisis.
- The unexpected and unorganized closing of our nation's university buildings due to the COVID-19 pandemic forced teachers to face the most vibrating and fast modification of perhaps any profession in history.
- During digital learning, many students feel that they miss the operative collaboration and group working with partners to construct knowledge, wherein digital learning, both students and teachers have to forget about the human aspects, not because they are behind the screen.
- This chapter explores the issue of student engagement under the COVID-19 Pandemic and analyzes the lessons that can be applied to ongoing online education

Introduction

Most countries in the world have experienced the shock of the first three months of the COVID-19 pandemic. Lockdown affected all spheres of the education systems, turned the habitual way of life upside down, taught everyone, without exception, to live in a new way. According to UNESCO estimates, about 1.5 billion schoolchildren worldwide have been transferred to self-isolation due to the COVID-19 pandemic. Many of them remain in quarantine, even where emergencies have already been lifted. Mishraa et al. (2020) thought that online teaching-learning became a massive challenge to deal with, and stakeholders are not potentially fit to adjust to the sudden educational change as they are not technologically competent to embrace the current situation.

On the other hand, they think that in the aftermath of the COVID-19 crisis, online education became a pedagogical shift from the classical way to the recent teaching-learning method from teaching space to Zoom, from physical to virtual, and from seminars to webinars. Sahu (2020) shows that the educational institutions worldwide (in 192 countries) have either temporarily closed or implemented localized closures affecting about 1.7 billion student populations worldwide. Many universities across the globe either postponed or canceled all campus activities to minimize gatherings and hence decrease the transmission of the virus. Lázaro et al. (2020) supposed that the education systems worldwide are taking measures to organize education in the context of the coronavirus (COVID-19) pandemic. As of April 15, 2020, the COVID-19 pandemic affected more than one and a half billion students in the least developed countries.

The events associated with the coronavirus pandemic, which swept the whole world in 2020, intensified the emergency transition of the entire educational system from face-to-face to remote-contact work, when all interaction between the subjects of the educational process moved to the digital environment. At this point, digital educational platforms acted as the connecting link that made it possible to minimize the negative consequences of the global threat from COVID-19, providing a safe format for conducting training events in self-isolation. Simultaneously, the emergency digitalization of all educational activity has shown that one of the most pressing applied problems. Grahame (1973) said that the transactional distance theory is based on the premise that students experience psychological and communication gaps in the online environment. Students in Moore's (1989) position must

interact with their peers, instructors, and content to reduce this distance. Moore (1989) described that when students interact with content, they have an internal dialogue where they think, discuss, and explore the content. He also noted that student interaction with instructors is essential because students gain experience from an instructor who is a content expert. Finally, the interaction between students is vital because as students interact with each other, they not only learn the content better but also learn to navigate the group dynamics. Although Moore (1989) did not address whether interactions should be synchronous or asynchronous, his primary condition was that any exchange should support student learning.

There have been several studies describing how cooperating interactions affect student perception (Amjad Almusaed and Asaad Almssad (November 5th 2018). The management and self-management of students' involvement in educational activities in the digital environment are insufficiently developed. In such a critical time, there has been a drastic change in how teaching and learning happen while learners are physically out of schools and separated from their teachers and co-learners.

Higher education is an area that brings together many aspects of the changes resulting from the digitalization of our world. Four factors determine the effectiveness of the introduction of digital tools into the processes of higher education and make it possible to use the solutions of the digital space fully:

- Students must acquire new skills and competencies that allow them to take full advantage of the dividends of digital technologies.
- Educational programs should promptly respond to changes in society and the labor market.
- Universities should become a space for designing and piloting social reforms aimed at ensuring the opportunity to use the benefits of digitalization in society.
- It is necessary to use digital tools to create new educational spaces to increase the availability and quality of educational services.

The ground of digital education has already shown its validity and worth and earlier research designated that there is no contradiction between; digital education and face-to-face education (Hu & Huang, 2022; Rusell, 1999; Xhelili et al., 2021). Thus, the educational process's digitalization is a counter transformation of the educator process and its elements, on the one hand, and digital technologies and tools used in the educational process, on the

other (Bozkurt, 2020). For Nazirul et al., (2019), leveraging digital technology is the access to technology for the transformation of the traditional learning system to the modern and digitalized learning system.

The changes in the education system under digitalization influence are widely discussed in academic institutions (Higgins et al., 2019). Much has been written about the benefits of digital technologies used in higher education (Higgins, Xiao, & Katsipataki, 2012; Echenique, Molías, & Bullen, 2015). Such advantages include broad access of students to information resources of education; the ability to build customized educational trajectories; transparency of the activities of educational organizations; optimization of the interaction between teachers and students, between all participants in the educational process; formation of mobile structures for managing the educational process, etc.

Digital education is gradually taking its place in both formal and non-formal education. There is an urgent need to improve the proliferation of online courses. Makarova (2018), assumes that the goal of transforming the educational process is to make the most of the potential didactic capabilities of digital technologies. Throughout the digital education landscape, future teachers are uniquely trusted by parents, students, and other teachers who see the potential of learning technology in and outside the classroom. However, this key group is still not as brave enough to accept or deploy these tools as they think. For the transformation of educational technology from a macro concept that will one day be realized into a necessary learning asset that can now provide value and connect the classroom to the rest of the student's life, it is important to understand the reasons and how to focus on them. The technological revolution promised to translate all scholarly communications into digital in the future, and this "progressive future" has come.

Study Objectives

The main aim of this study is to find out the impact of the students' engagement in the lecture and which is the optimal form to activate this engagement. It also aims to establish the consequences of communication for both students and teachers. On the other hand, this chapter will examine the objective correlation between teacher presence and social presence, and feelings of challenge and dilemma, self-efficacy, and motivation among students studying in digital education courses. The study also aims to create an investigation and find

solutions regarding the students and teachers engaged in the digital teaching process.

The chapter will answer the following questions:

- Which are the lessons that you get from 2021 digital education applications regarding the engagements?
- What are the main challenges and dilemmas regarding the digital education's environment?
- How can create the engagement process more practical and efficient in digital educations?
- What platforms and services took on the main burden in university segments, additional and corporate training during the pandemic, and can they replace offline lessons?

Methodology

This chapter represents a review reading of the consequence of digital education, where the physical distance doesn't have to mean social distancing. Emotional content in the classroom is the key to engaging both students and teachers who need interaction to build confidence and create expressive debates. At the same time, they need to develop a healthy connection as soon as they start with digital learning. This paper will present the dilemma of using digital learning in high education institutions and suggest objective solutions regarding efficient student engagement in the digital education environment during the COVID-19 epidemic time and teaching complex process.

Digital Education on EU Agenda and Vision

Most universities in the EU faced organizing logistics and ensuring the educational process for international students who remain during the pandemic in the country of study and leaving home, suspended student and teacher exchange programs, “Ministers of the European Higher Education Area (EHEA)” established in 2015 a close link between teaching and learning in higher education and the digital transformation process: “Improving the quality and relevance of learning and teaching is the critical task of the EHEA. It requires encouraging and supporting higher education institutions and staff to promote pedagogical innovation in student-centered learning environments and take full advantage of the potential benefits of digital technology for learning and teaching.

A broader vision was proposed in early 2018 in the Bologna Digital initiative, which several international organizations endorsed. Digitalization has not been ignored in the Bologna Process. However, the full potential of digital tools has not been realized at the system level. This is partly because digitalization is seen as an additional problem and not a means of solving existing higher education problems.

While this argument is neither original nor new, the document was welcomed in preparation for the April 2018 Bologna Ministerial Meeting due to its clarity and emphasis on the fact that the operational goals of higher education reform can be achieved digital technologies (Almusaed & Almssad, 2020). It was one of the first European higher education events organized under the Austrian Presidency in Europe to discuss digitalization opportunities (Dominic & Rampelt, 2020). The European Commission has focused on the topic of education in the digital age. In 2016, the following statement was formulated in the Guidelines for the Modernization of Education: “Digital transformation is changing the labor market and requires new skills.

Digital technologies also offer new ways of learning, provided there is adequate access to these technologies. Education and training systems must be better in response to changing realities (Rampelt, Orr, & Knoth, 2020). In 2018, the Digital Education Action Plan was approved, which identified three priorities:

- Using in a reasonable manner the digital technologies in the teaching process
- Developing relevant digital competencies and skills for digital transformation
- Improving education through better data analysis and forecasting.

The Paris Communiqué also made a new emphasis on the possibility of introducing digital tools into the educational process:

“Digitalization plays an important role in all spheres of society. It is potential to change the way people get higher education and learn at different stages of their lives. Today all academic institutions encourage higher education institutions to prepare their students and help their teachers to act creatively in a digital environment. It requires empowering the education systems by better use of digital and blended education. It needs to be an appropriate quality assurance to improve lifelong and flexible learning, develop digital skills and competencies, improve data analysis, educational research,

and remove bureaucratic barriers to open and digital delivery education. All EU Universities encourage the Bologna Process Observatory to tackle digitalization in the next working period” (Unger, & Zaussinger, 2018).

This promising statement led to the expectation that the Bologna Process will support a more open understanding of digitalization and focus on the formats for its effective implementation in education in the period leading up to the next ministerial conference. The Digital Bologna initiative aims to stimulate discussion and action on this issue until 2020 and beyond. The COVID-19 outbreak has forced educational institutions to close campuses and begin online learning (Almusaed & Almssad, 2020). Since the beginning of spring 2020, universities have experienced an unprecedented massive migration from traditional full-time education to online education. In a short period, thousands of teachers began teaching in front of a computer screen, and students listened to lectures and took courses over the Internet. According to the survey carried out by the Academic Unit of the Education Pro-Rectorate, by the end of March, 70% of the courses began to teach theoretical. Theoretical-practical distance courses, and 20% were preparing to do so in the coming days (Bergdahl & Nouri, 2020).

In Sweden, for example, the transition to distance learning was carried out from learning from Dec.7 for the rest of the term. In the context of the changed format of Swedish universities' activities, researchers argue that digitalization has become a megatrend that determines all aspects of the actions of a higher educational institution. The Swedish government was closely monitoring the development of the coronavirus pandemic and making the decisions necessary to limit the spread of infection and counteract its consequences for society. On February 01, 2020, the government classified the new coronavirus as a socially dangerous disease and initiated extraordinary measures to prevent the spread of infection (Wang & Yuan, 2018). Most Swedish universities were ready for this task: for accreditation and licensing, electronic information and an educational environment are required.

Currently, universities use various web tools and platforms to implement the online learning process: Zoom, Google Classroom, Microsoft Teams, etc. For educational purposes, elements of the gaming space have also been successfully adapted, for example, platforms such as Discord, which were initially developed for the gaming community. These tools became the

easiest and most attractive way for students to communicate and interact in discussions, presentations, exercises, and practical exercises.

Students independently created a virtual classroom that simulated a classroom and configured a server. Communication during the lecture is carried out through voice and text chat Discord: the lecturer publishes the necessary notes on the tablets. Each of the listeners has a separate virtual book for taking notes. It should be noted that digital approaches to learning delivery continue to raise several questions.

On the one hand, new learning delivery forms should be welcomed as they provide more flexible and more personalized learning support. However, there is a likelihood of a decrease in the quality of education, as well as not (Wang & Yuan, 2018). The digital skills of teachers and students must vary widely. The social conditions in which the teaching and learning activities are carried out, mean that there have been significant difficulties in access in some sectors of the population, preventing or hindering access and educational continuity in some cases. Engagement with the open digital ecosystem includes tools available on the web. In this sense, an appropriate selection was encouraged considering: the prioritization of the use of free software and open formats, as well as the privacy and management of users' data, avoiding those that require students to create accounts (Bronack, Riedl, & Tashner, 2006).

Lessons from 2021 Digital Education Curriculum and Engagements

The Confidences and the Digital Education Environment

Creating of a confident digital education represents one of the most urgent action for universities today. It is not coincidental that the creation of a legislative basis for the formation of a unified digital environment of trust and electronic civil turnover is attributed to the priority activities of the program. It required solving comprehensively, simultaneously in several directions, ensuring a unified digital environment of trust. These include the modernization of the conceptual apparatus, which took shape in the era of paper workflow and is not well adapted to electronic, the possibility of remote confirmation of the identity when performing various actions, including legally significant ones.

Today digital education became an industry with great potential, which is also likely to become more significant in the future. Unlike traditional attendance teaching, online teaching

has several advantages.

- It has the comprehensive ability to include a large offer of courses; Digital teaching allows students to complete entire degree programs or supplement their already completed degree program. It is easy for the individual to choose between several different courses and learning modules, which are not necessarily found through traditional teaching or formal supplemental education.
- Several offers of teaching tools; Digital teaching model has excellent opportunities to incorporate different types of teaching technology. It can significantly include multiple media and appeal to different ways of learning. It can consist of videos, which can be beneficial for those students who are not necessarily academically strong.
- Flexibility in working manner; The Digital teaching model can give students far greater flexibility, where the student can plan when the individual has the opportunity to receive teaching. They have more time to learn and do other activities. They save time and provides an opportunity for self-study (Paolini, 2015). As the course material is available online, it also means that the student will always have the chance to return to teaching and rehearse.

Teacher – Student Engagement and Supervising

Digital teaching can be a tool that can make the teaching-learning process more student-centered, more innovative, and even more flexible (Drollinger, Comer, & Warrington, 2006). A course provides an opportunity to build on top and maintain the positive development - to get more layers on the layer cake. The teacher role and engagement emphasize the value of being retained in the process, getting sparring, adjusting, and adjusting along the way.

Between each course, teachers can try out the new tools in everyday life so that there is an interaction between new knowledge and practical implementation. The role of teachers in a course includes the activities of coaching, teaching, consulting, sponsoring of the ideas, and director of his group working. These roles must take a continuous way and must be done simultaneously, according to the group works and requirements. Teacher-student engagement is an essential relation in any educational process (see Figure 1).

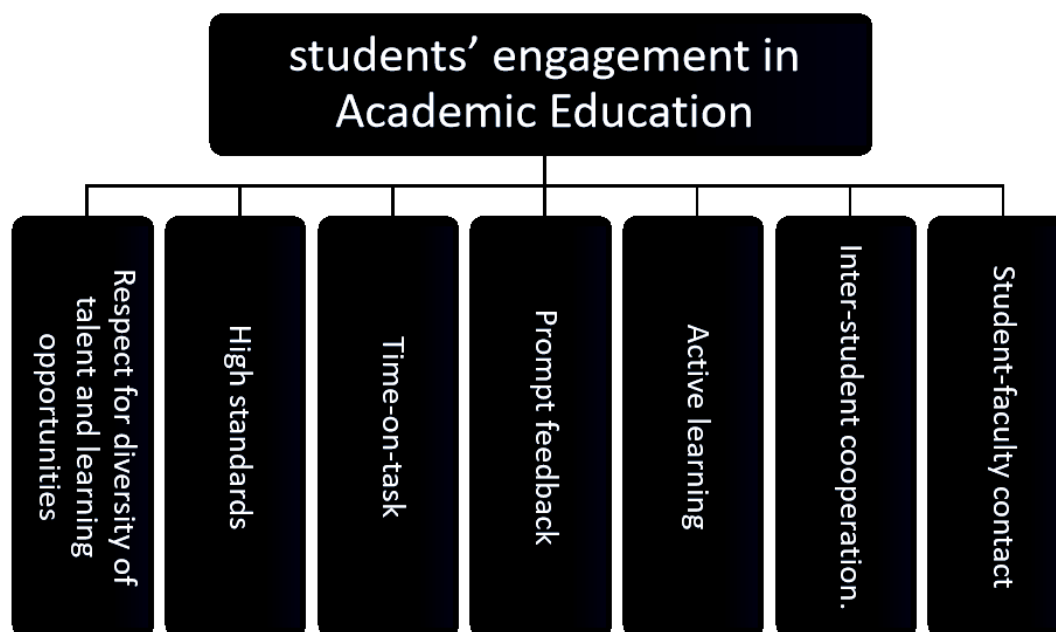


Figure 1. The Effective Student Engagement (Kim, Hong, & Song, 2019)

The value of the teachers is even more significant when experts talk about adult education. It required to engage the course coordinator to be more honest, where not every expert can be a good teacher:

- The teacher has to develop his communication skills (see Figure 1); he needs to know how to express and logically formulate a thought.
- The teacher has to be patient and calm in the learning process.
- The teacher has to accept the criticism and feedback positively from his / her students, and they need to know how to perceive the complaints and do not consider themselves the smartest and most expert in the matter.
- The teacher must open the lecture area in real impact, not just theoretical, but also practical knowledge of the topic.

The critical question is how to get teachers working on digital education in a simple form and effective act. Unfortunately, almost all students have a negative learning experience with lousy teachers. Following the lecture can create a dull feeling to listen to a university lecture that students want to skip, and some university teachers even want to forget. The student needs to give teachers frequent feedback and advice on how to improve the course content and process, where the teachers must react positively to criticism.

The Dilemma of the Digital Educational Environment

Students in teaching time may be involved in other activities (they can play games, watch films) or peacefully doze off since being in self-isolation allows the teacher to isolate themselves from the world and demonstrate what the teacher wants to show to others. In this situation, there is often a failure in the teacher-student interaction system, since in the EU at present in the digital educational environment, there are no adequate and methodologically sound tools for correctly tracking what students are doing, and well-established effective methods of attracting their attention and interest. Understanding engagement as a practically significant element of the educational process prompts studying it as a multidimensional characteristic within the framework of an interdisciplinary approach.

Students still prefer classes over online classes due to many problems they face when taking online courses, such as lack of motivation, understanding of the material, decrease in communication levels between the students and their instructors, and their feeling of isolation caused by online classes [24]. The teacher needs to avoid the students disconnect with the online course when they feel; Frustration, Fear, and Isolations, which can happen in the case of:

- No clear picture of the course area and the working process
- Loss of awareness of the course target. ILO
- Sometimes it is a weak connection to the university IT department.
- Variation of internet availabilities
- The availability of learning materials, instructions, devices, and the updated information
 - (the course area and the map)
 - A bad connection with course coordinators.
 - In many situations, the course literature is un-useful.
- Absence of application for the tasks, wherein some time unsynchronized with what they learned from the book.
- Absence of information regarding specific subjects, materials, and solving methods.
- It is unpractical to teach the practical exercises of design course by online mode
- Less interactive due to no contact between (students, teacher), (student-student) (Student – digital lecture), which makes it very dull and quickly lose concentration.
- A weak and unproductive communication with the course coordinator

- An essential part of the students has a feeling of loneliness.

In virtual life, Stress cannot be avoided - nor should it be avoided, as it can be helpful and necessary in emergencies, where it is required to act quickly and efficiently. It is essential to distinguish between positive and negative stress so that we can identify the symptoms that are inappropriate for our well-being. Stress happens when there is an inequity between body setting position, thoughts in course process, emotions reflecting the course information, and behaviors as an impact of the holistic impressions. Many will find that they lose their "drive" and slowly lose track and balance - perhaps without being aware of that in the beginning.

During the online course, it can be challenging to focus and be concentrated because one is not physically present; this can easily make one's thoughts go in different directions. When students lose the overview, it can reduce their performance, and the negative thoughts can cause them to lose courage and faith in themselves. It is therefore essential to raise awareness about it to avoid that the students get into a stress circle in the online course time. The main problem with digital education is the lack of synchronous communication between student and student and teacher, which has led researchers to find effective ways to involve students in the digital education atmosphere (Picciano, 2009). Factors associated with engagement are student bonds with peers and faculty, student motivation, and course outcomes such as grades (Daugule & Kapenieks, 2015).

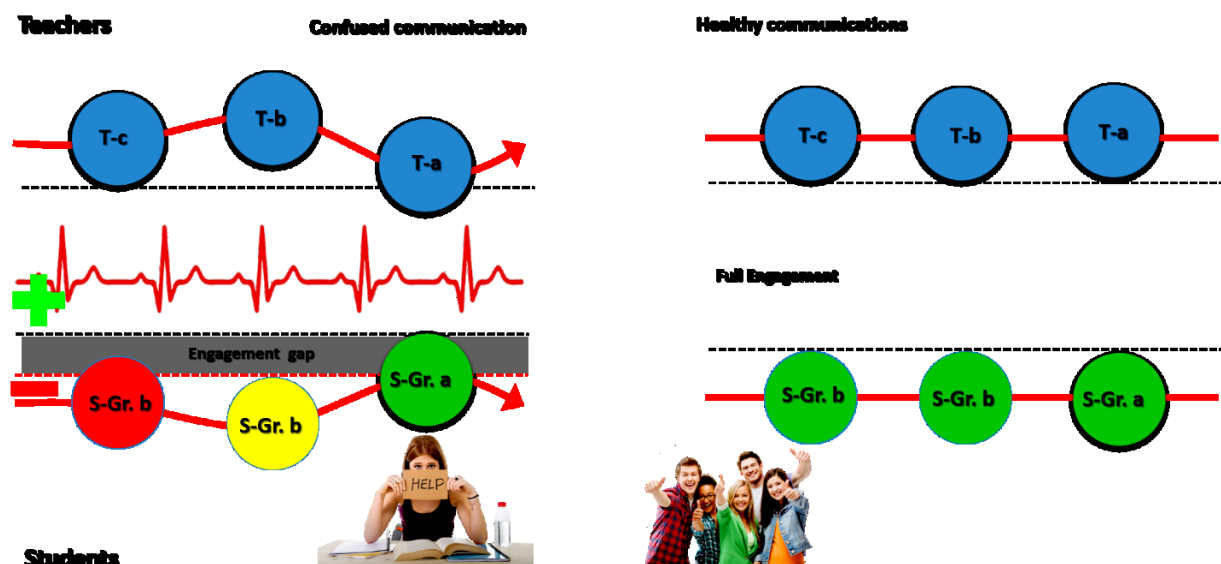


Figure 2. The Reflections of Students on the Team Supervising

In a team supervising environment, the supervisors' information is not similar and is sometimes divergent. That can create unbalancing state in the environment learning community, where students' groups became stressed and can make a panic case, and students start to ask for assistance, as shown in Figure 2.

Digital Educational Environment and Students' Coherent Engagement

Operative online education often needs more design and more energy than in- a physical learning process. Is it not a translation of classical teaching in online learning? It demands strict discipline and an active action with a comprehensive effort, and if not managed well, it can quickly turn into 'Zoom Classroom Fatigue.'

An online course aims to understand better the feasibility of using technological solutions to detect specific knowledge descriptors in online learning systems. Understanding the relevance of a particular knowledge in online courses is essential for the architecture of the content of the time and for improving the effectiveness of the learning process course design in tertiary education is subject to several constraints (Lisitskaya et al., 2018; Yamagata-Lynch, 2014). That means a good understanding of the student's environment can provide us with a valuable tool for perfecting the output. Higher education teachers have been challenged in recent decades by many technologies designed to help with teaching and learning. In sum, higher education's current environment requires the consideration of online technology in confronting several issues related to teaching, learning, student access, and academic program quality.

It became clear that most research on online learning environments has focused on asynchronous communications. In this situation, we will use both a synchronous and asynchronous approach, where synchronous chat communications are often introduced as an optional means to engage students in discussions (Yamagata-Lynch, 2014). In the end, the strategy has been proved to be effective in strengthening and improving the analysis and utilization of online learning data through experiments (Alawamleh, Al-Twait, & Al-Saht, 2020).

Recently online education has become a topic of discussion in the mainstream news and research literature related to higher education. Many university presidents are showing

interest in online learning as a viable instruction mode (Mohamed, 2020). The online course can support the educational process in crisis time as what happened today with coronavirus, where open online education became a requirement. The system has to work with many available educational resources (Online Education Resources) in teaching and learning and reside in the public domain or have been released under an intellectual property license that permits their free use and repurposing by others (Panel Franz Schott Norbert, 2015). Online Education Resources in this course include complete courses, course materials, modules, textbooks, streaming videos, tests, materials, or techniques to support knowledge access.

Digital Educational Environment in a Triangular Active Interaction (Research – Education-Companies)

In scope to generate an advanced course design project with effective working, the mechanism includes all academic requirements with a multilateral exchange. It is required to create a complex system that consists of the theoretical part and practical aspect, with the support of companies, by using a combination among the community, researchers, educations in the line of the time (history, today, and tomorrow) for today's needs and the future requirements as shown in Figure 3.

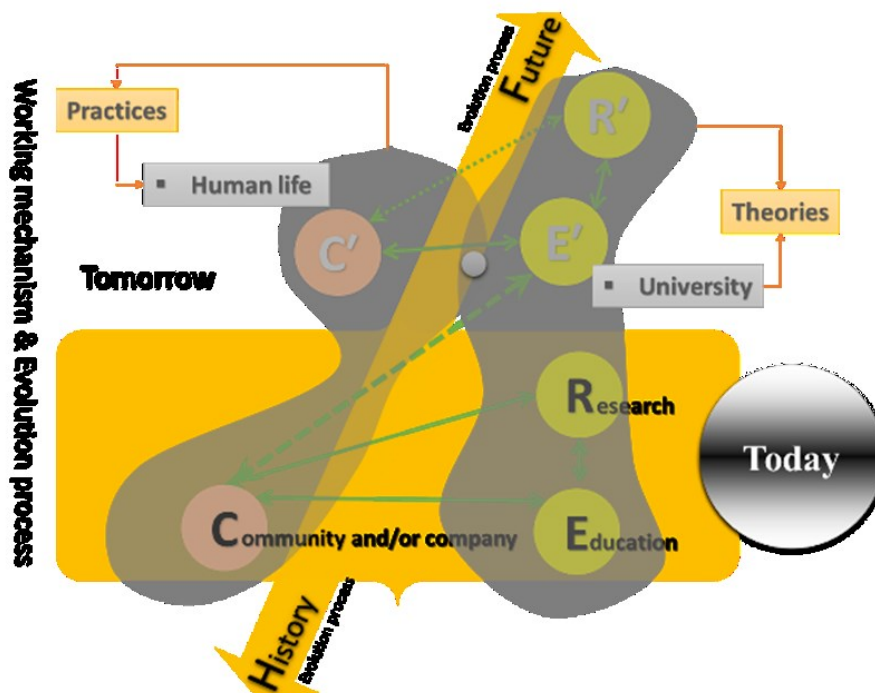


Figure 3. The Mechanism of Course Design with Multilateral Working Interaction

Improvement of the Pedagogical Aspects of the Course Design Process

Pedagogical Act on the Digital Course Design

Today, education and instruction must increasingly accommodate a diverse set of students who need to learn complex cognitive skills and transfer them to a varying set of complex real-world settings and contexts. Accordingly, these new demands present a severe challenge to the field of Instructional Design (ID) is a relatively new concept in the modern education system (Gumennykova et al., 2020). The need to form quality knowledge is constantly growing, while traditional tools are suitable for relatively simple, “linear” training methods.

When creating more complex programs, using traditional methods leads to a waste of time and resources. As a result, the concept of pedagogical design emerged - a discipline that development teams apply at the stage of designing, creating, and evaluating teaching materials. It is based on the methodical use of awareness about practical work, building an educational process with an "open architecture," and creating a natural learning environment.

Pedagogical design technology is relatively simple. It requires understanding the needs of students and define learning goals, and then transfer data and information as rapidly, precisely, and professionally as possible. At the same time, the tasks of a pedagogical designer are extensive and very difficult such as:

- Analysis of the needs of the target students, their competencies, and expected learning outcomes.
- Determination of the goals and objectives of the educational material
- Analysis and structuring of materials by the goals
- The choice of means and methods of educational work (Gumennykova et al., 2020).
- Creation of elements, style, and visual design of the course (Gumennykova et al., 2020).
- Development of tests and tasks, controls, and information collection
- Create a course using the appropriate tools or task team members to develop specific elements.
- Development of methods for evaluating the results and effectiveness of materials (Gumennykova et al., 2020).
- Elaboration of solutions for further improvement of educational content

Such an exact sequence will ensure the qualitative growth of the educational material as the work progresses and will hone the forms of its presentation. The main task of high-quality and systematic development of a training course is to complete the necessary information accessible to the student. It is not just providing it that is important - more straightforward methods do a good job. The main task is precisely a clear perception and subsequent application of the knowledge gained in practice. To achieve this, the principles of the American psychologist Robert Mills Gagne, one of the founders of pedagogical design may be used. Essential to Gagne's ideas of instruction is what he calls “conditions of learning”: internal conditions deal with what the learner knows before the teaching, external conditions deal with the stimuli presented to the learner, e.g., instructions provided by the teacher (Rieley, 2020).

- It attracts students' attention, motivation for learning, awakening interest in the topic and methods.
- Explanation of the goals and objectives of training (Hrastinski, S., 2008). Here, not only is the answer to the question “why?”
- Accompanying training. In essence, this is a guide to students and the semantic formation of an attitude to retain the material received in long-term memory.
- Practice. It is necessary quickly, while the new knowledge is still fresh, to test it in natural conditions or simply to confirm it with an appropriate experiment, which will clearly and very effectively link the theory and application of knowledge.
- Consequently, even at the phase of developing the course, the most flexible feedback system should be laid (here, the target audience's analysis and its capabilities will come in handy).
- Assessment of progress and overall evaluation of the effectiveness of the training course.

The translation into a practical plane, helping students to retain knowledge and their correct application. In contrast to the fifth principle, it is essential to transfer practical skills to new conditions that were not set.

Operational Act on the Digital Course Design

When an academic person teaches, in a digital environment, required to engage in two closely related but very different activities; first, when teachers design a digital course, they need to collect relevant information and decide how to teach the students. The second is to complete

the teaching practice of a well-designed curriculum through teacher-student interaction. The concept of teacher-student interactions is used here in a broad sense. On the other hand, creating an efficient course design is a complex process, where the course coordinator needs to follow the steps, which is given by the academic institution. The course coordinator needs to answer the following questions: where to start? How to arrange the course? What tasks required to prepare, what the main topics? How can divide them into themes? How to engage the student in the teaching process? How to create an operative channel with students? How to activate the feedback system? (see Figure 4). The research on teaching and learning in the past two decades has led to many new ideas and concepts in curriculum design, increased the feasibility of various curriculum designs, improved curriculum design standards, and made faculty feel more concerned about this critical issue. An operational way to create a digital course is to think about the inconsistency between teaching activities and learning goals. Students may learn the teaching content from the teacher's lectures, but such teaching activities will never allow students to practice critical thinking and get feedback from the teacher. When the teacher starts to design mid-term or final exams, he/she will encounter another problem. Figure 4 shows how to create a digital course, where the teacher chooses to include critical thinking components, where he combines the synchronous and asynchronies, teaching models.

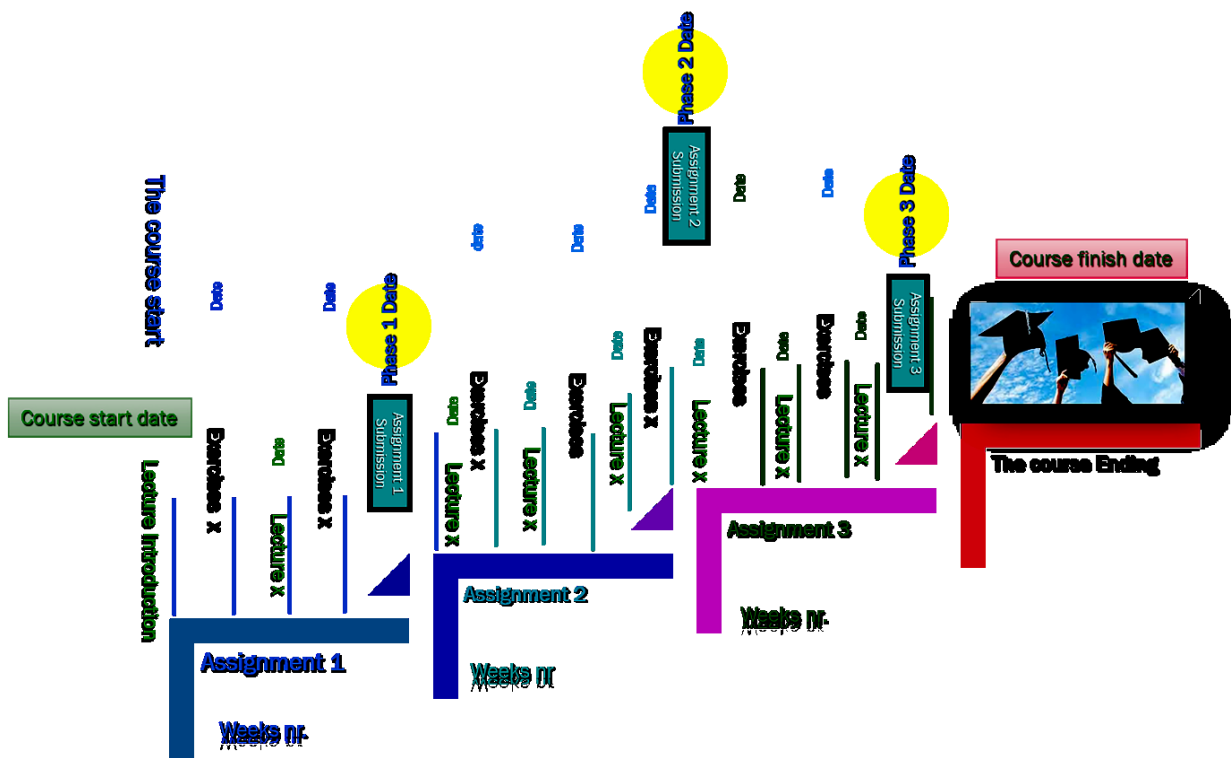


Figure 4. The Steps Required Designing an Online Course

Improvement of the Synchronous and Asynchronous Engagements

Synchronous and Asynchronous Communications

The asynchronous digital teaching imitates a traditional face-to-face lesson in which teachers and students see and hear each other, share knowledge, ask questions, and get immediate answers, work in groups, complete assignments, etc. Only the class in which they study is virtual: instead of a blackboard, it has an interactive whiteboard, instead of raised hands, there are activity icons, and instead of student notes, there are chats. There has been a large body of research suggesting the importance of considering motivation as a characteristic of successful digital learning students.

Still, there is little recent research on how synchronous interaction motivation can stimulate asynchronous interaction and vice versa. Considering motivation can be an area for further study due to the many asynchronous and synchronous communication methods available to students. Asynchronous communication is the traditional method of attracting students to the digital education system, but as technology advances, synchronous media has become increasingly focused on online courses.

This chapter aims to provide an argument for both types of interaction, including the role that asynchronous and synchronous interactions play in how learners feel connected in a digital education atmosphere, and how communications affect education, evaluations, and fulfillment in the digital environment; and if the student's motivation determines the type of communication in the online environment. Historically, asynchronous interaction has constituted most student contacts with peers and distance education teachers (Hrastinski, 2008). Asynchronous communication is defined as communication that occurs using e-mail and discussion forums, where the teacher plays a more critical role as a facilitator between students (Cacciagrano & Corradini, 2001). The main benefit of asynchronous dialogue is the flexibility, it provides for e-learning anytime, anywhere, which is the paramount convenience of online learning (Sharma, D., 2006). Also, pre-recorded video, allowing students to view multimedia simultaneously, has recently been included as another component of asynchronous communication (Cacciagrano & Corradini, 2001; Sharma, 2006; Schott, Norbert, & Seel, 2015).

Conversely, synchronous technology is defined as live video and audio streaming with instant

feedback. The goal of any type of interaction is to ensure that learners are involved in the learning process so that they feel like they are part of the learning process, and as a result, retain the material and feel involved in the distance learning environment. While it is clear that synchronous interaction is playing an increasing role in the digital education environment, asynchronous interaction still takes place in distance education.

The study has shown that asynchronous interactions allow students to spend time contemplating their thoughts, interacting more deeply with content, feeling part of the learning community, and posting more thoughtful comments on discussion boards (Sharma, 2006; Kayvan, Kamran, & Saudi, 2011). Hrastinski (2008) reported that the ability to reflect on content before it responds in discussion forums enhanced cognitive engagement with the content, especially when it was difficult. However, many respondents did not feel that they were entirely part of the educational community. Shirom, Oliver, and Stein (2010) also reported that participants felt that taking the time to reflect on their ideas and their peers allowed them to interact more deeply with the content.

Almenara et al. (2021) conducted three different case studies among faculty and students in two other digital teachings using asynchronous video to measure perceptions of immediacy and intimacy utilizing this format. Researchers interviewed students during each semester in which courses were offered and concluded that the asynchronous video format allows students to feel highly connected to the faculty. Students described that they were gratified with the reviews provided and thought that the instructor providing the reviews cares about them. The faculty believed that students should interact more deeply with the content when they could reflect before recording their video. One instructor reported that he/she could even understand students 'level of understanding by examining students' facial cues and voice tendencies. Creating a teaching system is a complex process, where many aspects require to be taken into consideration, such as synchronous and asynchronous teaching, a student teaching place, and material types required, course topics and components, and the relation between all these elements. Figure 5 shows how to create a digital course, where the teacher chooses to include critical thinking components, where he combines the synchronous and asynchronies, teaching models.

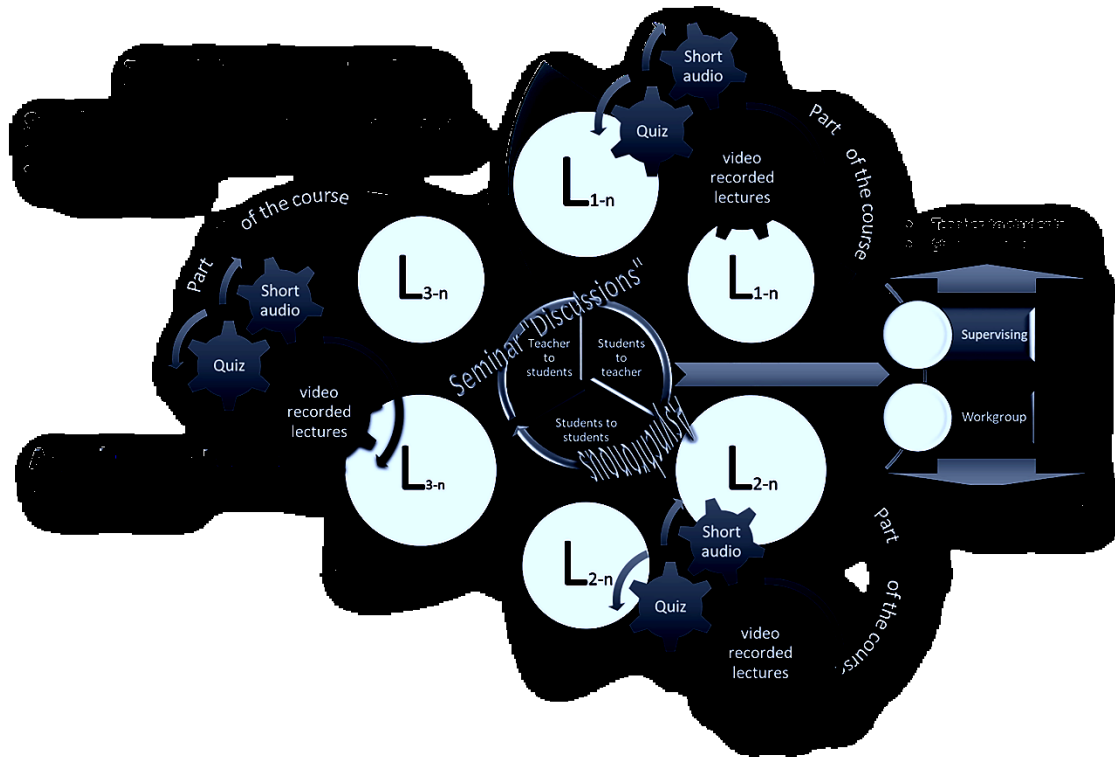


Figure 5. The Plan of a Complete Course Design

McBrien, Cheng, and Jones (2009) supposed that the asynchronous and synchronous interactions can be used concurrently, but students do not always report positive results. Ayesha (2016) thought that asynchronous e-learning could be challenging as only a carefully devised set of strategies can keep students engaged and interested in this sort of learning environment to facilitate motivation, confidence, participation, problem-solving, analytical, and higher-order thinking skills. The survey finds that 9% of participants (n = 62) were frustrated when listening to audio, type responses, and view PowerPoint presentations. The researchers concluded that frustrated students did not feel linked to the course, and their sense of transactional distance increased. Participants also reported feelings of prevention when they skilled technical difficulties and encouraged online tutors to consider offering training on a synchronous platform before class. Ashley and Edwards (2021) suggested that specialized training should be conducted with extra care for instructors to assume that all students are experienced or even familiar with online learning platforms and other live streaming programs. These findings are significant, as student feelings of overwhelm and frustration can increase transactional distance in online learning.

As stated, both asynchronous and synchronous interactions allow learners to participate in

online settings. When learners are engaged, course outcomes such as learning, grades, and satisfaction also improve. As synchronous technology advances, it may also be interesting to see if students predict synchronous interaction in the future instead of asynchronous interaction.

The importance of communications in online learning environments has been the subject of much research. Rizk and Davies (2021) suggest that the researchers are likely to continue discussing the positive and negative components of asynchronous and synchronous communications in online learning atmospheres. Regardless of the format, students report sensation more linked to the online knowledge, report higher gratification levels, continue to be motivated to participate, and are more successful in group and individual work. Research has provided sustenance for both kinds, and educators must consider the motivation and needs of their students, the specific requirements for course content, and the technical support available before deciding which communication method is appropriate for their courses.

Presence and Communication in a Digital Environment

According to Lowenthal and Dunlap (2020), the peculiarities of interpersonal communication of its subjects are considered as the primary psychological determinant of the effectiveness of the educational process. A specific method for studying digital education's content aspects is a theoretical analysis of modern research, highlighting and characterizing its psychological effects. The recent research on presence and communications in digital teachings show that the digitalization of education leads to ambiguous psychological consequences for the subjects of the educational process.

It is essential to change the spatio-temporal characteristics of their interpersonal interaction, "depersonalization," and virtualization of communication associated with the use of electronic educational communication. Tu & McIsaac (2002) mentioned that an increase in online communication level occurs with an improved level of social presence. This can be fostered by considering the countenances of the learners, by selecting the appropriate computer-mediated communication medium, and by applying correct instructional elements to course design. The most important psychological aspect of digital education is a fundamental change like communications between the educational process subjects, which determines its positive and negative effects. It is essential to consider the risks of

digitalization of specific academic programs and determine the need and directions for optimizing the interpersonal interaction of its subjects (see Figure 6).

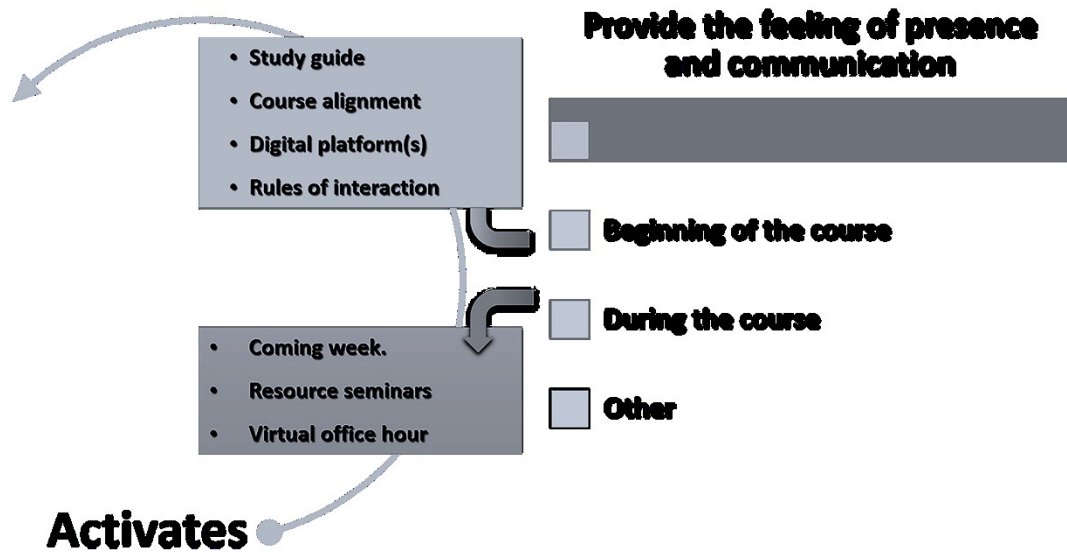


Figure 6. The Actions Required for Creating a Compelling Presence and Communication in Digital Education

At the Beginning of the Course

At the beginning of the course, teachers need to ask students to introduce themselves and their dream in the future: Create a communication plan with each student as a personalized approach. It will imply a focus in education on the development of 21st-century skills in students, the ability to set goals and achieve them, work in a team, understand oneself and others, be creative and think critically. Meens and Bakx (2019) affirmed that before the teacher starts with the course, create a calendar when you reach out to each student individually. The faculty needs to create an intentional prompt's introduction.

On the other hand, Hamzah (2018) affirms that the introduction represents the most critical section at the beginning of any course; it is also required to create an easy and creative study guide. Students can find easy the study guide and the requirements in friendly wayfinding. It includes the Intended Learning Outcome (ILO) and the objective learning alignment to the course goals, assessment, and the learners (students), see Figure 7.

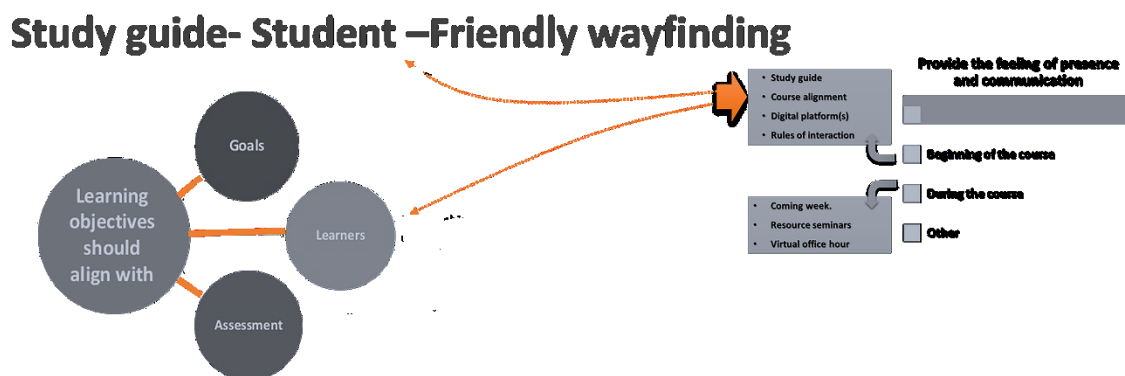


Figure 7. The Action required at the Beginning of the Digital Course

The teacher needs to activate the digital learning platform based on a personalized approach to education - a way of designing and implementing the educational process in which the student is the subject of educational activity. The system is based on the student's position and develops better if they are motivated, active and if his characteristics are considered. The student is allowed to plan his educational trajectory, set or choose educational goals that are meaningful for himself, manage the time and pace of learning, choose specific tasks, methods of solving and testing them, work individually and in a group, and motivate himself and others.

The digital learning platform can be created in synchronous with three plans:

- Learning Management Systems (LMS) (Shakeel, Ijaz, & Quresh, 2011)
- Learning Content Management Systems (LCMS)
- Virtual teaching space tools and virtual Learning Environments (VLE) (Alhogail & Mirza, 2011)

In the same situation, it is required to determine the rules of interactions in a digital environment as shown in below Figure 8, which is classified in vertical (teachers – students) and horizontal (students-students) interactions.

During the Course

Faculty needs to demonstrate their empathy and care for their students, which can be created a well-designed channel of communication with students, and they need to express their interest in students' works and to support their success. What will be in the next week is an essential open discussion with the student (Tu & McIsaac, 2002). Triacca (2017) affirms that

it will help the student to create a complete picture regarding the teaching process. The teacher needs to ask their student about what they feel this week and what will be in the coming week by creating several checkpoints, as shown in Figure 8.

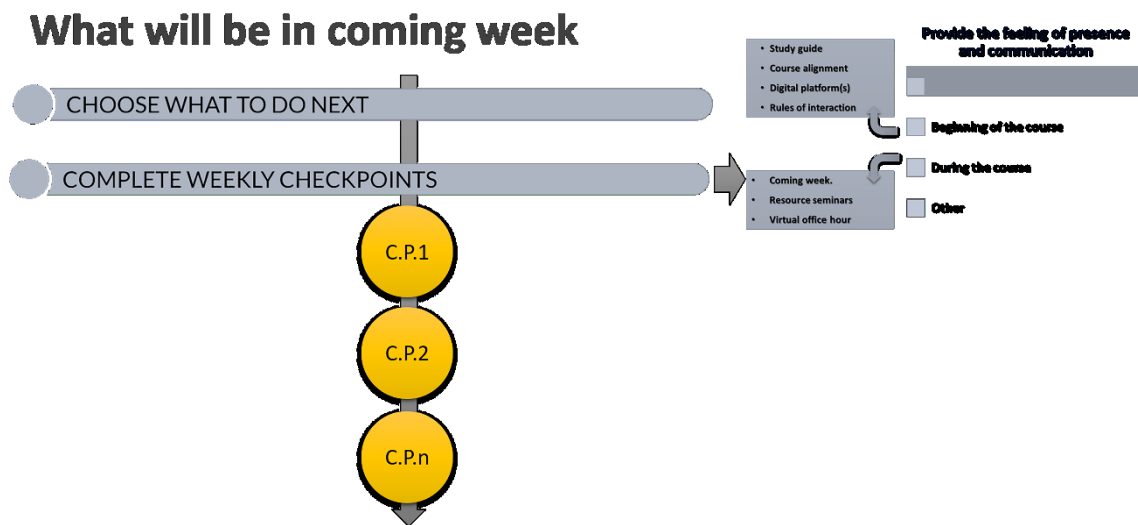


Figure 8. What Happen during the Course regarding Students' Orientation?

Creating an active learning community will require strengthening the interactions between teachers and students. At the beginning of any course, the first lecture needs to have a creative introduction where videos will enhance social presence and make class participants be more “real” regarding expectations to the course. Using multimedia tools supported by innovative visual information will avoid creating Knowledge Islands in a learning community (Shcheglova, 2018).

Lima et al. (2021) affirm that activate of virtual office hours will help faculty to make academic assignments easier it also improves work-life balance. Virtual office hours' work is a comprehensive online work solution suite that allows faculty to efficiently work from anywhere globally without forgoing a physical office's benefits. In simple terms, it provides you with a digital platform for performing academic work remotely, as well as giving faculty a physical address and presence at the desired location; the virtual office hours will strengthen the relationship between teacher and students, where the teacher has to create the working mechanism as shown in Figure 9.

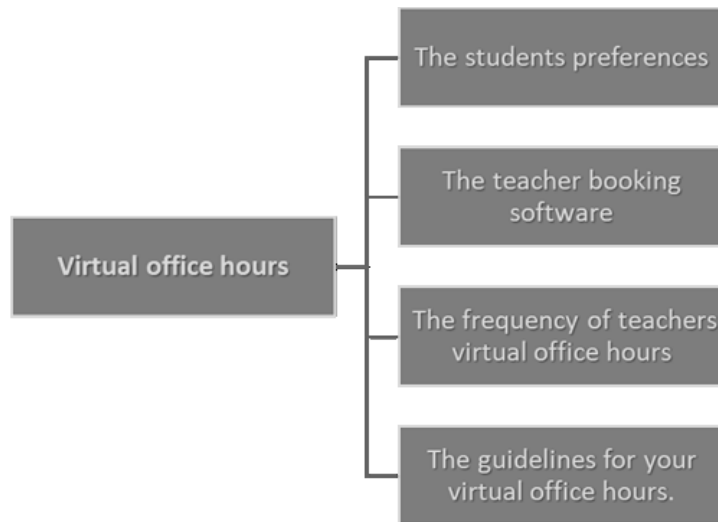


Figure 9. The Mechanism of “Virtual Office Hours”

Effective communication with students in the digital environment should be a priority for instructors as it not only contributes to retention but also provides a sense of community that is important to the student, see Figure 10. At the beginning of the course, be transparent with the students about the goals of the time (Bromley, Schonberg, & Northway, 2015). In the introduction lecture, teachers should clarify which competencies and the Learning Outcome Assessment will develop and how they will be evaluated. At the end of any course, students need to reflect and provide evidence of their progress toward mastery of each of those competencies.

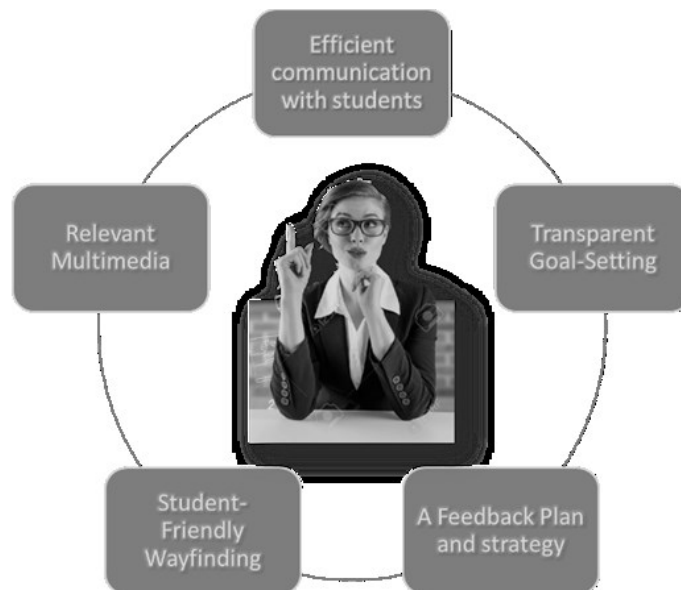


Figure 10. The Influential Role of the Presence and Communication in a Learning Community

Improvement of vertical has certain pedagogical functions and is aimed at creating a favorable psychological climate, as well as at the psychological optimization of educational activities and relations between the teacher and students within the student body. Optimal vertical communication between a teacher and student in a learning process creates the best conditions for student motivation development. Suzić et al. (2013) affirm that educational activities' creative nature, for the correct formation of the student's personality, provides a favorable emotional climate. Many students feel more pleasant by simply sitting quietly and listening to the teacher, avoiding communication. Teachers at universities may be inclined to justify this low level of student-teacher communication to argue that this type of conversation is unnecessary or appropriate in university teaching. A vertical communication between a teacher and a student has a wide variety of informational, normative, cognitive, communicative, regulatory, and educational. In digital teaching, the teacher must be more deliberate about student-student, and student-faculty exchanges happen. This can occur as:

- Synchronous session.
- Communal discussion boards.
- Group projects, students' presentations.
- Peer review groups (opposition).

Out of the digital teacher, the teacher can help to:

- Create study groups.
- Establish crowdsource notes.

Like all communications, these should be evocative, applicable, and hypothesized to evade misperception or anger that can sometimes result from group interactions.

Lecture Time (Anatomy and Management):

In the First 15 Minutes of the Talk: The first 15 minutes in online teaching is students' time, where the teacher needs to ask students about their feeling, and their expectations and learning goals are, and what challenges they face. Coman et al. (2020) support the idea that effective interaction in the first minutes is high and considers that it will make the participants more relaxed and interested in communication. In these minutes' teachers need to create an attractive linking with their students, where they need to ask the student to:

- Put their full names and photo in their screen area.
- Be active, and open in discussions.

Gregory (2013) believed that during the first 5-10 minutes, teachers could use several activities that connect to the student and make them relate prior knowledge to the lesson ahead. While vital that the students join the content, there is no remarkable proper technique to hook the students during initiation. However, the teachers need to call their students by names and memorizing details about them, so they feel unique and listen.

In the Lecture Time:

- Using easy conversation language supported by visual material and presentation of teacher background through storytelling give students more opportunities to know the teacher's career, research, and teaching methods.
- The teachers have to accept all students' questions as helpful and enjoyable questions that will encourage students to create teamwork and build trust (Burgan, 2006).
- The lecture has to be structured, and well prepared, where the student's faces represent a mirror of the students' understanding and satisfaction.
- It is creating a feedback system after each lecture for making a continuous improvement of delivered materials. That can read by looking into the eyeball of the students.
- Using the appropriate videos and constructive discussions that can help students to conceptualize the topic on hand.
- Using comfortable and competent presenting tools, such as PPTs, can help them cohere the whole process and the chronology of topics and subjects being taught.

Gregory (2013) thought that the middle of the lecture, where most of the content delivery happens, is another opportunity to use brief active lecture strategies. Students have difficulty staying focused for more than 12-15 minutes of traditional, lecture-style content delivery. She also believes that the activity that can provide students engagement in the middle of the lecture is a question generating technique. "Stump your neighbor" requires pairs of students to create questions that they feel are very problematic. These questions can be shared aloud, collected on cards, texted, e-mailed, or using a classroom responder system. The problems can be projected immediately such as using Poll during the Zoom meeting.

At the End of the Lecture: The teachers need to end their lectures using the following suggestions:

- A simple conclusion of a kindly narrative ties up loose ends

- Summarizing the main subjects, information, issues of the lecture
- Opening opportunities for creating connections beyond the lecture topic
- An effective closure activity

Lecture Time Management: Burgan (2006) thought that pausing every 12-15 minutes permits students to process the new information actively, and that will help students to keep students focused. Rowe (1980) suggested using minimum 2–3-minute breaks in the lecture at 8–12-minute intervals to improve the students' lecture focusing. The break help student to let the information to drown in and register deeply in minds students.

Efficiency in the Engagement of the Digital Education (Activities and Process)

For an efficient improvement in the educational process of online courses required to focus on some objective's tools designed to enhance online learning quality and ensure the fair and effective use of digital technologies in a pandemic time:

- Creating a clear learning process strategy, including unexpected problems, makes plans for preparedness for unforeseen issues (Pietarinen, Soini, & Pyhältö, 2014). To create an efficient plan Jensen (2017) thinks that introducing new knowledge is required to respond to a changing environment effectively. Since all courses are in online learning mode, the computer servers may not accept new users, causing the online learning platform to overload and crash. To address all unforeseen issues promptly, educators should prepare a plan B or even a plan C before starting and informing students in advance.
- Dividing the teaching time into small teaching units- One unit is about 20-25 minutes. Gholam, Mehrpourb, & Nikooravesh (2016) suggest that the teaching process's effectivity can create by dividing the educational material into smaller structural units. To enable students to focus on online learning, educators need to intelligently break down learning content into narrower topics and use a modular learning approach. In other words, based on ensuring a clear structure of knowledge in the curriculum for teachers of it is recommended to divide the content of a standard lecture (s) into several small modules, each of which lasts approximately 20–25 minutes.
- Online communications mean alive connections, where teachers have to use their voice. In traditional classroom teaching, essential tools are body language, facial expressions, and the teacher's voice. However, as soon as the course switches to the online format,

non-verbal communication possibilities become limited, and only the agent can function in full. Oladipupo (2014) assumes that in online learning, teachers should make the most of such verbal communication tools as intonation, the timbre of voice, the tempo of speech, diction, and others.

Because many teachers do not have a lot of experience working on online educational platforms, technical assistants' help is critical. They can also provide advice and answer questions for under-prepared students using email, social media, and instant messengers. The motivation for active learning may be outside the classroom. Compared to traditional lectures, teachers have less control over online learning, and students are more likely to miss classes (Bruen, Kelly, & Loftus, 2020). Thus, the progress of online learning and its effectiveness is highly dependent on the motivation and self-control of learners outside the classroom. Teachers must use various methods to modify homework and motivate students to learn outside the school actively. An effective combination of online and self-study, insufficient independent preparation for classes, limited participation in discussions, and inadequate depth of mastering the material at know the most common problems of traditional teaching. These questions should not be overlooked in online learning as well.

When planning an online course, instructors may include two Learning phases: Offline Self-Learning Phase and Online Learning Phase. During the offline self-study phase, learners must read course-specific literature and submit short articles based on critical materials before class. Kebritchi, Lipschuetz, and Santiago (2017) think that during the online learning phase, educators can use the discussion method to assess understanding of the material and stimulate further study. The educational environment's psychological essence is revealed as a system of relations between participants in the educational process. The educational environment is regarded as a condition of development of its subjects' personality - the student and the teacher and creating a sense of community. A review of approaches to understanding the educational environment as systems of possibilities for the person's development is given.

The psychological essence of the effective interaction process is described as a system of relations of the participants of the educational process. Stouten, Rousseau, and De Cremer, (2018) suggest that the educational environment of a university is a phenomenon that has a complex of certain psychological characteristics that affect the personality of both the student and the teacher. Figure 11 shows the fundamental topics for generating an effective

interaction and then the sense of community in a complete system.

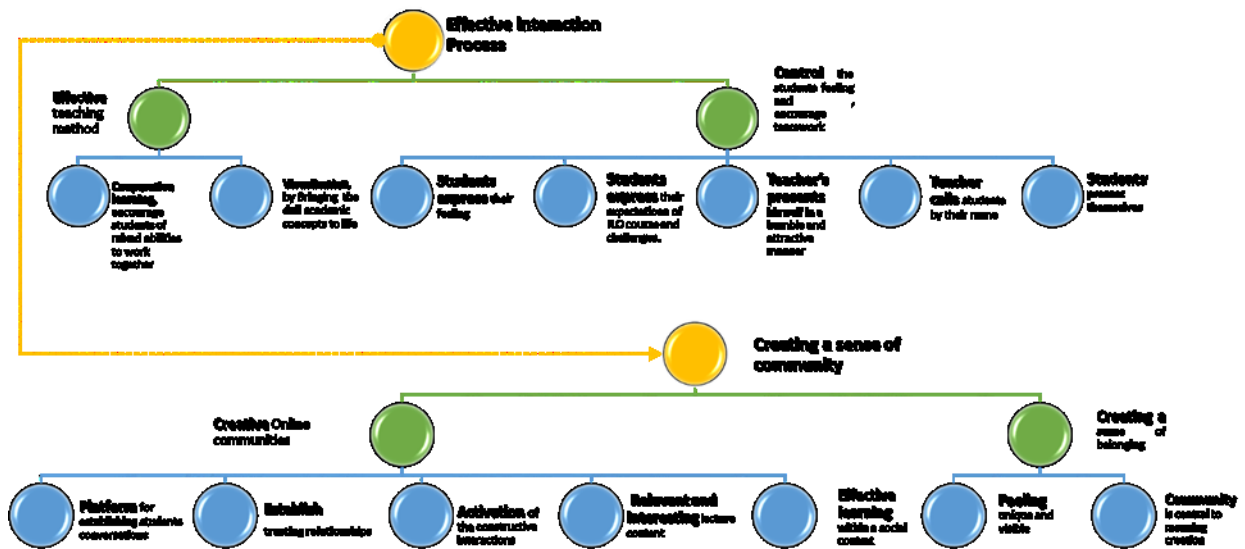


Figure 11. The Elementary Subjects for Creating an Effective Interaction and then the Sense of Community

Efficiency in the Engagement of the Digital Education State

Engaged students are defined as participating in class, characterized as engaging in class discussions, applying knowledge, ideas, and concepts from different courses (Dinh, Cannata, & Miller, 2018). Implementing these principles can be ensured by transforming a student from an object of pedagogical influences into a subject of education. At the same time, an educational institution should create opportunities for students to productively solve personal development problems, introduce them to the meanings, purposes, values, the content of the professional activity, the peculiarities of its development and implementation. The implication of a student into a theme interested in self-change determines his future development as a professional, capable of building his activity, changing, and developing it, contributes to the formation of professional thinking. Therefore, the university leaders have to pay immediate attention to what the students do and how they performed, and how to create healthy student engagement in academic communities.

Intellectual Student Engagement

One of the important principles of organizing the pedagogical process should be the creation

of conditions for the choice and construction of students' own education and self-education program, the formation of personal responsibility for the process, and the result of learning. Student engagement and intellectual challenge are essential to successful understanding (Grillo & Damascena, 2015). When people feel tired, the learning effect is low. When they are in a state of excitement, the feeling of fatigue is always late, the duration of learning is long, and the degree of intellectual participation is relatively high. Through active learning to use the brain, new shoots grow at the synapses between the brain's nerve cells, the brain function will develop, and the human intelligence level will be improved. The more the human brain is used, the more flexible it is, and the more it uses it, the more developed it makes people smarter. Therefore, from the analysis of physiological mechanisms, active intellectual participation is beneficial to learning.

Emotional Student Engagement

Psychological research results show that love is a universal psychological need in people. People cannot leave the collective environment. People in the joint need not only others to love themselves, but also to love others by themselves. Perceived emotional engagement constructed in the peer group in (teacher-student) interaction together with course-related well-being contributes to students' perceived cognitive attention and, further, to their course achievement. Cognitive engagement, on the other hand, refers to the student's investment in learning activities, including self-regulation, the commitment to mastery learning, and the use of studying strategies (Ellemers, Kortekaas, Jaap, & Owerkerk, 1999).

Behavioral Student Engagement

To fully implement the university education policy, it is required to strengthening the ideological and moral education of students, guide students to improve their behaviors and ideas, form good moral qualities, cultivate civilized behaviors. (Virtanen et al., 2014) Behavioral engagement means the student's activities and involvement in the course activities, academic, social, or optional. Recent theoretical conceptualizations of student engagement have raised questions about measuring student engagement and how arrangement varies across schools and within the school and classrooms (Shcheglova, 2018).

Social Student Engagements

In real life, some students often take a "nothing to do with themselves" attitude when they are not involved in their vital interests, even if it is related to their interests (correspondingly when the interests of other people are involved.), it is often a careless attitude, losing the consciousness of working hard for the benefit of others and oneself. Social engagement represents the manner of cooperating (engaging) in the online form. The dialogue can be created by the social media platforms, where the zoom meeting platform is the common interaction area, but there are many other platforms. The social interaction dimension of engagement involves an engaged individual interacting with others with whom they share the interest in the object of engagement (Hurst, Wallace, & Nixon, 2013). Ciszek (2017) suggested that social identity is related to favoritism within a group. Behaviors prejudiced by social identity strengthen the individual's self-definition expressed through acknowledging the individual as an essential member of the group.

Cultural Student Engagement

Shao and Dongju (2016) believed that the campus culture mainly refers to the spiritual life of university students after class, including ideas, literature, and art, in universities. The construction of campus culture should eliminate the original stereotypes so that every student can find his figure. The development of cultural activities has always been inextricably linked with the development of society. The construction of campus culture should eliminate the original stereotypes so that every student can find his figure. Universities from various countries are trying to save a viable location for themselves on the global market for educational services. Currently, thousands of universities from diverse continents are stressed to enter worldwide rankings (Zepke, 2019).

Results

COVID-19 has affected all levels of education, including higher education. The “collective consciousness” and efficiency of decision-making became important. The field of higher education can be safely called one of those that the pandemic has had the most significant impact on a global scale. Moreover, the higher education sector has become one of the few prepared to move most of its processes online. Digital teaching in the COVID19 epidemic

became the most urgent requirement for academic institutions today. Building approaches for quality communications leading to learning, satisfaction, and communication has been a challenge in digital education for decades.

Although digital education has been the primary interaction method in online environments, technological advances have allowed students and faculties to interact more personally. This does not mean that traditional education is no longer essential or desirable as a method of interaction. The transition to digital education, the creation of a virtual educational environment gives rise to the need to change the management of an educational organization. And if these changes do not occur, then digitalization can lead to negative consequences. The study shows that the impact of digital technologies and tools on the institution of higher education is multifaceted. The literature study both positive and negative aspects of digitalization, which are essential to study systematically.

It is recognized that digital education in higher education is an objective process that reflects the general logic of the transition to a digital society. However, this process is associated with several social risks affecting both individual social groups (in this case, teachers, and students) and the most important social institutions. It is necessary to activate the studies on the systematic risks for the digitalization process to be manageable. Its negative consequences are minimized as much as possible. Also, there is a need for a learning model on an online system that would implement automated learning support and adaptive learning in the future. A severe challenge in online education is the contradiction between open online courses and the Intended Learning Outcomes (ILOs). Thus, the educational process's digitalization is a profound counter transformation of the educational process and its elements, on the one hand, and digital technologies and means used in the educational process, on the other. When planning to achieve the goals set by academic institutions, it is necessary to consider that the process of digitalization of education has two sides:

- A digital education environment should be designed to be a set of digital teaching aids, online courses, and electronic educational resources.
- A deep modernization of the educational process is designed to prepare a person for life in a digital society and professional activity in a digital economy.

The most straightforward way to understand the meaning of efficient digital education engagement is by creating a total concentration in online learning by a greater understanding

of what works, why, and how. The field of online learning can improve the experiences of an increasing number of online students through connections between theory and research. That can also be by creating a change in learning models (digital education) under digital technologies' influence. The question of how the institution of higher education itself is changing remains open.

Many research types show that both formats play a crucial role in maintaining engagement and communication between students, exploring content, and ensuring digital education satisfaction. Teachers should consider student motivation, especially in interactions with peers and coaches, as a significant component in determining when and how to use both forms of interaction. There is no clear opinion regarding how and when to perform asynchronous and synchronous interactions have been mixed, as well as the methods used to collect, and interpret data; researchers find it difficult to determine if an exchange is the best in the digital environment.

The expected goals of digital education are associated with the identification and maximum full use of the possibilities of digital technologies, which can conclude to:

- Expanding opportunities for the use of various group (team) forms of organizing educational activities
- Ensuring the complete assimilation of the given educational results - professional knowledge, skills.
- The competencies required to obtain professional qualifications.
- Expanding opportunities for pedagogically effective professional education
- Building a system of continuous diagnostic and formative assessment based on instant feedback directly during the execution of educational tasks.
- Liberation teacher from the classical teaching process

This study plays an essential role in understanding what requirements should be imposed on the modern teacher and student, at the same time, understanding the university's role in creating the best management models. Thus, it is required to answer the question, “what actions need to be taken to mitigate the negative consequences of higher education digitalization?”

Conclusion

Based on the new situation of the COVID-19 outbreak and its consequences regarding supporting higher education digitalization, this article identifies practical ways to improve the students' engagement in digital education. That includes the introduction of digital technologies and tools into the educational process and the creation of a virtual (digital) educational environment, supported by the changing approach to the management of educational organizations. On the one hand, digitalization contributes to an increase in openness, the flexibility of education, increased student engagement in the digital teaching process, and a network model of interaction between universities. On the other hand, it leads to creating a new educational situation, the inclusion of new actors in the education system, which changes the configuration of relations between its main participants.

Digital teaching contributes to an increase in openness, the flexibility of education, increased student involvement in the learning process, and a network model of interaction between universities. On the other hand, it leads to creating a new educational situation, including new actors in the education system, which changes the configuration of relations between the main its participants. Digitalization introduces significant changes in the teacher and student role in the learning process, which requires appropriate adaptation. The transition to online education, the creation of a virtual educational environment generates the need to change the management of an educational organization. And if these changes do not occur, then digitalization can lead to negative consequences. Due to the introduction of a self-isolation regime, traditional education was forced to move to an online format, which in one form or another will continue in the new academic year.

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CHAPTER 7: TO SYNC OR NOT TO SYNC? STUDENTS' PERCEPTIONS OF THEIR LEARNING IN FALL 2020 SYNC CLASSROOM DURING COVID-19 PANDEMIC

Derar Serhan 

Chapter Highlights

- In a response to COVID-19 pandemic and to meet the teaching and learning challenges that faced higher education institutions, Arizona State University (ASU) offered a new modality for teaching in Fall 2020 called ASU Sync.
- The purpose of this study was to investigate students' perceptions of their learning in the Sync classroom during COVID-19 at ASU in Fall 2020. In addition, it investigated students' perceptions of their learning and engagement in the Sync classroom in comparison to the traditional f2f classroom.
- The findings of this study indicated that students had a positive attitude toward the Sync classroom and that they believed that the Sync classroom structure had a positive impact on their learning.
- Students believed that the Sync classroom structure had mostly a positive impact on their classroom engagement with the instructor but not their interaction with their classmates.
- Students found the Sync classroom to be flexible and accessible. In addition, the students mentioned that they faced some challenges in the Sync classroom including technical and social challenges.

Introduction

During the Spring 2020 semester, due to the COVID-19 pandemic, universities moved instruction from face-to-face (f2f) to remote instruction. This was not an easy move neither for students nor for instructors and administration. Many instructors were not ready for this sudden change that required the use of new platforms. They faced many challenges such as learning how to use new technologies in a short period, designing instructional materials that fit the new environment, providing interactive learning and adopting new assessment techniques.

Universities provided professional training sessions to their faculty members to facilitate the transition. Many of them provided their students with laptops and internet access. To be ready for Fall 2020, like other universities, Arizona State University (ASU) was among those universities who set plan for students' return in the Fall 2020. In a response to COVID-19 pandemic and to meet the teaching and learning challenges that face higher education institutions, ASU offered a new modality for classes called ASU Sync.

What is ASU Sync?

ASU Sync is a synchronous, technology-enhanced and fully interactive remote learning based on live Zoom lectures. It provides students with real-time remote access to classes that are taught on campus by combining live Zoom lectures with the in-classroom instruction. Students who are enrolled in Sync classes are able to use Zoom to learn in real time alongside other students who are participating in f2f classroom instruction. Students are able to interact with the class and the instructor. This approach can help accommodate students' individual circumstances, enable social distancing in classrooms or can be used as standalone technology. It offers the benefits of f2f instruction in an interactive group learning environment. (ASU website: <https://adulging.asu.edu/blog/understanding-asu-sync>, Nov 3, 2020).

What the ASU Sync/in-person classes look like?

To create physical distancing in classrooms, students attended some class sessions remotely via Zoom. Students who were enrolled in ASU Sync Fall 2020 classes that met twice-a-week

were divided into two groups. Each group attended one day a week in person, and one day via Zoom. In addition to accommodate students' needs, students had the option of attending the class completely online. For example, a Tuesday, Thursday class was designed as follows: *On Tuesdays*, half of the class meets in-person while the other half of the class participates in the live Zoom class. *On Thursdays*, the students who attended class f2f on Tuesday, attend via Zoom on Thursday, the Tuesday group that attended via Zoom attends the class f2f on Thursday.

What is Zoom?

Zoom is a web-based collaborative video conferencing tool that was founded in 2011 by Eric Yuan. Zoom provides quality audio, video, and screen sharing. It is a very convenient tool for online lectures, meetings, webinars, and more. Zoom offers many features that can be very helpful for instructors. These features include a virtual white board that allows for annotation, breakout rooms that allow the creation of small groups to facilitate group work and student collaboration. It also offers a polling feature to solicit student feedback promote interaction as well as a chat feature that can facilitate class discussions and participation. In addition, it is possible to record Zoom meetings and make them available for future reference (ASU website: <https://ets.engineering.asu.edu/zoom/>).

As stated on the ASU Web site (<https://provost.asu.edu/sync/faculty/FAQ>, Nov. 3, 2020), Zoom simply and easily allows ASU students, faculty, and staff to collaborate, bringing flawless video, clear audio, and instant screen-sharing to potentially frustrating virtual meetings. It provides the following benefits: Instructors can explain concepts with a virtual white board and annotation feature; instructors can use Zoom to conduct virtual office hours; instructors can create small group collaboration with break out rooms; instructors can solicit students' feedback with polling; instructors can facilitate discussions through the chat feature and instructors can record their own presentations.

Literature Review

Over the past few months, many studies emerged focusing on remote teaching and learning during the COVID -19 pandemic (Abbasi et al., 2020; Adnan & Anwar, 2020; Agarwal & Kaushik, 2020; Basilaia, et al. 2020; Bao, 2020; Demuyakor, 2020; Giovannella, 2020;

Hamilton et al., 2020; Ioos & Gallicchio, 2020; Murphy, 2020; Naciri, Baba, Achbani & Kharbach, 2020; Özer, 2020; Toquero, 2020). Some of these studies focused on student and teacher perceptions of the teaching and learning during the COVID-19 pandemic (Al Rawashdeh, Syam, & Serhan, 2020; Angelova, 2020; Hebebcı et al., 2020; Marpa, 2021; Niemi & Kousa, 2020; Serhan, 2020; Tümen Akyıldız, 2020; Unger & Meiran, 2020). The results from these studies varied widely.

Abbasi et al. (2020) explored students' perceptions of e-learning during the Spring 2020 lock down. They collected data from 382 students using a 23 item, 5-point Likert scale questionnaire. The questionnaire consisted of 23 items: five items covered demographics, one item investigated the choice of gadgets used for e-learning, and 17 items covered students' positive and negative perceptions of e-learning. The researchers found that most students (77.4%) had negative perceptions towards e-learning. The researchers concluded that students preferred face-to-face instruction over e-learning instruction during the lockdown.

Agarwal & Kaushik (2020) analyzed the responses of 77 students about their perceptions after their f2f classes were replaced with 40-minutes Zoom lectures for 12 days. The majority of the students (97%) indicated that the sessions were relevant to their learning needs and clinical practice and 99% of the students perceived the sessions to be designed to meet their level of learning. All the participants suggested that this format of online classes should be made part of the medical curriculum. Based on these results, the researchers concluded that online teaching should be part of the postgraduate training in future classes.

Demuyakor (2020) investigated 315 Ghanaian international students' level of satisfaction of online learning in higher educational institutions in China. The results of the study indicated that students supported the implementation of online learning programs and that they were satisfied with their experience with online teaching and learning during the transition from f2f traditional sessions to the online ones. The results indicated that the students found online learning effective. On the other hand, students who participated in the courses from outside China indicated that securing internet data for online learning was very costly, while students who lived in dorms Complained of slow internet connectivity.

Giovannella (2020) conducted a study in Italy exploring the effects of the Corona virus pandemic on students after they transitioned from face-to-face instruction to a virtual one.

The participants in the study were 101 students enrolled in an educational science course. The students completed a 40-item questionnaire that included qualitative, quantitative, and multiple-choice questions. The results of the study showed that even though the students missed the traditional face-to-face class settings, they had a positive attitude toward the sudden change in educational settings.

Serhan (2020) investigated students' attitudes towards the use of Zoom for remote learning and compared between students' perceptions of their f2f vs remote learning. Data were collected from thirty-one university students using a 5-point Likert-type survey. The results indicated that students had a negative attitude toward the use of Zoom and perceived it as having a negative effect on their learning experience and their motivation to learn. Students listed flexibility as a main advantage to using Zoom for learning.

Al Rawashdeh, Syam, & Serhan (2020) investigated the effects of the transition from f2f to remote learning on students' perceptions and achievements in Calculus I due to the spread of Coronavirus. Data were collected from sixty college students who were enrolled in a Calculus I using two tests and a survey. The results indicated that students had a positive online learning experience; most of them felt confident in their remote learning and even expressed that it allowed them more interaction than the f2f modality. However, half of the participants reported that they had to put more effort into their learning after the shift to the online format. Participants found online learning to be flexible, useful and helpful to their learning.

Hamilton et al. (2020) surveyed nationally representative samples of K–12 USA public school teachers and principals after the transition from f2f instruction to a remote one. Their goal was to document the delivery of instruction, the support, and services that the participants needed as well as expectations and plans for the 2020–2021 school year. The researchers found that educators needed additional resources that included the following: access to technology for students, remote instruction training for teachers, strategies for motivating students in the new remote setting, strategies to support students' social and emotional needs and adequate support for students with disabilities and homeless students. Researchers also identified disparities in the quality of instruction and school resources according to different student populations. Their study suggests that the inequities during the pandemic might get worse.

Ioos and Gallicchio (2020) gathered data on the effects of COVID-19 on healthcare practice, medical and pre-medical educational experiences. They concluded that the pandemic has affected the medical field. For example, medical schools put extra limitations on students' contact hours with patients and postponed their spring exams, which will result in delaying their graduation. Physicians have turned to telemedicine to reduce exposure and possible disease transmission. The impact of COVID-19 extended to pre-medical students who were unable to participate in many of the activities required by medical schools as part of the acceptance process including shadowing and volunteering opportunities.

Özer (2020) reviewed the Turkish Ministry of National Education educational policy in response to the COVID-19 pandemic. The researcher found that the Ministry of National Education established an extensive distance education by strengthening the infrastructure of digital educational portal, collaborating with Turkish Radio and Television Corporation to establish an effective distance education system and established a psychosocial support system to help students cope with the negative psychological effects of COVID-19.

Alba-Linero et al. (2020) investigated the effects of the COVID-19 pandemic on the education of students across different disciplines. Data were collected from 326 students from the College of Medicine, Education and Engineering at the University of Malaga. Data were collected using a 20-item questionnaire. The results of the study indicated that the transition to online learning was not easy for students and it has not been entirely satisfactory. Students indicated that they invest more effort and time in the online environment compared to the f2f one.

Yilmaz Ince, Kabul, and Diler (2020) examined academics' beliefs about distance learning during the COVID-19 pandemic. One hundred thirty-six academic staff working in Isparta University of Applied Sciences in Turkey participated in the study. The results indicated that the participants saw distance education as a powerful tool that allows education to reach many students. However, the participants also believed that distance education can prevent students from socializing, and that successful learning cannot be achieved without an instructor in distance education. Toquero (2020) encouraged researchers to document the effects of the present pandemic on educational systems worldwide. She called on institutions to adjust their pedagogical practices to adapt to the learning needs of the students beyond the classroom walls.

As COVID-19 affected institutions of higher education around the world, thousands of universities turned towards remote learning. Some universities relied on Zoom for their delivery platform. The purpose of this study was to investigate students' perceptions of their learning in the Sync classroom during the COVID-19 pandemic at ASU in Fall 2020.

Research Questions

1. What are students' attitudes toward the Sync Classroom?
2. What are students' perceptions of the impact of the Sync Classroom on their learning?
3. What are students' perceptions of the effect of the Sync Classroom on their interaction?
4. How do students compare between their learning in Sync vs f2f classrooms?
5. What are the advantages and the challenges of the Sync Classroom?

Method

The participants in this study were 34 students who attended Sync classes at ASU during Fall 2020. The participants filled a 5-point Likert-type 20-item survey. The scale of the survey responses ranged from Strongly Disagree (1) to Strongly Agree (5).

The survey consisted of four sections: students' attitudes toward the Sync Classroom, students' perceptions of the impact of the Sync classroom on their learning, students' perceptions of their classroom interaction in the Sync classroom, and Students' comparison between f2f and Sync classes. In addition, the survey included two open-ended questions: What are the advantages of the Sync classroom? What are the challenges that you faced in the Sync classroom?

Results and Discussion

The responses collected from the 5-point Likert-type survey items were grouped into four categories: students' attitudes toward the Sync classroom, students' perceptions of the impact of the Sync classroom on their learning, students' perceptions of their classroom interaction in the Sync classroom, and students' comparison between f2f classes and Sync classes. In addition, students' responses to the questions about the advantages and the challenges of the Sync classroom were analyzed.

In the following discussion, the “A” designation includes all “agree” and “strongly agree” responses while the “D” designation includes all “disagree” or “strongly disagree” survey responses, and the designation “N” includes all “neutral” responses.

To provide an answer to the first research question about students’ attitudes toward the Sync classroom, 68.57% of the participants agreed that they enjoyed the Sync classroom structure while 8.57 % disagreed. The means of students’ responses for the six survey items ranged from 3.77 to 4.23 out of 5 which indicated a positive attitude toward the Sync classroom (see Table 1). This indicates that students had a positive attitude toward the Sync classroom learning, in general 65.71% indicated that they overall enjoy remote learning. In the Sync classroom, Zoom was used as the delivery platform. This agrees with Wang et al.’s (2018) findings that students had positive attitudes toward the use of Zoom. They perceived it as a valuable tool for facilitating teaching in spite of facing some technical issues.

Table 1. Students’ Attitudes toward the Sync Classroom

Item	M	SD	A%	N%	D%
1: I enjoyed the Sync classroom structure.	3.80	1.04	68.57	22.86	8.57
2: I felt comfortable in the Sync classroom.	4.17	0.91	85.71	8.57	5.72
3: The Sync classroom saved me time and effort.	4.06	1.12	74.28	17.14	8.57
4: The Sync classroom allowed flexibility in my learning schedule.	4.23	1.07	80	14.29	5.71
5: I am satisfied with the Sync classroom.	3.94	1.04	68.57	22.86	8.57
6: Overall, I enjoy remote learning.	3.77	1.07	65.71	20	14.29

Regarding students’ perceptions of the impact of the Sync Classroom on their learning, only 28.57% agreed that the Sync classroom structure improved their learning, while 22.85% disagreed. The majority of students (48.57%) had a neutral view of the impact of the Sync classroom on their learning. In addition, the majority of students (62.86%) agreed that attending the class virtually via Zoom made it easier for them to understand the class concepts. Students expressed the same positive attitude toward the video resources that were provided in the Sync classroom. The means for students’ responses ranged from 3.17 to 4.37 out of 5, which indicated that students had a positive view of the Sync classroom and its impact on their learning (see Table 2).

Table 2. The Impact of the Sync Classroom on Students’ Learning

Item	M	SD	A%	N%	D%
7: The Sync classroom improved my learning in the class.	3.17	1.08	28.57	48.57	22.85
8: The use of the video resources in the Sync classroom made it easier for me to understand the required class concepts.	3.83	1.13	65.72	22.86	11.42
9: The Zoom sessions in the Sync classroom made it easy for me to understand class concepts.	3.8	1.09	62.86	28.57	8.57
10: The Sync classroom structure helped me develop confidence in the class.	3.51	1.11	54.29	28.57	17.14
11: The Sync classroom allowed me access the teaching and learning materials anytime and anywhere.	4.37	0.93	88.57	5.71	5.72
12: I really think I would do better in this class if it were taught completely in traditional classroom format not in Sync format.	3.17	1.16	40	31.43	28.57

In regards to the third research question that investigated students’ perceptions of the effect of Sync classroom on their interaction, 45.71% agreed that the Sync classroom structure increased their interaction with the professor in and/or outside of class, while 22.86% disagreed. Regarding classroom interaction with classmates, 34.29% agreed that their interaction increased, while 48.57% disagreed. The means of students’ responses ranged from 2.77 to 3.83 out of 5, which indicated that students believed that the Sync classroom structure had mostly a positive impact on their classroom engagement with the instructor but did not increase their interaction with their classmates (see Table 3). The results of this study match some of Wang et al.’s (2018) results where students’ interactions and experiences during the Zoom sessions were lower than the students’ interactions in traditional classroom settings.

Table 3. Students' Perceptions of Interaction

Item	M	SD	A%	N%	D%
13: I felt comfortable conversing using the Sync classroom structure.	3.83	1.11	68.57	20	11.42
14: The Sync classroom increased my interaction with the professor in and/or outside of class.	3.31	1.24	45.71	31.43	22.86
15: The Sync classroom increased my interaction with my classmates in and/or outside of class.	2.77	1.31	34.29	17.14	48.57
16: The Sync classroom motivated me to seek help from tutors, classmates and the instructor.	3.31	0.98	37.15	45.71	17.15

In regards to the fourth research question investigating students' perceptions of remote vs f2f learning, the majority of the students (57.14%) indicated that they preferred to enroll in future classes using the Sync classroom compared to the f2f classroom. In addition, 45.71% of the students indicated that they felt more motivated to study in the Sync classroom in comparison to the f2f classroom. The means of their responses ranged from 3.2 to 3.54 out of 5, showing that they had a neutral view that is favoring the Sync classroom instruction in comparison to the traditional f2f classroom (see Table 4). This disagrees with the conclusion in Roy et al.'s (2020) study where students preferred to go back to the f2f instruction post the COVID -19 lockdown. This also disagrees with Doggett's (2007) study in which the majority of students indicated that they would have been more comfortable in a traditional classroom setting.

Table 4. Students' Comparison between ftf and Sync Classes

Item	M	SD	A%	N%	D%
17: I spent more time studying in the Sync classroom compared to face-to-face classroom.	3.54	1.25	57.14	25.71	17.14
18: I put more effort completing tasks in the Sync classroom compared to face-to-face classroom.	3.29	1.26	42.86	28.57	28.57
19: I am more motivated to study in the Sync classroom compared to face-to-face classroom.	3.2	1.3	45.71	20	34.29
20: I prefer to take future classes using the Sync classroom compared to face-to-face classroom.	3.49	1.20	57.14	22.86	20

In regards to the fifth research question investigating students' perceptions of the advantages and challenges of the Sync classroom, students' responses were tabulated based on commonalities. The two advantages that were mentioned by students were flexibility and accessibility. This finding agrees with the findings of Wang et al.'s study (2018). They found that students liked attending lessons via Zoom, in particular they liked the flexibility of Zoom sessions in comparison to f2f classrooms. Similarly, in this study, the Sync classroom allowed students the flexibility of attending classes anywhere. Here is a sample of students' comments about the flexibility and accessibility of the Sync classroom:

- The Sync Classroom allowed me to get to class efficiently and effortlessly, otherwise I believe I would somewhat struggle to get to the actual classroom.
- There is obviously more freedom and flexibility in terms of arranging my study time and other more.
- Ability to access content whenever convenient and I can do it from my home without having to worry about social distancing or the covid situation.
- The Sync Classroom really helps me to save much time and make a class schedule. The most significant advantage for me is saving time and costs.
- Advantages of the Sync Classroom is that it's really remote and I can save a lot and do everything with minimal resources but at the same time have all the help I need to do well in class.
- It allows me to have the availability to do the class on my own time. Which is great since day to day life is not very consistent due to the pandemic.
- Easy access to classroom, no daily commute needed. -Easier to interact with classmates. -Easier to interact with professors.
- Some advantages of Sync Classroom is the flexibility. With Covid-19 going on and this upcoming election, there have been a lot of changes in our daily life's. Having sync allows us students to be able to do this in the comfort of our home. When it comes to the classes taught mainly by the posted lectures, this allows students to do other things during the day, such as working a job in order to pay things because of the pandemic, and to do the homework at night.

On the other hand, students' perceptions of the challenges of the Sync Classroom were summarized under four categories: technical issues, interaction and social issues, attention and general Issues. Below are samples of students' responses under each category:

Technical Issues

- The technology is not always reliable. At times, the classroom projector seemed to have a mind of its own and would keep going in and out of focus.
- Sometimes there was technical difficulties, but nothing that severely affected the class
- Internet connection
- Some zoom classes with technical difficulties are more difficult to follow.

Interaction Issues, Social Issues

- Students are much less likely to interact and participate with others in group activities.
- Difficult to get everyone participating. -Depending on class/professor structure, there may be very little interaction. -Harder to communicate. -Students can sometimes feel isolated.
- The social aspect really impacted me in being confident to ask for help from either the teacher or the students, I'm a little more hesitant.

Paying Attention

- Paying attention
- Harder to learn online due to not actually paying attention and its just harder to follow along online
- Time management

General Issues

- The challenge might be that more preview is involving in this kind of teaching style, which may take up more time in a specific subject compare to traditional teaching.
- Sync classroom posed some challenges as it sometimes felt like I was watching a very long video and i dozed off quite a bit. I did my best not to fall into that but it does get a tad bit challenging at times.

- It is different for each professor. Some professors who are teaching at their own house have a clear voice, but some professors, wearing mask and teaching at school, have an unclear voice. So, it is really difficult to understand what they are talking about.
- Challenges I face is not being able to get the full learning experience. I feel that as a student I am not grasping the important information as I would be in a traditional face-to-face classroom. I also feel that with some teachers, I do not have a good teacher and student relationship.

Conclusion

In response to COVID-19 pandemic and to meet the teaching and learning challenges that face higher education institutions, ASU offered a new modality for classes called ASU Sync. ASU Sync is a synchronous, technology-enhanced and fully interactive remote learning using live lectures via Zoom technology. It provides students “real-time” remote access to classes that are taught on-campus, it combines live Zoom lectures with in-classroom instruction. The purpose of this study was to investigate students’ perceptions of their learning in the Sync classroom during COVID-19 pandemic in Fall 2020. In addition, it investigated students’ perceptions of their learning and engagement in the Sync classroom in comparison to the traditional f2f classroom.

The findings of this study indicated that students had a positive attitude toward the Sync classroom and that they believed that the Sync classroom structure had a positive impact on their learning. In addition, they believed that the Sync classroom structure had mostly a positive impact on their classroom engagement with the instructor but not their interaction with their classmates. Students found the Sync classroom to be flexible and accessible. In addition, the students mentioned that they faced some challenges in the Sync classroom including technical and social challenges. More studies are needed to investigate the effects of the COVID-19 pandemic on students’ learning during the whole academic year to explore how new teaching modalities can improve student learning in the future.

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CHAPTER 8: PRESERVICE MATHEMATICS TEACHERS' OPINIONS ON ONLINE MICRO-TEACHING EXPERIENCE

Halil İbrahim Akyüz , Güler Tuluk 

Chapter Highlights

- Until the 2019 COVID-19 outbreak, preservice teachers taught by interacting in real-life situations that naturally occur in practices based on variable practice schools.
- Micro-teaching was carried out in this study in an online learning environment to fill the gap between preparation for undergraduate and real world application, and to propose a technological solution
- This study aims to professionally examine preservice mathematics teachers' experiences during the micro-teaching experience in an online learning environment.
- The data in the case study were obtained from the written opinions of the candidates and the observations made by the researchers during the candidates' lectures.
- Micro-teaching can also be considered as the preparation of preservice teachers who had to return to compulsory distance education due to the COVID-19 pandemic in face-to-face education for technology-supported teaching practice.
- This practice should be considered as technology-aided preparation for the teaching profession together with the school experience course in the fall semester of 2020-2021. The same scenario should be taken into account in Teaching Practice I and II courses to be implemented in the following years.

Introduction

The recent COVID-19 pandemic (epidemic) has significantly disrupted education and training activities at all levels worldwide. According to the epidemic process of the United Nations Educational, Scientific and Cultural Organization (UNESCO), 1.5 billion students in 191 countries were affected by this situation due to school closures all over the World. It states that approximately 63 million teachers use the remote learning approach to teach their students (United Nations, 2020).

The situation was no different in Turkey. The Ministry of Education has suspended all of its classes in all educational institutions, and distance education programs were put into effect within the first 1-2 weeks. Authorities tried to carry out their educational processes by employing TV broadcasts, synchronous and asynchronous course tools, where learners would follow the lessons at home. In the meantime, problems emerged, and legal regulations were needed regarding the remote administration of some applied courses. Compulsory "teaching practice" courses, which are one of the important courses of Education faculties, come first among these applied courses.

The first of the main tasks in the training of preservice mathematics teachers is to know how to teach mathematics in their education at the university. For mathematics teachers, adequate knowledge in each of the three areas of technology, pedagogy (Andreasen, Haciomeroglu, Akyuz, Coskun, Cristwell, Whitby, 2008), and content domain (Baki, 1996; 1997; 2008) appears to be relatively critical for a teacher's effectiveness in today's mathematics classroom. When first dealing with the content domain of mathematics, the teacher should know enough of the content to appreciate and represent the depth of this critical discipline. Second, they should have a sufficient knowledge of the teaching profession (pedagogy). Using mathematics teaching systematically to help students understand mathematics similar to the teacher's own understanding is necessary. And finally, understanding and using mathematical technology, in teaching, as much of today's mathematics, is intricately intertwined with technology is necessary. However, as Mishra (2006) points out, TPACK is much more than three individual components and "represents the intertwining of the three basic sources of information - technology, pedagogy, and content - in a way, as in Figure 1 for teaching mathematics."

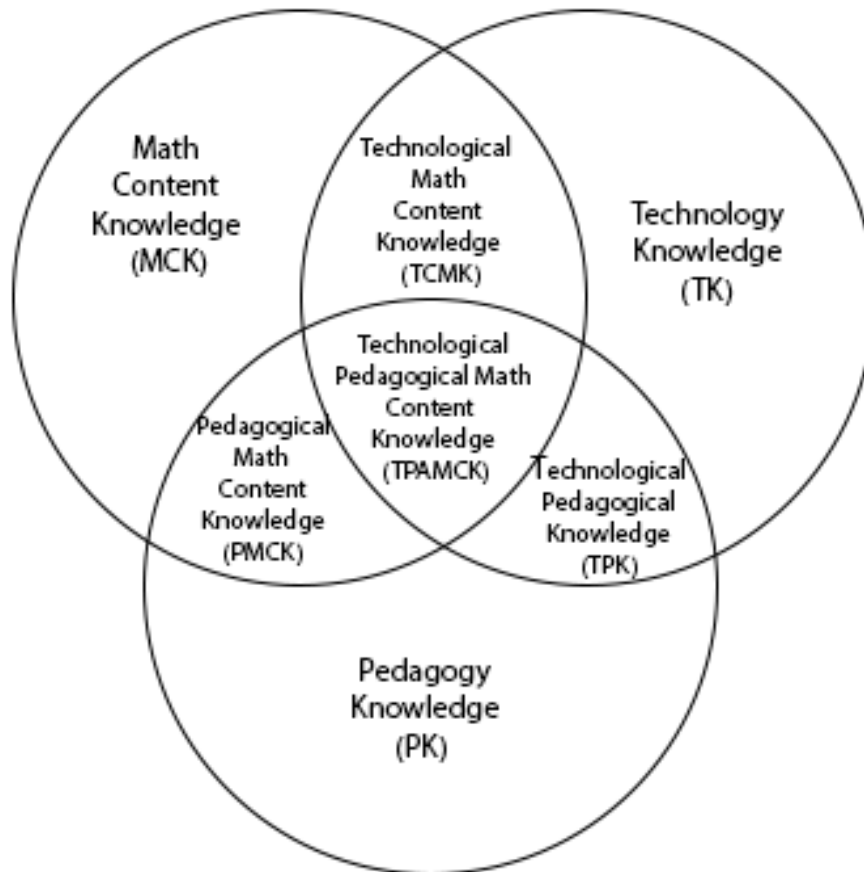


Figure 1. TPAB Framework for Mathematic Teachers

In order to address the TPACK that teachers need in effective mathematics teaching, educators must first give some information about the mathematics discipline itself. What exactly is the study of mathematics? What are we trying to teach while working in our classes?

These types of questions are actually more difficult than they seem at first glance. When you ask many primary school students and their teachers to describe mathematics, they will usually define it as arithmetic and basic geometry knowledge and skills. Middle and high school students and their teachers can also talk about variables and perhaps various math topics such as algebra, geometry, trigonometry, and analysis. However, we should not lose sight of the spirit and depth that can be found in mathematics. Mathematics often represents a rich and dynamic journey towards attempting to understand and govern our world through patterns. It is a discipline that enables humans to navigate the oceans and launch satellites into space.

Due to the COVID-19 pandemic, technological advancements and developments necessitate a new structure in mathematics teaching. Anyone looking for ways to improve preservice mathematics teachers' TPACK should think about the strategy of providing teachers with experience in all possible combinations of technology, pedagogy, and content in the math classroom. First of all, we should consider equipping preservice mathematics teachers with all the potential TPACK they can use in the mathematics classroom. That's why we need to help them develop a math lesson.

Different applications are required for preservice teachers to self-evaluate their performance in their lecture presentations in a real classroom environment. Micro-teaching, a strategy commonly used in teacher training programs, combines both reflective practice (Keser, 2007) and situational learning approaches. The traces of situational learning can be seen in Gibson's (1986) qualifications theory and Vygotsky's (1980) social learning theory studies. The perception of the environment inevitably opens up certain paths of action. Although these actions often use embodied learning activities, technology-based learning activities, or abstract concepts, they are rather brought to life through real-life contexts such as applications and simulation. Terms and approaches such as cognitive apprenticeship, embodied learning, problem solving, explanation and justification, tasks and assessment, scenario-based learning, and action research represent how learning theory is applied in teacher training programs.

Technology also plays an important role in this area with the introduction of online virtual classrooms. The TPACK framework, proposed by Mishra and Koehler (2005, 2006), functions as a conceptual lens that helps researchers to examine how teachers use technology in teaching. While the first generation TPACK research focused mainly on defining and conceptualizing the seven structures of TPACK, recent studies have shifted teachers' knowledge of integrating technology, hence TPACK, to using the framework to facilitate and improve their teaching through technology interventions.

Micro-teaching is a condensed lesson plan that is used to practice, rehearse, and reflect on action (Arsal, 2014; Ledger & Fischetti, 2020). It is usually presented in a role playing context for real-time feedback and reflection. Micro-teaching provides a forum for pedagogical and strategic teaching, which are considered essential for the development of

teacher self-efficacy, both for mastership experiences and for indirect experiences. As it is known, the microteaching method has an important place in mathematics teachers to have information about technology-equipped mathematics learning environments and in teaching methods and practice lessons.

During the microteaching, the classmates of the teacher candidates act as students. Here, the preservice teacher is faced with the problem of lecturing to peers who have at least as much knowledge of the subject as herself/himself. However, it should not be forgotten that the focus of micro-teaching is not on what is taught but on how the subject is taught (Görge, 2003). Steps followed during micro-teaching practices are; preparing a 5-20 minute lesson plan, preparing the lesson and recording the lesson, evaluating the lesson by both the teacher and the following group, making the necessary suggestions and arrangements with feedback, re-preparing the lesson and re-evaluating it if deemed necessary (Benton-Kupper, 2001). With this study, I or we aimed to understand the process of the micro-teaching application carried out by the teacher candidates with the distance learning method and evaluated by the followers and teachers.

The Learning Management System (ÖYS-LMS) is internet-based software that is used to carry out training management processes such as assigning e-learning trainings to employees, taking employees into training, tracking outcomes, and reporting results. Moodle is an open source server-side learning management system software that includes the solutions needed for internet-based distance learning. Moodle is a modular system developed to run the needed add-ons together. It is used with the GPL license and is managed with a portal logic. SSL provides TSL support, and since plugins are loaded as modules, it is a very easy system for those who have done portal management (Elmas et al., 2008).

The <https://ders.kasefuk.org> system, which has been under testing since 2017, has been prepared and opened for use of some courses in the fall semester of 2019-2020. While this course was conducted both online and face-to-face for the first four weeks at the beginning of the term, the application part of the course, which was conducted face-to-face, could not be carried out and the planned evaluation and implementation parts could not be carried out due to the COVID-19 pandemic. The aim of the researchers is to ensure that preservice teachers are not deprived of practical experience within the scope of the teaching practice lesson, and

to eliminate the disadvantages of the pandemic period and turn them into an advantage. This involves designing and organizing the entire course online in order to prepare preservice teachers for more online classes.

Purpose of the Research

The aim of this study is to examine the competencies and opinions of Primary Mathematics teacher candidates regarding what they think they have obtained as a result of online micro-teaching application within the framework of TPACK. While direct observation in classrooms has provided abundant information about the nature of teaching in previous studies (Good & Brophy, 2000), now the successful integration of technology with effective teaching also provides this information (Harris & Hofer, 2009). In this study, it was observed how preservice teachers applied TPACK while conducting a lesson in an online learning environment (Kereluik, Casperson, & Akçaoğlu, 2010), and then the opinions of preservice teachers for actual planning and implementation were examined.

In teacher training, school practices aimed at the integration of field knowledge and field teaching knowledge, that is, the application, mostly faculty-practice school cooperation cannot provide teacher candidates with the desired competencies for various reasons (Arkün, 2011; Sarıkaya, 2014; Alkan, 2019; Sepet, 2020;). Considering the development of social media tools, the level of use of these tools by the new generation defined as digital natives, the proven importance of ICT's integration into teacher education, and especially the suitability of these tools to the reflective teacher education model (andragogy); In this study, a web-based online learning environment was established (Uzak.kasefuk.org). In this environment, an online learning community consisting of application lecturers and teacher candidates has been created, the teacher candidates have acquired conference software, a 3-month trial version managed entirely by themselves, and their own online learning environment (<https://www.adobe.com/products/adobeconnect/learning.html>). Each of the preservice teachers had their own virtual classroom. In this virtual classroom, they can plan live conferences that can start and end whenever they want, invite their students, store their previously used materials, use the whiteboard application, and record their live lessons.

The aim of this study is to observe the use of technology, field knowledge, and pedagogical knowledge within the framework of the TPACK model during online micro-teaching practice and to examine mathematics preservice teachers' views and opinions about the application. It aims to understand the TPACK of preservice mathematics teachers through both online observations and interviews.

Problem Status

The aim of this study is to observe the use of technology, content knowledge, and pedagogical knowledge within the framework of TPACK model during online micro-teaching application and to examine their opinions and thoughts about the application. Three research questions guided the research:

1. What are the level of technology use among participating mathematics preservice teachers in an online learning environment?
2. What kind of shares are there among participating mathematics preservice teachers in online learning environment?
3. What are the opinions of teacher candidates about TPCK, TCK, TK in the online learning environment?

Method

Research Model

In this study, one of the qualitative research methods, case study was used. Case studies provide the opportunity to examine the research subject in a short period of time on a small number of participants, using one or more data collection tools. In this study, the case study method was preferred because it was necessary to work with sixteen teacher candidates, to use observation as a data collection tool, and to complete the study in a limited period of time. Within the scope of the study, micro-teaching activities were carried out for a period of 5 weeks.

The sample of the study consists of 16 teacher candidates, 12 female, and four male, studying in the elementary school mathematics teaching program in Northwest Anatolia. In the study, written opinions and lessons that were evaluated and preparatory work that was carried out

were used as data collection tools. Interview data were requested as a Word file, and their views were collected online with a questionnaire, live lectures, and video recordings where micro-teaching took place. During the micro-teaching, application lecturers, mentor teachers, and other preservice teachers participated in online course sessions. The notes obtained from the observations of the lecturers who followed the course, the reflective diaries prepared by the students, and the answers they gave to the online open-ended form were subjected to qualitative data analysis.

Working Group

Sixteen teacher candidates who voluntarily participated in the study enrolled in the Teaching Practice course in the 2019-2010 Spring Semester at Kastamonu University elementary mathematics teaching program. In addition, two application lecturers and two application teachers participated in the study. For micro-teaching, firstly, preservice teachers were asked to choose one of the 5, 6, 7, 8-grade levels in the elementary school mathematics curriculum and to plan the activities that would lead to desired achievement by making a 40-minute lesson plan for the consequent grade level. While making this plan, it was explained that they could use the messaging parts of the system to interact with the teacher of the course and the application instructor.

Later, they were asked to revise this plan to fit 20 minutes online and present it to their preservice teachers, faculty members, and teachers in their virtual classrooms with a micro-teaching application. At this stage, preservice teachers were informed, and trials about virtual classroom management were made by the researchers, and by discussing their solution suggestions about virtual classroom management problems and what they wanted to do, experience in virtual classroom management and virtual classroom management skills were developed. While this process was continuing, the feedbacks about the 20-minute lesson plans were discussed and reviewed with other teacher candidates, faculty members, application teachers, and researchers, and the candidates revised the lesson plan and the lessons to be lectured.

At the end of this training, which lasted about four weeks, the students performed the micro-teaching application. In this micro-teaching, other teacher candidates and faculty members

behaved like a primary school student. After the micro-teaching was finished, weaknesses and strengths were stated by the mentor teachers and lecturers about the course. In addition, what should be done to use the technology at higher levels was discussed together.

Data Collection Tools

The data were collected through observations during the micro-teaching application, written statements and interviews consisting of open-ended questions after the application. In the study, technology usage levels defined by Hughes (2005) were discussed as used in Kaleli-Yılmaz (2012) research.

Level-1 (Replacement): At this level, the preservice teacher uses technology only to change the environment

Level-2 (Expansion-Amplification): Technology at this level is used to contribute to the fast and effective execution of the learning process.

Level-3 (TransformationTransformation): Preservice teachers are required to make changes in their learning-teaching routines and to design learning environments that will lead to a deep understanding of students (Hughes, 2005).

The observed lessons of the teacher candidates were analyzed according to these levels of technology use. A descriptive case study approach developed by Yin (2003) was used to examine what TPACK characteristics of teachers look like in the classroom. Data, observations, and written opinions of preservice mathematics teachers were handled as guided by the TPACK framework.

Results

Technology Usage Levels Of Preservice Teachers in an Online Learning Environment

The researchers analyzed the lessons taught by the candidates in the online learning environment, and in this study, Table 1 was prepared regarding the findings of the candidates' technology usage levels.

Table 1. Candidates' Technology Usage Levels

Level	f	Functions
1	16	<p>The preservice teachers prepared a daily plan and a presentation for this daily plan based on the gains in the curriculum related to the subject they will teach.</p> <p>They detailed these presentations with appropriate visuals.</p> <p>In their presentations, they added sequential animations that provide attention.</p> <p>In addition, in their daily plans, they thought about how to use the applications (algebra board, etc.) that preservice teachers think to use in face-to-face teaching in online virtual classroom.</p> <p>It was observed that they tried to make use of technology, especially in the assessment and evaluation part.</p>
2	16	<p>The preservice teachers used software suitable for the narration of the subject (MS-Power Point, MS-Word, activity papers, GeoGebra, animation, game, using the whiteboard).</p> <p>In this process, they made some efforts to solve the problems, not only software but also hardware related ones.</p> <p>In particular, they tried to save the lesson from monotony and plain lecture to increase interaction by sharing the software they installed on their own computers with the students through screen sharing.</p> <p>Discovering, measuring, and evaluating by using technology through discovery.</p>
3	12	<p>The preservice teachers tried different methods about which technologies they could use or how they could use them differently to correct the places that were criticized or seen weak in the experiments, and they improved their ability to use technology without hesitation and providing self-confidence.</p>

Table 1 summarizes the work done by the candidates according to their levels. Level 1 (f = 16) and Level 2 (f = 16) studies were carried out by all candidates. Twelve teacher candidates

conducted 3rd level study. For example, one of the 3rd level studies is teaching the acquisition of the sum of the angles of triangle is 180 degrees through exploration using GeoGebra software in 5th-grade math lesson. The other study is a teaching graphics in 7th-grade mathematics lesson through problem-based learning with the use of MS-Excel. In other studies, teacher candidates thought and used GeoGebra software in accordance with the goals. Some of them developed lesson plans for the 3rd level stage (f=4), but they remained at level 2 without using this during the lecture phase.

Sharing Types of Teacher Candidates in Online Learning Environment

In order to answer the sub-problem about what kind of shares the participants share in the online learning environment; researchers performed the data analysis based on the field notes kept in the process. At the end of the data analysis process, Table 2 was prepared regarding the sharing contents of the participants, taking into account the themes and frequencies created regarding the shares.

Table 2. Sharing the Content of Teacher Candidates

Sharing the content of teacher candidates	f
Class management:	
Time management, ensuring the participation of other preservice teachers and application lecturers in the course, management of the question-problem solving process, adherence to the lesson plan, communication with other preservice teachers and the application instructor, material use process management	16
Giving feedback:	
Giving directive feedback, rewarding, waiting time, giving adequate feedback	16
Mathematical knowledge:	
Terms, formulas, multiple representations, communication, association related to the teaching of the subject. Providing explanations and justifications	16
Teaching problem solving:	
Exercise and problem solving activity process, contextual problems	16

As seen in Table 2, it is very important to create classroom management ($f = 16$), discussions that can question mathematical ideas ($f = 16$) in a technology-based course. The preservice teachers were diligent and consistent in using mathematical knowledge ($f = 16$) for these situations and they used mathematical skills (problem solving, multiple representations, association, communication) explicitly.

Competencies that Preservice Teachers Think They Have Acquired within the Scope of Micro-teaching in an Online Learning Environment

The third sub-problem is researching technological pedagogical content knowledge of preservice mathematics teachers while using the online learning environment. Findings were obtained from the candidates' diaries, and the researchers' notes kept during the lecture given by the candidates. At the end of the data analysis process, tables were prepared regarding the sharing contents of the participants, taking into account the themes and frequencies created from the written reports.

Table 3. Preservice Teachers' Views on Technological Content Knowledge

Technological Pedagogical Content Knowledge Dimension (TPCK)	f
Using digital technologies to increase teaching efficiency.	16
I learned how to effectively use software that can apply and maintain a few distance learning	14
Effectively managing a technology-enriched classroom, I felt like a teacher in the live lesson.	14
We used technology to motivate students.	15
When I asked a question, I could see who gave feedback. We used technologies to deliver better information to students.	16
Using the whiteboard, ensuring active participation of students in learning	16
When I asked questions, there were people who gave feedback. We used technology as an aid in student assessment.	16
I can easily conduct distance education lesson. Thanks to the meeting platforms we use, if face-to-face education is interrupted for any reason, I can easily communicate with my students and teach my	16

course to them. It allowed me to do what I already knew in practice.	
By using digital content, we were able to integrate effective and efficient lessons into our planning and practice. So I think the lessons are more fun and understandable.	15
I used digital technologies that make it easy to do subject-specific mathematical activities.	15
I saw how what I want to do can be achieved with the help of technology with live examples.	15
Preparing lessons with technical support is both laborious. It takes too much time. It does not provide any benefit according to the direct expression.	1
Technology helps to make the content of the lesson meaningful, but I had difficulty using it in live lessons.	12
In fact, I had very good lesson plans in my mind, but I had trouble presenting them.	16
While I was transferring the lesson to the student, the sound and image problems disturbed my concentration. But I was able to produce solutions.	13
I felt like a teacher in the live class to effectively manage a class enriched with technology.	16
With systems such as GeoGebra, we have shed light in a very good way for the student to continue learning even when he/she is alone with the use of pure mathematical knowledge such as visual, graphics, and tables that appeal to a different part of the student's intelligence.	16
I would like to do this class face to face with students in the classroom.	12

Table 3 shows preservice teachers' evaluations of TPACK in the micro-teaching application. The difficulty in presenting the field knowledge by combining it with technology (f = 16) is striking. At this stage, the candidates felt just like a teacher (f = 16). The candidate (f = 1) who says it does not benefit according to the direct expression is only one person. All the candidates (f = 16) agreed on the continuation of these learning. In addition, all candidates (f = 16) stated that they would like to teach face to face.

Table 4. Preservice Teachers' Opinions about the Technological Pedagogical Knowledge

Dimension	
Technological Pedagogical Knowledge dimension (TPK)	f
Using digital technologies to increase my teaching efficiency.	16
To give the opportunity to do the questions in a certain time frame	16
Organizing questions.	16
While lecturing and listening, we could ask questions wherever we wanted and participate in the questions asked.	16
Seeing who got the right answer	16
Anyone can be active online with images, sound, or written expression	16
I was able to increase my motivation to the lesson by using a digital stopwatch.	16
We saw why we could not design a lesson that we designed face to face while using technology for 40 minutes in distance education in the same way.	16
The number of students in the classroom varies according to the technology to be used.	16

When Table 4 is examined, the pedagogical elements that teacher candidates use in their expression of TPK in micro-teaching practice can be seen. They emphasized the use of technology both to make better presentations to students (f = 16) and to actively engage the student in the lesson (f = 16). They explained that technology increases efficiency (f = 16), students can answer questions when asked (f = 16), and they can see and evaluate those answers (f = 16).

Table 5. Views on the Technological Knowledge of Teacher Candidates

Technological Knowledge Dimension (TK)	f
We became aware of the technological tools required to effectively use the whiteboard in distance education.	16
I realized what needs to be done to prepare my class for lectures, to make my students join this class, and what technologies they should	16

use. I saw that I could create my own solutions.	
I have used web-based storage devices with which I can share large files.	12
I used the applications for which I could prepare the presentation materials by finding them online.	16
I learned the things I should be careful about when using the word processor, spreadsheets, and the distance education platforms that I am already using.	16
I just searched for, found, learned, and used an application whose name I heard. We cannot expect someone to teach us all. We can learn software that we think will be useful for us.	13
I was able to edit and use an existing long video in a way that would work for me. I was able to achieve this, although my first attempt took a little long.	5
I can use necessary photo editing software to improve the quality, readability, and appearance of the photos I use in presentations.	16
I made learning effective by using a video I made in my presentation.	2
I can share an application on the computer with students.	14
Technology can make our lives easier.	16
Although technology makes life easier, I have clearly seen that we need to prepare for more lessons than face-to-face training.	16
I realized the importance of communication tools, such as e-mail and instant messaging.	16

As seen in Table 5, the preservice teachers were able to enrich the mathematical content with technology. They organized and developed content that would enable the student to participate in the lesson. They were able to organize exploratory activities using technology. They ensured that the questions and answers were evaluated. They demonstrated exploratory activities using learning spaces. In accordance with the gains, they organized activities that would not only verify the rule dynamically but also ask why it is valid and whether it is valid in every situation.

Discussion and Conclusion

In this study, the contribution of micro-teaching practices to technological pedagogical content knowledge was examined by taking the opinions of preservice mathematics teachers based on their online micro-teaching experiences. Candidates in the study used softwares such as MS-Office (Excel, Word, PowerPoint), GeoGebra, and websites such as <https://cmap.ihmc.us/>, www.mathsisfun.com, www.mathworksheets4kids.com, www.ixl.com, <https://wordart.com/>, <https://makeagif.com>, etc. During the lectures in the micro-teaching process, mentor teachers from the Ministry of Education, mathematics educators, and a researcher from the Department of Computer and Instructional Technologies Education were present. After the lectures, the stakeholders shared their views, contributing to the positive progress and shaping of the process. The most important aspect of this online work is that the employees in the field are actively involved in the process. The candidates performed the 1st level, 2nd level, and 3rd level, and some of them developed lesson plans for the 3rd level stage, but they remained at level 2 without using this during the lecture phase. This part of the study is compatible with Kaleli-Yılmaz (2012) and Akyüz's study (2016).

Preservice teachers have struggled to ask questions that enable them to reach generalizations by combining technology with rich mathematical content and a pedagogical approach, and they have struggled to develop contents that enable students to discover mathematical rules. Jang and Tsai (2013) stated in their research that it is difficult to make a precise distinction, especially between TCK, TPK, and TPCK components since TPCK components are interrelated and overlapping. This is the case for this study as well. Studies using various data sources are designed to examine the TPCK development of teachers (Koehler, Shin & Mishra, 2012). These are performance evaluation rubrics (Angeli & Valanides, 2009; Harris, Grandgenett & Hofer, 2010; Şay, 2014; Kanbolat, 2015; Yılmaz, 2019), open-ended questionnaires (Robertshaw & Gillam, 2010; So & Kim, 2009), teaching approaches and tools such as interviews (Harris, Grandgenett, Hofer, 2012; Mishra, Peruski, & Koehler, 2007; Ozgun-Koca, Meagher & Edwards, 2009-10; Williams, Foulger, & Wetzal, 2010) and observations (Agyei & Voogt, 2011; Hofer, Grandgenett, Harris, & Swan, 2011; Koehler, Mishra, & Yahya, 2007; Suharwoto, 2006). Therefore, it is necessary to continue research

efforts to improve the understanding of TPCK among preservice teachers, focusing on using multiple data sources that include the online environment.

This study, conducted within the scope of the Teaching Practice course, is thought to be beneficial in terms of providing options for Teaching Practice I and II courses to be implemented as of 2021-2022 and for the 2020-2021 fall semester School Experience course. In the light of the application data obtained, determining the results and suggestions of online learning communities created using an online learning environment built on social media tools to provide faculty-practice school cooperation was one of the other main objectives of this study (ders.kasefuk.org). This structure includes teacher candidates chat, forum, blog, and so on. It is a moodle application with technological equipment to perform applications.

In this study, the mentor teachers in the schools where the candidates worked were involved in the process and expressed their views. In addition to using the zoom.us program, the mentor teachers have seen and participated in another program. Online classes offer students convenience (Poole, 2000), flexibility (Chizmar & Walbert, 1999), and opportunities to work collaboratively and closely with teachers and other students from different schools and even different schools.

Fifteen theses were reached in a search with the keywords "mathematics and micro-teaching" on tez.yok.gov.tr. Eleven of these are related to mathematics education. In this regard, two theses were found in 2009, one in 2011, one in 2015, one in 2016, three in 2017, one in 2018, and two in 2019. In only one of these studies (Arkün, 2011), the online environment was used in lectures. This is the second study that has been done online environment. Akkaya (2009) found that in Akkoç's TUBITAK-supported project study, five preservice teachers who are doing micro-education have shown a significant improvement in the development of the concept of derivative in the TPACK's student difficulties component (derivative-limit, derivative-slope and derivative-change ratio relationship).

In Dönmez (2009) study, 37 teacher candidates applied a content domain knowledge exam about limit and continuity unit in functions. Later, he followed and recorded the lectures of four preservice teachers with micro-teaching method. It was observed that the teacher

candidates had deficiencies and misconceptions in their pedagogical content knowledge and its sub-knowledge.

Ergene (2011) handled the TPACKs for the concept of derivative of 41 preservice teachers in the multiple representations component and analyzed the personal development of 5 preservice teachers in interviews and videos of micro-teaching lessons. Analysis of the data obtained as a result of TPACK training reveals that preservice teachers' knowledge of multiple representations has developed in the direction of both using multiple representations and establishing connections between the representations they use, and this development becomes more evident with the introduction of technology.

Ergün (2015) examined the micro-teaching activities of five preservice teachers in technology-equipped mathematics learning environments in a 5-week period according to three levels and stated that the preservice teachers generally benefited from technology at Level-1 before micro-teaching, and after micro-teaching, technology at Level-2 and Level-3. It is found that they tend to use it at Level-3. In addition, it has been observed that the micro-teaching method is effective in changing the role assigned to the teacher from teacher to facilitator in technology-equipped environments and in using technology at higher levels. Ergün's work is compatible with this study.

Kurt (2016) examined the development of technological pedagogical content knowledge (TPACK) of preservice mathematics teachers in terms of teaching statistics with virtual manipulatives within the scope of micro-teaching course research (MTCR). Nine participants prepared a lesson plan in groups of three to add virtual manipulatives for a particular statistical concept throughout the MTCR. It was observed that the participants showed significant improvements in terms of TPACK knowledge dimensions, especially statistical field knowledge, statistical pedagogical knowledge, and technological field knowledge.

Açıkgül (2017) divided preservice teachers into four groups, Micro Teaching Practice and Gamified TPACK Activities in G1; GeoGebra Supported Micro Teaching Application in G2; Micro Teaching Practice in G3; In G4, GeoGebra Supported Micro Teaching Application and Gamified TPACK Activities were carried out. When the proficiency scores were examined at the end of the study, it was determined that there were significant differences between the

pre-test and post-test efficacy scores of all groups (G1, G2, G3, G4) in CK, PCK, TCK, and TPACK dimensions.

In his study, Çetin (2017) examined the development of secondary mathematics teacher candidates in the pedagogical formation education program in their Technological Pedagogical Content Knowledge (TPACK) competencies and levels. Within the scope of the research, TPACK competency scale for mathematics teachers was developed and the development of preservice teachers in TPACK and its sub-components was determined with the help of this scale. Candidates who received TPACK training carried out micro-teaching applications. The order of development of the qualification levels of the candidates is PCK, TKB, TPACK, TPK, PCK, and TCK. In addition, it was observed that the candidates' knowledge of purpose, strategy, method and technical knowledge, assessment and evaluation knowledge, and the difficulties they faced increased.

In his study, Aldemir (2017) investigated the effect of the Micro Teaching Lesson Image method on the development of TPCK levels on geometric objects in elementary mathematics teacher candidates in an environment created with a dynamic software (GeoGebra 3D). The research was designed as a qualitative study (case study), and the Micro Teaching Lesson Signage method was used. According to the results of the research, while the pre-intervention TPACK levels of the teacher candidates were mostly low, they increased after the intervention.

Koştur (2018) showed in his study that technology lesson is effective in mathematics education. The course was planned and implemented on the basis of four principles: transformational approach, cooperative learning, activity-assisted learning, and practice-based learning, which were determined based on TPACK and TPACK-P theoretical frameworks. The principles, design, and application details of the application-based and field-specific UTME course were explained clearly in order for the researchers to teach UTME in teacher education programs in order to increase and examine the development of TPACK-P of secondary school mathematics teacher candidates.

Karakuş (2019) examined the effect of the lesson study method on the development of the technological pedagogical content knowledge (TPACK) level of secondary mathematics

teacher candidates regarding the subject of trigonometry. The data were collected through the lesson plan, micro-teaching, semi-structured interview form, and semi-structured interviews made for these data collection tools. While the answers regarding the pre-recognition or discovery level before the intervention generally attracted attention, answers were given from all levels except the acceptance level. A level above the acceptance level was not found in the lesson plan and micro-teaching findings. After the intervention, it was observed that the teacher candidates were generally at the level of adaptation and discovery in their lesson plan and micro-teaching findings.

In Durusoy (2019) study, the effects of teaching material development processes of preservice mathematics teachers on Technological Pedagogical Content Knowledge (TPACK) were investigated. The preservice teachers worked in groups, designed teaching materials, and shared the development of the materials with their classmates. In the study in which micro-teaching applications were used, it was found that there were significant positive changes in TPACK and TPACK self-confidence levels of teacher candidates and their learning experiences had significant learning outcomes within the scope of Fink Taxonomy.

Öztürk and Işık (2020) found that expanded micro-teaching applications are an important technique that can be used in secondary mathematics teaching programs. Studies can be continued with an online environment envisaged in this study. Moreover, while the teacher candidates teach their lessons, the mentor teacher and other application lecturers can participate in the study. In this way, expanded academic feedback can be obtained from all stakeholders. Candidates can renew their studies by using this feedback. In addition, what needs to be done to use the technology at higher levels is discussed with the teacher candidates. In addition, after the micro-teaching activities in the study, the teacher candidates shared their comments and other files they prepared for their own lessons for development for the 2nd and 3rd levels according to the feedback from the mentor teacher, other teacher candidates, and the application instructor.

The finding that preservice teachers improve themselves in content-related posts in Peker's (2009) study on micro-teaching is valid for this study conducted online. In Kaleli-Yılmaz's (2012) study, micro-teaching activities were carried out over a 5-week period in order to

determine how elementary mathematics teachers changed their technology usage levels. The sample of the study consists of two candidate mathematics teachers. Technology usage level indicators developed by Kaleli-Yılmaz (2012) were used to analyze the data. When the findings were examined, it was seen that preservice teachers generally benefited from technology at Level 1 before micro-teaching. It has been determined that they tend to use technology at 2nd and 3rd level after micro-teaching. In the light of this information, it is thought that the micro-teaching method will be effective in using technology at higher levels. It is compatible with Yılmaz-Kaleli's work in this online study.

It has been determined that before micro-teaching, preservice teachers generally used technology to support traditional teaching in order to change the environment, that is, at Level 1. After micro-teaching, it was observed that they used technology in constructivist ways to make their learning more effective, faster, and more understandable, and they made use of technology at the 2nd and 3rd levels. In light of these findings, it was seen that the micro-teaching method has a positive effect on improving the technology usage levels of preservice teachers.

Although micro-teaching is based on studies conducted in Turkey, micro-teaching studies to examine the online development of professional skills and mathematics teachers dealing with the media is noteworthy, indicating that quite insufficient research in this area should be increased. Considering the contribution of the practices carried out within the scope of the research to the professional experience and development of the teacher candidates, the micro-reflective teaching practices, the stages of which are clearly expressed, are in the teacher education process, especially in numbers, algebra, geometry-measurement, statistics teaching and later on teaching. It is thought that its official inclusion in Practice-I and II courses may have positive effects.

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CHAPTER 9: CONSTRUCTION AND VALIDATION OF AN INSTRUMENT TO EXPLORE INSTRUCTOR AND STUDENT PERCEPTIONS OF ONLINE TEACHING

Sanaa Shehayeb , Eman Shaaban , Nina Haifa 

Chapter Highlights

- The COVID-19 Pandemic forced the widespread use of online learning while not necessarily approaching it in the most efficient and validated means.
- The purpose of this chapter is to construct and validate two questionnaires for instructors and students at the university in order to measure their perception towards online teaching in three constructs: teaching presence, cognitive presence and collaborative activity.
- Content validity was encountered theoretically through alignment of items with the theoretical framework indicators and empirically through inter-rater reliability and kappa statistic.
- Construct validity was measured through translation validity, face validity and piloting.
- Factor analysis was implemented in order to confirm the correlation of the items with their constructs and was also used to explore the discrimination between the three constructs.
- Results showed that the two questionnaires are valid and reliable for future use in research.

Introduction

Due to the COVID-19 pandemic throughout 2020, many higher institutions have opted to cancel all face-to-face classes, including labs and other learning experiences (Schleicher, 2020). They have mandated faculty to move their courses online to help prevent the spread of the virus. Similarly, in Lebanon the faculty members and the students of the Lebanese University found themselves obliged to cope with this new online learning environment regardless of their readiness, attitude, experience, background, interest and expectations (Hashem, 2020). The rising of the Corona virus pandemic led higher institutions of education to cancel physical classes over the course of 2020 and shift to alternative virtual platforms (Cakin & Kulekci Akyavuz, 2021; Ilhan, Kaba, & Sin, 2021; Schleicher, 2020). Throughout the lockdown periods, the faculty members and the students of the Lebanese University managed to adapt to the new online learning environment with various attitudes, interests, expectations and experiences (Hashem, 2020).

The process of online teaching is flexible whereas it creates opportunities of teaching and learning from any location, yet the speed of the process is staggering. The process can be problematic for many faculty members whose experience is advanced within the frame of face-to-face instruction, yet brings them back to being novice educators in online teaching without training and time to reconsider their pedagogical approaches. This rapid switch into online teaching helped the instructors better direct their instructional methods, thus it is essential to understand their perceptions about online teaching. Fundamental to perception is the experiencing person or the perceiver, the thing being perceived (an object, person, situation or relationship), the context of the situation in which objects, events or persons are perceived, and the process nature of perception starting with the experiencing of multiple stimuli by the senses and ending with the formation of percepts. Although it may appear from the above mentioned that perception is a disconnected and slow process, the formation of percepts takes milliseconds to complete and are not fragmented (Jordaan & Jordaan 1996).

Purpose and Rationale

The purpose of this research is to construct and validate two questionnaires to explore the instructors and students' perceptions of online teaching. Questionnaires are useful instruments implemented in gathering data about abstract ideas or concepts that are difficult

to quantify (Artino et al., 2014). They are also helpful in collecting information about behaviors that are not directly observable, assuming that the respondents are willing to report on this behavior. Questionnaires are mainly used to measure knowledge, perceptions, attitudes, emotions, cognition, intentions or behavior (Rattray & Jones, 2007). The two questionnaires designed in this study are particular in the sense that they target both the instructors and their students' perceptions of online teaching and learning at the Lebanese University with an alignment between the items.

Significance

Since there is a trend towards blended learning and online teaching (El-Husseini & Taha, 2017; Nnebedum, Obuegbe, & Nwafor, 2021), the questionnaires developed in this study can be used by researchers in order to explore the perceptions of instructors and their students of online teaching. These questionnaires take into consideration several constructs related to teaching presence and cognitive presence as experienced; in addition to the collaborative activity between instructors and students as well as between students, which characterizes the online learning environment.

Theoretical Framework

This research aims at studying the perceptions of instructors and their students at the Lebanese University, faculty of education towards online teaching. The Lebanese university instructors had to deliver their courses online without any face to face interaction due to Corona lockdown. The course content was adjusted, the instructors prepared documents and learning activities that facilitate the interaction among teachers and students, students and their peers, and students and content during online sessions. The platform Microsoft Teams along with other media (WhatsApp, google classroom, zoom, mail...) were implemented for discussions and collaborative activities. This online learning environment provides the opportunity for learners to go through the process of constructing knowledge, inquiring, exploring and thinking critically. Assignments, collaborative activities and group projects were used to assess students' performance (Anderson, 2010).

For the purpose of this research a new model was elaborated integrating two basic theoretical

frameworks of the Multimodal for online education developed by Picciano (2017): The Community of inquiry CoI model for online learning environments developed by Garrison, Anderson and Archer (2000); and the Online collaborative learning (OCL) a theory proposed by Linda Harasim (2012). This new model was used to investigate critical thinking, cognitive presence, teaching presence, and collaborative activity in the online learning environment during the Corona pandemic. Figure 1 illustrates the adapted elaborated model for online education implemented in this research.

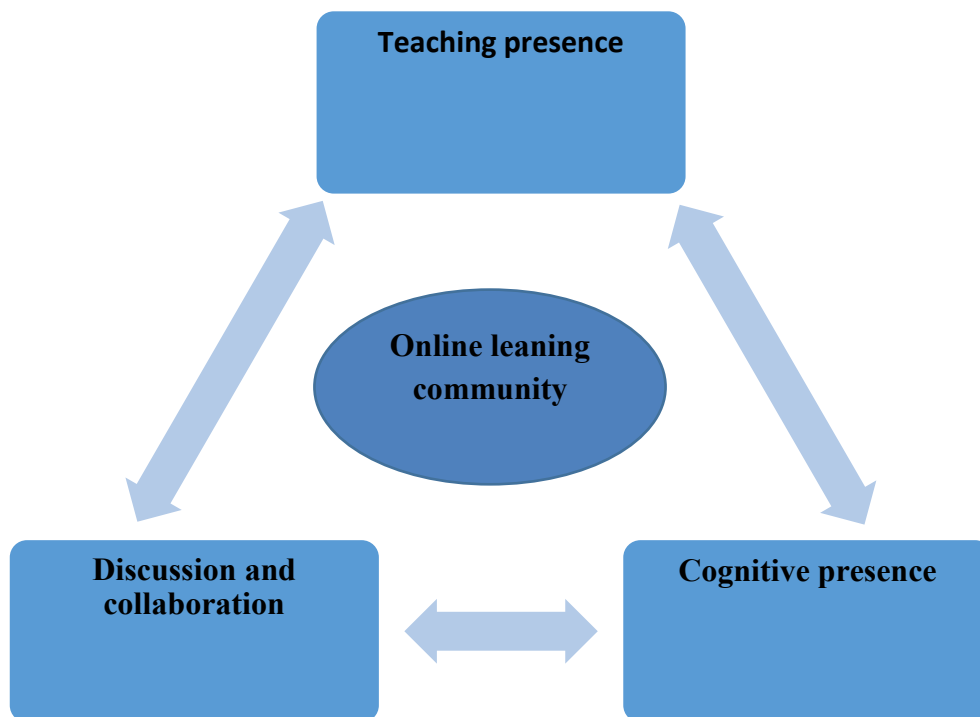


Figure 1. Elaborated Model for Online Education

The “community of inquiry” (CoI) model supports the design of online courses as active learning communities where instructors and students can share ideas, information, and opinions. Learning communities are based on collaborative learning (Gaspar & Santos, 2009) where students communicate, cooperate, and collaborate to construct new knowledge. The CoI framework is used to investigate critical thinking in online learning environment, where learning occurs in a community through the interaction among three elements: social, cognitive, and teaching presence. These three elements are essential to effective educational experiences. Teaching presence (what the teacher does) may have a significant impact on cognitive presence (level of student thinking and understanding) but it has yet to be empirically demonstrated (Garrison, Cleveland-Innes, & Fung, 2010).

Teaching presence begins before the course commences as the teacher, acting as instructional designer, plans and prepares the course content, and it continues during the course, as the instructor facilitates the discourse and provides direct instruction when required. Usually a formal distance education course consists of much more than dialogue between and among teacher and students and includes course readings, web explorations, exercises and individual and collaborative projects. Teaching presence mediates all of these components (Anderson, Rourke, Garrison, & Archer, 2001).

Garrison, Anderson, and Archer (2010) suggest that social presence occurs when the participants are “identifying with the community, communicating purposefully in a trusting environment, and developing interpersonal relationships” (p. 7). Cognitive presence represents “the analysis, construction, and confirmation of meaning and understanding within a community of learners through sustained discourse and reflection” (Garrison & Anderson, 2003, p. 55). The concept of cognitive presence is congruent with Dewey’s (1933) view of critical thinking. Cognitive presence is the key element in critical thinking, a necessary element for higher levels of thinking and learning” (Kanuka & Garrison, 2004, p. 33).

Cognitive presence is described in more depth in the Practical Inquiry model, which includes four phases of events within the cognitive dimension that need to happen to stimulate the cognitive processes and critical thinking in an educational context generally and online learning specifically (Garrison & Anderson, 2003). The four phases of this model were developed to guide the design and implementation of learning experiences. The triggering event is the first phase that initiates the inquiry process through a well-thought out activity to ensure full engagement from the students. This has several positive outcomes in terms of involving students, assessing the state of knowledge and generating unintended but constructive ideas.

The second phase, exploration focuses on understanding the nature of the problem and then searching for relevant information and possible explanation. Third is integration, this moves into a more focused and structured phase of constructing meaning. Decisions are made about integration of ideas and how order can be created parsimoniously. Finally, resolution is the phase of the dilemma or problem, whether that is reducing complexity by constructing a meaningful framework or discovering a contextually specific solution. This confirmation or

testing phase may be accomplished by direct or vicarious action.

There is a direct link between the process and outcome of critical thinking and cognitive presence. The development of critical thinking is an important rationale for higher education and plays a central role, both as a goal for and as a prerequisite of successful online discussions. Moreover, there are many elements of cognitive presence and the practical inquiry model that are associated with reflection: reflective reading, deep reading, reflective questioning, reflective discussion including attentive listening, and questioning. However, the term reflection does not appear within the categories or indicators of the framework, although one of the authors contends that learners move through the four phases “in an environment of reflection and discourse; analysis and synthesis” (Garrison et al., 2010, p. 32).

In our model we added reflection as an indicator in the resolution phase which includes reflection on the learning outcomes and reflection on the learning processes (Redmond, 2011). Online collaborative learning (OCL) is a theory proposed by Linda Harasim, “it focuses on collaborative learning, knowledge building, and Internet use as a means to reshape formal, non-formal, and informal education for the Knowledge Age” (Harasim, 2012, p. 81). OCL focuses on the facilities of the Internet to provide learning environments that foster collaboration and knowledge building, it includes three phases of knowledge construction through discourse.

Idea generating, a brainstorming phase where divergent thoughts are gathered; idea organizing where ideas are compared, analyzed, and categorized through discussion and argument; and intellectual convergence where intellectual synthesis and consensus through an assignment or a project (Harasim, 2012). OCL also derives from social constructivism, since students are encouraged to collaboratively solve problems through discourse and where the teacher plays the role of facilitator as well as learning community member. OCL can promote deep learning by encouraging discussions, in addition it supports high-level skills such as critical thinking, analytical thinking, synthesis, and evaluation.

The constructs under study in this research are the teaching presence, the cognitive presence and collaboration. The items of the questionnaire were constructed based on the indicators of the categories related to these four constructs as presented in Table 1.

Table 1. Categories and Indicators for Teaching Presence, Cognitive Presence and Collaboration

Construct	Category	Indicators
Teaching presence	Design and organization	Establishing interaction, setting parameters for the inquiry.
	Facilitating discourse	Stimulating constructive inquiry assessing process
	Direct instruction	Providing steps to solutions, summarizing discussions
Cognitive presence	Triggering event	Sense of puzzlement , stating a problem, changing direction.
	Exploration	Brainstorming, broad search for insights, information exchange.
	Integration	Connecting ideas, computations, creating solutions
	Resolution	Achieve solution, analysis of solution, implementation, and reflection
Collaboration	Idea generating	Divergent thoughts are gathered.
	Idea organizing	ideas are compared.
	Intellectual convergence	Intellectual synthesis and consensus are sought.

Challenges in Designing the Questionnaire

The researchers faced several challenges while designing the questionnaires, which manifested essentially in the item construction. Designing questionnaire items that assess perception are different from those that assess factual knowledge. They aim at identifying the processes that make people form beliefs about the experience they had and the extent to which it affected their attitudes and behavior (Lavrakas, 2008). Thus, the researchers faced difficulty in choosing the items that could qualify students' and instructors' perceptions. The challenge moreover prevailed in choosing matching items for students and instructors and in

choosing items that align with the theoretical framework. Another concern was the choice of the verb tense to be used that gauge perceptions, between either the present tense or past tense. The items were designed to take into consideration students' perceptions about the experience and instructors' perceptions about their experience and readiness based on their online teaching (Linjawi & Alfadda, 2018). That is why modal verbs were used in formulating the instructors' questionnaire. The modal verbs used in constructing the questionnaire were "can" and "should" which express dynamic and deontic modality (Vičič & Petek, 2016). It is deontic in the sense that it stresses duty as an ethical concept and dynamic in the sense that it is characterized by constant change. The simple present tense in the passive voice has been used in writing the students' questionnaire items to highlight the object of the sentence, as one of the items indicates: "The students are encouraged to reflect on course content"—wherein their potential role as active learners is emphasized.

Another concern was that students, at the university level, usually take courses with several instructors. To explore their perceptions about the experience of online teaching in general demands reflection on more than one course and more than one instructor, which makes their responses inconsistent and different from one course to another. That is why the instructions given to students emphasized their experience during online teaching, not on a specific course or instructor. Additionally, the items were carefully designed in order to make students think of their experience of online teaching in general; if students were to respond while having in mind one course only, they would be directed to evaluate the instructor which is not the aim of this study. In addition to the above, forming a questionnaire based on one course only violates the validity and reliability of the questionnaire.

Rationale for the Likert Scale

The advantage of Likert Scales is that they do not expect basic yes or no answers from the respondent, but rather they allow for degrees of opinion including no opinion at all. Offering anonymity on self-administered questionnaires should further reduce social pressure, and thus may likewise reduce social desirability bias (McLeod, 2008). Survey measurement scales usually have at least five points, this presumably provides enough room for variation, and it provides a neutral midpoint as well. Four point scales for Likert type questionnaires are preferred since they can be evenly split into simple dichotomies: Agree and Disagree. Four point scales were used in the constructed instruments in this research mainly because offering

neutral options allows them to move on without giving careful thought to the question (Dolnicar, 2011).

Construction of the Instrument

The questionnaire constitutes of five parts:

1. Demographic information: gender, certificate, major/specialty, class standing/teaching experience, language.
2. Technology skills and e-learning experience.
3. Perception measurement items: for teaching presence (10 items for instructor's questionnaire and 7 items for students' questionnaire), cognitive presence (15 items for both questionnaires) and collaboration (4 items for both questionnaires) (Table 2).
4. Assessment methods used.
5. Reflection on the online teaching experience.

The items were first gathered by the researchers from various resources relevant to the theoretical framework (Haghighi & Tous, 2014; Jansen et al., 2016). Specific items were selected and adapted. Also, new items were constructed to align with the theoretical framework indicators. The items that measure perception of instructors and students were based on the three main constructs elaborated in the framework: Teaching presence, cognitive presence and collaboration. Each researcher worked on the items alone and then the final version emerged collaboratively.

Validity

Validity refers to the extent to which the concepts under study are reflected in the instrument's items. To be able to rate the quality of a questionnaire, content validity and construct validity should be taken into consideration. Content validity examines the extent to which the concepts of interest are comprehensively represented by the items in the questionnaire. Construct validity is the extent to which instruments used mainly questionnaires test the hypothesis or theory they are intended to measure. Convergent construct validity shows how constructs are related. Discriminant construct validity tests the relationship between the construct and unrelated measure (Ginty, 2013).

Content Validity

Content validity can be defined as the adeptness of the items to reflect the variables of the construct to be measured. It also verifies whether the instrument items are a comprehensive sample of the content. In addition, it can provide information on the representativeness and clarity of items and help improve an instrument through achieving recommendations from an expert panel (Polit & Beck, 2006). Content validity was verified through building the items of the questionnaires in alignment with the framework constructs. Items related to the content, teaching presence, cognitive presence and collaboration were developed taking into consideration all the indicators presented in Table 2.

Table 2. Alignment between the Questionnaires' Items and the Theoretical Framework

	Teacher questionnaire items	Student questionnaire items	Construct Indicators
1	The course(s) content should be adjusted to fit the needs for online teaching	The course(s) content are adjusted to fit the online teaching	Design and organization
2	The course objectives should be shared with students	The ideas/topics are clearly communicated	Facilitating discourse
3	The instructor can encourage students to explore new concepts	The students are encouraged to explore new concepts	Facilitating discourse
4	The instructor can provide feedback on time	The students receive instant feedback on their work	Facilitating discourse
5	The instructor can discuss assignments with students	The students receive constructive feedback on their work	Facilitating discourse
6	During the session the instructor can call up for students to participate	The students are asked to answer questions	Direct instruction
7	The instructor can post	Assignments are	Design and

	assignments on the platform or using other media when needed	posted on the platform or sent on other media when needed	organization
8	The instructor can trigger students to reflect on fundamental concepts of the course (s)	The students are encouraged to reflect on course content	Resolution
9	The instructor can pose problems that need variety of information sources to be solved	The students are encouraged to search references others than those sent by the instructor	Exploration
10	The instructor can design problem situation that leads to students' cognitive conflict	Questions are posed to allow the students explore the course content	Exploration
11	The instructor can use discussion as a teaching strategy	Discussions are implemented during online sessions	Triggering event
12	The instructor can use the inquiry method as a teaching strategy	Inquiry method is implemented during online sessions	Exploration
13	The instructor can deliver the course through the lecturing method only	Lecturing is implemented during online sessions	Exploration
14	The instructor can design activities/ assignments to trigger students' curiosity	Course activities trigger the students' curiosity	Triggering event
15	The instructor can help students relieve their misconceptions	The students' misconceptions are	Resolution

		identified	
16	The instructor can use brainstorming	Brainstorming is utilized during online sessions	Exploration
17	The instructor can help students appreciate different points of view	Students challenge themselves and others	Integration
18	The instructor can provide the opportunity for students to make judgement on the procedure utilized in solving problems.	Students have the opportunity to make judgement about the strategy utilized in solving problems	Resolution
19	The instructor can design activities to urge students to construct explanations/ solutions	Learning activities urge the students to construct explanations/solutions.	Exploration
20	The instructor can provide the opportunity for students to describe ways to test the knowledge constructed	The students are encouraged to test their constructed knowledge	Resolution
21	The instructor can provide the opportunity for students to apply the knowledge constructed	The students are capable of applying the constructed knowledge	Resolution
22	The instructor can urge students to defend the procedure used	The students are encouraged to justify the procedure used during learning activities	Resolution

		The students have the opportunity to make judgement about the strategy utilized in solving problems	
23	The instructor can provide the opportunity for students to support their peers and ask for support when needed	The students provide support for their peers and ask for support when needed	Idea generating
24	The instructor can provide the opportunity for students to exchange ideas with their peers	The students have the opportunity to exchange ideas with their peers	Idea generating
25	The instructor can reinforce collaborative learning	Team work is emphasized	Idea organization
26	The instructor can collaborate with students to adjust the course content for online teaching	Working in small groups helps students to solve complicated problems	Intellectual convergence

Note that the three items related to teaching presence in the teacher questionnaire were not included in the alignment table since they don't apply for students. Content validity was also quantified by content validity ratio (CVR). Experts in the domain were requested to specify whether an item is necessary for operating a construct in a set of items or not. Five experts in the domain of education were consulted. Each expert was informed of the purpose of the research and the framework constructs. The expert had to check each item in the questionnaire and choose either "essential", "useful but not necessary" or "not necessary". Content validity ratio varies between -1 and 1. The higher score indicates further agreement

of members of panel on the necessity of an item in an instrument. The formula of content validity ratio is $CVR = (N_e - N/2)/(N/2)$, in which the N_e is the number of panelists indicating "essential" and N is the total number of panelists. In our study the number of panelists consisted of 5 members, The value of CVR should have a minimum of 0.99 in the case of 5 experts (Ayre & Scally, 2013). Accordingly, each item which did not have total agreement by all the panelists was deleted or corrected.

Interrater reliability is a measure used to examine the agreement between judges related to the formulation of each item. The items that had total agreement between all experts were examined in terms of formulation and Likert scale coding. Interrater reliability analysis using the Kappa statistic was performed to determine consistency among raters. Landis and Koch (1977) research shows that values of Kappa from 0.40 to 0.59 are considered moderate, 0.60 to 0.79 substantial, and 0.80 outstanding (Landis & Koch, 1977). The interrater analysis Kappa values for these questionnaire items are between 0.37 and 0.84 with $p < 0.001$ for the majority of the cross-tabulation between the raters as shown in table 3. This measure of agreement, while statistically significant, is only marginally convincing. That is why researchers made a consensus between raters related to the items on which there was a disagreement. These items were revised and edited accordingly. The raters were also consulted for modifications suggestions. Based on that, some items were adjusted and others were omitted before being administered.

Table 3. Kappa Values for Interrater Reliability

	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5
Rater 1	1.000	.64*	.84*	.38*	.54*
Rater 2	.64*	1.000	.78*	.23*	.45*
Rater 3	.84*	.78*	1.000	.32*	.37*
Rater 4	.38*	.23*	.32*	1.000	.37*
Rater 5	.54*	.45*	.37*	.37*	1.000

*(Modified Kappa) was computed using the formula: $K = (I-CVI - P_c)/(1 - P_c)$. Where CVI: item-level content validity index, ** p_c (probability of a chance occurrence) was computed using the formula: $p_c = [N! / A! (N - A)!]$*

Thus, the final items of the instructors' and students' questionnaires were aligned with the framework constructs as presented in Table 2.

Construct Validity

The questionnaires were built along three constructs in the instructors' and students' questionnaires. The constructs were teaching presence, cognitive presence and collaboration. Construct validity is an assessment of how well you translate your ideas or theories into actual programs or measures (Trochim, 2020). Convergent validity is a subtype of construct validity; it measures the strength of the relation between the items of the same construct. Situating the construct in a network of other constructs is called the nomological construct network (Ferr & Heuckeroth, 2019). In this context, designing the items referred to the specified constructs in the theoretical framework. The constructs differ relatively, not absolutely. Thus, the three constructs tackled in the two questionnaires were segregated into categories with indicators for each category as shown in table 1 and then, the developed items were aligned with the categories in Table 2.

Construct validity was also measured using translation validity, face validity and pilot validity.

Translation Validity is one of the assessments used to ensure construct validity. It was established through designing the questionnaire in English language taking into consideration the constructs' definitions, then it was translated to French by one researcher and then "back-translation" to English was done by another research and questions in both versions were adjusted accordingly (Carvalho & Clement, 2007).

Face Validity is a type of validity that shows if the designed instrument is apparently related to the constructs. It reveals whether participants agree with items and their wording in an instrument. Face validity is related to the appearance and apparent attractiveness of an instrument, which may affect the instrument acceptability by respondents (Glen, 2015). It was established through a read aloud strategy done by an expert colleague in education after building up the items. The expert was required to read aloud each item in the questionnaire and reflect on it and give her opinion relative to whether the item fits the construct it implies.

Pilot Study. The pilot study for the students' questionnaire was performed on 25 undergraduate students and 5 graduate students. The aim of the pilot study was to examine

the items' comprehensibility and simplicity of language as well as the time needed to answer all items. A focus group was then held online with two graduate and three undergraduate students. Each item in the questionnaire was discussed in reference to issues encountered through the pilot study. The researchers, then, checked the results of the focus group and took the consequent actions on the students' questionnaire.

The instructors' questionnaire was also piloted on 5 instructors who were not included in the study and other than the experts consulted. The notes concerning the language and length of the questionnaire were taken into consideration and modifications were subsequently made on the instructor's questionnaire. Since the variables under study are related to perceptions of instructors and students about online teaching then they are not directly observable.

To combine a number of items to represent one construct, evidence must be provided that these items truly represent the same construct. Evidence must be proved empirically by showing that participants demonstrate a coherent response pattern over the set of items representing the same construct. If students do not demonstrate a coherent response, this indicates that the items are not functioning as intended and they may not all measure the same construct.

Factor analysis helps to confirm the relationships between survey items and identify the total number of dimensions represented on the survey. In order to provide evidence that a measure does or does not measure what it intended to, a Factor Analysis must be conducted to produce Factor Loadings. Factor Loadings are scaled from 0 to 1 and are essentially coefficients that tell us how strong the relationship is between the variable and the factor (Knekta et al., 2019). The first step was to ensure that the coding of each statement is consistent. One of the items in the questionnaire "The instructor can deliver the course through the lecturing method only" has a sense opposite to the other items. The codes for this item were reversed on SPSS before performing analysis.

Confirmatory Factor analysis was implemented on the students' questionnaire only since assumptions of this analysis are satisfied. Number of participants is $245 > 200$, $KMO > .6$ and Bartlett's test Sig.: $p < .05$, then the data are suitable for confirmatory factor analysis as shown in Table 4.

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.912
Bartlett's Test of Sphericity	Approx. Chi-Square	2813.4
	Df	85
	Sig.	325
		.000

Factor loadings were close to or above 0.50 for all but four items (see Figure 2), meaning that, for most items, around 50% of the variance in the items was explained the theorized factor. This means that the factors explained most of the items well.

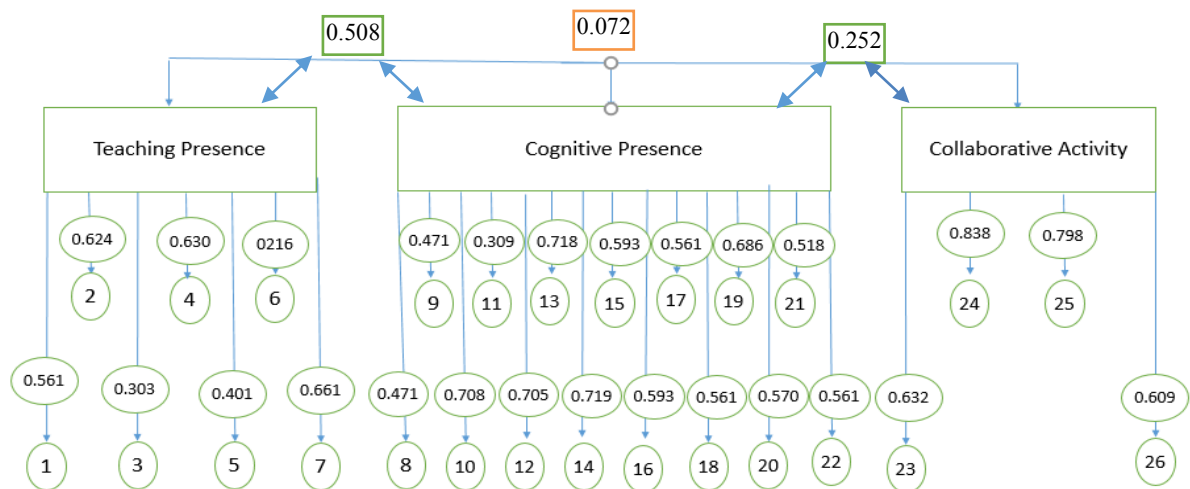


Figure 2. Confirmatory Factor Analysis for Students' Questionnaire Items

Discriminant validity is another evidence of construct validity. It shows how the constructs under study are deviating from each other. Two measures intended to measure distinct constructs have discriminant validity if the absolute value of the correlation between the measures after correcting for measurement error is low enough for the measures to be regarded as measuring distinct constructs.

The specified three-factor model also showed good model fit ($\chi^2 = 2813.485$, $df = 325$, $p < .00$) and all factor loadings were above 0.70 (see Figure 2). The correlation between the teaching presence factor and cognitive presence factor was (0.58) higher than that between

Collaboration and Cognitive presence (0.252) and lowest between collaboration and teaching presence (0.072) and (Table 5). This result shows that the constructs specified by the theoretical model are also verified by the empirical model used employing confirmatory and discriminant validity.

Table 5. Correlations among the Factors (N =245)

Factor	Teaching presence	Cognitive presence
Cognitive presence	.508**	
Collaboration	.072	.252**

** correlations at the 0.01 level (2-tailed)

Reliability

One of the most common ways to demonstrate reliability of an instrument uses the Cronbach's α statistic. This statistic uses inter- item correlations to determine whether constituent items are measuring the same construct. Cronbach's α should exceed 0.70 for a developing questionnaire and 0.80 for a more established questionnaire (Rattray & Jones, 2007). It is also recommended to report the Cronbach's α statistic for the separate constructs within a questionnaire rather for the entire questionnaire. Calculation of coefficient alpha is based on the assumption that all items in a scale measure the same construct. If the average correlation among items on a scale is high, then the scale is said to be reliable. Tables 5 and 6 show a value of Cronbach alpha greater than 0.7 for each construct which represents good internal consistency of the items in the scale but it does not mean that the scale is unidimensional.

Table 5. Reliability Statistics for Instructors' Questionnaire

Construct	Cronbach Alpha	Number of items
Teaching presence	0.880	10
Cognitive presence	0.953	15
Collaboration	0.877	4
Total	0.967	29

Table 6. Reliability Statistics for Students' Questionnaire

Construct	Cronbach Alpha	Number of items
Teaching presence	0.792	7
Cognitive presence	0.903	15
Collaboration	0.734	4
Total	0.921	26

Conclusion

The purpose of this study was to construct and validate an instrument that explores the perceptions of instructors and students' perceptions of online teaching at the faculty of education in the Lebanese University. The theoretical framework proposed three constructs: teaching presence, cognitive presence and collaboration. Items were carefully chosen to fit the construct in which they fit. Content validity and construct validity were conducted theoretically and empirically to ensure validity of questionnaire items.

The theoretical validation involved a profound explanation of the theories through extracting the indicators, constructed questionnaire items were then aligned with the indicators and consequently with each construct. The empirical validation was done through convergent and discriminant construct validity in addition to translation and face validity. Content validity ratio and Kappa inter-rater reliability were run in order to approve the content validity of the questionnaires.

Confirmatory factor analysis and factor loading were conducted to study the correlation between items of the questionnaire (variables) and predefined constructs (factors). Reliability was targeted and confirmed through Cronbach alpha values for the two questionnaires as a whole and for each construct alone. Based on all the tests done, the constructed instruments can be considered valid and reliable to be used in future research.

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CHAPTER 10: EFFECTS OF COVID-19 PANDEMIC ON METACOGNITIONS, EMOTIONS AND INDIVIDUAL CHARACTERISTICS OF CANDIDATE TEACHERS PREPARING FOR A NATIONAL EXAM IN TURKEY

İbrahim Benek , Behiye Akçay 

Chapter Highlights

- In this study, effects of COVID-19 social isolation process on metacognitions, emotions and individual characteristics of candidate teachers preparing for KPSS (Public Personnel Selection Examination) in Turkey have been examined.
- In this study, phenomenological design, one of the qualitative research methods, was used.
- The sample of the study consists of 20 pre-service teachers from different branches determined by criterion sampling method, one of the purposeful sampling methods.
- The data were collected using a semi-structured interview form consisting of 10 questions with face-to-face interviews using various video interview platforms.
- In the category of Regulation of Cognition; planning, monitoring, evaluation, debugging and information management, in the Affective Characteristics category; postponement of the exam, attitude and belief, in the Contribution of Isolation to Individual category; Positive and negative subcategories of isolation on individual and various codes have been created in these subcategories.
- The social isolation process experienced as a result of the pandemic was effective in regulating teacher candidates' cognitions such as planning, monitoring, evaluation, debugging and information management.
- In the study, it was seen that this process, positively and negatively, affected the affective characteristics of teacher candidates' attitudes, motivations and beliefs towards the exam.

Introduction

Our age is the age of information and technology. There are knowledge and skills that individuals should have in order to keep up with the times. These knowledge and skills are acquired through education. In fact, education has become an indispensable part of human nature. A good education means a good individual, a good individual means a good future. One of the important elements of a good education to be gained to individuals is undoubtedly the teacher. A teacher is a person who guides individuals to achieve desired learning experiences in educational institutions and is responsible for directing individuals (Turkish Language Institution [TDK], 2020). The teacher who will raise a qualified generation must be equipped socially, culturally and scientifically, because he is one of the role-models students take for life. In addition to these, showing proficiency in professional development and special field dimensions is important for the future of education. Because the teacher is a strategically important element of education (Safran, Ustundag, Birbudak, & Yildirim, 2014). According to the Basic Law of National Education, “*Teaching is a specialization profession taking on the government's education, teaching and related administrative duties*”. (Basic Law of National Education, 1974, p.5109).

According to the 45th article of the Basic Law of National Education, the teacher is selected from among the graduates of higher education institutions or equally high education institutions abroad (Ministry of National Education [MEB], 1974). In fact, with the legal regulation made in 1982, primary school teachers were trained by higher education schools and secondary education teachers by education faculties (Kuru & Uzun, 2008). Today, the task of training teachers is performed by universities, and the appointment of graduates is performed by the Ministry of National Education. In addition, today teacher training is provided by faculties that offer four-year undergraduate education rather than academies. In fact, with the vision of education for 2023, MEB will cooperate with higher education institutions for teachers in needed fields and it is aimed to open a postgraduate minor program for these teachers (MEB, 2018). Actually MEB, aimed to provide the employment of teachers who are highly qualified, well-educated and most suitable for the teaching profession among university graduates (MEB, 2017). So, how does the teacher employment happen in Turkey?

Teacher Assignment in Turkey

From the past to the present, MEB has followed different methods in choosing teachers. Teachers were employed in many different ways, from reserve officer teachers to training teachers by letter, deputy teacher, military teacher or the appointment of graduates of all faculties and colleges as teachers (Kuru & Uzun, 2008). In the last two decades, methods such as appointing graduates from different faculties and training teachers with non-thesis master's programs have been followed (Akdemir, 2013). In fact, until recently, a teacher shortage has been present since the establishment of the Republic of Turkey. Thus, recruitment of teachers was easily made (Uygun, 2010). The teacher candidates who graduated from the relevant institutions would apply to the ministries in the provinces with a petition, and the ministry would make their appointments where needed (Uygun, 2010). For the first time in 1985, the "Professional Competency Exam for Teaching" was conducted by ÖSYM (Measurement, Selection and Placement Center) in line with the request of MEB (Onal, 2011). Later, MEB applied exams for teacher candidates in 1986, 1987 and 1988 with its own means (Onal, 2011). In 1991, despite the appointment of all candidates who took the exam, the shortage of teachers could not be met, so no exam requirement was sought for teachers to be admitted in 1992, and in 1996, those who had undergraduate education were appointed as classroom teachers without any examination or pedagogical formation requirement (Onal, 2011).

Teacher appointments have taken a different path since 1999. In 1999, teacher appointments were made through the Civil Service Examination (DMS) (Güven & Dak, 2017). In 2001, the Central Qualification Exam for Institutions (KMS) was held (Güven & Dak, 2017; Onal, 2011). The KMS and DMS, which were conducted respectively by ÖSYM in 1999 and 2001, were combined within the scope of the Public Personnel Selection Examination (KPSS) in 2002 (ÖSYM, 2002). Since there were not enough supply and demand balance in employment and training of teachers in Turkey, it has been inevitable to assign teacher who graduated from the university with an examination. In addition, it becomes important in terms of measuring the competencies that MEB put forward and required from teachers. Thus, from 2002 until today, the appointment of teachers in Turkey is done with KPSS carried out by ÖSYM.

Public Personnel Selection Exam (KPSS)

MEB has suggested certain features and qualifications that candidate teachers should have in teacher selection. MEB seeks qualifications in terms of general culture, special field education and pedagogical formation in the teacher candidates it will choose (MEB, 1974). In this context, it can be said that the test contents in KPSS serve this purpose. General Culture, General Ability and Educational Sciences tests were included in KPSS conducted by ÖSYM from 2002 to 2013 for teacher appointments. For the first time in 2013, in addition to these tests; Teaching Field Knowledge Test (ÖABT) was conducted in the fields of Turkish, Primary Mathematics, Science, Social Studies, Turkish Language and Literature, History, Geography, High School Mathematics, Physics, Chemistry, Biology, Religious Culture and Moral Knowledge, German, French and English Language Teaching. In 2014, a field test for Classroom and Guidance Teaching was added to these fields. In the following years, in the appointment of teachers in foreign languages other than English, the results of the Foreign Language Exam (YDS) carried out by the ÖSYM were taken into account in addition to general culture, general, skills and educational sciences. Finally, the ÖABT exam has been added for Pre-School Teaching, Physical Education Teaching and Imam-Hatip High School Vocational Courses. No ÖABT has yet been carried out in the fields of Music and Visual Arts Teaching (as of 2020).

Looking at the current situation; when the KPSS 120 score type taken into account in teacher appointments, general ability has 15%, general culture has 15%, educational sciences has 20% and OABT has 50% power of effect. In addition to KPSS and ÖABT in teacher appointments, interviews with candidate teachers have been initiated since 2017 (Simsek, 2019). The assignment of all candidate teachers who graduated from university teaching fields until 1999 were done without an examination in order to fill the teacher shortage, except for several years. However, there has been a serious increase in the number of graduates in recent years. In order to fill the teacher shortage, it is observed that although the Ministry of Education appointed teachers one or two times every year, the number of teachers who cannot be appointed is high. There is a serious difference in the number of graduates taking the exam and the number of teachers appointed. For example; In 2019, 359,952 candidates entered the educational sciences test in KPSS (ÖSYM, 2019), a total of 40 thousand teachers were appointed in January (first appointment: 20 thousand) and June (additional appointment: 20 thousand) (MEB, 2020).

The number of teachers who graduated from the University teaching departments is more than the number of teachers with assignments every year and unfortunately it caused a phenomenon like "unassigned teacher" in Turkey. As a result, the individual and social losses of candidates who could not be appointed to the profession have become an issue to be discussed (Aydın et al., 2014). This issue was included in our country's agenda and various discussions were held on it (Karatas & Gules, 2012).

Regulation of Cognition and Metacognition

Metacognition is an individual's awareness of his/her own cognitive structure or knowledge of his/her own cognition (Flavell, 1979; Schraw, 1994; Georghiades, 2004). Metacognitive knowledge includes personal task and strategy factors or variables and includes the individual's various cognitive tasks, actions, goals and experiences (Flavel, 1979). It is the knowledge that the child has about his own thinking and learning activities (Baker & Brown, 1980). In other words, it is the awareness of the effectiveness of the strategies followed by the person in the process of learning information, his understanding of the information and his knowledge about the learning about the concepts. It is important for the person to be aware of what and how he/she learns and which strategy positively affects the cognitive process. In addition, the arrangement of tasks and strategies that facilitate self-learning increases learning success. In the metacognitive learning process, the person uses the skills of planning, organizing, controlling and evaluating activities related to his/her own learning. Metacognitive knowledge is divided into two elements as Knowledge of Cognition and Knowledge of Regulation (Schraw, 1994). Schraw and Dennison (1994) examined the Knowledge of Cognition as; (1) declarative knowledge, (2) procedural knowledge, and (3) conditional knowledge. They also examined the Knowledge of Regulation as; (1) planning, (2) monitoring, (3) evaluation, (4) debugging and (5) information management. Knowledge of Cognition is the knowledge of one's own cognitions, and Knowledge of Regulation is activities that help control one's own learning and thinking (Schraw and Moshman, 1995). In the Knowledge of Cognition, *declarative knowledge* is the knowledge of the individual and the factors affecting his/her performance, *procedural knowledge* is the knowledge of the method used by the person in performing a situation and *conditional knowledge* is a person's knowledge of when and how to use cognitive activities (Schraw and Moshman, 1995). In the Knowledge of Regulation, *planning* includes selecting appropriate strategies and organizing resources (Schraw, 1998). *Monitoring* includes instant awareness of the person's

understanding and task performance, and *evaluation* includes organizing one's own learning process and evaluating the product (Schraw & Moshman, 1995). *Debugging* is using strategies for understanding and correcting performance errors and *information management* includes using skills and strategies to process information more efficiently (Schraw & Dennison, 1994).

Social Isolation and Preparation for KPSS

COVID-19 disease caused by the corona virus that broke out in late 2019 turned into a global pandemic in a short time and affected the whole world. The countries where the pandemic occurs took measures quickly in areas such as health, transportation, economy, education, etc. One of the areas most affected by the pandemic has been education. The first of these measures was to suspend the education given in schools. Countries affected by the pandemic have closed schools for a certain period of time at all educational levels from pre-school to university. The first COVID-19 case in Turkey was announced by Fahrettin Koca, the Minister of Health, on March 11, 2020 (TRT News, 2020a). In the statement made by Presidential Spokesperson İbrahim Kalın on March 12, 2020; Primary, secondary and high schools were closed for one week as of March 16 (TRT News, 2020b). Later, the break was extended and eventually schools were closed until September 2020. Due to the pandemic, all private education courses affiliated to the Ministry of National Education also suspended training during this period. One of these private teaching courses is the KPSS courses where candidate teachers receive exam preparation training. Since the target audience of our study is teacher candidates who are preparing for this exam, we find it useful to take a look at the candidate teachers' situations regarding the exam.

Teacher candidates who have graduated from relevant universities in Turkey must overcome the KPSS barriers to start their profession. In fact, for some, the process is just beginning. For this, they go to courses that provide preparation for KPSS (some of them start to prepare for the exam while they are studying in the university), receive numerous resources, take lessons with distance education and watch videos on exam topics. This process may take a while for some candidates or it may take 4-5 years. Unfortunately, teacher candidates who cannot be appointed with KPSS many times have despair and their belief in being appointed decreases (Kilic & Sahan-Yilmaz, 2015). Teacher candidates are required to get points above the points determined in KPSS after their preparations and enter the desired rank in the branch ranking

(Simsek, 2019). KPSS has played an important role in determining the future of individuals and therefore the preparation process for those preparing for the exam has been worrying (Karatas & Gules, 2012). Since the exam preparation process requires an intense, attentive, diligent and disciplined work, this process can be painful for most candidates. The increasing number of graduates with each passing year has caused a serious race among candidates to enter the rankings. It has become compulsory to get high scores in order to enter a good ranking and this situation causes pressure on the candidates (Karatas & Gules, 2012). The pressure on teacher candidates to be successful in the exam and to be appointed to the profession made it inevitable for them to worry about their future. In fact, it was found that teacher candidates' levels of anxiety centered on being appointed were high (Sadikoglu, Hasturk, & Polat, 2018). Such that, due to a sufficient KPSS score requirement in appointments and the employment problem experienced in certain branches, the opinions of the candidates about the teaching profession were negatively affected (Aydin et al., 2014).

In order to reduce the spread of the pandemic caused by the corona virus among people, the "social isolation" measure came to the fore worldwide and the authorities constantly warned people to comply with social isolation. All public and private educational institutions in Turkey were closed for some weekends, public and religious holidays (19th May, Ramadan, etc.) have been declared curfew in all major cities and closed their people home. The teacher candidates preparing for the exam, the target audience of our study, were naturally affected by this situation. Many teacher candidates also isolated themselves from the society and went to their families and continued their exam preparations.

Purpose and Importance of the Study

Candidate teachers who graduate from the required departments of universities go through certain stages (preparing for KPSS, getting a good score and entering the rankings, oral exam) in order to be able to perform their profession. Since the number of teacher candidates graduating from these departments every year in our country is higher than the number of teachers appointed to the profession, the candidate teachers who cannot be appointed cause despair for their future. In fact, teacher employment policies have become a rooted problem in the Turkish education system (TEDMEM, 2014). In order to solve this problem, MEB (Ministry of Education) and YOK (Council of Higher Education) work in cooperation to determine road maps.

There are many studies examining teacher assignments in Turkey as well as KPSS (Mediterranean, 2019; Akpınar & Erdamar, 2020; Bahar, 2011; Karaca, 2011; Kaya et al., 2019; Ozkan & Pektas, 2011; Sadikoglu et al., 2018; Sezgin & Duran, 2011). It is seen that the studies focused on the hopelessness and social support levels of the teacher candidates (Kilic & Sahan-Yilmaz, 2015), their perceived social support and their continuous hope levels (Kaya et al., 2019), the opinions of the teacher candidates about KPSS (Güven and Dak, 2017; Karataş and Güleş, 2012; Memduhoğlu & Kayan, 2017), the KPSS anxiety and burnout levels of the candidates (Akdeniz, 2019; Kucuksuleymanoglu & Egilmez, 2013; Ozay Kose et al., 2017), and the employment of the teacher candidates (Akpınar & Erdamar, 2020; Simsek, 2019). In addition, it has been determined that there are studies on the content of KPSS, determination of the relationship between graduation grade and KPSS scores, and the beliefs and attitudes of candidate teachers towards KPSS.

Due to the COVID-19 pandemic that negatively affected the whole world, hundreds of thousands of teacher candidates, who were looking for a good future, have also been disrupted in their efforts on KPSS in this process. Being aware of the importance of health, teacher candidates have entered the social isolation process like other people. In fact, the employment of graduate teacher candidates is of great importance in their private, social and economic life. Every teacher candidate wants to be successful in the exam and meet his/her students as soon as possible, but competing with hundreds of thousands of candidate teachers may cause them to develop negative thoughts about the exam, the teaching profession and their future. The demoralization created by the COVID-19 pandemic was added to the anxiety that teacher candidates experienced with the anxiety of not being appointed with the end of their university education (Ozsari, 2008). It is important to investigate how they worked to overcome the KPSS obstacle, which has become an important turning point in their lives, is affected by the pandemic. In the literature review, we did not find any study examining the effects of the social isolation process on individuals' studies for the exam, so we think that this situation makes our study unique.

In this study, how the social isolation process experienced due to the COVID-19 pandemic affected the candidate teachers who were preparing for KPSS and for this purpose, the following questions were sought;

1. How does the social isolation process affect candidate teachers' metacognitions?
2. How does the social isolation process affect candidate teachers affectively?

3. How did the social isolation process contribute to candidate teachers?

Method

Research Design

In this study, which aims to determine how the social isolation process experienced with the COVID-19 pandemic affected the metacognitions and affective characteristics of pre-service teachers who were preparing for KPSS and how this process contributed to them, a phenomenological pattern, one of the qualitative research methods, was used. In this design, it focuses on how people experience the phenomenon, how they perceive it, what they think about the phenomenon, and how they make sense of the phenomenon (Patton, 2014). Phenomenological pattern is the common meaning of the same experiences of several people (Creswell, 2015). Phenomenon can be event, experience, perception, orientation, concept and situation (Yildirim & Simsek, 2013). The case in this study, on the other hand, was considered as the "social isolation process (closure to home)" experienced with the outbreak of COVID-19. The data were collected from candidate teachers who experienced the same process (social isolation) and prepared for the exam. In this study, the phenomenological design was used as it was tried to reveal what the candidate teachers' perspectives towards the exam during the social isolation process, how their metacognitive characteristics were, and how they perceived and interpreted their experiences in this process.

Study Group

20 teachers who are taking sessions in a paid KPSS course in a province of eastern Turkey forms our study group. The study group was determined by the criterion sampling method, which is one of the purposeful sampling methods, for the purpose of the research. In this sampling method, units that meet the determined criteria are included in the sampling (Buyukozturk et al., 2014). In this research, depending on the purpose of the research, criteria were assigned as; 1) Being a teacher candidate (graduate or senior student), 2) Preparing for KPSS, and 3) being in the "social isolation process" due to COVID-19. In-depth interviews were conducted with 20 candidate teachers who met these criteria. It was observed that the data were repeated after 20 participants, so 20 participants considered to be sufficient. Information on gender, age, educational status, university and study periods before and after the pandemic of the study group are given below:

Table 1. Demographic Characteristics of the Study Group

Participants	Gender	Age	Department	Status	University
P1	Female	25	Theology	Graduated	Hakkari Uni.
P2	Female	25	Music	Graduated	İbrahim Çeçen Uni.
P3	Male	28	Physical Education	Graduated	Fırat Uni.
P4	Female	22	German Lang.	Senior St.	Dicle Uni.
P5	Female	31	History	Graduated	Gaziantep Uni.
P6	Female	26	Science	Graduated	Ahi Evran Uni.
P7	Male	24	English Lang.	Graduated	Bingöl Uni.
P8	Male	24	English Lang.	Senior St.	Yüzüncü Yıl Uni.
P9	Female	25	Sociology	Graduated	Bingöl Uni.
P10	Male	26	Theology	Graduated	Kafkas Uni.
P11	Female	24	Pre-school	Senior St.	Çukurova Uni.
P12	Male	29	Music	Graduated	İbrahim Çeçen Uni.
P13	Female	23	Classroom Tc.	Graduated	Yüzüncü Yıl Uni.
P14	Female	25	Pre-school	Graduated	Muş Alparslan Uni.
P15	Female	25	Classroom Tc.	Graduated	Yüzüncü Yıl Uni.
P16	Female	24	Music	Graduated	İbrahim Çeçen Uni.
P17	Female	27	Accounting	Graduated	Yüzüncü Yıl Uni.
P18	Female	24	English Lang.	Senior St.	Yüzüncü Yıl Uni.
P19	Female	26	Physical Education	Graduated	Hitit Uni.
P20	Male	25	Music	Graduated	Yüzüncü Yıl Uni.

As can be seen from the Table 1, six of the participants are male and 14 are female. Participants' ages range from 21 to 31. Participants' branches are; Music, Physical education, English, Accounting, Preschool, Classroom, Theology, Sociology, History, and German. 4 of the participants are senior students and 16 of them are graduates. Participants completed/are completing their teacher training in different universities of Turkey such as Hakkari, İbrahim Çeçen, Fırat, Gaziantep, Yüzüncü Yıl, Bingöl, Kafkas, Çukurova, Muş Alparslan. Maximum diversity is provided in terms of the fields of the participants and the universities where they study. In addition, 7 of the participants stated that their lesson hours during the isolation

process increased compared to pre-isolation and 13 of them stated that their lesson hours decreased. Additionally, it was determined that 17 participants continued their course work for the exam in classes/libraries and 3 at home before the pandemic, on the contrary, during the isolation process, all of the participants carried out their exam-oriented lessons at home with their families.

Data Collection and Analysis

In the phenomenological design, data are collected through in-depth interviews with individuals who have directly experienced the phenomenon (Patton, 2014), and descriptions that define the experience itself are made with data collected from people with the same experience (Creswell, 2015). In this study, in-depth interviews were made with teacher candidates who shared common experience, thus their reactions and views on the social isolation process were made meaningful. A semi-structured interview form was prepared for this. First, a draft form consisting of 15 questions was prepared and presented to the opinion of 2 field experts and 1 Turkish teacher in terms of grammar in order to ensure the content validity of the form. In addition, a pilot interview was conducted with a candidate teacher for the comprehensibility of the questions. The 10-question interview form was finalized by making the necessary corrections in line with all the feedback and suggestions received. The form consists of two parts. The first part consists of questions about the basic demographic characteristics of the participants, and the second part consists of interview questions. Interview questions aims to examine the effects of social isolation process on candidate teachers' metacognitions towards the exam, their reading comprehension skills, study strategies, study programs and affective characteristics.

Due to the effects of a world pandemic Covid-19, educational institutions in Turkey was closed and education is interrupted. As a result, all participants left the place (city) where their education took place and entered the isolation process with their families. Since both participants and researchers were far from each other during the isolation process, video interview applications such as Zoom, Google Meet and Skype were used in conducting the interviews. Participants in the study group were interviewed one-on-one on the phone to determine the time of the meeting. Then, a link was sent to them via the WhatsApp platform at the specified time and the conversations were initiated at the scheduled time. Since some participants did not want to open their videos, only a voice call was made and these

interviews were recorded. Afterwards, the recorded interviews were examined one by one, and all the conversations were transferred to a word file. Various readings were made on the digital interview data and deciphered. Content analysis method was used in the analysis of the data. In fact, experiences and meanings are revealed while analyzing the data in phenomenology design, so the themes that can define the phenomenon are tried to be revealed (Yildirim & Simsek, 2013). While analyzing the data; steps of Coding of data, finding themes, organizing and defining data according to codes and themes, definition and interpretation of findings were followed (Yildirim & Simsek, 2013). First of all, codes were created, meaning and relationships were found among similar codes, then themes and sub-themes were formed by bringing these codes together. It is then interpreted and presented in a way that the reader can understand.

Reliability, Validity, and Ethics

While providing validity and reliability in qualitative research methods; The methods of credibility, transferability, reliability and verifiability are used (Merriam, 2013, p.201). All of these methods were used in this study. *Credibility*; It is about internal validity and whether the findings obtained in the research are in accordance with the reality (Merriam, 2013, p.203). Researchers use strategies such as long-term interaction, depth-focused data collection, diversification, expert review, and participant confirmation to increase credibility (Lincoln & Guba, 1985; as cited in Yıldırım & Şimşek, 2013). Another method used to increase credibility is to ensure appropriate and sufficient participation in data collection processes (Merriam, 2013, p.209). In this study, expert review, participant confirmation and data saturation methods were used to ensure credibility. An expert in qualitative research took an active role in the study at the stages of creating data collection tool, data collection, data analysis and interpretation. *Member control* or *participant confirmation* is to send some of the participants to examine the analyzes and to check whether the interpretations are correct (Merriam, 2013, p.207). In this study, the theme, sub-theme, codes obtained as a result of the content analysis and their interpretation, the meanings extracted from the data were sent to 2 participants (P2 and P6) and had them checked. In addition, data were collected from different participants until the data were repeated and the researchers felt that the saturation point of the data obtained by the researchers was reached, and the data collection process was terminated when the data obtained from 20 participants were considered to be sufficient. *Transferability*, is that the results obtained in the study are generalizable (Merriam, 2013,

p.214). In order to increase the transferability of the results obtained in a study, rich and dense definitions are made (Merriam, 2013 p.218). Direct quotations are a method used by researchers (Yildirim & Simsek, 2013, p.304). In order to increase the transferability of this research, frequent quotations from the participants' opinions were made and presented to the reader. In addition, it was tried to increase the transferability of the study by collecting, analyzing and interpreting the data in the study and by presenting the information of the participants in detail. In order to increase the *reliability* of the study, the data obtained were coded by two different researchers and the codings were compared. In the comparison, coder reliability was calculated using the reliability formula proposed by Miles and Huberman (1994), and compliance was obtained 91%.

In addition, to ensure validity and reliability in qualitative research, the research should be conducted in an ethical manner (Merriam, 2013). Ethical principles were taken into consideration in this research. For this, the participants were told that volunteering was essential in their participation in the research. Participants were informed about the purpose of the research. Within the framework of ethical rules, no "video talk" was made with the unwilling participant during the data collection process. Before starting the interviews, it was stated to the participants that the audio recordings or images obtained in the interview would not be used anywhere, they would not be shared with anyone or any institution, and would only be used in the research. In addition, instead of the real names of the participants, codes such as Participant-1 (P1), Participant-2 (P2) were used.

Results

In this section, the data obtained as a result of examining the contribution of the social isolation process to the metacognitions, affective characteristics and individual characteristics of candidate teachers were discussed. The obtained data were respectively presented for the sub-problems of the research.

Findings Regarding Social Isolation Affecting Candidate Teachers' Metacognitions

The opinions of the candidate teachers who were preparing for KPSS about the metacognitive characteristics of the social isolation process are summarized in Figure 1.

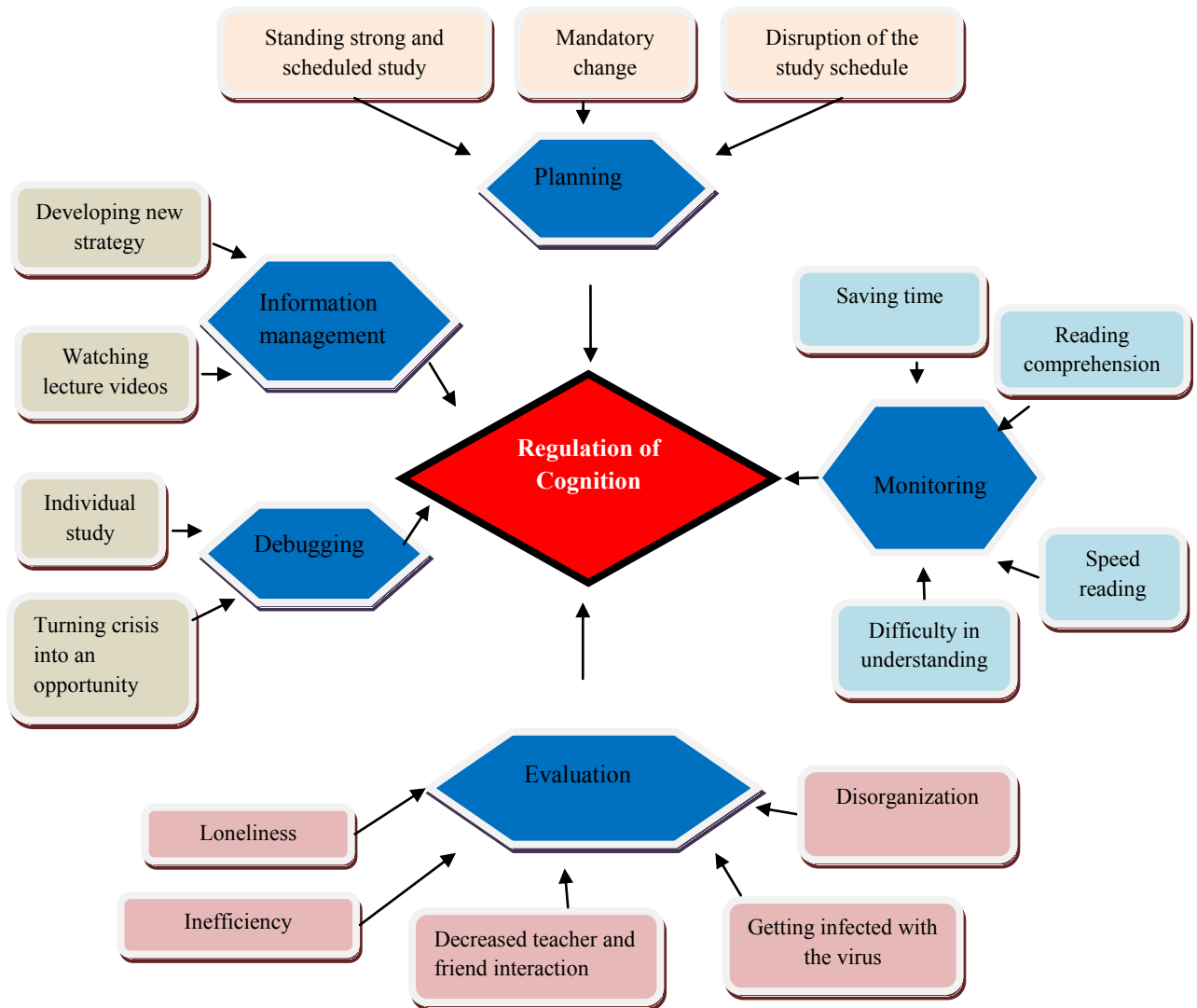


Figure 1. Subcategories and Codes Obtained from Participants' Views on Cognitive Features

The cognitive learning that the candidate teachers made towards the exam during the social isolation process were brought together in the "regulation of cognition" category proposed by Schraw and Dennison (1994). Researchers examined the regulation of cognition in five sub-categories as; planning, monitoring, evaluation, debugging and information management. These sub-categories are considered as sub-themes in this study. The codes obtained from the students' views on their cognition are brought together under these five sub-themes. These sub-themes and the codes in these sub-themes are presented in the following order:

Planning

Facing the crisis created by the pandemic and the difficulty of the social isolation process as a result; it was determined that some teacher candidates tried to stand strong and even studied

programmatically during this process, the working conditions for the exam changed necessarily, this situation caused the previous course study program to deteriorate, and they developed new strategies for studying. It was determined that candidate teachers set targets for KPSS in this process and developed strategies in accordance with the targets they set. The codes for the opinions of the participants regarding the planning element in the regulation of their cognition under isolation conditions are given below:

Standing Strong and Scheduled Study

The candidate teachers are aware of the seriousness of the exam they will take and think that they will be conscious of this regardless of what happens and that it is important to study consistently for this. It was observed that some teacher candidates eliminated the negative conditions of social isolation and stood strong in the context of studying, and their determination and willingness did not decrease. As a result, it has been determined that they made efforts to study as planned. Some of the teacher opinions on this issue were as follows:

P4: I had a schedule before the quarantine, but due to the difficulty and stress of the exam, I immediately created a new program suitable for quarantine. I couldn't let it fall. Because I am aware that I will take an important exam.

P9: Of course I had a study schedule before the pandemic. As if the wind cannot help a ship with no direction, the KPSS marathon meant a plan for me. Spontaneous tendencies in our daily life are generally not permanent. Of course, it is interrupted by the way I am at home, but as much as I can, I try to progress with discipline and consistency in the program I have created.

P14: During the quarantine process, I changed the hours in the program. When our course was closed due to the pandemic, I added another two hours to the study hours of each lesson.

Mandatory Change

It was observed that the social isolation process during and after the pandemic caused a necessary change in the teacher candidates' strategies of studying for the exam. It was determined that the teacher candidates developed study strategies suitable for their home conditions and were able to adapt their working methods to their new lifestyle. Some of the candidate teachers' views on this issue are given below:

P6: ... There has been a little change since I have always been in the same environment. Now, I continue my study according to the order I have established.

P7: I used to start the day by solving paragraph questions. Now I only study with subjects and repetition of them, I don't solve questions because there is always an interruption.

P9: I used to study with the method of constantly repeating the subjects. Now, I try to see my shortcomings mostly through answering questions, note them down and do catch up studies.

Disruption of the Study Schedule

Candidate teachers think that the effective and efficient strategies they followed in studying before the pandemic were interrupted during the pandemic. The candidate teachers put forward various reasons for the interruption of their study plan, program or strategies during the isolation process. The most prominent reasons; Doing housework such as cooking and cleaning, staying in a crowded family environment, having no friends to study with, having insomnia, lack of motivation, stress, anxiety for the future, fear of not being appointed, inability to focus on the lesson, and struggling with people who do not take the COVID-19 pandemic seriously. Some of the teacher opinions on this issue were as follows:

P5: Lack of motivation, I feel sad as a result of people being unemployed, hungry and in a difficult situation, and struggling with people who are not aware of the seriousness of this epidemic process ...

P9: The noise distracts me due to our crowded house and I have to compromise my lesson hours by helping cleaning because I stay at home longer.

P10: Mental and psychological depression, inability to create a comfortable environment and not being able to focus on the stage conditions...

P15: Psychology, future anxiety and family interrupts my work ...

Information Management

Candidate teachers followed strategies such as regulating, elaborating, organizing and focusing exam topics and concepts during the isolation process and developed skills for more efficient use of information. The codes for the opinions of the participants regarding the

planning element in the regulation of their cognition under isolation conditions are given below:

Developing New Strategy

It was observed that the teacher candidates developed new and unique study strategies in accordance with the conditions of the social isolation period. Thus, it was determined that they quickly adapted to new conditions and prevented interruption of their study efforts.

Some of the candidate teachers' views on this issue are given below:

P2: Most of the time, I associate the themes I study with the age range of my nephews, call my sister and repeat what I have learned.

P5: I added virtual questions and memory techniques to every moment that I felt I was moving away from the themes.

P13: I do something like taking a break and trying to go back to class due to being at home all the time.

P17: I can study in a calmer environment, in an area where I can concentrate and stay away from situations that will attract attention (social media).

P20: I mainly revise the themes and solve problems. Besides, I watch lecture videos.

Watching Lecture Videos

It was observed that the candidate teachers developed the strategy of watching lecture videos via some web channels in order to learn better during isolation. Some of the candidate teachers' views on this issue are given below:

P6: Before the pandemic, I used to study the theme from the source book and then solved problems. I was working as a subject-question, but I had difficulties in some subjects on quarantine days. I normally didn't prefer watching lesson videos but I had to. First I watch videos on the subject, then I try to do it in the form of subject-question. Since the history lesson requires memorization, I especially follow such a method in this lesson.

P19: I study by reading from the book and writing what I understand. I was repeating again from the book that I did not understand, but I am covering some themes by watching lecture videos on the subject which I did not understand.

Monitoring

The candidate teachers stated that they gained time in learning and understanding exam subjects and concepts during isolation, so their performance during isolation was better. Some candidate teachers think that they understood exam topics they read better during the isolation process and that their reading speed progressed compared to the pre-pandemic period. In addition, it was determined that some candidate teachers had difficulties in understanding what they read during the isolation process. The codes for the opinions of the candidate teachers about saving time, reading comprehension, reading fast and having difficulty in understanding are given below:

Saving Time

The teacher candidates stated that they were very busy in their daily lives due to their efforts such as going to universities and private teaching institutions, working in private schools or working as a paid teacher before isolation, but these intensity ended with isolation, so they saved a lot of time to study exam subjects. Some of the teacher opinions on this issue were as follows:

P14: It is certain that I learned more because I never left the house during the isolation process. My only occupation was lessons. I prepared a study plan and applied it day by day. In this process, I covered the lessons that I was incompetent and never studied before the isolation.

P20: I learned more after the pandemic. It reminded me that sometimes we should retreat during the struggle for life that we constantly produce, consume, and put our mental and physical health into the background. I think that I devoted more time to myself during this period of seclusion and thus worked more programmatically for KPSS.

Reading Comprehension

Candidate teachers think that the isolation process gives individuals time to read books and that reading has a positive effect on their level of understanding the exam subjects. It has been determined that their positive improvement in reading comprehension helps them to solve the questions better. Some of the participants' views on this issue are as follows:

P1: As a result of the ample time that comes with social isolation, I felt that I increased my reading time, and this situation taught me that I should understand, examine, and not accept what I read as it is.

P14: Actually, it was like this about reading; Since I studied the subject that I did not fully understand more carefully before the isolation process, I started to understand what I read. This helped me solve questions I could solve partially or not at all.

Speed Reading

It has been observed that the isolation process saves time for teacher candidates and thus they spend more time reading books, as a result of which there is a significant increase in their reading speed. In fact, it was determined that before the pandemic, people did not spare time to read books due to the busyness, and they started to read again with the opportunity brought by the end of this busyness during the isolation process. Some of the candidate teachers' views on this issue are given below:

P1: I think there is a significant increase in my speed of reading in my KPSS marathon, which is my most important activity in this process, even if it is not regular.

P12: I can say that it affects my reading speed positively...

P13: Actually, I think it positively affected the reading speed since I had the opportunity to read a lot of books in this process.

P20: Social isolation has given me speed reading skills. Because when I had a lot of tasks and assignments that I routinely undertook before the pandemic, it caused a decrease in my speed reading skills because I felt tired both mentally and physically. However, since the stagnation of isolation and the lack of tasks reduced the pressure and stress on me, my speed reading skills increased as I spent more time on reading.

Difficulty in Understanding

It was observed that the candidate teachers who are preparing for the exam had problems focusing on the exam subjects in isolation conditions, are distracted by some variables in the family environment, had difficulties in concentrating on the lessons, lost their motivation because of the anxiety, fear and stress for the exam, had uncertainty about their future and all these prevented them from understanding better. Some of the candidate teachers' views on this issue are given below:

P15: Constantly, there are the effects of the pandemic and uncertainty about the coming days. I always think of different things. This has negative effects on my reading comprehension.

P16: It affected my morale and motivation badly...

P18: I am experiencing too much distraction. I focus involuntarily on everything that is said to me or who comes by me due to the home environment. That's why I can't understand and read. Many times I have to repeat it and this slows down my study speed.

P19: I have difficulty understanding what I read during the social isolation process, because I cannot focus on what I read. Because I can't focus, I go back and try to read and understand again, but nothing much changes because I am constantly in anxiety, fear, and stress and therefore have difficulty understanding what I am reading.

Debugging

Candidate teachers were able to cope with some situations that could negatively affect their studying performance during the isolation process. In this process, it was determined that they attempted to correct the mistakes that occurred in their understanding of information. It has been observed that some teacher candidates studied better by taking advantage of the crisis caused by the epidemic (as they found more time to study). In addition, some teacher candidates who were left alone due to isolation think that studying individually affects their performance more positively. The codes for the opinions of the candidate teachers about debugging while regulating their cognition in isolation conditions are given below:

Turning Crisis into an Opportunity

Some teacher candidates stated that they should deal with the crisis that started with the pandemic in a correct and effective way and that they turned this crisis into an opportunity. Some of the teacher opinions on this issue were as follows:

P1: The social isolation period positively affected my cognitive learning about exam subjects. I believe that I have progressed individually with a more strategic method in this process. The social isolation period taught me the best way to turn crises into opportunities.

P19: I did not get much information at the beginning of the isolation period, but as the process progressed, I started to learn more, because after a while I got used to this situation and turned this situation into an opportunity and now I have learned more than before the pandemic.

Individual Study

Those preparing for the exam stated that an individual study strategy was important for them after the pandemic because they were away from the course, their teachers and their friends. For example P1 shared opinion on this *"I believe that the information I have acquired without any intermediary (teacher, course, friends, etc.) and completely in line with my own means is more permanent."*

Evaluation

Some of the participants who were preparing for the exam stated that they got less information compared to pre-pandemic period due to catching COVID-19 disease, studying alone, not getting efficiency in isolation conditions, interrupting the interaction with course teachers and friends, and disrupting the existing schedule in isolation conditions. It was determined that the participants were able to interpret their performances and the effectiveness of their strategies towards the regulation of cognition, be aware of the situations that made it difficult for their learning, examine their knowledge acquisition, and reach a conclusion between their goals at the beginning of the process and their goals at the end of the process. The codes for the opinions of the participants regarding the assessment involved in the regulation of cognition in isolation conditions are given below:

Getting Infected with the Virus

Some participants stated that their studies for the exam were interrupted due to the factors caused by the fact that they and their close relatives had Covid-19 disease. Some opinions of candidate teachers on this issue were as follows:

P2: In the first period, I started studying more intensely and with more determination than I did before the isolation. Everything was going very well. Of course, I felt desperate after my sister and her family caught COVID-19. I could not get rid of the

idea that everything was meaningless and we would all get COVID-19, and I stopped studying in this process. Later, after my sister and her family recovered, I came back to myself, had more positive thoughts, made positive decisions and started studying again...

P16: I was affected negatively because I was infected with the virus, because I was not fit and I could not study for a long time and lost time...

Loneliness

Unlike some candidate teachers (P1 and P4), P13 stated that “*Yes it affected me negatively. The study I do alone at home is not efficient enough. That's why I learned less.*” Based on his view, it was observed that he was negatively affected in terms of education by studying alone away from the library/study environment and from his friends.

Inefficiency

The teacher candidates stated that they could not get efficiency from studying due to reasons such as staying at home, thinking about the pandemic, and family environment during the social isolation process. For example, P11 stated opinion as “*I learned less. As this situation reduced my working efficiency, I could not get enough information and it affected my learning badly.*”

Decreased Teacher and Friend Interaction

The candidate teachers reported that they learned less during the pandemic about the exam issues due to the inability to exchange information and the lack of mutual interaction with the course teachers and their friends with whom they were preparing for the exam. Some of the candidate teachers' views on this subject are as follows:

P3: Social isolation negatively affected my cognitive learning because you cannot go out, you cannot interact with your teachers and friends, you cannot exchange information and you cannot talk face to face ...

P15: I am no longer in interaction with my classroom teachers and friends. In this case, I only learn from my own study at home. This made me learn less.

Disorganization

It was observed that they had a working schedule for the exam during pre-isolation period and thus they could study efficiently, but there were problems in the context of learning because they disrupted the old schedule during the isolation process. For example KP stated opinion on this as *"I learned less because I could study in an orderly way inside the classroom, but there are many days when I don't study during isolation."*

Findings Regarding the Affect of Social Isolation on Teacher Candidates Affectively

The opinions of the candidate teachers preparing for the exam regarding the effect of social isolation process on their affective characteristics are summarized in Figure 2.

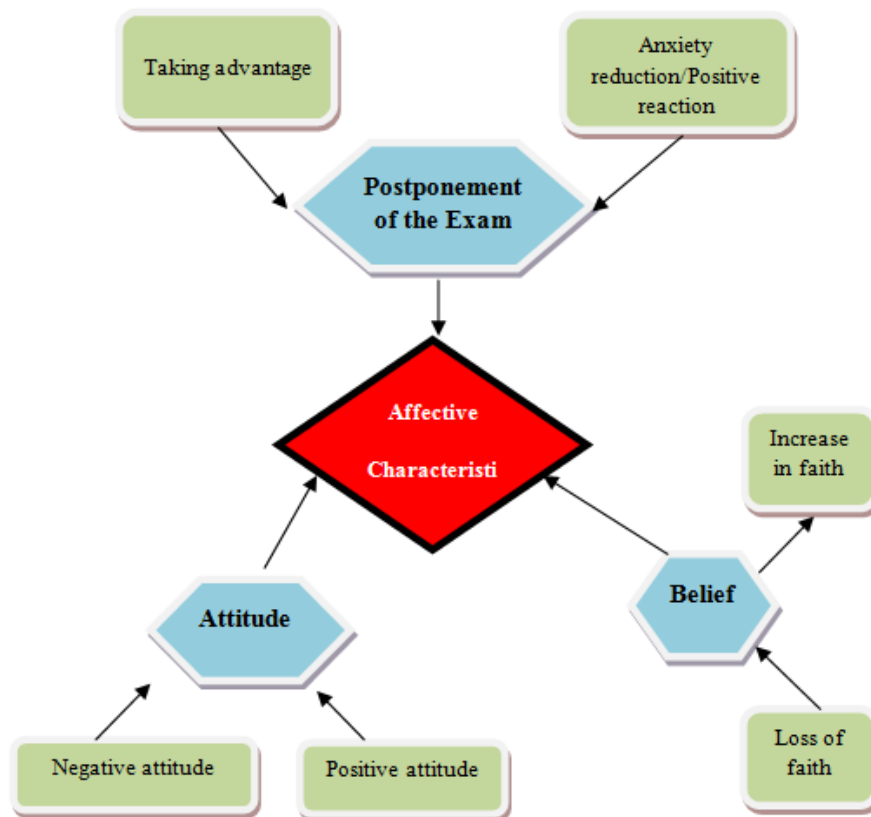


Figure 2. Subcategories and Codes Obtained from Teacher Candidates' Views on Affective Characteristics

With the emergence of the pandemic during the preparation for KPSS, the understanding of social isolation prevailed and as a result, the teacher candidates turned their understanding

into action and closed at home. Candidate teachers who made an effort to study at home stated that they were emotionally affected by both the pandemic and preparation for the exam. The opinions of the teacher candidates in this context were brought together under the theme of "affective characteristics" and sub-themes of the postponement of the exam, attitude and belief. The sub-themes and the codes in these sub-themes are presented below in a certain order:

Postponement of the Exam

If COVID-19 pandemic had not appeared in Turkey, teacher candidates would have attended to KPSS on July 19 and August 20, 2020. However, with the outbreak of the pandemic, ÖSYM revised the exam dates as September 6 and 20, 2020. Some of the candidate teachers think that their concerns regarding the delay of the exam have decreased, they are relieved about this issue and this situation gives them an advantage. In addition, some candidate teachers were found to have neutral thoughts regarding postponement. The codes for the opinions of the teacher candidates regarding the postponement of the exam during the pandemic are given below:

Taking Advantage

Some candidate teachers think that postponing the exam saves them time and thus gives them an advantage in that they will study more and eliminate their lack of subject. For example, opinions of P4 and P20 are as follows respectively *“Postponing of KPSS gave me an advantage, because I couldn't spare time for KPSS from studying for the field exam.”*, *“The postponing of KPSS is an advantage for me. Since I don't have a lot of time for studying because of work, I can now have more time. ”*

Anxiety Reduction/Positive Reaction

The pandemic outbreak in Turkey caused candidate teachers who are studying for KPSS to increase their level of concern towards the exam since the private courses they attended were closed and they had to stay away from their friends with whom they studied; however, the postponement of the exam resolved their worries. In short, the postponement of the exam was

welcomed by most candidate teachers. Some of the candidate teachers' views on this issue are given below:

P3: Postponing KPSS was a correct move to be taken. If it hadn't been postponed, I would have worried because I was negatively affected by this process and the courses were closed. I had shortcomings in the subjects and I would feel stressed about how to cover them, which would have had very negative consequences for me.

P14: It was good that it was postponed. I'm just beyond happy! Because the course was closed. I was very impressed by the worry that I was studying for the first time with so many topics. I could not even focus on my studies ... Fortunately, when I got the news that it was postponed, I made a schedule and tried to comply with it.

P17: It was very good that KPSS was postponed. I wasn't lacking any subjects, but frankly I was worried that I would not be able to do more question solutions and more experiments and analyzes. Postponing the exam was good for me.

P18: It was definitely a very good decision to postpone it. Because this process reduced the performance of everyone who studied, and during this time, perhaps we would not be able to complete many things. I would be very worried if it wasn't postponed. I'm already a very panicked person in exam matters.

Attitude

It was observed that some candidate teachers developed a positive attitude towards the exam itself, the lessons within the scope of the exam, and the content of the lessons, while some candidate teachers displayed negative attitudes. There is no clear attitude on this issue among the teacher candidates. This situation is thought to be related to the different characteristics of each teacher candidate and their isolation under different conditions (family, economic, etc.). Codes for teacher candidates' attitudes during the pandemic are given below:

Positive Attitude

Some candidate teachers who are preparing for the exam think that their attitudes towards some exam subjects they have difficulty with have changed positively compared to the pre-pandemic period. In fact, it has been determined that candidate teachers think this way because they have more time to study during the isolation process. Some of the candidate teachers' views on this issue are given below:

P1: The quarantine process has partially changed my attitude towards my KPSS lessons. As a result of my progress in this process, I had a positive development in a few lessons that I had difficulty.

P20: I had a pessimistic attitude before the quarantine process. For example, I was in an attitude that I would fail because I could not study enough for the exam, but I study in the quarantine process and I feel that I will succeed in return.

P20: While I was studying on solving methodology and curriculum development lessons reluctantly before, now I am studying more willingly. I was having a time problem due to the large number of subjects and the fear of not being able to catching up with them was making me reluctant. I am happy and enthusiastic as I don't have time problems right now.

As a result, it was concluded that some candidate teachers who had pessimistic thoughts about the exam had the opportunity to study and gained enough time to study, so the isolation process had a positive effect on their attitudes.

Negative Attitude

It has been determined that the isolation conditions have a negative effect on the attitudes of some teacher candidates. The crowded home environment, home conditions preventing studying, lack of motivation caused by loneliness, lack of external motivation by teachers and friends, and the cessation of expert support in lessons that they consider to be difficult, have negatively affected their attitudes. Some of the candidate teachers' views on this issue are given below:

P3: The quarantine process has definitely negatively affected my attitude towards lessons and I cannot study and I cannot get the efficiency I want when I study. This includes a bit of crowded and inconvenient home environment. Before, I had very positive energy for the lessons and I was working with determination, because I was really working with a systematic and regular schedule. I was using the classroom study and my studies were passing efficiently.

P18: In the previous period, I believed that I could do it more with the motivation and support of our teachers and of course this helped me to develop a positive attitude, but now my attitude towards the lessons has changed a little...

P2: I did not have a solid foundation in the measurement and evaluation subject. I started to like it after I took classes. I had a positive attitude when our instructor made us love the lesson and I could understand from him very well. It affected me negatively during this pandemic process.

Belief

It was observed that among the teacher candidates who are preparing for the exam, those who think of turning the epidemic crisis into an opportunity and those who have more time to study have increased their beliefs that they will be successful in the exam, and those who are negatively affected by the conditions of isolation (lack of studying environment, not being able to focus, motivation disorder, anxiety) have a negative belief in being successful. Teachers' views on this topic have been put together under codes of "Increase in faith" and "Loss of faith". For example P12 stated opinion in this regard as "My belief that I will be successful has increased because there is nothing to spend time with at home and you inevitably study. This happens to be good. Of course, I have more opportunities to study on subjects that I did not know before. This affects my belief positively." P13 thinks as "Before the pandemic, my faith in success was stronger considering the course of study. Since I could not find many opportunities to study in this process, my faith on success decreased." P15 stated opinion as "My anxiety has increased. Before, the thought that I would work well and win had increased. Now that my anxiety level has increased, my faith has decreased."

As a result, the attitudes and beliefs on being successful of the teacher candidates who had time to study were positive, while those who had bad isolation conditions were negative.

Findings Regarding the Contribution of Social Isolation to Teacher Candidates

With the pandemic, the concept of "social isolation" has taken place in our lives. So, how did social isolation affect candidate teachers preparing for an important test about their future? The opinions of the teacher candidates on this subject are summarized in Figure 3.

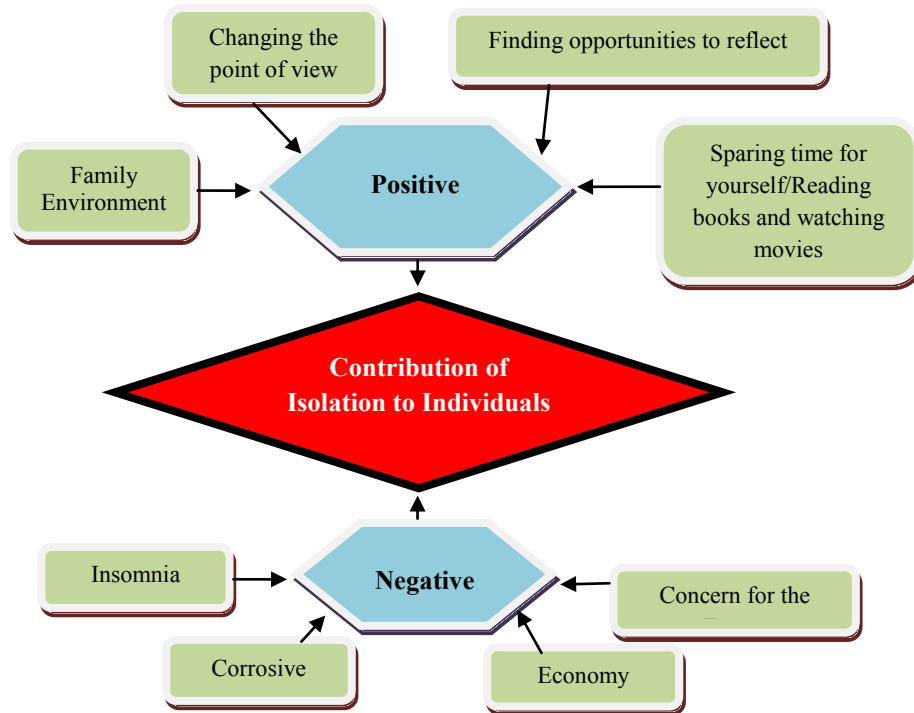


Figure 3. Sub-categories and Codes obtained from the Opinions of the Teacher Candidates About their Contribution to the Isolation Process

It is seen in the narratives of the participants that the isolation process, which imposes restrictions on social life, contributed positively to them both through the exam and their lives, as well as affecting negatively. The opinions of the teacher candidates in this context were brought together under the theme of "contribution of isolation to the individual", and "positive" and "negative" sub-themes. The sub-themes and codes are given below.

Positive Contributions of Isolation to Individuals

The isolation process, which started with the pandemic, has been seen to allow teacher candidates to spend time with their families, to have the opportunity to think, read and watch movies, and to change their perspectives. The codes for their opinions regarding the positive contributions of the isolation process are given below:

Family Environment

As is known, most of the university students complete their education in places far from their families. Most teacher candidates, who were senior university students and went to a different

place to receive support training for the exam, moved to their families with the outbreak of the pandemic and spent the isolation process with their families. Most candidate teachers think that they spend a good time with their families during the isolation process, miss the family environment and realize their value. Some of their views are given below:

P2: I understood the value of family well and learned to regard life as loving people, not getting irritated easily by people and love them all. I learned to love, to be loved.

P4: It is good to be at home after nine years. There is nothing really like a mother's meal, nothing like home.

P8: My bond with my family has strengthened.

P12: It helped me complete my shortcomings. It helped me spend more time with my house and my wife.

Sparing Time for yourself/Reading Books and Watching Movies

Teacher candidates think that they have the opportunity to devote more time to themselves thanks to isolation. This process made them realize that they were neglecting themselves. It has been observed that their isolation provides them with the opportunity to evaluate the events correctly, and contributes to them reading the books they neglect and watching the movies. In addition, it was determined that they descended to their own selves, experienced the beauties they ignored, and their questioning and examining skills developed. Some of the candidate teachers' views on this issue are given below:

P2: I didn't use to spare time for myself individually. While I did not even have time to think, I made more logical decisions and read a lot of books with this process. I understood the value of family very well and learned to regard life as loving people, not getting irritated easily by people and love them all. I learned to love, to be loved.

P5: My level of questioning myself increased. I started to examine all aspects of me, positively and negatively. My heart used to be open to the people and my eyes were closed. I opened my eyes and gave my ears to their voices. I couldn't live the beauties I overlooked, and then it brought its longing. I missed people, laughs, conversations, greetings, discussions, streets, life bustle and most importantly children. What would be a bigger contribution?

P17: It is very nice for a person to listen to himself and hear his inner voice, and also to discover things that exist in himself. Without taking time for this and being in a highly social society, we would not have the honor of reaching this awareness.

Changing the Point of View

Candidate teachers who are in the process of social isolation think that it is bad to hurt people, family structure is important, life is valuable, health is more important than anything else and they are closed to criticism; In short, they become aware of themselves thanks to isolation and thus change their point of view about events. Some of the candidate teachers' views on this subject are as follows:

P1: I learned how unnecessary it is to hurt people at the slightest thing. I learned the value of my loved ones incredibly. It was my biggest loss to be in the same house and not being able to hug my mother. During this period, I learned that the sentence "do not approach me" has become more valuable than the phrase "I love you very much". I believed that the environment, nature really needed to renew itself.

P2: I realized myself. I understood much better the importance of friendship, environment, family. I'm trying to understand myself.

P9: I understood that I had to realize that I condiered things wrong and that I should not insist on these mistakes. I realized that I was closed to criticism, I realized that I read a little, I realized that I did not know the value of my life, I realized the importance of our conversations, weddings, friendship visits, and most importantly, I learned that we are unique and the most precious thing is health.

Finding Opportunities to Reflect

The prospective teachers think that, in isolation, they find time to think and make decisions about their future. For example P5 and P19 stated their opinion as *"In this process, I made decisions about thinking, feeling and future."* and *"It got me thinking a lot. As long as you have a lot of time, you can do anything and most importantly, you have a lot of time to think."*

Negative Effects of Isolation to the Individual

Some candidate teachers stated that the isolation process was wearing, they had insomnia problems during this process, they had an anxiety for the future, and that the process affected them economically. It was determined that some teacher candidates who worked with discipline for the exam before the isolation had no planned and scheduled study conditions due to isolation. In addition, it was observed that isolation negatively affected the morale and

motivation of some teacher candidates. For example, P13 said, "This situation (isolation) affected my study schedule, lessons and motivation negatively." The opinions of the teacher candidates on this sub-theme were brought together under the codes of "insomnia", "corrosive" and "economy". P13 stated opinion on insomnia "*The quarantine process harmed me because I am always at home. When the home environment was not inconvenient and crowded, I could not study systematically and programmatically at first, and the study plan was broken, and my sleep was distorted. The time I slept is not known, and my wake-up time is not known...*" P5 stated opinion on corrosion "*While it has good health effects, it is emotionally exhausting and isolating.*" P3 stated opinion on economy "*It also caused financial damage. Because of this process, employers have terminated our jobs, we are not going to work, our salaries have been cut.*" P8 shared about future anxiety "*I'm not happy and my anxiety for the future is ruining me.*"

Discussion and Conclusion

In this study, the effect of COVID-19 social isolation process on the regulation of cognition of teacher candidates who are preparing for the KPSS conducted regularly every year was examined. When the opinions of the candidate teachers regarding the regulation of cognition are examined in the category of *planning*; Standing strong and scheduled study, compulsory change and disruption of the study schedule are included. Candidate teachers tried to stand strong by minimizing the negativities caused by the pandemic process and studied programmatically as before the pandemic. Teacher candidates made obligatory changes in their study strategies due to the new lifestyle brought about by the isolation process, and tried to increase their studying performance by choosing strategies suitable for the isolation process. It was determined that some teacher candidates who isolate themselves had crowded houses, did more housework, had insomnia problems, and could not focus on exam subjects, and their study schedules were disrupted.

In the category of *Information management*; there are codes for developing new strategy and watching lecture videos. In the process of isolation, teacher candidates developed new strategies such as virtual questions, memory techniques, associating the concepts they learned with the age range of the children around them, and listening to lecture videos on the internet. In the category of *Monitoring*; There are codes for saving time, reading comprehension, speed reading and having difficulty in understanding. It was concluded that the candidate

teachers gained more time to study during the isolation process, as a result, they understood the concepts and subjects better, and their reading accelerated. In addition to these, it was observed that some candidate teachers had difficulty in understanding concepts and subjects due to family factors, deterioration of motivation, uncertainty about their future, and unable to focus on studying.

In the category of *Debugging*; there are codes for turning crisis into opportunity and individual work. Some candidate teachers think that it is more beneficial for them to study individually during the isolation process without the help of any course, teacher or friend. In addition, it was concluded that some teacher candidates studied better by turning the crisis (staying at home) caused by the pandemic into an opportunity. In the category of *Evaluation*; The codes of catching the virus, loneliness, inefficiency, decrease in teacher and friend interaction and disruption of schedule are included. It was concluded that cognitive learning was negatively affected as a result of the fact that some teacher candidates were infected with the virus, and as a result of the decrease in teacher and friend interaction, they studied alone and the study schedule they prepared before isolation were disrupted.

As a result, it was concluded that the candidate teachers who went through the social isolation process used cognition regulation strategies such as planning, information management, monitoring, debugging and evaluation towards KPSS. Camadan (2020) concluded that Turkish university students who learn English as a foreign language find themselves successful in using planning, monitoring and evaluation strategies. Karaaslan (2019), in his study with gifted students, concluded that while some students see themselves as competent in the regulation of cognition, others see themselves less competent. Anumudu et al. (2019) in their study with 210 university students in Nigeria concluded that students think their metacognitive awareness is high, especially for the regulation of cognition.

In their study with candidate teachers, Kılınç and Uygun (2015) determined that intensive teaching activities at the university positively affected the candidate teachers' awareness in planning, monitoring, evaluation, debugging and information management dimensions. Sakarya (2020), in his study on violin students studying at the undergraduate level, concluded that the posttest scores of the planning, monitoring, evaluation, debugging and evaluation sub-dimensions of the experimental group students in the regulation of cognition differ significantly from the control group students. These findings in the literature are similar to

the findings we obtained in our study. However, as a result of the literature review, no research examining both the metacognitions of teacher candidates preparing for the KPSS in Turkey and the impact of COVID-19 social isolation process on teacher candidates was found. Therefore, we think that the results we obtained in our research are original. In the light of the findings we obtained in our research, it was concluded that the social isolation process experienced due to COVID-19 was effective in the regulation of candidate teachers' cognitions such as planning, monitoring, debugging, cognition management and evaluation.

It has been observed that the teacher candidates who went through the social isolation process were affected affectively both for the exam and for the pandemic. In this context, it has been determined that delaying the exam gives them an advantage in gaining time and completing the missing subjects. Thus, it was concluded that this situation led to a decrease in their worries about the exam. Ekici and Kurt (2012) and Ozay Kose, Diken and Gul (2017), in their study with candidate biology teachers, concluded that the KPSS exam anxiety of candidate teachers was at a moderate level. Sadikoglu, Hasturk and Polat (2018) concluded in their study that teacher candidates' appointing-centered anxiety levels were high. Postponement of the exam reduced the appointing anxiety of candidate teachers. Therefore, the postponement of the exam was welcomed by the candidate teachers.

In addition, it was determined that, during the social isolation process, some candidate teachers' attitudes towards the exam and courses such as educational sciences, general culture and general ability were positively and some were negatively affected. It was concluded due to the fact that candidate teachers who had positive attitude found more time with the isolation process, while candidate teachers who had negative attitude lacked external motive and had inappropriate home environment to study. In parallel with this, It has been determined that those who think to turn the crisis into an opportunity and those who find time to study have increased their faith that they will be successful in the exam, whereas the faith of those who are living in a crowded house, having to stay with their family, etc. is negatively affected by the isolation process because they would not be able to study as they wish. In the study conducted by Kaya, Kaval and Bedir (2019), candidate teachers who took the exam several times and were not appointed increased their opinions about not being appointed and their prospects for appointment decreased. Kilic and Yilmaz (2015) include similar results in their study. When the literature was examined, it was determined that teacher candidates' thoughts about KPSS were generally negative, their hope levels and beliefs about being

appointed were low (Dereli & Kabatas, 2009; Kirimoglu, 2010; Kuran, 2012; Tosten, 2012; Yilmaz & Yasar, 2016). While some of the findings we obtained about the beliefs of candidate teachers about KPSS were in line with the findings obtained from the literature, some of them contradicted.

It was concluded that the isolation process had positive and negative effects on candidate teachers preparing for the exam. As is known, most of the university students complete their undergraduate education in places far from their families. With the outbreak of the pandemic, education in universities was also suspended, and as a result, many teacher candidates returned to their families. In fact, it was observed that most teacher candidates realized the value of their families as a result of spending more time with their families during the isolation process and that it was enjoyable to spend time with them, as well as strengthening family ties and having positive changes in their respect and love for them.

It was observed that the teacher candidates who were locked in their homes due to isolation devoted more time to themselves and fulfilled their tastes such as reading books, watching movies and listening to music, which they neglected before the pandemic. In this process (due to staying at home longer), it was determined that they thought about life and events more, questioned and analyzed them, as a result they got the opportunity to evaluate the events more accurately, changed their perspective towards life, and also experienced the beauties they ignored. In fact, the participation in artistic, sports, social and cultural activities of teacher candidates preparing for KPSS are negatively affected because they devoted most of their time to preparing for the exam (Karadeniz & Demir, 2010; Memduhoglu & Kayan, 2017; Sezgin & Duran, 2011).

The result we reached in our study is in contrast with these findings in the literature. We attribute this situation to the fact that teacher candidates find more time thanks to isolation (teacher candidates spend a part of their time studying and the remaining time for reading books, listening to music, watching movies, etc.). In addition to all these, it was determined that some teacher candidates were worn out during the social isolation process, suffered from insomnia, started to have anxiety for the future, their morale and motivation deteriorated as a result of the change in the scheduled study conditions and they experienced serious economic problems.

Recommendations

The result of this work shows us that, after graduating, teacher candidates in Turkey experience a great future anxiety and worry of employment because of the huge exam obstacle which put in front of them to overcome. The reason for this situation is that, as mentioned before, more candidate teachers graduated than needed. In order to prevent this problem, universities that train teachers throughout the country should make revisions in their student admissions. In addition, we think that a new standard should be caught in the pedagogical formation certificates given to students who graduate from faculties other than education faculties (they should not be given or they should be reduced by considering the teacher needs of the country). Some of the experiences we have observed in this working process are; Candidate teachers are experiencing assignment and employment anxiety, they have future concerns, they start to experience professional inadequacy, they experience despair, and KPSS is a major obstacle in building their future. We think that it would be beneficial for new researches to deal with this issue in depth.

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CHAPTER 11: PROFESSIONAL SATISFACTION OF TEACHERS OF STUDENTS WITH LEARNING DISABILITIES ABOUT VIRTUAL CLASS DURING THE COVID-19 PANDEMIC IN SAUDI ARABIA

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Chapter Highlights

- The current study aimed to measure the professional satisfaction of teachers of students with learning difficulties about the distance education programs provided during the Corona pandemic
- The study group consisted of 50 teachers for students with learning difficulties in the Kingdom of Saudi Arabia.
- The level of professional satisfaction of teachers with learning difficulties about the distance education programs offered during the Corona pandemic is not satisfactory, so the general trend of all the questionnaire axes was lack of approval.
- The absence of statistically significant differences on the dimensions of the questionnaire and the overall degree of the level of professional satisfaction of teachers with learning difficulties attributable to the educational qualification variable.
- The absence of statistically significant differences between the responses of teachers of learning difficulties on the dimensions of the questionnaire and its total degree due to the variable of the number of years of experience.
- The absence of statistically significant differences on the dimensions of the questionnaire and its overall degree to the responses of teachers of learning difficulties to measure their level of professional satisfaction with the distance education system due to the age group variable.

Introduction

Taking care of people with special needs and educating them with what fits their abilities became a necessity and one of the most important nurturing strategies at the current time, as they are a part of our nation's sons, on one hand they have all the rights nation's sons have and obliged to do all duties they do, on the other hand, as they have the full right to get a fair educational chance matching their circumstances in addition to solving group pressures which make them vulnerable to psychological and social incompatibility that hinder needs and vanish energies (AlAntably, 2020). So, Kingdome of Saudi Arabia KSA took giant steps towards moving people with special needs from isolation environment to the regular school environment which is able now to accommodate most of them that KSA is on the top of Arabic countries which present special care for people with special needs and give them all kinds of carefulness and nurturing through building educational and rehabilitation centers and associations, saving their rights and duties as ministry of education started to present educational services in the special needs field at schools since 1952.

We live today in the information age that is characterized by rapid developments and changes resulting from the scientific and technical progress that the world witnessed in the last decade of the twentieth century and the beginning of the twenty-first century, the most prominent of which was the development of the use of computers and information and communication technology, the Ministry of Education began to computerize school curricula and the introduction of the E-learning system in schools, but the acceptance and appropriate use of educational developments do not lead to positive results without prior studies that determine the extent of acceptance of the target group, its trends, abilities and capabilities to absorb new developments (Tawalbeh, 1997).

Al-Mousa and Al-Mubarak (2005) indicated that E-learning is one of the methods of virtual class through the use of computers, its networks, and its multimedia, including sound and image, graphics, search tools, libraries, and Internet gates, but E-learning is broader and more comprehensive than virtual class to be used in the classroom. Occupational satisfaction is one of the important issues that need attention in all areas of work and at all times, for two reasons, the first because it is the goal of every work as a life goal, and the second is because it contributes to the rest of the trends as it has negative or positive effects on all the phenomena in the work (Rabie, 2015) The teacher is the cornerstone of the educational

process, as he is not just a transmitter of knowledge, but rather a model for effective education that gains the learner the greatest potential and capabilities, and the teacher in the field of special education plays an important and essential role (Suhail, 2012).

The field of learning disabilities is one of the most important areas in special education, in which the differences between students are clear, as it seems that students with learning disabilities appear to be completely healthy in most psychological manifestations, but they suffer from a clear disorder in one or another area of learning, and international legislation tends to ensure that pupils with special needs are given educational opportunities appropriate to their needs, as well as provide health care and public services to them, especially pupils with learning disabilities who lack appropriate educational methods and learn in environments that depend on the method of preservation and indoctrination to provide them with skills which contribute in decreasing their academic achievement, Abu Nayan (2012) confirms that this requires educators and teachers to improve teaching methods and use effective strategies that aim to raise the level of learning among these students.

Mind maps are among the best methods that contribute to student acquisition of Information, storage and retrieve them back in subsequent educational situations, also contribute to organizing and linking information, organizing the student's thinking and giving him a holistic picture of the skill. Safi and Gharbi (2020) stated that the new Corona pandemic, which is considered a health crisis that affected the whole world and led to the cessation of life manifestations in all fields, and as a result of the actions adopted by the state on all institutions in general and educational institutions in particular, it was necessary to close schools and move towards virtual class and take advantage of the latest applications to resume the curriculum scheduled through the educational electronic platform. So, current study comes to measure professional satisfaction of teacher's for students with learning disabilities about virtual class during the COVID-19 pandemic in Saudi Arabia.

Research Problem

As Safy and Ghareeb (2020) indicated that there are approved instructions by the state on educational institutions in particular to use virtual class services during the Corona pandemic

and the exploitation of the latest applications to resume the curricula prescribed through the educational electronic platforms. The current study aimed to:

1. Measuring the professional satisfaction of teachers of students with learning disabilities about the virtual class programs introduced during the Corona pandemic.
2. Measuring the differences between school teachers in the level of professional satisfaction in light of some variables (educational qualification, years of experience, age group).

Professional satisfaction is a fundamental pillar in any construction and success of any institution, especially educational institutions, as the effect of this is reflected on many parties and bodies, including students, parents and the educational process, so the importance has emerged here in knowing the level of professional satisfaction among teachers of learning disabilities, and the problem of this study came To find out the level of professional satisfaction of teachers of students with learning disabilities about virtual class programs offered during the Corona pandemic, so this study seeks to answer the following questions:

1. What is the level of professional satisfaction of teachers of students with learning disabilities about the virtual class programs offered during the Corona pandemic from the teachers' point of view?
2. Are there statistically significant differences on (the dimensions of the questionnaire and the overall score) of the level of professional satisfaction among teachers of students with learning disabilities attributed to the educational qualification variable?
3. Are there statistically significant differences on (the dimensions of the questionnaire and the overall score) of the level of professional satisfaction of teachers of students with learning disabilities attributed to the variable of the number of experience years?
4. Are there statistically significant differences on (the dimensions of the questionnaire and the overall score) of the level of professional satisfaction of the teachers of students with learning disabilities attributed to the variable of the age category?

Hypotheses of Research

- 1- The average teacher scores on the questionnaire (the level of professional satisfaction of teachers of students with learning disabilities about the virtual class programs offered during the Corona pandemic) are low.
- 2- There are statistically significant differences (on the dimensions of the questionnaire and the total score) of the level of professional satisfaction among teachers of students with learning disabilities attributed to the educational qualification variable.
- 3- There are statistically significant differences (on the dimensions of the questionnaire and the total score) of the level of professional satisfaction of teachers of students with learning disabilities attributed to the variable of the number of experience years.
- 4- There are statistically significant differences (on the dimensions of the questionnaire and the total score) of the level of professional satisfaction of teachers of students with learning disabilities attributed to the variable of the age group.

Importance of the Study

We can state the theoretical and implicational importance of the study as followed:

- There is a shortage of studies about professional satisfaction among teachers of learning disabilities about virtual class programs.
 - This study helps to explore obstacles that faces teachers at all the educational factors so it clears the way to preparing programs, activities and electronic planes that guarantee educational goals fulfilling.
 - The importance of people with learning disabilities and their different educational requirements and special needs, which necessitate conducting such research and studies to provide them with a better education.
 - It is expected that the results of this research will contribute to helping decision makers and officials to identify the level of professional satisfaction of teachers in light of the Corona pandemic and work to overcome the difficulties related to the problems of virtual class.
- Through the questionnaire designed by the researchers, it can provide them a tool to help them conduct more research.

Terms of the Study

Current study used the following terms:

- Students with learning disabilities: Procedurally, they are defined as students who have been classified as having learning disabilities, based on the approved exams with which they were classified in the Ministry of Education in the Kingdom of Saudi Arabia.
- Professional Satisfaction: It is procedurally defined as the level of job satisfaction of male and female teachers of learning disabilities and the extent of satisfaction and acceptance of work and pursuit of achieving educational goals without obstacles and was measured by a questionnaire.
- Virtual class: It is defined as educational programs, services and activities that are provided electronically using technology as an alternative to those provided in presence in schools during the Corona pandemic.

Boundaries of the Study

We can state boundaries of the current study in the following:

- Objective boundaries: teachers (males and females) of learning disabilities.
- Spatial boundaries: this study has been applied on schools of AlJubeel, AdDammam and AlKhobar at the western Province, Kingdom of Saudi Arabia.
- Temporal boundaries: This study was applied in the first semester of the academic year 1442 AH - 2020 AD.
- Human boundaries: This study was applied on Primary school teachers in government schools in the Eastern Province in the Kingdom of Saudi Arabia.

Previous Studies

Al-Khudari, Al-Sanafi, and Ramadan (2020): The study aimed to discuss the role of e-learning in the integration and empowerment of people with special needs within the Kuwaiti society and the availability of educational content on the Internet and social media sites. The study applied the descriptive approach, results showed effectiveness of e-learning in inclusion, empowerment and access to people with special needs Within Kuwaiti society.

Muhammad's study (2020): Which aimed to recognize the special needs teachers' awareness of e-learning importance for special needs students in the Governorate of Dhofar, according to the following indicators (type of disability, degree of disability, educational level, gender of the teacher). The descriptive approach was used in it, the study reached a number of results, the most important of which are: The academic preparation does not train teachers sufficiently to use e-learning and then direct it to students with special needs, which led to a decrease in the number of teachers who use these methods with students with special needs.

Muaizah and Abdul Malik (2019): aimed to know the extent of the contribution of educational technology methods to alleviating the distress of people with learning disabilities from the perspective of teachers, where the researchers used the descriptive analytical approach. Results indicated that the majority of the sample members confirmed by 90% the contribution of these devices to alleviating the severity of the disorder for people Learning disabilities, and that there is an improvement after their use in teaching people with disabilities, and they saw that in several areas such as improvement in mental abilities and the level of understanding speed, as well as to enrich the linguistic balance, improvement in speech and writing in addition to an increase in motivation to learn and improvement in academic achievement in general, and the development of intellectual skills For the child (memory, attention, intelligence).

AlMoqbel (2019): The study aimed to identify the types of educational technologies used with learning disabilities students and the obstacles to their application from the viewpoint of the learning disabilities teachers in Riyadh using descriptive analytical approach. Researcher concluded that the teachers use educational technologies at a higher than average level, the most prominent of which were smart applications such as : Ipad, mobile, and the obstacles to the use of educational technologies were educational obstacles in the first place, followed by administrative obstacles, then human obstacles.

Al-Mazmoumi and Al-Hafithi (2018-2019): The study aimed to know the effectiveness of applying a proposed program through mobile learning in treating some learning disabilities among (10) fifth grade students in the elementary stage with learning disabilities, who studied through the proposed program through mobile learning prepared by the researcher, and used the quasi-experimental approach. The study found that there are statistically significant differences in the pre and post application of the test in favor of the post application, which

indicates the positive effect of e-learning represented by the application of the proposed program through mobile learning in the treatment of mathematics difficulties, and training mathematics teachers to produce mobile learning applications and employ them in the educational process.

Dryer and Lembart (2018): The study aimed to explore the impact of the educational challenges faced by online learning environments on pupils with learning disabilities, through interviews conducted with eight students with learning disabilities. Results indicated the need to make electronic learning environments helpful for these students on high academic achievement and low levels of anxiety and provide Technical support programs for all academic and emotional fields.

Burdetto, Greer, and Woods (2018): The study aimed to find out the prevalence of virtual class in the education of ordinary students and those with special needs, and the results showed an increase in the number of states that provide education via the Internet, especially for students with special needs, and the obstacles that may prevent the participation of these students in e-learning which mentioned as an importance of technical aids that help these students and meet their needs.

Lemasters and Roach (2006): The study aimed at determining degree of student satisfaction with the training courses offered online compared to the training courses on the ground, descriptive approach, and results showed the student's satisfaction with the online training courses. Nevertheless, it indicated valuable concerns that must be addressed and discuss its implications which include the need to develop educational units to help learners prepare for e-learning, in addition to students' possession of appropriate hardware and software to achieve success.

It is evident from previous studies that the professional satisfaction of teachers is directly proportional to the quality of professional and practical services provided by the governmental and private sectors, as mentioned in the study of (Al-Samadi 2015) and (Muhammad 2020), where the degree of teachers' compatibility and satisfaction increases the level of services provided to students with learning disabilities, also studies identified the reality of the use of e-learning in the educational fields for people with learning disabilities as stated in the study of (Al-Najm 2012), (Al-Muqbel 2019) and (Al-Qahtani 2018), while

others identified the challenges and the extent of the widespread use of virtual classes within programs for people with Special needs as a study of (Lembart, Dryer 2018), and (Burdetto, Greer, Woods 2013).

Methodology

This chapter deals with a detailed presentation of the field methodology for the research, the procedures used, the sample of the research and the tool used, the statistical method for verifying the validity and reliability of the tool, as well as the statistical methods used in processing the research data and extracting the results.

Data Analysis

Descriptive analysis method was used to address research data. Through this method we can collect and interpret data about a given phenomenon in order to determine its strength points and weakness.

Research Group

The research community consisted of 5569 teachers of public education for the primary stage in the Eastern Province of the Kingdom of Saudi Arabia. The statistical indicators of the questionnaire used in the current research were verified by applying them to (20) teachers for pupils with learning disabilities for the elementary stage in the Eastern Region, and they were chosen by a random method from the research community, in order to ensure the validity and reliability of the questionnaire, and its validity for use in the current research. Sample of the research consisted of 50 teachers for pupils with learning disabilities for the elementary stage in the Eastern Region, KSA. They responded to the questionnaire of the current research.

Reliability of the Questionnaire

The general stability of the questionnaire was estimated on the survey sample individuals by using Cronbach's Alpha and Split-Half. The general stability coefficient of the tool was (0.896) using Cronbach's alpha method and (0.874) using the half-segmentation, and these

values are very high stability coefficients. This indicates that the scale has a high degree of stability and can be relied upon in the field application of the research. The stability coefficient was also calculated using the Cronbach alpha method and the Split-Half of the items of each axis separately, and it is clear from the results in Table (4) that all the stability coefficients for the axes ranged between (0.747 - 0.920) by the Cronbach alpha method and ranged between (0.723 - 0.905) by the Split-Half method. This indicates that all the axes of the tool have high stability and reliability in application.

Validity of the Questionnaire

The validity of the internal consistency of the questionnaire items was verified by calculating the correlation coefficient between each item with its axis, showing the correlation coefficients for each paragraph with its axis and it is clear that all correlation values are positive and statistically significant at the level of significance (0.01-0.05).

Constructive Validity

The constructive validity of the tool was verified by calculating the correlation coefficient for each axis with the total score of the tool, that all correlation values are positive and significant with statistical significance at a significance level (0.01, 0.05), which indicates the validity of consistency between the axes of the tool and its relevance to measuring what was set for it.

Results

A detailed presentation of the results of the current research will be covered, by answering the research questions according to the appropriate statistical treatments, and then interpreting these results, as follows:

1-What is the level of professional satisfaction of learning disabilities students' teachers about the virtual class programs offered during the Corona pandemic from the teachers' point of view?

To determine the level of professional satisfaction of teachers of learning disabilities about virtual class programs, the arithmetic mean of the responses and the relative mean% of the general axes of the tool were calculated, and they were arranged to know the general direction of the responses as shown in Table 1. Learning ranges between (sometimes and rarely) on the four axes of the tool and the general direction of all the tool's axes was (rarely) with an arithmetic average (2.55 / out of 5) and it was evident from the results that the highest level of satisfaction for them was for the first axis (Professional satisfaction with the virtual class system) with a mean of (2.94), followed by the second axis (Professional satisfaction in communicating with students) with a mean of (2.55), then the fourth axis (The general trend of all axes of the questionnaire) with an mean of (2.51), and finally the third axis (The fourth axis: professional satisfaction with the educational plan) On the evaluation and diagnosis process for students) with a mean (2.20) (see Figure 1).

Table 1. Responses of the Participants on each Axis of the Questionnaire

General axes	N	Mean	Relative mean	Relative error	S.D	Rank	Level of satisfaction
1- Professional satisfaction with the virtual class system	50	2.94	58.85	0.11	0.78	1	neutral
2-Professional satisfaction in communicating with students	50	2.55	51.00	0.10	0.71	2	Disagree
3-Professional satisfaction with the assessment and diagnosis process for students	50	2.20	44.08	0.10	0.71	4	Disagree
4-professional satisfaction with the educational plan	50	2.51	50.20	0.12	0.82	3	Disagree
The general trend of all axes of the questionnaire	50	2.55	51.03	0.09	0.62		Disagree

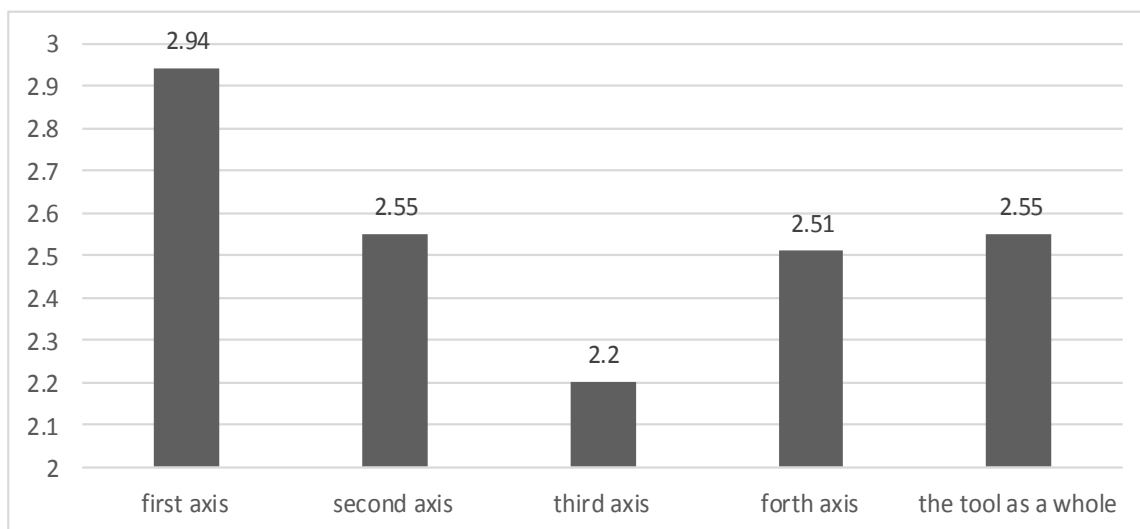


Figure 1. Average Responses for the Four Axes

2- Are there statistically significant differences at the level of significance (0.05) on the dimensions of the questionnaire and the overall score for the level of professional satisfaction between teachers of students with learning disabilities attributable to the educational qualification variable (diploma - bachelor - master)?

Table 2 shows the results of the analysis of variance and the value of (F) and its statistical significance at the level ($\alpha < 0.05$) for the differences between means of responses on dimensions of the questionnaire and the overall score of the level of professional satisfaction among teachers of students with learning disabilities attributable to the educational qualification variable (diploma – bachelor - Master).

Table 2. Professional Satisfaction among Teachers based on Graduation Level

Educational qualification and axes		N	Mean	Std. Dev.	Std. Error	df	F	p	significance
General score of the tool	Bachelor	3	2.92	0.38	0.22	2	1.49	0.234	Not significant
	Diploma	43	2.49	0.63	0.10	47	8		
	Master	4	2.93	0.52	0.26				

To answer the question are there statistically significant differences at the level of significance (0.05) on the dimensions of the questionnaire and the overall score for the level of professional satisfaction between teachers of students with learning disabilities attributable to the educational qualification variable (diploma - bachelor - master), The arithmetic mean of the teachers 'responses was calculated for each axis of the tool and the total score, and then using one-way analysis of variance and calculating the value of (f) and its statistical significance at the level of (0.05), and the results came as shown in Table 2. It is evident from the results in Table 2 that there are no statistically significant differences at the level of significance (0.05) where the significance levels ranged between (0.104-0.744) and they are all greater than (0.05), which means that there are no Statistically significant differences between groups according to the educational qualification of all tool axes (first, second, third, and fourth), as well as the overall degree of the tool. Here, the null hypothesis can be accepted that there are no statistically significant differences on the dimensions of the tool and the overall degree of the level of professional satisfaction of teachers of learning disabilities attributable to the educational qualification variable.

3- Are there statistically significant differences at the level of significance (0.05) on the dimensions of the questionnaire and the overall score for the level of professional satisfaction between teachers of students with learning disabilities attributed to the variable of the number of experience years (less than 5 years- 5:10 years – 10:15 years)?

Table 3 shows the results of the analysis of variance and the value of (f) and its statistical significance at the level (0.05) for the differences between the means of responses on (dimensions of the questionnaire and the total score) of the level of professional satisfaction among teachers of students with learning disabilities attributed to the variable of the number of years of experience (less than 5 years - 5: 10 years - 10: 15 years).

To answer this question: Are there statistically significant differences at the level of significance (0.05) on the dimensions of the questionnaire and the overall score for the level of professional satisfaction between teachers of students with learning disabilities attributed to the variable of the number of experience years(less than 5 years- 5:10 years – 10:15 years)? means of the teachers 'responses were calculated on the dimensions of the study and

the overall score, also one-way analysis of variance and the value of (f) at the level of significance ($\alpha < 0.05$) and the results came as shown in Table 3.

Table 3. Professional Satisfaction among Teachers based on Experience Level

Years of experience and axes	N	Mean	Std. Dev.	Std. Error	df	F	p	significance	
General score of the tool	less than 5 years	11	2.29	0.54	0.16	2	1.722	0.190	Not significant
	5-10 years	30	2.58	0.68	0.13	47			
	10-15 years	9	2.78	0.37	0.12				

Results show that there are no statistically significant differences, as the statistical significance ranged between (0.654-0.190) which are all values greater than (0.05), which means that there are no statistically significant differences between groups according to the number of years of experience for all the axes of the tool and its total score. So we can accept the null hypothesis that there are no statistically significant differences between the responses of the learning disabilities teachers on the dimensions of the tool and the total degree of it attributed to the variable of the number of years of experience.

4- Are there statistically significant differences at the level of significance (0.05) on (the dimensions of the questionnaire and the total score) of the level of professional satisfaction of teachers of students with learning disabilities attributable to the variable of the age group (25: 35 years - 36: 45 years - 46 years and above)?

Table 4 shows the results of the analysis of variance and the value of (f) and its statistical significance at the level of ($\alpha < 0.05$) for the differences between the means of responses on the dimensions of the questionnaire and the overall score of the level of professional satisfaction among teachers of students with learning disabilities attributable to the variable of the age group (25:35 Years - 36: 45 years - 46 years and over).

The means of the teachers' responses were calculated on the different dimensions of the study as well as the total score of the tool, using one-way analysis of variance and calculating the value of (f) at the level of significance (0.05). Results show that there are no significant differences between means, as the statistical significance ranged from (0.459- 0.077), which

are all values greater than the significance level (0.05), which means that there are no statistically significant differences between groups according to the age group variable for all axes of the tool and its total score.

Table 4. Professional Satisfaction among Teachers based on Age

Age groups and axes	N	Mean	Std. Dev.	Std. Error	Freedom	F	p	significance	
General score of the tool	25-35 Years	37	2.45	0.61	0.10	2	2.493	0.093	Not significant
	36-45 years	10	2.93	0.57	0.18	47			
	46 years and over	3	2.58	0.58	0.34				

Here we can accept the null hypothesis that there are no significant statistical differences between dimensions of the study and its total score between the responses of the learning disabilities teachers on the dimensions of the tool and the total degree of it attributed the variable of the number of years of experience. Here, the null hypothesis is accepted that there are no statistically significant differences on the dimensions of the study and the total degree of it for the responses of learning disabilities teachers to measure their level of professional satisfaction with the virtual class system attributable to the age group variable.

Discussion

Results indicated that the sample members were generally dissatisfied with the level of virtual class services provided during the Corona pandemic, and their professional satisfaction was moderate in: the virtual class system and low in: communication with students, the educational plan, the evaluation and diagnosis process for students. Perhaps this result is expected because virtual class services have been recently and surprisingly adopted during the Corona pandemic and their infrastructure is weak, and this result is consistent with the study by Blash & Piotrowski (2006), which indicated a low level of professional satisfaction of special education teachers, and differs with the study Al-Abd Al-Jabbar

(2004), and Awad (2009), which indicated that the professional satisfaction of special education teachers was moderate.

To answer the second question, teachers were classified into three categories according to their academic qualification, and the results show that there are no statistically significant differences in the level of professional satisfaction of the teachers of students with learning disabilities with the scientific qualification variable, and this result is due to the recent reliance on virtual class services during the Corona pandemic, and their employment in Schools will be a new experience, which makes them similar in their use of these services. This result is consistent with the Maaytah study (2018) and Choucair's study (2011), which indicated that there are no statistically significant differences in the level of professional satisfaction of teachers attributed to the educational qualification variable, and disagree with The study of Al-Zeyoudi and Zaghoul (2008), and Al-Hakimi (2005) study, which indicated that there are statistically significant differences in the degree of professional satisfaction of teachers attributed the educational qualification variable.

To answer the third question, teachers were classified into three categories according to the number of years of their experience. The results showed that there were no statistically significant differences in the level of professional satisfaction of teachers of students with learning disabilities attributed to number of experience years variable. This is due to the recent reliance on virtual class, which weakens his influence with the teacher's experience, and this result is consistent with the study of Choucair (2011), which indicated that there are no statistically significant differences in the degree of professional satisfaction of teachers attributed to number of experience years variable and it agrees With the study of Abu Mustafa and Ashkar (2011), which indicated that there are statistically significant differences in the degree of professional satisfaction of teachers attributed to number of experience years variable.

To answer this question, teachers were classified into three groups according to the age group, results showed that there were no statistically significant differences in the level of professional satisfaction of the teachers of students with learning disabilities attributable to the variable of the age group. This result consists with the study of Yahya (1992) and Smith (2000), and Roy (2001), which indicated that there were no statistically significant differences in the level of professional satisfaction of teachers attributed the variable of age.

Conclusions

The level of professional satisfaction of teachers of students with learning disabilities about the virtual class programs offered during the Corona pandemic from the teachers' point of view is unsatisfactory. There are no statistically significant differences at the level of significance (0.05) on the dimensions of the questionnaire and the total score of the level of professional satisfaction among teachers of students with learning disabilities attributed to the educational qualification variable, the years of experience variable, and age group variable.

In light of the study results, we can suggest some of the following recommendations:

- Providing basic infrastructure as a main starting point that helps teachers provide effective education for students with learning disabilities.
- Professional development for teachers of pupils with learning disabilities about virtual class services by the Ministry of Education.
- The multiplicity and diversity of training programs for teachers to raise the efficiency of the educational process.
- Developing the educational capabilities of teachers in designing strategies and electronic activities in a manner that fits the nature of virtual class.
- Opening channels of communication and interaction between the teacher and the specialized and distinguished expertise to contribute to addressing the teacher's problems.

The researchers recommend:

- Conducting the study on a larger sample of teachers of students with learning disabilities about virtual class services.
- Study the reasons for the dissatisfaction of teachers of students with learning disabilities about virtual class services.
- Replicate the study after developing the capabilities of teachers and after the Corona pandemic.
- Conducting a study on the obstacles facing students and parents in virtual class.

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SECTION III: NATIONAL SPECIFIC ISSUES

CHAPTER 12: IMPLEMENTING DISTANCE LEARNING IN ALGERIA: AN OPPORTUNITY OR A CHALLENGE?

Nassima Kaid 

Chapter Highlights

- The Higher education system in Algeria is currently based on the traditional form of education where teachers hold classes face-to-face with their students. The teaching practice was challenged after the COVID-19 Pandemic struck the country in March 2020.
- This chapter explores the impact of COVID-19 on the Algerian education system through teachers' perceptions of this new pedagogy and their exceptional experience with this new form of teaching.
- The findings of the study reveal that teachers have been able to provide courses on e-learning platforms despite all the challenges and problems they have encountered.
- This chapter examines how distance learning will be further implemented in Universities by providing adequate professional development for teachers and more involvement of the Ministry to ease the shift from in-class to remote teaching.

Introduction

The COVID-19 pandemic that struck the world in January 2020 led to a lockdown that paralyzed many companies and sectors including the educational ones. Schools and universities, all over the world, closed their doors for an unlimited period of time in order to avoid the spread of the virus among students and teachers. According to a UNESCO report (2020), globally, more than 90 percent of the world's students could not join their schools in 190 countries and regions. The pandemic did not only affect learners, especially the ones coming from underdeveloped countries, it has also impacted teachers who are supposed to deliver effective Distance education.

The exceptional nature of the current global situation has resulted in a dramatic change in education. It has pushed many governments to resort to and adopt Distance learning or remote teaching to keep up classes with students. While this shift is easy for developed countries, it is a challenge for less developed nations. Like many institutions around the world, Algerian university teachers were asked to shift to distance learning in order to help students keep learning.

Many countries worldwide have looked for effective solutions during the pandemic to continue the education process. Online libraries, TV broadcasts, guidelines, resources, video lectures, online channels were introduced in at least 96 countries (Basilaia 2020). To increase the delivery of lessons to the students, the Ministry of National Education, in cooperation with the Algerian Broadcaster's Sixth Channel has launched the educational project entitled - "Al Maarifa" (Knowledge) in April 19th. The channel relied on a live transmission of lessons to students undertaking exams like Baccalaureate and BEM (Certificate of Secondary Education) in different subjects nationwide. Henceforth, these measures were designed for Secondary school students only while University students did not benefit from the same system.

Literature Review

Several research works have been published on remote teaching the last few years. Yet few recent works have explored the opportunities and challenges associated with remote teaching during the pandemic. The papers range from discussing issues related to the workability of

distance learning, online assessment of students to the increase of digital inequalities that widened the gap between social classes. In a recent paper, Adnan and Anwar (2020) examined Pakistani students' attitudes toward distance learning during COVID-19. They concluded that despite the fact that most students had a positive attitude towards online teaching, they have faced some problems and difficulties related mainly to the lack of interaction with their instructors as well as lack of on-campus socialization, which prevents them from effectively completing their courses. Basilaia and Kvavadze (2020) have conducted a research on Georgia's capacity to adopt online teaching after face-to-face education was suspended because of the pandemic. A special focus was made on the use of Google Meet as a way to keep up with students at a private school. The results have revealed the success of this method and recommend the generalization of the practice to other institutions.

An interesting paper published by Robinson et al. (2020) discussed the problem of social and digital inequalities that was worsened by the pandemic. It provides a deep analysis of how the COVID-19 has led the underprivileged more vulnerable to the changes occurring in society. The findings revealed that "existing digital disparities and COVID-19 lockdowns may have potentially deleterious effects for low-SES students in terms of educational trajectories and life opportunities if not effectively remediated" (p.15). Thus, more research is needed to explore the impact of COVID-19 on Algeria and the challenges encountered by teaching in using Distance learning by Algerian University teachers. In this sense, the study aims to determine the effectiveness of distance learning in Algerian Higher Education and to highlight the main challenges faced by teachers.

The Impact of COVID-19 on Algerian Higher Education

The Algerian Higher Education system is based primarily on traditional face-to-face teaching. It requires students to attend lectures at university every day in order to validate their academic year. Teachers use books, whiteboards or power point presentation as teaching supports.

The situation changed in March 2020 when the first case of COVID-19 was detected in Algeria on February 25th. In order to prevent the spread of the virus among the population, the government announced a partial lockdown from March 1st on Blida and Algiers

(Government of Algeria, 2020). The confinement led to an economic, cultural and social crisis which had a direct impact of Higher Education (Jensen et al. 2020, p.6). In March 12th, the president called for a complete shut down of schools and universities for 21 days. Accordingly, teachers were asked to shift to “emergency online teaching” (Jensen et al., 2020, p.6). In order to ensure the continuity of students’ learning, the minister of Higher Education urged teachers to use all the tools available to put in place a digital learning mechanism in order to validate the academic year. A few days later, the Ministry of Higher Education and Scientific Research has issued a ministerial directive on March 17th recommending teachers, under the supervision of their directors, to start distance teaching in order to “... continue to offer the student lessons via internet so that he can acquire a certain level of knowledge and skills that will lead him to validate his academic year if he succeeds in the exams” (The Official Statement of the Minister of Higher Education, 2020).

It is worthy to mention, at this level, that despite the fact that the Algerian Higher education has established a telecommunication system that links different universities since 2003, the integration and use of ICT is still not fully implemented partly because of material deficiency in different universities as well as lack of skilled workers (Michel, 2017). Thus, though the use of ICT is inevitable in Higher education, no special funds are allocated by the Algerian ministry for the latest technologies. As a result, teachers were confronted with an unplanned situation where they faced a double challenge, that of using Distance learning and coping with problems related to ICT skills as most of them are not really “tech savvy.”

Methodology

The Questionnaire

The aim of the present research is to investigate Algerian University teachers’ perceptions and experience with Distance learning after the pandemic of Coronavirus. The analysis is based on an online survey among teachers from Djillali Liabes University in Sidi Bel Abbes. I did not rely on a national survey since the objective of my research is to shed light on the exceptional use of Distance Learning Algerian Higher Education.

The questionnaire was divided into two parts: 1) the professional information of teachers and 2) teachers’ perceptions and experiences with Distance learning. My research was based on different variables namely the efficiency of remote teaching, work environment, the main

challenges encountered by teachers when first dealing with distance learning, and teachers' recommendations for improving remote teaching in Algeria.

Sample Description

The teachers who participated in the survey are divided into 96% full time teachers and 4% part time teachers. They represent 52% females and 48% males. 20% of respondents are professors while 36% are Associate professors. On the other hand, the Assistant professors represent 40% and part time teachers 4%.

Results

The quantitative data obtained through the online survey are stated in percentages.

Accessibility to E-learning Platforms

72% of respondents affirm they were first initiated to distance learning after the pandemic. For 14% of teachers, they started using remote teaching before Covid-19 while the remaining has not started teaching online yet (see Figure 1).

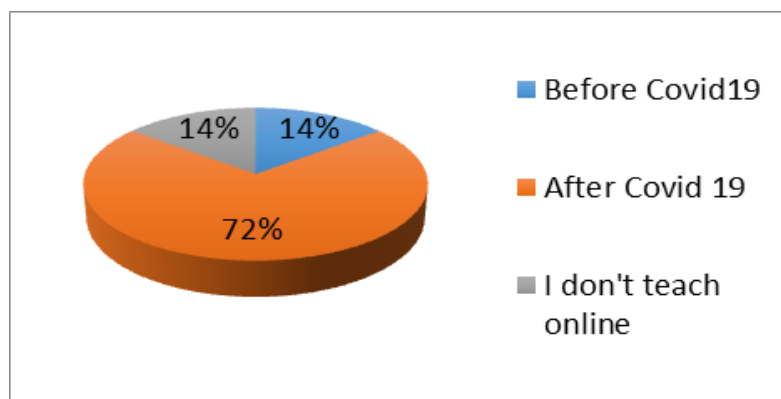


Figure 1. First Use of Distance Learning

As to the platforms used, University e-learning platform is the most used by 56% of respondents. It is followed by Moodle with 24% of respondents. 8% of respondents have chosen either emails or Messenger to keep in touch with their students while 8% have

preference for Zoom. Google meets and Jitsy comes last with only 4% of respondents claiming their use (see Figure 2).

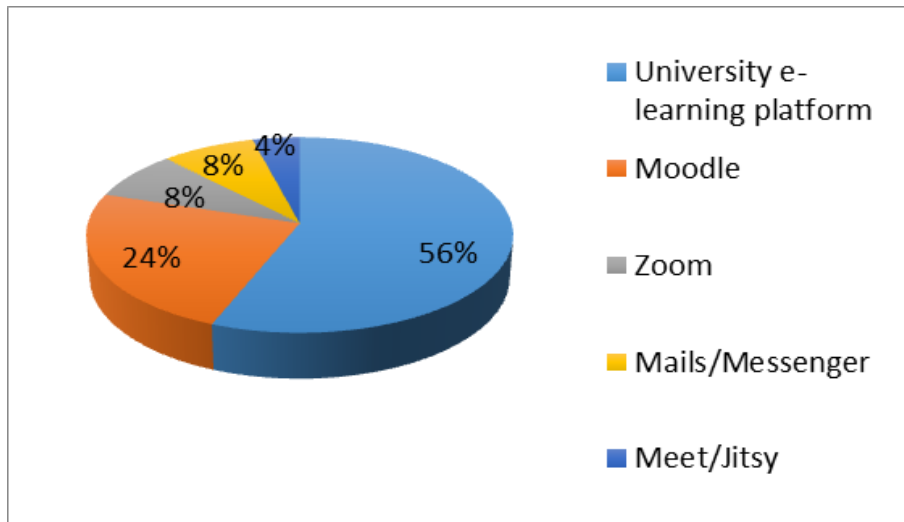


Figure 2. Types of Platforms used

For 56% of respondents, the use of digital technologies has somehow contributed in improving their way of teaching. 36% however acknowledge the use of ICT in their teaching while 4% do not feel there was any change to their teaching methods (see Figure 3).

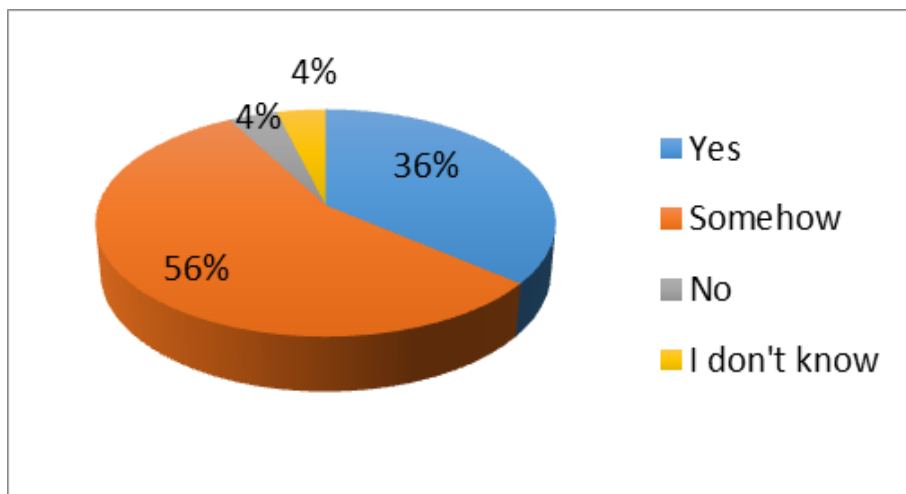


Figure 3. Impact of Digital Tools on Teaching Practices

When asked if they have the necessary tools and resources to work in a virtual environment, 80% of respondents were quite pessimistic as they affirm that there are not enough tools to facilitate their use of distance learning. Yet for 20% of respondents, they have everything they need in order to work in this new environment (see Figure 4).

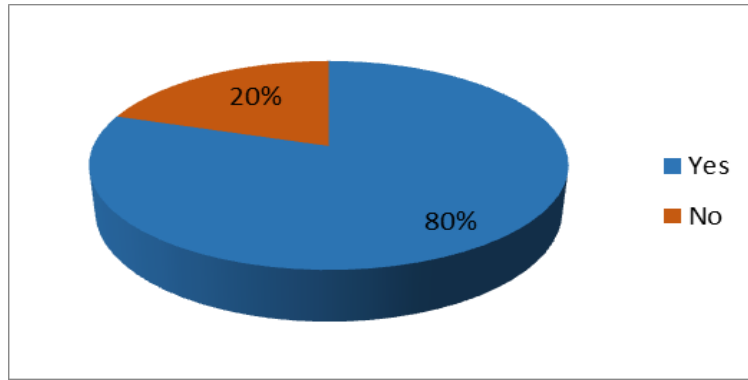


Figure 4. Necessary Tools for a Virtual Environment

All surveyed teachers have posted lessons in pdf format on university e-learning platform. For 32% of respondents, they have also added links to videos as a support material. Interactive exercises online were chosen by 8% of respondents while 4% have used social network namely Facebook as a means to distance learning (see Figure 5).

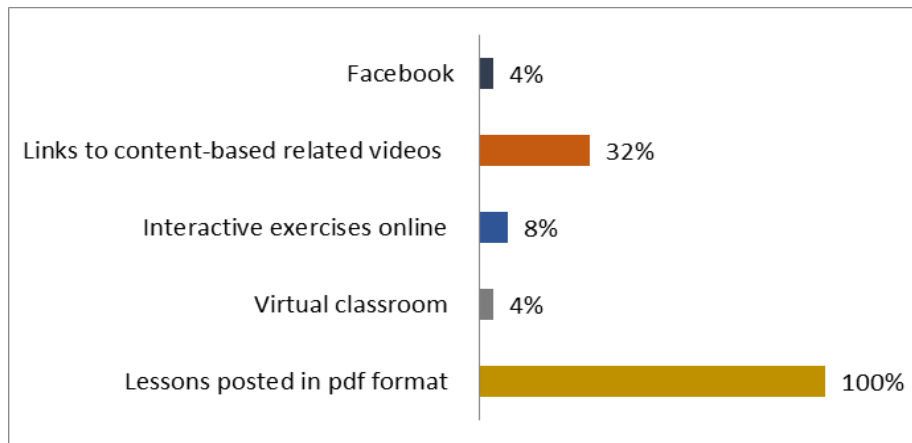


Figure 5. Teaching Methods

Challenges Encountered by Teachers

As to the challenges faced by teachers, the most frequently mentioned problem was students' access to technology for 92% of respondents. Another challenge brought about by 72% of respondents relate to the difficulty of keeping students motivated and engaged in the learning process. 44% of respondents find teachers' access to technology as one of the problems that obstructs their way of teaching. Assessment is another challenge for 64% of respondents while others identify digital competence as a serious problem with 44% having issues planning courses for distance learning against 28% struggling to convert content into distance

learning. 36% of respondents feel that there is little or no guidance and support from the Ministry of Higher Education (see Figure 6).

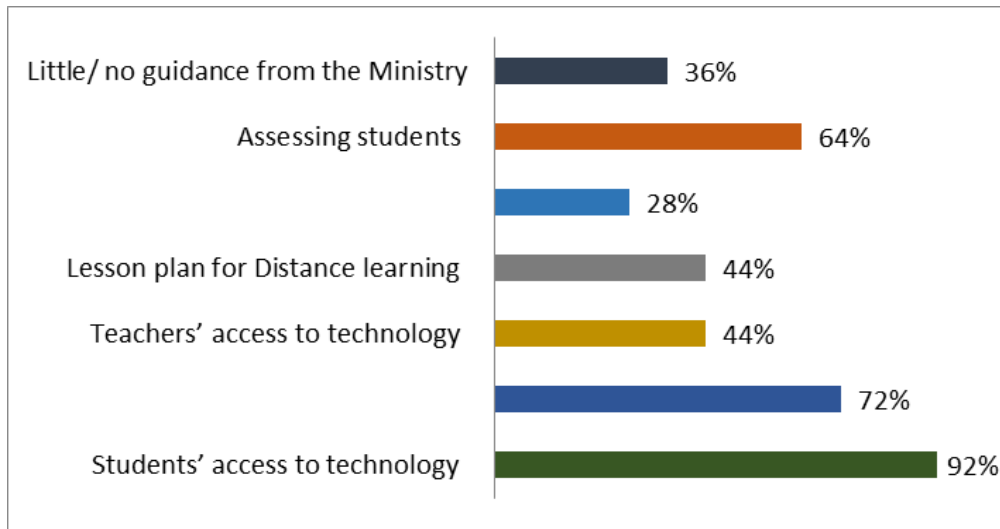


Figure 6. Challenges Encountered by Teachers

Teachers Attitudes and Recommendations

Of the four possibilities suggested, the need for teacher training by experts was the most frequently chosen by 80% of respondents. For 64%, they need to have access to more free resources and tools. The need for the Ministry's support and guidance in this new experience was mentioned by 40% of respondents while the remaining wish to check websites with a list of useful resources to guide them in their teaching (see Figure 7).

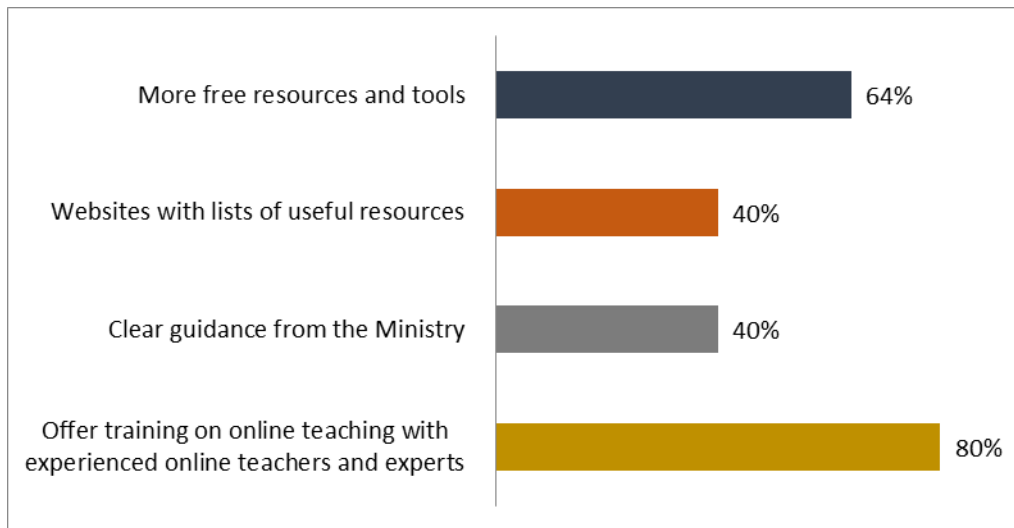


Figure 7. Improvement of Distance Learning

University teaching practices will be different according to 60% of respondents. 24% assert that Distance learning will become an integral part of university practices while 16% were more pessimistic as they argued that university will return to its traditional way of teaching (see Figure 8).

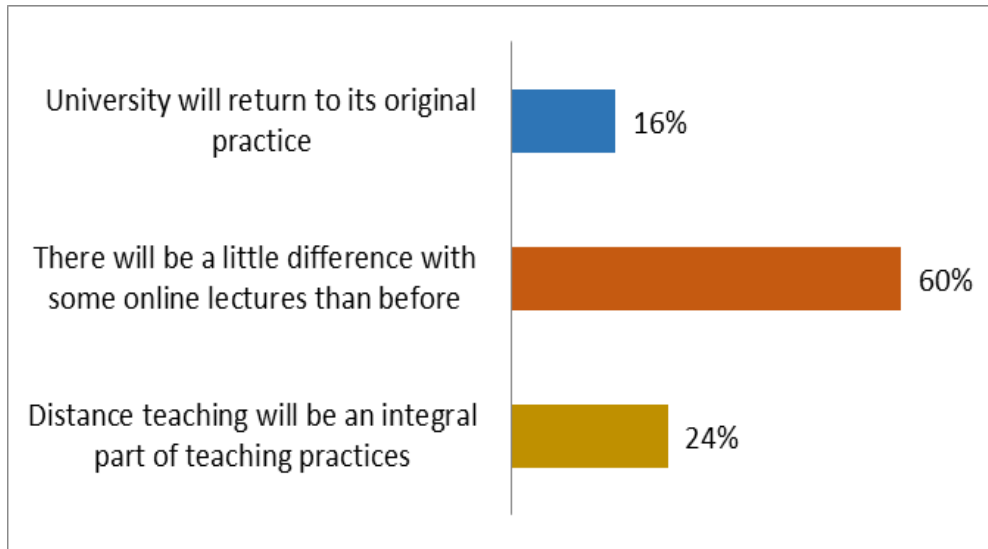


Figure 8. Future of Distance Learning

56% of respondents think their first experience with distance learning was average against 36% who find it a good. Only 4% of respondents believe the experience was bad or excellent (see Figure 9).

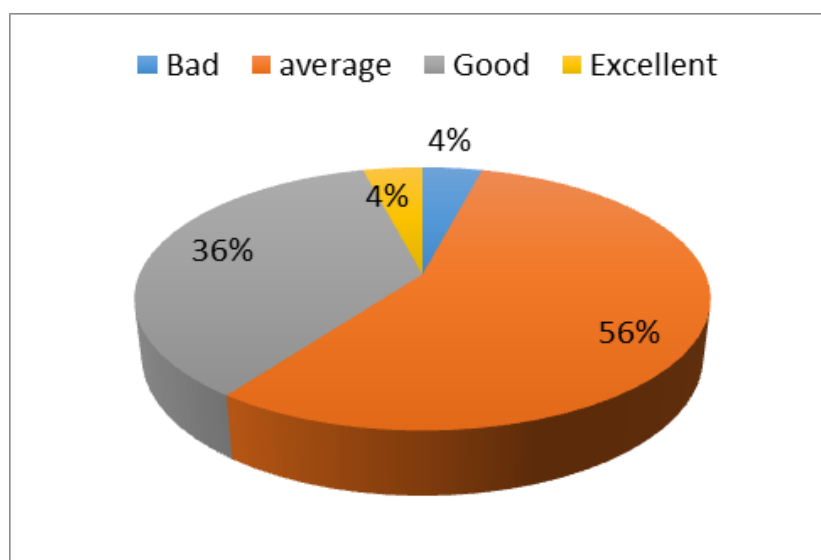


Figure 9. Teachers' Overall Impression of Distance Learning

Discussion

The data analysis led to important and interesting results. It brings out that the majority of teachers have been initiated to distance learning after universities closed because of the pandemic. However, they maintain that they suffer from the lack of the necessary tools to ensure high quality remote teaching. Most surveyed teachers had concerns about distance learning as almost every respondent has faced challenges, the most frequent being the limited access to technology by students. In fact, the lack of access to Internet facilities, a prerequisite to distance learning, combined with the absence of proper interaction and contact with students has made the transition to remote teaching problematic and challenging. The sudden shift to distance learning has resulted in a different learning experience for students (Adnan and Anwar, 2020). Moreover, the new situation had led to the increase of digital inequalities, as it is not easy for all students to have a suitable, high-level connection. Others, especially the ones coming from low-income families could not afford buying computers or having smartphones to access the platform, download the lessons posted by teachers or even communicate with their instructors and peers. The divide between those who have access to technology and those who do not lead to an inability to provide equal opportunities for students to complete their academic year (Jensen et al., 2020; Wallace-Spurgin, 2019).

Another issue related to students is teachers' inability to keep their students motivated and engaged in the new learning process. Though motivation has been viewed as a personal characteristic that remains relatively stable across contexts and situations (Bradley, 2020; Hartnett, St. George & Dron, 2011), students' lack of interaction and the new format of the classes have deeply affected their motivation and the completion of their courses. Accordingly, teachers complain about students' absence or lack of engagement in Distance learning as most of them have disappeared and did not take part in the course.

Besides students' limited access to technology, teachers came across another problem pertaining to assessment, a crucial aspect of instruction. Garrison (2011) claimed that assessment strategies send "a very strong signal as to what is important and how they should approach learning" (p.14). Yet, researchers have provided few guidelines to instructors regarding accurate assessment procedures in the online milieu (Gur & Vanschaak, 2004). As there is no physical proximity between students and teachers, it became a huge problem for teachers as to how they should grade their students.

As far as Distance learning competencies and pedagogies are concerned, the results demonstrate that teachers have relied mainly on uploading lessons in pdf format on the platforms developed by their university as recommended by the Ministry while others have a preference for Moodle as their new delivery method. A few teachers have used social networks as Facebook to communicate with their students. Their inability to use other e-learning platforms stems from the fact that they have suddenly been asked to shift to “emergency online teaching” (Jensen et al., 2020) without preparation or training. Planning online lessons or converting lessons to an online content was a different kettle of fish. It proved extremely difficult for teachers to master the different strategies in order to prepare an effective online lesson. The teachers’ struggle with these miserable circumstances and poor facilities led to constrained teaching and learning.

The shift to distance learning requires teachers to be familiar with the different technological tools. It is undeniable that the use of university e-learning platform and Moodle prove that teachers need to be acquainted with the diverse e-learning platforms. In order to remedy to the different problems, most teachers maintained that they need assistance and support in order to develop the required skills for a better message delivery.

Professional development, in that case, will help teachers enhance their teaching practices by empowering them with the required skills. Attending training sessions on the use of ICT in teaching by experts and online teaching by experts, providing teachers with the necessary tools and allocating them with more resources will facilitate the shift toward distance learning. It will help them improve the quality of their courses by making them more interesting and appealing to students.

This would be more effective if there is a fruitful collaboration between the Ministry and specialized experts who would help guide teachers in integrating the new technologies in their teaching. Respondents claim clear guidance and support from the ministry and access to more free educational resources would help them meet the challenges. These findings offer some indications to policymakers that the experience of distance learning, though challenging, may help in opening up new possibilities for educational innovation and new ways of working, if supported by appropriate professional development.

Conclusion and Recommendations

The year 2020 was different in a myriad of ways be it economic, political, social or educational. The intensive use of e-learning platforms aimed to ensure the learning continuity was unplanned and unexpected by Algerian teachers. Yet, it is undeniable that COVID-19 is reshaping education forever. The Algerian university, as many other universities around the world, has been constrained to review its teaching methods in order to ensure the continuity of learning.

The present study aimed to examine teachers' attitudes towards distance learning and the challenges they have encountered in the shift towards this new pedagogy. The research allowed to have a better understanding of what is working and what is not in order to improve distance learning in Algeria. Though teachers have faced many obstacles that complicated their teaching, they contend that it is important for them to seize this opportunity and step forward in developing their online teaching skills that will ultimately lead to their professional improvement. Algerian university teachers expect a shift towards hybrid learning wherein they can mix synchronous and asynchronous learning for more flexible learning possibilities.

In comparison to developed countries, it is clear that Algeria's e-learning capabilities are still at a nascent stage. Despite the progressive lifting of lockdown, it remains unclear when all students will be able to return to university seats. Thus the new modes of e-learning should be improved to be more effective.

Accordingly, in order to improve distance learning in Algeria, many initiatives should be implemented. These could include more involvement of the government by investing more in technical infrastructures in order to provide more free access to resources for teachers and students alike. Additionally, university leaders should spend time in raising awareness about the importance of integrating technology in teaching will result in more enthusiasm and better outcome for the years to come. Furthermore, the creation of a reliable database with teachers' and students' email would eventually re-establish communication between teachers and students and ensures better learning achievement.

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CHAPTER 13: THE ROLE OF COVID-19 IN RESTRUCTURING THE EDUCATION SECTOR IN NIGERIA THROUGH INFORMATION AND COMMUNICATION TECHNOLOGY

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Chapter Highlights

- This chapter examines the role of COVID-19 in promoting education in Nigeria through information and communication technology (ICT) and e-learning means.
- The study considered the concepts of education, information and communication technology, e-learning and COVID-19.
- The chapter discusses the role of the COVID-19 pandemic in restructuring the education sector in the country through the introduction of ICT and e-learning; it was shown that COVID-19 is playing a major role in reforming the Nigerian education system.
- The chapter recommends that the federal government in conjunction with relevant stakeholders should work hand in hand to ensure that necessary policies, facilities and infrastructures needed for effective and continuous learning in this modern age of ICT be put in place.

Introduction

Education is referred to as the general experiences to which an individual is exposed to, and which makes the individual relevant to himself and the society; it is the basic human need without which personal or national development is unthinkable (Oyelade & Abolade, 2017). Hopenhayn (2006) described education as the foundation for growth, human development, accelerator of modernity and a means of bringing people together from different cultural background. More so, education according to Al-Shuaibi (2014) is the practice of gaining knowledge and information that are capable of leading one to a positive future. According to Kumar and Ahmad (2008) education may be define as any social, scientific, psychological activity that is either planned or unplanned which is capable of facilitating progress in the life of an individual and in the society in general. Furthermore, the researchers simply described education as the development or advancement of individual in accordance with the needs, desires and the demands of the individual's society.

Education generally may be seen as a process through which the knowledge of the values of the society, the norms, principles, ethics, and skills are effectively transferred or passed across. Education is an accumulated knowledge or experience with a corresponding fundamental influence on human character, attitudes and mind. Thus, in order to acquire or accumulate knowledge, education is very essential. The place of education to mankind cannot be overemphasized. Education is very vital to the growth and progress of every nation and the world in general. It is a tool for development of mankind and the society. Furthermore, it is a means of socializing and making a nation to be politically and economically stable (Idris, Hassan, Ya'acob, Gill, & Awal, 2011; Williams-Britton, 2021). According to Al-Shuaibi (2014), education is responsible for the development of human personalities, thoughts and social skills. It equips people for necessary life experiences; enables people to attain special positions in the society and develop good career choices.

The role and importance of education to the entire world and particularly to Nigeria as a nation has been exceptional; perhaps, it is in the realization of the importance of education to the national development that the National Policy on Education (FRN, 2013) referred to education as an instrument necessary for national development. Consequently, UNESCO realizing the importance of education had previously stated in her Global Report 2017 (UNESCO, 2018) to recipient nations of its 26% national budget benchmark to be devoted to

education. In view of the above, the Nigeria Union of Teachers (NUT), as reported in Vanguard of May 2nd, 2013, also drew the attention of the federal government to honor the standard set by UNESCO in the country's national budget with a view of making education better in the country. One could say that this is part of the reason why the National Policy on Education mentioned that education should be prioritize in order to attain national development since education is an instrument of change. To this end, the educational system in Nigeria technically involves the process of transmitting the societal norms and values towards the development of the nation (FRN, 2013). Considering the importance of education to individuals, societies and national development, it is essential that education be continuously improved and advanced through modern and innovative means such as the information communication technology. The United Nation Educational, Scientific and Cultural Organization (2002), referred to ICT as a combination of information technology and other related technology; it is regarded as the bedrock and basis for every other thing in our modern-day world; to this effect, an in-depth understanding of this improvement and development in knowledge is indispensable for accurate and functional education. According to UNESCO (2006), ICT is any form of technology capable of can be used for transferring, storing, constructing and distributing information. In view of the above, one may regard ICT as technology involving products such as video, computer hardware, software etc. According to Beebe as reported by Odede and Enakerakpo (2014), ICT is a general term for software, computers, satellite links, networks and other systems which enables one to identify, understand and transmit information and knowledge.

Literature is brimming on the benefits and importance of ICT to education. According to UNESCO (2014), ICT plays vital roles in advancing the education system of a nation as it enables learners to quickly gain knowledge as well as enhances the skills, social flexibility and empowerment of individuals to partake in the world economy. More so, ICT is capable of enhancing the standard of education according to Balasubramanian et al (2009). Equally, (Yushau & Nannim, 2018) mentioned that ICT enables and improves transmission and acquisition of knowledge. As opined by Suryani (2010), advancement in ICT is steadily taking over the place of conventional teaching methods as the traditional whiteboard or chalkboard is being substituted by interactive whiteboards, books and printed materials are being substituted by on-line materials and resources, and the conventional face-to-face classroom interaction is gradually been replaced by online communications and classrooms; hence, in the word of the researcher, ICT integration can restore the education sector from the

stone-age to the light-age. More so, UNESCO (2019) asserted that ICT can supplement, empower and transform education for good- UNESCO believes that ICT can enhance global access to education, support the improvement of teachers, facilitate the quality and importance of learning, close the learning gaps, strengthen inclusion and as well as increase education administration and governance. Nigeria as a nation must not be left out of these awesome benefits of ICT. Bakare and Olaniyi (2017) have stated that institutions in Nigeria should generally support the usage of innovative and modern technology so as to improve education. According to (Bhattacharya & Sharma, 2007; Sanyal, 2001; Sharma, 2003), ICT and its products are very resourceful to education; these resources such as teleconferencing, emailing, audio conferencing, radio broadcast, television lesson, audiocassettes, virtual classrooms etc. are very relevant in the education system. Perhaps, all these resources form the e-learning resources of ICT.

E-learning according to Hedge and Hayward (2004) is an innovative and modern way of making available electronically facilitated, learner-centered, well-designed and cooperative learning situations to anybody at anyplace in time through the usage of internet and digital technologies with respect to instructional designs. Furthermore, Sale as cited in Ajadi, Salawu and Adeoye (2008) defined e-learning as the process of using technology to electronically provide education and training applications, observe learners' performances and provide feedback on learners' progress. eLearningNC (2020) also defined e-learning as any form of learning involving electronic technologies to gain access to educational curriculum outside the traditional or conventional classroom. Islam (1997) stated that merging of the internet and learning, or internet facilitated learning is called e-learning; the researcher further stated that e-learning can be done or received through such media as the computers, web, virtual classroom and digital collaboration which require the usage of the internet, extranet and intranet, video devices, audios, satellites, TV, CD-ROM etc. to deliver learning materials.

Numerous benefits and importance of e-learning exist. According to Pavel, Fruth and Neaucsu (2015), e-learning saves a lot of time and cost and makes it possible to learn anytime and anywhere; more so, it is a convenient and very flexible way of learning for majority of students. The authors further stated that it is in the realization of the benefits and flexible nature of e-learning that the European Foundation for Quality in eLearning (EFQUEL) was founded. The essence is to ensure that EFQUEL maintains quality assurance and the

enhancement of the various technologies employed in education as well as encourages merit and novelty in learning and e-learning. eLearningNC (2020) pointed out that e-learning has demonstrated to be one of the most successful and informed approach of learning and education as it has been embraced by many nations, particularly, developed nations. Also, (Ajadi et al., 2008) opined that e-learning is not a new phenomenon in stimulating education in some parts of the advanced nations. It is therefore clear that the place of e-learning and ICT in promoting education is not being taken for granted in developed nations (Anene, Imam, & Odumuh, 2014). However, it appears that developing and underdeveloped nation, despite knowing the relevance of ICT and e-learning medium are yet to align with the reality of how important the modern mean(s) of learning and information transmission is; perhaps, this is evident as reported by Adeosun (2010) and UNESCO (2014) that the difference in terms of ICT utilization in developed; developing and underdeveloped nations are not comparable. As a result, underdeveloped and developing nations such as Nigeria expecting to rise to the level of developed countries in terms of quality education and national development must continuously strive to see that ICT and e-learning becomes a thing of concern to the education system of the country.

According to Ajadi et al. (2008), e-learning is only used by few institutions in Nigeria in promoting distance education and lifelong learning. As reported by Nwabufo, Umoru and Olukotun (2012), the Federal Ministry of Education (FME) has put forward a policy on the implementation and deployment of e-learning across the Nigerian education sector through private-public partnership which has been approved by the National Council on Education (NCE); surprisingly, it is yet to be officially launched. Likewise, according to Economist Intelligence Unit (2009), Nigeria occupies 62nd position in terms of nations' institutions in using ICT to actualize their educational goals. Thus, Nigerian ranking placed her below South Africa and Egypt ranked 39 and 57 respectively, this therefore shows that Nigeria's e-learning readiness needs immediate attention (Tella, Toyobo, Adika, & Adeyinka, 2012). Chiaha, Eze and Ezeudu (2013) carried out a study on education students' access to e-learning facilities in universities in South-East of Nigeria and reported that Nigerian higher institutions of learning were not yet ready for e-learning services. According to Osuafor and Emeji (2015) in their study on the utilization of e-learning facilities by science teachers' educators in teaching pre-service teachers in Nigerian Colleges of Education, it was noted that e-learning facilities were to available for teaching in Nigeria institutions to a large extent.

Amidst these setbacks, it was identified that the problem of poor internet connectivity, technophobia, cost of ICT facilities, school curriculum, power issue etc. are challenges on ICT and e-learning implementation in Nigeria (Nwabufo et al., 2012). More so, awareness, bandwidth issue, digital divide has also been identified (Tella et al., 2012). Siddiquah and Salim (2017) also pointed out low processor speed of computers, virus threat, load shedding, poor signal strength, poor access to the internet etc. to be part of the problems. Despite the importance of e-learning and ICT to the education sector of a nation, reviews show that Nigeria is still lagging behind in terms of its implementation and usage. The researchers therefore believe that the outbreak of Coronavirus will help in the restructuring of the Nigeria education system with the help of ICT.

COVID-19 is an infectious disease caused by a newly discovered strain of virus in the coronavirus family; it is a virus which infects human and result to upper respiratory infection (URI), the viruses usually spread through coughing, sneezing, close contact with and infected person, touching contaminated object etc. (WHO, 2020; Stoppler, 2020). According to Mayo Clinic (2019), Coronavirus belong to the virus family that is capable of causing such illness as severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) and cold. The virus was found to be responsible for the outbreak of a disease that is said to have originated from China. The COVID-19 outbreak was declared a pandemic by WHO in March 2020 with symptoms such as cough, fever, tiredness, difficulty in breathing, headaches, sore throat, chest pain etc. COVID-19 has been declared to be a very deadly disease that spreads rapidly from one person to another and from one country to another, sparking alarm all over the world; with a death rate of about 10% (UCI Health, 2020), countries of the world are struggling with several confirmed cases of this virus; as a result, self-quarantine and isolation, social distance, regular hand washing, basic hygiene and mask wearing have become necessities (Harvard Health Publishing, 2020; UCI Health, 2020). According to Worldometers as at May 27, 2020, the total number of persons infected by the virus in the entire world stands at 5,762,820 while 355,942 are death cases, 2,476, 978 are recovered cases. In Nigeria, 8,344 persons have been infected, 2,385 persons have recovered from the disease while 249 death cases have been recorded (Nigeria Center for Disease Control: NCDC, 2020).

This virus which has continued to spread out infecting people all over the world has brought so many activities to a stop. This novel Coronavirus has kept people in confinement,

businesses, schools and other activities closed. Since the outbreak of the pandemic (UCI Health, 2020), several countries have taken bold steps to contain the spread of the virus taking several measures like putting a stop to public gathering, quarantine or isolate people, closure of churches, mosques, markets and schools; and even enforcement of lockdown. Nigerian government since the outbreak of the pandemic has continuously sensitized her citizens to take preventive measures in stopping the spread of the virus since enforcing lockdown in March 30, 2020 and the shutting down of schools on 26 March, 2020 as reported in Business Day Newspaper of 19 March, 2020.

It is clear that the closure of all major activities in the country and people having to quarantine themselves has affected so many people and the country in so many areas such as businesses, politics, worships, the country's economy and particularly the country's education sector. This study therefore sought to examine the role of COVID-19 in restructuring the Nigeria education system through modern technology like ICT and e-learning. From the foregoing, it is clear that Coronavirus has hindered a lot of activities and has momentarily halt education in the country; and in view of this, the pandemic is seen by many as a threat and setback to the education sector of Nigeria. However, to the believe of the researchers, the outbreak of the pandemic is here to reposition the education sector and take the country from the dark age of traditional or conventional methods of teaching and learning to a more organized, coordinated, flexible and informed method-the modern and technology inclined age of ICT usage were e-learning is gradually gaining dominance. One may want to disagree with the view above in that all school related activities have been placed on hold as students and lecturers are now at home; also judging from the aspect that students have abandoned their studies, assignments and examinations are placed on hold, the school and academic calendar is being shattered as nothing is happening- with all these, many would say that the COVID-19 is nothing but bad luck to the education sector. Apparently, the bigger picture is beyond the bad side of COVID-19 as the benefit to education is overwhelming.

According to World Economic Forum (WEF, 2020), the education system has been positively changed by the COVID-19 pandemic forever, with the aid of e-learning medium where teaching and learning are done using ICT means. More so, according to the University of People (UoP, 2020); the outbreak of the COVID-19 pandemic has swiftly drawn attention to a flexible means of learning online. Lerma and Sen (2020) as reported by The World

University Ranking (TWUR) stated that there is nothing fair like a good crisis shaking up an industry; according to the authors, this era is the right time to adopt the e-learning approach, thus the COVID-19 pandemic should help institutions speed up in embracing online teaching and learning. Also, Baum (2020) as reported in the Teen Vogue Newsletter of 19 March, 2020; opined that with policies implemented by the governments such as curfews, shutdowns of businesses and schools in this pandemic outbreak, schools should gradually switch to online and distance learning in order to meet up with academic needs of the present days. Equally, the Computer Aided E-learning (CAE, 2020), an innovative learning solution; on Coronavirus and changes in education mentioned that the spread of COVID-19 which brought about closure of educational institutions all over the world has accelerated the development and progress of the online learning environments within institutions, this will enable learning never to be interrupted. Additionally, CAE teams see the pandemic as a test on the readiness of e-learning centers to handle crises needing online and remote measure. Consequently, Saavadra (2020) as reported in World Bank Blogs of 30 March, 2020 on educational challenges and opportunities of Coronavirus (COVID-19) pandemic mentioned that we are living in the time of potentially one of the greatest threat of life time to education where over 1.6 billion children and youths are out of schools due to COVID-19 pandemic; as such, a lot should to be done to minimize this impact by switching to remote learning strategies or online learning.

Going by the above assertions, the outbreak of COVID-19 pandemic is bringing about an exponential growth in the education sector considering the potentials of e-learning and ICT to education; Nigeria as a country should swiftly move into this wave of e-learning and integration of modern technology usage in the education sector by complementing the traditional methods of teaching and learning with more improved learning modalities through such mediums as the use of virtual classrooms, online tutoring, interactive classroom, video conferencing etc. This will ensure an accelerated education system by marginalizing the mechanical and old methods of teaching like lecture-based approach of teaching, deeply rooted biases in institutions and other outdated methods of learning, and integrate a more flexible method of learning that will not only focus on the teacher but shifts attention to the learners. One may fear that with limited access to the internet and poor network issues in some parts of the country, these may not be attainable; but all hopes are not lost as some offline e-learning software can be provided, or the use of mediums such as television lesson, radio broadcasting, audio conferencing among others related means can be adopted in areas

where quality network is lacking. More so, other means like Facebook, Whatsapp, YouTube, Instagram, Twitter (social media) and other means can be adopted including the short message service (SMS) etc. These views above agree with the view of (CAE, 2020; Saavedra, 2020; WEF, 2020) that the involvement of e-learning and ICT in education accelerates teaching and learning process.

Consequently, the outbreak of this pandemic is bringing about partnership that is on the verge of producing a rapid improvement in the education sector as it has created rooms for stakeholders- government, education professionals, examination bodies, telecommunication network providers, school owners, technology providers to come together and collaborate in order to liberate and sustain the education sector of the country amidst the break in the system. This in essence will end up reshaping the education system as the stakeholders will partake actively in putting available resources together in making sure that education is continued in the country. This is in line with the view of WEF (2020), (Lerman & Sen, 2020) who sees the COVID-19 pandemic as a wakeup call to all institutions of learning and CAE (2020) that referred to the outbreak as a test to determine how ready institutions and stakeholders are in handling crisis requiring e-learning in the education sector.

The outbreak of COVID-19 as a way of restructuring the education system has drawn the attention of the Federal Government of Nigeria (FGN), Federal Ministry of Education (FME), National Education Council (NEC), National University Commissions (NUC) and other stakeholders to rapidly invest hugely in the education sector and ensure implementations of educational budgets; execute abandoned educational projects, enforce implementation of e-learning and modern methods of learning all over the country. This is evident in the fact that The Academic Staff Union of Universities (ASSU) had earlier urged the federal and state government to learn from the coronavirus pandemic affecting the whole world and invest adequately in education as reported in Vanguard Newspaper of 23 April, 2020. Additionally, the Nigerian Tribune Newspaper of 24 April, 2020 and Premium Times Newspaper of 25 April, 2020 both reported the launching of free e-learning portals for primary and secondary school students by the FGN with free mobile subscriptions in collaboration with network providers. This is a clear indication that the coronavirus pandemic is helping in repositioning the education sector for future challenges.

The outbreak of the COVID-19 pandemic is also offering novel, innovative, flexible and new learning opportunities as well as more online resources and programmes. With COVID-19 pandemic on rampage and with classes, schools and learning institutions and environment momentarily closed down, there appears to be a transition in the education sector as new and innovative learning means are gradually taking over the academic world; students are constantly being engaged and simulated; thus, reducing the rate of potential school dropouts and decay in memory that might have arisen from being away from schools. Also, students become more active in the learning process with access to numerous learning resources and materials that will increase their scope and understanding. This is agreement with the opinion of (Saavedra, 2020, UoP, 2020) that the coronavirus pandemic is offering students more opportunity of staying engage academically.

Conclusions

During this period of COVID-19 pandemic, a lot has happened as many sectors in the country have experienced drastic impact of the outbreak whereas, others have witnessed massive transition over these trying time. The education sector of course is not left out of these changes brought about by this novel pandemic-COVID-19. Since the enforcement of lockdown on all institutions of learning, students and stakeholders have stayed indoors in attempt to contain the spread of the virus; as such, all academic related activities have been on hold- such as lessons/lectures, assignments and examinations and even the academic calendar is completely tumble-down, one fear that the outbreak is a great threat to the education sector. However, the education sector is rather experiencing an exponential and accelerated growth in this period of COVID-19 pandemic as it is shifting attention from the conventional or traditional method of teaching and learning to a flexible, innovative, enhancing and a digital/modern age of teaching and learning where ICT and e-learning are greatly making breakthroughs. This is clearly seen in several aspects such as the switch from the traditional method to the modern method of learning been adopted by many schools involving the use of e-learning means-virtual classrooms, video conferencing, audio conferencing, social media, television lesson, radio broadcasting etc.; more so, the collaboration existing among government and various education stakeholders, technology industry and network providers to keep education alive and in shape is a great push to the education sector. Equally, the attention of the government and stakeholder in education is being drawn to invest adequately in education and also to ensure that existing policies,

projects and programmes that will enhance the quality of education are being implemented. Consequently, new learning opportunities and online resources are and programmes are currently in place to keep students engaged and simulated to ensure that learning never stops. Considering all these, it is apparent that the COVID-19 pandemic is playing a vital role in restructuring the Nigeria education system through modern technological means-ICT and e-learning. Based on the findings, the following recommendations were made:

1. Government and education stakeholders should massively invest in the education sector to ensure that modern technological facilities with innovative teaching methods are adopted in all learning institutions.
2. All relevant agencies and education stakeholders should ensure that allocated education budgets, approved projects and relevant abandoned education programmes are being executed.
3. Policies that will enhance the implementation, adoption and utilization of modern means of learning and teaching in various institutions of learning should be enacted


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CHAPTER 14: LEARNINGS FROM ONLINE CROSS CULTURAL EXCHANGE DURING THE COVID-19 PANDEMIC

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Chapter Highlights

- Due to the travel restrictions of the COVID-19 Pandemic, international travel was highly restricted impacting educational opportunities for study abroad and cross-cultural exchange
- This chapter explores the challenges and adaptations implemented for an international cross-cultural exchange between faculty and students of universities in the United States, China, and India using the Zoom platform.
- The chapter examines the challenges and benefits of cross-cultural exchange when physical study abroad is not possible, and used student feedback and faculty observation to evaluate the program and the potential for ongoing utilization
- The chapter explores the pedagogy and methodology of cross-cultural exchange using Zoom as adapted from in-person or on-site learning experiences
- The chapter explores the dynamic of holding an international symposium on “Art, Culture, and Mind,” adapting the parameters of the previously in-person format to a wholly online format.
- The chapter examines the student’s experiences and analyzes the role of art and identity in forming culture and mind.

Introduction

The COVID-19 pandemic brought a halt to the world and caused schools to turn to online teaching. No matter how technologically advanced the schools were, the shift from in-person to on-line education was challenging for both students and teachers. However, the COVID Pandemic continuing during 2020 provided a new opportunity for the development of online education. With the outbreak of the pandemic, China's policy of "no schooling but no suspension of classes" (Ministry of Education of the People's Republic of China, 2020) has made online education become the main method in colleges and universities.

The pandemic changed education from being physically present in the classroom to online interaction. This demanded a quick change of classroom teaching styles to on-screen presentation. Though it has been a challenging phase for education in all fields, for most educators the initial fear of technology was soon replaced with interest and experimentation with the newly introduced electronic mediums and educational challenges. This paper discusses the lessons learned from an online symposium and cross-cultural exchange during COVID-19, as well as the future possibilities brought forth through the methods in the symposium. The symposium included faculty and students across disciplines from China, India and the United State as a collaborative effort of Wuyi University PRC, Amity University Maharashtra, India and Evergreen State College, USA.

In the past eight years, Evergreen had regular study abroad programs in China that connected Evergreen students and faculty with students and faculty of Wuyi University. Because of the pandemic, study abroad in 2020 was canceled. The faculty of Evergreen, Wuyi, and Amity University developed an alternative plan to online platforms to host a symposium for students, as an innovative answer to the "COVID problem."

The cross-cultural exchange described in this chapter was systematically planned by the faculty of the Art, Culture, and Human development program at Evergreen State College, Washington, US, the faculty of the Psychology Program at Amity University Maharashtra, and faculty of the Business English Program, Wuyi University, PRC. Through emails and zoom conversations, faculty from the three universities designed a symposium to bring together students from their respective schools. This interdisciplinary and international collaboration created a common platform for students from India, China, and the US to share

ideas about art, culture, and mind, and to share perspectives from their country of origin and culture. The objectives for student exchanges in the symposium were for students to interact in small groups and later share their new learning and understanding about each other's culture. On November 20, 2020, 80 students synchronously participated in the symposium: 30 students from Amity University (AIBAS), India; 25 students from Wuyi University, China; and 25 students from The Evergreen State College, USA.

Teaching and Learning during COVID-19

The situation created by COVID-19, is the first in human history that has put similar challenges and limitations on administrators, teachers, and students worldwide in terms of age, gender, geographical location and levels of technological understanding. Before the rapid spread of COVID-19, few universities offered live online classes in China, so many teachers had never used or heard of We Meet, Ding Talk or QQ Group Talk. Since the outbreak of the pandemic, every teacher was required by the Chinese government and schools to carry out online classes. At Evergreen State College all teachers were required to participate in on-line classes facilitated by the Information Technology (IT) department to learn how to use Zoom. Teachers had to spend a lot of time and energy learning the new on-line tools. This training was not an easy task, especially for older teachers. Often during class, due to the disparate understanding of technology, teachers needed help from their students with various technology problems, such as how to share the screen, how to assign homework, how to record the class, etc. The use of technology tools seemed easier for young students. They fumbled a bit and then told teachers how to use this or that App. Gradually, teachers grasped the technology and could use those tools to give lessons smoothly, which was beneficial for the students to learn more effectively during the online classes. This situation is an example of the “two-way learning process” which rapidly evolved, wherein students could teach their teachers and teachers could learn from their students; a new dynamic for many, being one of many adaptations needed during the pandemic.

Everyone in the early period of the lockdowns appeared ready to help each other to make the transformation to on-line learning happen. The anticipation that the long lockdown may impact the education of future generations made educational institutions and teachers work as teams to wade through the difficult times overcoming the technological fears and knowledge monopoly. New dimensions of teacher student relationships emerged where the educational

content was with the teachers, but students were better equipped with the technological delivery. This reversal of student-teacher role created a two-way learning process where students eagerly taught their teachers the technological details, thereby facilitating the students' learning of the material from the teachers.

Disruptions from the pandemic and subsequent limitations on travel have also significantly reduced international student enrollment. A survey found that new international student enrollment dropped by 43%. Additionally, most universities have shut down their study abroad programs and canceled school-sanctioned travel (Smalley, 2021). Thus, it is clear that the pandemic significantly affected and limited opportunities for cross cultural exchange and education on campus.

Importance of Cross-cultural Exchange

Cross-cultural exchange refers to the communication between native speakers and non-native speakers, as well as any people with different language and cultural backgrounds. (Jin, 2010) Importance of cross-cultural exchange has come into being in the era of globalization. There is documented proof for the importance of cross-cultural exchange in the field of education. On the one hand, cross-cultural exchange facilitates advancement of knowledge and skills and on the other hand, it brings acceptance, respect, self-awareness, tolerance, adaptability, flexibility, and resilience. There is abundant research available in the area of benefits of cross-cultural exchange (Morin, et al. 2013; Braskamp, et al. 2009; Hunter, et al. 2006). Moreover, with the concept of the world being a global village we are moving towards multiculturalism which can be defined as emotional stability, empathy and tolerance, secure racial/ethnic identity, spirituality, capacity to self-reflect, ability to negotiate multiple roles and cultural contexts, and awareness of social injustices and unearned privileges (Ponterotto, 2010).

The student exchange is a stepping-stone towards developing multicultural personalities, which are more resilient, empathetic, adaptive and tolerant. Many universities have integrated cross-cultural exchanges as part of their curriculum in form of study abroad programs. There are also other globally representative agencies that facilitate the inter-country exchange, such as AISEC (Association Internationale des Étudiants en Sciences Économiques et Commerciales). AISEC is an international organization that provides young people with

leadership development, cross-cultural internships, and global volunteer exchange experiences. Moreover, the idea of multicultural education based on justice, equality and cross-cultural exchange gives real exposure to the actuality of developing multicultural competencies, which are very much needed considering the world’s shrinking boundaries. Marshall (2002) points out that multicultural education is part of the teaching and learning process in Canada, England, France, Australia and South Africa. Recent advancements in the educational philosophy in India have also considered these student exchanges as an important part of exposure and learning enhancement strategy. The Behavioral Sciences Institute at Amity University Maharashtra (AIBAS) in the past year has worked on providing experiential learning, and cross-cultural experiences through AIESEC in Navi Mumbai’s global exchange programs, such as Global Volunteer, Global Talent and Global Teacher. In the past year AIESEC in Navi Mumbai has facilitated over thirty impactful exchanges for the students majorly from the Amity Institute of Behavioural and Allied Sciences (AIBAS) in various countries such as, Sri Lanka, Vietnam, Egypt, and many more.

These global internships not only helped the students of AIBAS gain field knowledge, but have also created a global impact, and have helped the students build their own international networks. Students worked in various settings such as schools, special education facilities, industrial settings, human resource departments, etc., where the students could understand the practical implementation of their knowledge while creating a massive social impact for the same.

Table 1 represents the details of the exchanges from the year 2018-19 where students have worked for the 17 sustainable development goals set by the United Nations.

Table 1. AIBAS Exchanges in 2018-2019

School	Year of study	Country	Host LC	Opportunity name/ Description
AIBAS	1st year	Egypt	Cairo University	Humans of Cairo Mental Health Blog
AIBAS	2nd year	China	UNNC	Special Care 5.0 Depression Care
AIBAS	2nd year	Turkey	Adana	MYSELF MY WORLD'19 Healing the Healer

AIBAS	1st year	Vietnam	Ho Chi Minh City	Psychology] [Sexual Education] Support-Educate-Prepare- JUNE
AIBAS	2nd year	Malaysia	UNMC	Share the Future (HFTA) in UNMC-Education and healthcare For Orphans
AIBAS	1st year	Sri Lanka	SLIIT University	Minisa 8.0 - All are Human Volunteering to help differently abled
AIBAS	1st year	Sri Lanka	SLIIT University	Minisa 8.0 - All are Human Volunteering to help differently abled
AIBAS	2nd year	Egypt	Ain Shams University	Empower Human Resources (HR) intern at Arab West Report
AIBAS	2nd year	Egypt	Ain Shams University	Empower Human Resources (HR) intern at Arab West Report
AIBAS	2nd year	Egypt	Cairo University	Humans of Cairo Mental Health Blog
AIBAS	2nd year	Vietnam	Ho Chi Minh City	Psychology Sexual Education Support-Educate-Prepare
AIBAS	2nd year	Vietnam	NEU	Gender Expression- SEXPRESS Sex Education project
AIBAS	2nd year	Vietnam	FTU Hanoi	Leadership Development through Mental Health Awareness
AIBAS	2nd year	Vietnam	Hanoi	Gender Equality & Sex Education
AIBAS	1st year	Egypt	Cairo University	Human Resources (HR) Trainer - Social Entrepreneurship-SdG#8
AIBAS	2nd year	Vietnam	Ho Chi Minh City	Psychology] [Sexual Education] Support-Educate-Prepare- JUNE
AIBAS	1st year	Sri Lanka	SLIIT University	Minisa 8.0 - All are Human Volunteering to help differently abled

AIBAS	2nd year	Sri Lanka	NSBM Green University	Teach Happiness 1.0 Special Education and accessible Mental Health care for Orphans
AIBAS	2nd year	Sri Lanka	NSBM Green University	Teach Happiness 1.0 Special Education and accessible Mental Health care for Orphans
AIBAS	2nd year	China	UNNC	Special Care 5.0 Depression Care
AIBAS	1st year	Egypt	AAST Alexandria	Empower Refugees Accessible Mental Healthcare Project
AIBAS	2nd year	Morocco	Rabat	Yalla Health Volunteer with Disabled
AIBAS	2nd year	Morocco	Rabat	Yalla Health Volunteer with Disabled
AIBAS	1st year	Egypt	AAST Alexandria	Empower Refugees – Egypt
AIBAS	2nd year	China	UNNC	Dare to Dream Accessible Mental Healthcare for all
AIBAS	2nd year	China	UNNC	Dare to Dream Accessible Mental Healthcare for all
AIBAS	2nd year	Egypt	Damietta	Reducing inequalities Assisting Students on the Autistic Spectrum
ASAP	3rd year	Egypt	Mansoura	Architecture Engineering I Architect-Volun(tech)eer
Amity University Maharashtra	2nd Year	Sri Lanka	Jayawardhenapura	Entrepreneurship- Inspire 13.0
AITT	1st year	Cambodia	LUCT	Raise Me Up - Summer Education Camp

The exchange has shown that the students who participated in the program performed better in various dimensions of life skills as compared to the students who were not part of any exchange program (Karishiddimath, 2019). Similarly, students in Wuyi University in China

had opportunities for study abroad in Indonesia and Taiwan and students in Evergreen University had opportunities every year to study abroad in Europe and Asia.

Benefits of Cross-Cultural Education

Cross-cultural exchange can develop empathy and eliminate cultural centralism. Empathy is to put oneself in the shoes and experience of others, resulting in emotional resonance. In cross-cultural exchange, if there is no empathy, people from different cultures cannot correctly understand the values of others, which is one of the main reasons leading to communication failure. Secondly, cross-cultural exchange requires the development of two-way communication. Communication is a cyclical process of interaction, which includes the sender, the receiver and the message itself. Because of cultural differences, people from different cultural backgrounds bring their different values, beliefs and customs into the communication process. They interpret information from another culture according to their own cultural background, which leads to inaccurate understanding of each other's information, and thus may lead to bad judgments and decisions (Zhuang, 2012). Through two-way communication and feedback, people can stimulate the enthusiasm of cross-cultural communication, broaden communication channels, make a timely summary of good experiences in communication and promote a proper correction of communication problems.

Cross-cultural exchange is also important for understanding oneself. To know ourselves is to recognize simple behaviors. We all have attitudes, opinions, and tendencies that help determine not only what we say and how we say it, but also the things to which we most easily listen. Cross-cultural exchange is an important cause of many problems, contradictions and conflicts. Knowing ourselves also involves discovering the impressions we make about the rest of the world, about how we communicate. If we have a clear understanding of how we present ourselves, and our own cultural communication style, we will be better able to understand the reactions of others. Thereby, we can make necessary adjustments in our communication style as we move from one communication situation to another.

Before the 20th century, the communication between people of different cultures was limited by time and space and the existent means of information transmission. In the 21st century, with the new wave of science and technology, both modern transportation and communications technology has developed rapidly. Globalization has made countries

communicate with each other more closely (Min, 2002). However, due to the COVID-19 pandemic, all plans for study abroad and student exchanges were cancelled, which greatly hindered the cultural exchange and development between universities in different countries. Our objective was to connect students in different parts of the world, to explore how they are different from each other, and yet how they all are inter-connected in their experience of living through the pandemic. We were fortunate that we had previous personal and institutional connections, so we were able to brainstorm and to create this experiment in cross-cultural exchange and education.

Lockdown and Emerging Online Teaching and Learning Stages

The education field experienced and delineated its own systematic developments in teaching and learning during the pandemic. The stages of this development were defined to a certain extent, on the basis of the formal and informal feedback mechanisms created by the institutes to capture and describe the challenges of the online teaching-learning process. We defined these stages following corresponding student and faculty responses. We further divided the stages with time periods correlations, as depicted below in Table 2.

Table 2. Stages of Development in Attitudes of Learning and Teaching in the Pandemic

Stage	Attitudes	Timeframe
Stage 1	Excitement vs Fear	Beginning to first two months
Stage 2	Enjoyment vs Security	two to four months
Stage 3	Normalcy vs Cataclysm	four to six months
Stage 4	Flatness vs Grief	six to eight months
Stage 5	Woolgathering vs Breakdown	eighth month onwards

Stage 1: Excitement vs Fear

The period immediately before the lockdown was announced, proceeding to the first two months of the lockdown, can be understood as an emergency response in the teaching-learning dynamic. As the situation was novel, it brought both excitement about the new methods, and fear of the disease. This dual situation was true for both teachers and students. Within a few days of quarantining at home, the responses of students were like:

“When are we going to begin classes?”

“We can use google classroom.”

“We can use zoom.”

“Ma’am you can record sessions in Microsoft team also.”

These responses show the excitement as well as the readiness in this phase towards the new situation.

Conversely, there were feelings of apprehension amongst many including families, whose members were travelling, became infected, or were in vulnerable zones. Stopping of house keeping services in India was a major fear factor, as many of the teacher and student households have an interwoven dependence on household servants, providing services as well as receiving employment. Hence, there was fear regarding day-to-day chores and responsibilities, from cleaning, to food services, to day care, and the potential impact on professional commitments. The following statements display the fear responses:

“My father got tested positive and he is not with us.”

“We have old parents and we have to take care of them.”

“My kid does not listen to me and disturbs in between.”

“I got stuck at an airport, as I tested positive.”

Stage 2: Enjoyment vs Insecurity

Towards the second month onward, a new stage developed wherein the technological instabilities became stabilized, institutes started standardizing preferred platforms for use. In India, Microsoft Teams and Google Meet became most widely used, while Zoom was less favored but still a common option. In Evergreen State College, Zoom was the preferred platform. At Wuyi University, Tencent QQ was the preferred option. The stage held some level of excitement, as still new online teaching aids were introduced on these platforms, such as enabling background change features, attendance downloading, doodling etc.

Also, classes resumed, and students and faculty had a sense of security in place of the initial fear of educational loss due to extended lockdown. The students and faculty who were not able to access the internet, due to poor net connection, or due to geographical limitations faced a situation of insecurity and endangerment as the lockdown was extending beyond the

originally foreseen period. The following statements display the range of responses to this stage:

“I can have tea while attending class.”

“It is fun just get up and have class, no need to bath and get ready.”

“There is really no network at our place, and we are missing a lot of studies, I do not how I will come up with this when other students are easily attending classes.”

“How are we going to manage examination when we do not have internet connection?”

Stage 3: Normalcy vs Cataclysm

Nearly in the fourth month, a situation of a new “normalcy” was achieved, and it became an ordinary event to attend and deliver online classes for most of the teachers and students. Clear instructions spread regarding how to conduct online education, and there was feeling of adaptation and customization to the situation. On the other hand, there was a segment of society that was continuously facing high stress due to financial loss, illness, loss of family members, negative family environment, physical constraints etc. which brought upheaval and a sense of cataclysm to them. The situation required the need of counselling services for this segment of society. The same can be understood through following responses:

“Ma’am can we combine the classes together?”

“So by next week we will be able to complete syllabus?”

“It’s seven months and we are not able to attend class without disruption.”

“Our parents are unable to pay fee, we are in extreme stress.”

Stage 4: Flatness vs Grief

Towards the seventh month of the lockdown, diminished interest and pandemic fatigue took over the enthusiasm of the online teaching and learning. The normalcy of the situation now achieved a flat curve and no more innovation or enthusiastic endeavors could be observed. The number of webinars rose, and although it connected students and faculty with experts, but this came to dominate the field. On the one hand, pressure arose to arrange more such interactions with experts and enrichen the learning experience. However on the other hand, the in-person normal interaction was gone, and the online experience descended into flatness that was understood by both students and teachers as being the best that could be done during online sessions.

Concurrently, those who were in a situation of cataclysm were provided with appropriate support such as counselling, peer interaction, and teacher mentor support could be brought back to a stage of grieving and functionality. These support mechanisms had previously been developed in AIBAS to address student needs, but were now adapted to the online environment. The situation for the students of concern could be reconstructed from a view of catastrophe which envisioned the end of the world, to the systematic return to an orientation of the new reality wherein the view that world is together coming up with interventions to fight the challenges could be embraced. The responses in this situation were:

“Ohh no! No more webinar now.”

“It is compulsory for all of you to attend the webinar.”

“It is very difficult to be attentive towards webinars along with the number of online classes we have.”

“Yes, hope there will be vaccine soon.”

“Some countries are doing well, so we shall also be.”

“Things will fall to the normal.”

Even with the advantages of the more highly developed techniques of the online teaching-learning process, it became difficult for teachers to sustain student attention. There are a number of surveys which show the stressful effects of online education on physical and emotional wellbeing such as body ache, eye strain, frequent headaches, irritability, lack of concentration, constant fatigue, lack of interest and hopelessness (Halupa, 2016; Donahue, 2020). These effects have further increased in the current pandemic. Therefore, apart from all teaching innovations that occurred during this period, we saw the exploration of an online international cross-cultural exchange as a good experiment to break the pandemic fatigue. We also considered that online cross-cultural exchange would counteract the lack of interest in the regular online schedules for faculty and students.

Stage 5: Woolgathering vs Breakdown

The current state of the pandemic is like woolgathering for most of the teachers and students, which implies just doing the task by rote, without paying much attention, as there is no escape from the situation. Yet for those who were experiencing continuous upheaval though

this period, they went into the state of breakdown and some decided to drop their courses. Their attitudes expressed as follows:

“See we are also not enjoying the teaching on online mode but we do not have another option left.”

“It’s not possible for me to further go with this situation.”

“I think I will try to rejoin the course next time when situation is normal.”

All the stages described above are derived from the basis of student and faculty responses and they give important insight to the educators, indicating the need of changed strategies to deal with the particular situation of the pandemic.

Planning and Design of the Online Cross-cultural Exchange

The collaboration between our colleges situated in China, India, and the US created a common platform for students from these countries to share ideas about art, culture, and mind, and to share perspectives from their country of origin and culture. Our primary objectives for student exchanges in the symposium were to create a space for students to interact in small groups and later to share their new learning and understanding about each other’s culture.

Students demonstrated the outcome of this cross-cultural communication objective in the papers they shared. These papers clearly demonstrated students’ increased awareness and interest in each other’s cultures. For example, Catherine, a student from Evergreen, wrote about her research about honoring Cows in India. She wrote:

Honoring the cow in different world cultures (especially Hinduism) inspires people to the virtues of gentleness and connects them with nature. The cow is honored in Hindu tradition during festivals throughout India, including the annual festival dedicated to Krishna called Gopastami. They are bathed, adorned in garlands of flowers, and given special feedings during these festivals. Cows are thought to be sacred in Hinduism and are deeply respected as they are seen as a caregiver or maternal figure. Kamadhenu is a divine bovine-goddess described as Gou Mata, or the “Mother of all cows”. She is portrayed as a miraculous “cow of Plenty” and is regarded as a symbol of wealth, strength, abundance and prosperity in Hinduism (Appendix 2).

Learnings and Benefits of the Cross-cultural Exchange

The exchange at the symposium demonstrated that it is possible to connect students across the globe even during the pandemic. Interestingly, the limitations of required physical distancing increased student interest and participation in international connections and learning. The symposium opened horizons for students to appreciate the differences in the varied cultures and discover their similarities too. It was interesting for the students from India and the US to know that students from China had two names. In addition, the fact that there were students on the “other side” who equally hated the names given to them by their parents brought the students together, and everyone of course had a story behind how they acquired their names. Such discoveries connected the students across cultures. They were able to find a sense that they were not alone in this pandemic, and students on the other side were also experiencing more or less similar phenomena in terms of the long screen hours, physical fatigue, lack of interest, monotony and social isolation in their day to day living.

The international exchange also turned into an emotional and psychological relief as everybody’s feelings were validated. Students commented that participating in the symposium was a refreshing activity for them which took them away from the monotony of regular online teaching. For example, students from China commented in the Zoom Chat room at the end of the symposium as follows in Figure 1. More comments are included in Appendix 1.



Figure 1. Chinese Student’s Comments on Symposium

Language was another factor that drew everyone’s attention, as there were varying accents and levels of proficiency in the one common language that was used for communication –

English. Everybody displayed patience, respect, and acceptance towards the respective native languages and levels of proficiency. These are some of the important qualities required for cross-cultural exchanges to be effective. Students need to be prepared to hear different ways English is spoken around the world. They need patience, empathy, and a non-judgmental attitude to be able to communicate and understand one another. Figure 2 reflects the students' accepting and supportive attitudes developed in the symposium.



Figure 2. Student Attitudes toward the Symposium

It is obvious that on-line cross-cultural exchanges are not the same as physical study abroad wherein students have the opportunity to be fully immersion in a different culture. But our experiment showed that if thoughtfully designed, on-line cross-cultural learning could be very effective and in the future, can be used for students who are place bound due to physical handicap, or cannot afford study abroad financially, or are ineligible for any other reasons. Our methodology of on-line cultural exchanges can potentially be expanded to be used for greater inclusion of disenfranchised students, whether physically, economically, or otherwise excluded from international work. Here the access to technology will help to cross the digital divide. The methodology that was developed in our symposium of online international cross-cultural exchange during the pandemic can be used as a platform for enhancing cross-cultural understanding and creating a way for global peace and harmony in the future.

Methodology of our Experiment in Online Cross-cultural Exchange

Our intention was to empower students and to inspire them to develop international cross-cultural educational opportunities. Each university designated one or two students to be Teaching Assistants (TA). These TA's participated with faculty in planning the symposium and as leaders during the symposium ensuring that all flowed smoothly. In preparation for the symposium, students were asked to write an answer to three simple questions developed by the faculty. Students were asked to respond to questions in a simple way, as if explaining something to a child. The faculty wanted the questions to be accessible, personal, and grounded in place and time. For example, we wanted to acknowledge that the symposium was to take place in December when light was diminishing and night was getting longer with the approaching winter solstice. In India it was the time of Diwali, the festival of light. In the US, Christmas, Chanukah, and Kwanza were approaching, and in China preparations were beginning for the Chinese Lunar New Year of the Ox.

Students were asked to write an answer to three questions:

1. What is your name? How did you get it? What does it mean? Do you like your name? Did you consider changing your name?
2. How do you understand light and darkness? Chinese culture developed the Yin Yang symbol, and India developed the Purusha and Prakriti principal. As we approach the winter solstice, many cultures have festivals to help understand darkness and light, for example the festivals of Diwali, Christmas, and Xia Yuan. How do you understand the nature of darkness and light?
3. The coming Lunar New Year will be the year of the Cow/Ox/Buffalo. Can you help us to understand the importance of the bovine in world cultures and civilizations? Can you share a simple children's story or a nursery rhyme celebrating this important animal and their teaching? (You can also write and share your own story, song, or a nursery rhyme about the bovine)

Faculty allowed 30 selected students from each country to be included in the symposium. Students had a chance to interact with students from the two other countries in small groups of six students each. The students' written answers to questions were collected, edited and shared among all symposium participants.

To start the symposium, student TAs showed short films about each university. TAs selected characteristic video clips from existing promotional videos of each university. The students enjoyed seeing the physical location of each school and everybody appreciated that all three schools, although separated by great distances, had beautiful campuses and payed attention to nature, plants, and beauty. Seeing universities abroad inspired students to continue participating in cross-cultural exchanges via Zoom, and to plan to visit the universities in the future when international travel will be possible.

It was essential for us to allow student-to-student interaction in the symposium. Using Zoom allowed students to meet in small groups through the Chat function. We made sure that each group had students from China, India, and the US. During the symposium, the same small groups of students met on Zoom Chat three times to talk about names, seasons of light and darkness, and the Chinese Lunar New Year. Students were not limited to talk only about the above topics; the lively conversations in the Chat rooms ranged from the upcoming US elections to any topics in which the students were interested. Especially poignant were realizations of cross-cultural influence, like for example a question from Sarah, a US student, about Nandi, the Blue Bull of Shiva and Paul Bunyan' Babe Blue, who wondered, "Did Paul Bunyan borrow Nandi, the blue bull of Shiva, and rename it Babe Blue?"



Students were also encouraged to respond to questions by using art. For example, Alysia, a student from the US, expressed her feelings of sadness, fear, and alienation caused by the pandemic with this drawing:



And Melissa shared the drawing of a 10-year-old child she was tutoring who made a book about the race of the animals that established the order of Chinese Zodiac:



This painting by Ivory shows the first three animals that swam the river in a race to establish the order of zodiac: Mouse, Ox, and Tiger.

Inclusion of art in the symposium allowed students to express their feelings of understanding and appreciation of each other's culture. The conversations in chat rooms were lively and flowed naturally. Students were able to express the challenges and difficulties of living in the time of the pandemic and to celebrate their similarities.

Challenges and Opportunities

International cross-cultural electronic exchange presents educators with both challenges and opportunities. For us, two of the major challenges in the online cross-cultural communication and exchange between the three countries were first matching time zones, and second deciding on the electronic platforms for the exchange. For example, Google services could be used in India and the US, but not in China. China, India, and the US have their own electronic cloud storage platforms and Apps that cannot communicate with each other. We were able to overcome challenges of time zones and technology with good will, and a spirit of collaboration between students and faculty. We found that a time zone most suitable for all three countries would be on Friday at 6:30 pm in Olympia, WA, which would be 8 am on Saturday in Mumbai, India, and 10:30 am on Saturday in Wuyi Shan, China. We selected Zoom as a technology for synchronous participation in the symposium, due to its accessibility for all three countries.

Creating common online breakout rooms for the discussion and then moderating them was also a challenge. We wanted the discussion groups to be small and to include six students with two students from each country. We had to assign students to breakout rooms manually, while the symposium was in progress. This process was difficult and labor intensive to do while the symposium was in progress. Later in 2020 after the symposium, Zoom updated their controls so students can choose breakout rooms on their own.

The most important opportunity the Zoom platform allowed was to connect students from three different countries in a synchronous conversation. We also utilized the Zoom Chat function where students could post their questions and comments without disrupting the main

conversation. The Chat was moderated by a TA. The TA who tracked the Chat brought to questions that needed to be answered to the attention of the group.

As we mentioned earlier, a significant challenge was the need for the students to all communicate in English, which brought the greatest pressure and challenge to the Chinese students. In China, English is generally not taught until middle school. In addition, Chinese students do not use English in their daily communication, so their familiarity with English could not compare with Indian or US students. Chinese students' listening and speaking training is far less than that of American and Indian students. The Chinese students were greatly challenged by the demands of operating fully in English during the symposium. The Chinese students rose up to the occasion and worked hard to improve their listening and speaking skills to reduce communication difficulties. In future symposia of this type, increasing preparation and efforts will bring a smoother communication to all parties.

Inspired by the success of the first symposium and prompted by the students' expressed desire to continue the collaborative work, we are planning to continue our cross-cultural exchanges. In our first phase, students shared their ideas about personal identity and names; grappled with philosophical and ethical ideas about light and darkness; and considered cultural and ecological aspects of human-bovine relationships. Now we are planning to edit the proceeds of the symposium and to publish them in a book form to create a knowledge resource. This resource can be shared with a wider audience as a case study demonstrating the creation of cross-cultural electronic exchanges. As we continue our collaboration, we plan for faculty and students to participate in classrooms where cross-cultural sharing will be an integral part of student learning. We are also planning for electronic exchanges of faculty teaching specific classes. For example, a lecture given in Mumbai, India, could be attended by students from China and the US.

For the immediate future, we are planning a second and third symposium to take place in March and May 2021. Building on the foundation established in the first symposium, we are planning for students to form small groups and to develop independent entrepreneurial projects in the fields of cultural competency, health, arts, resilience, and social renewal. Students will form small groups in March 2021 to define their projects. Afterwards students will stay in contact and work collaboratively during the months of March and April

developing their projects. Students will present the results of their work and research at Evergreen's May Celebration during the third symposium.

Our third symposium in May 2021 will be a celebration of student accomplishments in research, art, and entrepreneurial initiatives. At the symposium students will address questions of national identity and international cooperation, states of community health, and explore traditional health practices that can prevent and reduce the effect of COVID-19. Each student presentation will be recorded and later edited to be used as a possible resource for other classes and cross-cultural projects.

We are planning to conclude our third symposium with a celebration complete with tea arts and drinking tea grown in India, China and the US. We believe sharing tea and sharing ideas will promote the students' sense of global community and cooperation.

Conclusion

When the pandemic put the world on halt, new potentials were discovered and developed in the fields of education and communication. Although there is no doubt of the value of personal, physical, in-field cross-cultural exchanges, online exchange programs were not well developed before the pandemic. However, the methods pioneered in the symposium could be considered as a parallel or simultaneous model to live in-person programs. The online cross-cultural exchange model described in this paper was a pilot program of cooperation in teaching and learning via electronic means. The specific outcomes of our symposium included increased cultural competency, growing empathy and tolerance, secure racial/ethnic identity, spirituality, capacity to self-reflect, ability to negotiate multiple roles and cultural contexts, and awareness of social injustices and unearned privileges. These outcomes were clearly articulated and demonstrated in students' reflection papers about their learning at the symposium. As an acknowledgement of student work, each student received a Certificate of Recognition for participation in the symposium (Appendix 3).

The student reflections from this online exchange between Amity University Maharashtra, India, Evergreen State College, US and Wuyi University, China is indicative of the fact that the core values of respect, flexibility, patience, and tolerance expected from international exchange of student and teachers could also be achieved in the online environment. Our

experiment demonstrated that a shared cognitive space can be created in an on-line learning environment. Student reflections showed that participation in the symposium allowed them to transcend physical isolations dictated by the pandemic and national boundaries dictated by governments.

The example of our symposium could be a model for developing future exchanges of cost-effective programs benefiting many students, including the ones who would otherwise not be able to have international experiences of travel for economic, health, or other reasons. The online exchange can be a good, cost effective method of teaching internationally. In pandemic like situations, when physical movement is restricted, on-line international exchanges could develop new teaching and learning pedagogy invigorating student and faculty collaboration, relationships, and education. Our educational experiment demonstrated that cross-cultural communication and cooperation is both possible and necessary and we hope governments and politicians can learn to cooperate and appreciate each other for the greater good of people and the planet.

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Appendix 1. Samples of Students' Reflections from Zoom Chat Rooms

<p>Sophia 范诗婷 to Everyone 8:31 PM</p> <p>I think it will be a very meaningful experience for me and I will always remember it. Thank you all.</p> <p>Mayor 莫成媚 to Everyone 8:31 PM</p> <p>Thank you all of you .It is a wonderful experience!</p> <p>rachel 洪心如 to Everyone 8:31 PM</p> <p>I am so grateful to have the opportunity to communicate with you all. It is a wonderful experience!</p>	<p>ambika अंबिका to Everyone 8:27 PM</p> <p>I love how language isn't a barrier, its nice to find out so many amazing things about different culture and how we are all so similar yet oceans away <3 ...</p> <p>JC Wortham (They/Them) to Everyone 8:27 PM</p> <p>and my Instagram @crow.boi_</p> <p>Parama- परम-支持 to Everyone 8:27 PM</p> <p>Insta id @paramaray would love to know more about all of you...</p> <p>Travis - 鸣禽 - चरण to Everyone 8:27 PM</p> <p>It's been so great to connect with international students. It gives us an indispensable perspective on what we have in common across cultures.</p> <p>Ojas- ओजस to Everyone 8:27 PM</p> <p>I had a great time sharing and hearing about different cultures and discussing different topics with other beautiful people</p>
<p>Harleena (हर्लीना) (She/her) to Everyone 8:26 PM</p> <p>it was very refreshing to connect to people from different cultures, I felt connected.</p> <p>Rhea to Everyone 8:26 PM</p> <p>It was totally amazing, loved meeting new people from different cultures !! i would love to have this kind of meet again :)</p> <p>JC Wortham (They/Them) to Everyone 8:26 PM</p> <p>Also just the incredible amount of patience and kindness as we all are dealing with varying different levels of difficulties. I think next time having more time to socialize and talk about our personal lives, I think would be very cool and give an opportunity for more connection</p> <p>Tanya तान्या to Everyone 8:26 PM</p> <p>I had a great time meeting students from the other universities and hearing about their experiences.. I hope we are able to do another symposium soon!</p>	<p>We had a wonderful time. I would love to get to know more about everyones culture more next time. Everyone was so nice and amazing. I want to go visit Mumbai!</p> <p>Bobbi de Padua (they/them) - बॉबी - ... to Everyone 8:25 PM</p> <p>Thank you all for being here, thank you for being present. Thank you for engaging and sharing and for such a wonderful opportunity</p> <p>Taniya-तान्या/譚雅 to Everyone 8:25 PM</p> <p>And group 15 I would love to meet you all in Mumbai</p> <p>Molly Simons to Everyone 8:25 PM</p> <p>It was so great to hear from people on the other side of the world and connect. I thought it was a really lovely experience. It was so cool to see the other schools. I would love to learn about fashion, hobbies, lifestyle and cuisine :) ...</p> <p>Rajeshwari (राजेश्वरी) to Everyone 8:25 PM</p> <p>@kate from group 8. would love to connect some more, drop your social if you don't mind please?</p>
<p>Sophia 范诗婷 to Everyone 7:25 PM</p> <p>It's a very meaningful experience. Thank you my friends.</p> <p>सबीना (Sabina) to Everyone 7:26 PM</p> <p>It was amazing to talk to my room everybody was super sweet and nice!</p> <p>Rajeshwari (राजेश्वरी) to Everyone 7:26 PM</p> <p>this has been such a cool experience so far!! ...</p>	

- Kate 凱特 韋特 to [Everyone](#) 8:24 PM
 It was really wonderful learning about Indian Culture and Religion as well as Chinese Culture. For next time I would love to find ways to communicate more over text because not everyone's English listening and speaking skills are the same, but reading the English language can be easier. Maybe utilize Google Translate more as a collective? ...
- Bobbi de Padua (they/them) - बॉबी - ... to [Everyone](#) 8:24 PM
 IG: @BabyBobbiPop
- sagarina - सागरिना to [Everyone](#) 8:24 PM
 @sagarina_ghosh I would love to stay connected with you guys!
- 周舟 Jojo Chou to [Everyone](#) 8:24 PM
 Glad to be here :-D
- Safa to [Everyone](#) 8:24 PM
 I would love to connect with y'll
- Hannah - 漢娜 - हन्ना to [Everyone](#) 8:25 PM
 I was nervous at first but I feel so lucky to have heard from you. I feel like we could have spent a whole day talking and learning from each other.
- Rajeshwari (राजेश्वरी) to [Everyone](#) 8:25 PM
 the symposium was so lovely! I would love to attend such an amazing event again! getting to know different stories from different cultures was such a wholesome and informative experience!
- Alysia Rosback to [Everyone](#) 8:25 PM
 I really enjoyed hearing others perspectives about each question. It brought us together in such a wonderful way. Personally, I would like to spend more time talking to those from other countries and get a better grasp of their culture. Everyone was so great!
- Taniya-तान्या/譚雅 to [Everyone](#) 8:25 PM
 Thank you so much giving me the opportunityyy ...
- Mehnaz Patel - मेहनाज़ पटेल to [Everyone](#) 8:24 PM
 it was such a beautiful experience. would want to attend this symposium again. i loved every bit of it!
- Gargi (गार्गी) to [Everyone](#) 8:24 PM
 gargi2802 my insta id ...
- सबीना (Sabina) to [Everyone](#) 8:24 PM
 I would really love to talk more with my room if they could drop their ig username mine is @itsabinaaaa
- Sarah - הרה to [Everyone](#) 8:24 PM
 I loved seeing everyones schools! I would so love to hear about what everyone is studying and what they want to do for a career. I would also love to hear about how the pandemic is, and how all of the students internationally are handling staying positive and connected to their communities
- Catherine Straley कैथराइन स्ट्रेली to [Everyone](#) 8:24 PM
 I will add many of you! ig @madeByFamilyGrown
- Cassandra 卡桑德拉 कैसांद्रा / कैसांद्रा / कस्संद्रा to [Everyone](#) 8:25 PM
 I loved hearing how similar and different our cultures are and how we can relate on a lot of the same things. Also the stereotypes that people hear about each culture and if there is truths in those. I just really enjoyed connecting with people that we wouldn't have the opportunity to connect with on a normal basis.
- Taniya-तान्या/譚雅 to [Everyone](#) 8:25 PM
 My experience was really amazing I never thought that I would be able to connect with people so many people during this pandemic and learn so many things of different people of different cultures so I am really grateful for it
- Gautam गौतम to [Everyone](#) 8:25 PM
 cross cultural understanding leads to peace and harmony in our international community-Gautam

Appendix 2. Samples of Student Writing about Bovine Human Relationships

- Oxen are symbols of strength in American culture. Paul Bunyan is a frontier folk hero created in 1910 Detroit, Michigan and popularized in Minnesota in 1925, from the Pacific Northwest of the United States. He is a giant, strong, lumberjack who carved out the Grand Canyon and the Puget Sound next to Seattle. He is famous for his animal companion, Babe the Blue Ox, and for eating pancakes one-acre wide, about 0.4 hectare, in a pan that humans can grease skate on with pieces of bacon under their feet. -Kate W.
- Bovine animals have held an importance in religions and cultures around the world, I know cows are viewed as sacred in Hinduism and mentioned in the Bhagavad Gita. Personally, I remember the story ‘Ferdinand’ from when I was a kid about a bull who spends his days smelling flowers. After he is captured by people and forced to fight a matador, he notices all the flowers and colors surrounding him and decides to sit down in the middle of the bullfighting ring. I admired his pacifism and his intrapersonal understanding, reading this story as a kid has helped me practice these values in my current life. - Luciano S.



Drawing by Hope W.

- In our home the karabaw (Carabao) is significant to my spouse. We pass on its importance to our children by telling stories, viewing art and researching the animal. The karabaw is a swamp water buffalo native to the Philippines which has been traced back to the Neolithic Era. They need water and mud to keep cool and are the work animal of the country. To my husband it represents masculinity, a strong work ethic, and a father’s duty to his family and marriage. This symbolism of duty, masculinity

and work ethic is one we value in our home and have instilled in our children that it is hard work and not talent that you must possess to achieve your goals. Below is a sculpture in our home we brought back from the Philippines this past January. We had a trip planned to visit the animals at work but sadly, Mount Taal erupted which restricted our mobility during our stay. We were able to see art, skulls and taxidermied karabaw in the national museum and are anxious to get back and watch them at work. With this carving, we have a concrete symbol of the values and traditions we want to continue in our home here in Olympia. - Marcy T.

- The buffalo takes his walk down near a stream, watching as other animals run and fish jump up and around in the stream. He finds himself maintaining a steady pace, not giving the same burst of energy and then resting that the smaller or faster animals do. The buffalo is strong because he is patient. He makes friends with the smallest creatures, and gives them rides atop his back. He may not run as fast as a fox or bunny, but he is sturdy and safe and that makes the small critters happy. For they have found someone wise and safe to keep them company and help them to find a new home. - Mavis R.
- One story that I grew up with that had a cow was Jack and the Beanstalk. Basically, there is a boy who lives with his mom and they are short on money. She asks him to trade a cow for coins and he instead trades them for magic beans. The beans grow a giant beanstalk in which a giant lives in. The story is called “Jack and the Beanstalk” - Molly S.
- When I think about what the cow/ox/bison represent in my culture, I immediately think of a cowboy. I believe that is because many people in the United States do not see beyond what the animal can do for them. Cows in particular are farmed animals and used for meat and dairy, “cowboys” are their killers. It’s actually quite sad. The only song that is coming to mind is Old MacDonald Had A Farm

Old MacDonald had a farm
Ee i ee i o
And on his farm he had some cows
Ee i ee i oh

With a moo-moo here
And a moo-moo there
Here a moo, there a moo
Everywhere a moo-moo
Old MacDonald had a farm
Ee i ee i o...- Olivia H.



Drawing by Alina P.

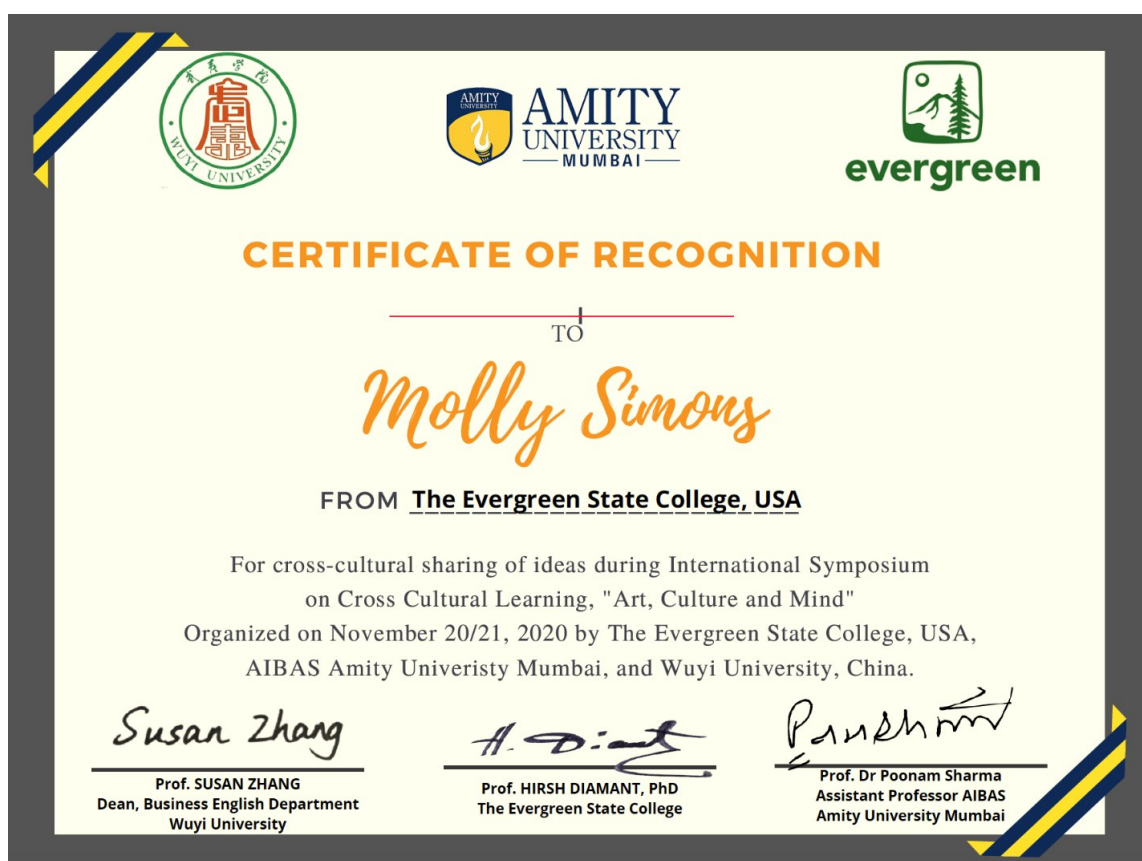
The coming Lunar New Year will be the year of the Cow/Ox/Buffalo. Can you help us to understand the importance of Cow/Ox/Buffalo in world cultures and civilizations? Can you share a simple children's story or a nursery rhyme celebrating this important animal and their teaching? (You can also write your own simple story or a nursery rhyme)

Honoring the cow in different world cultures (especially Hinduism) inspires people to the virtues of gentleness and connects them with nature. The cow is honored in Hindu tradition during festivals throughout India, including the annual festival dedicated to Krishna called

Gopastami. They are bathed, adorned in garlands of flowers, and given special feedings during these festivals. Cows are thought to be sacred in Hinduism and are deeply respected as they are seen as a caregiver or maternal figure. Kamadhenu is a divine bovine-goddess described as Gou Mata, or the “Mother of all cows”. She is portrayed as a miraculous “cow of plenty” and is regarded as a symbol of wealth, strength, abundance and prosperity in Hinduism. The cow is not necessarily worshiped in Hindu culture, but it is considered a sacred symbol of life that should be protected and revered. I had a difficult time finding a children's story that was easy to translate. This is what I was able to find that connects Krishna and the cow. Cows and Krishna have always been together. In His original form in the spiritual world, Krishna is a cowherd boy in the agricultural community of Goloka ("cow planet") Vrindavan, where he keeps unlimited, transcendental *surabhi* cows. When he descends to earth, Krishna brings a replica of Vrindavan with him, and he spends his childhood tending cows and calves while playing in the pasturing grounds with his friends.

Catherine S.

Appendix 3. Certificate of Recognition



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CHAPTER 15: THE IMPACT OF THE COVID-19 PANDEMIC ON THE CREATIVE ARTS EDUCATION IN BARBADOS

David O. Akombo 

Chapter Highlights

- The COVID-19 pandemic has irrevocably altered the lives of people worldwide thereby changing the social and economic fabrics of the society.
- Different parts of the world have experienced some form of disruption leading to failed achievements in key dimensions of human development.
- Since the outbreak of the pandemic, the Barbados' entire population of more than 290,000 has felt the impact of the pandemic with academic programs that serve more than 80,000 children and young adults in primary, secondary, tertiary, and university levels having been affected the most.
- This chapter examines how institutions modified their means of educational service provision, assessments to the students were conducted, and how the government adjusted its protocols to accommodate the movement of people, infrastructure, and businesses in order to sustain teaching and learning in schools.
- The unprecedented economic shock and educational disruptions generated by the pandemic has exposed children, schools, teachers, private donors, the government, and communities to be part of the changing learning environment emphasizing the online-blended learning approach for children in Barbados.
- This chapter provides a literature review that describes how Barbados managed to provide education to its youth and adults during the COVID-19 pandemic, when, in a very short time, primary schools, secondary schools and tertiary institutions and universities had to adapt online-blended learning approach.

Introduction

Since its emergence, the COVID-19 pandemic has altered the lives of people around the world to a catastrophic magnitude that human beings have not experienced since the bubonic plague in the mid-1300s. The bubonic plague was documented to have caused devastating mortality of people and animals across nations and continents (Frith, 2012; Shipman, 2014). Similarly, the COVID-19 pandemic has unleashed a human development crisis endangering dimensions of human development and elevated levels of deprivation last seen in the mid-1980s (United Nations Development Programme, 2020). Following the COVID -19 pandemic, different parts of the world have experienced academic disruptions in varying magnitudes of human development which is measured by the ability to lead a long and healthy life, the ability to acquire knowledge, and the ability to achieve a decent standard of living (International Organization for Migration, 2019).

For educators, the COVID-19 Pandemic is the quintessential challenge that requires adaptive and transformative approach. Unfortunately, there is no preconfigured playbook that can guide appropriate responses these circumstances (Reimers, Schleicher, Saavedra & Tuominen, 2020). Since the outbreak of the COVID-19 (the pandemic) the entire Barbadian population of more than 290,000 has felt the impact, with the academic programs that serve more than 80,000 children and young adults in primary, secondary, tertiary, and university levels being the most affected. Even though the Barbadian student population makes up a staggering 17.3 per cent of its population, the disruption to education sector caused by the pandemic has had a profound effect to the nation. Thousands of jobs have already been lost while schools, thousands of livelihoods are at risk. An estimated additional 112,000 people will be living in extreme poverty if the crisis persists and remains unmitigated (UNDP, 2020). The Barbadian economy is the largest in the Eastern Caribbean and even before the pandemic, it was estimated to have shrunk by 0.1% in 2019 while the levels of poverty were already at 7% (UNDP, 2020, p. 4). Even though the number of new COVID-19 cases is relatively low in many Barbados Parishes, much uncertainty remains about how children will be able to resume normal school life either synchronously or asynchronously as the pandemic runs its course.

While this chapter impinges upon the effects of the pandemic in nearly all sectors of socio-economic, political and cultural practices in Barbados, the focus of this chapter is on the

pandemic's massive recession with far reaching consequences on education and school-age children. The unprecedented economic shock and educational disruptions generated by the pandemic has exposed children, schools, teachers, private donors, the government, and communities to be part of the changing learning environment for children in Barbados. Since the first reported COVID-19 case in Barbados on March 16, 2020, the pandemic has created disruptions on an unprecedented scale and uncovered the vulnerability educational infrastructure already lacking technological resources needed to provide online-bended learning (PAHO/WHO, 2020).

Contingencies Taken during the Pandemic

In Barbados, the Ministry of Education, Technological and Vocational Training continues to support distance learning through flexible and distance home-based learning resources such as on-line platforms, mobile phones, FM Radio Stations and TV learning content, broadcasts, learning content through social media, and podcasts (UNICEF-LARCO Education Section, 2020). The mobile phone is stimulatingly the most important technological revolutions in human history and in fact, studies have shown that people spend more on phones than they spend on food (Harris & Cooper, 2019). Mobile Phone are electronic devices for communication equipped with personal digital assistants (PDAs) to cameras and multimedia devices to touchscreens, with much overlap between these tools (Kroski, 2008). In Barbados for instance, with 100.86 mobile phone subscribers per 100 people, Barbados is already at the top of mobile phone usage (The World Bank, (2021). This makes Barbados one of the fastest developing small island nations to embrace the use of mobile phones as telecommunication device in the entire Caribbean. Based on this data, the teachers took the advantage of exploring the usage of mobile phones since many children already have the devices. With the use of mobile phones, the teachers explored the use of Bluetooth to transfer data to the children. The teachers also explored the use of MP3 functions for teaching. In addition, since the lockdown was imposed, Barbados government also started explored teaching using FM Radio Stations. The Ministry of Education, Technological and Vocational Training partnered with the Radio Stations to produce programs with a mix of games, images, videos, quizzes, exercises and live feedback from children through this media communication.

All sectors of the education ranging from preschools to universities were engaged in all aspects of learning using transformational initiatives to deal with the pandemic. These aspects

included but not limited to technology education workshops, procedural and pedagogical preparedness, affective resource identification network, and community pandemic preparedness. These workshops provided strategic avenues for all children including those with disabilities to participate in educational programs with their assistance of their families. Many children found these resources both and user-friendly and the children were able to express themselves through technology using the arts such as dance and music (Veiga, Custode & Pinzón, 2020).

These efforts of using online-blended teaching methods ultimately a competitive pedagogical avenue and in some cases, improved the learning experiences leading to a positive impact on both formative and summative learning assessments. The guidelines provided by the Ministry were used effectively in developing these tools which made it easy for assessing and monitoring students' learning outcomes in contexts of distance education provisions. Some of the pedagogical applications used during the pandemic replaced sectional face-to-face education, where only a few students at a time, attended courses in a tutorial setting while socially distanced, in a synchronous learning environment. In order to expand the delivery of the educational series, the teachers engaged both blended synchronous (b-learning) and asynchronous online (distance education) models.

The pandemic has generated unprecedented changes in the teaching-learning process in higher education institutions and has influenced the interaction between teachers and students (Coman, Țiru, Meseșan-Schmitz, Stanciu, & Bularca, 2020). According to the Centers for Disease Control (2020), COVID-19 spreads mainly among people who are in close contact thus within 6 feet, for a prolonged period. Close contact between students and teachers in the classroom is typical in schools in Barbados. In order to reduce the speed of its spread, many countries slowed down their economies by enforcing pronounced restrictions on socioeconomic activities and public life (Schäfer, Sopp, Schanz, Staginnus, Göritz, & Michael, 2020). Consequently, the government of Barbados put in place a regulated lockdown policy, a measure dubbed “national pause” across Barbados to help control the spread (Rawlins-Bentham, 2021). These efforts were aimed at helping the nation that faced extended and longer curfew hours as the government tried to avoid the spread of the virus and to ensure the continuity of the education in primary, secondary, and tertiary institutions. In so doing, the only option available to support the education sector was to invest in blended learning.

Educational Impact of the Pandemic on Primary Education

Barbados has approximately 480 primary schools (Blackman, Conrad & Philip, 2017). Primary School Education in Barbados is based on the British model where students begin primary education when they are three years old. By the time the children are between three and seven years of age, they attend kindergarten or nursery schools (Ministry of Education, 2013). Barbados has four public kindergartens, 71 publicly funded primary schools, and 30 private primary schools. In Barbados, when the children attain the age of 11, they take a Common Entrance Examination that assesses their preparedness for secondary school (Ministry of Education, 2013). In 2020 during the pandemic, these educational programs including the examination processes were interrupted and brought to a halt making children unable to participate in creative arts programs such as music, dance and theatre. In order to avoid the high risk of transmission of COVID-19 through bodily fluids such as saliva and aerosol, the Barbados Ministry of Education, Technological and Vocational Training banned all face-to-face teaching in all public schools. This impacted the teaching of the creative arts and many subjects such as music, dance, drama and theater, whose typical pedagogical approach encompasses face-to-face teaching, had to be discontinued. This led to the decline of creative arts education in Barbados.

However, it is worthy of note that the decline of creative arts education in Barbados schools is part of a much longer trend. Prior to COVID-19, the creative arts subjects across all the 11 Parishes was already facing significant challenges in a nation paradoxically considers the creative arts as critical for national development. The Parishes of Barbados were fashioned after the British Elizabethan Vestry system by the first settlers during the 1600s. While the Ministry of Education, Technological and Vocational Training oversees the educational programming, the individual Parishes were responsible for adopting measures that would perpetuate continued blended online learning for children at all levels. While students faced many challenges in the delivery of creative arts lessons particularly in music, dance, class meetings for other subjects at primary schools were also cancelled. The only alternative measure left for the schools and teachers to use was to have students utilize online technology without the benefit of studios and laboratories especially in high schools and tertiary institutions and universities. The use of online teaching and learning necessitated a need for alternative assessment for the creative arts such as dance, music and theater. Considering the value music education plays in young people's lives, therefore there must be a genuine cause

for alarm. Beyond the intrinsic value of studying music for its own sake, there is a plethora of evidence that studying music builds cultural knowledge, creative skills and improves children's health, wellbeing and wider educational attainment (Underhill, 2020).

Educational Impact of the Pandemic on Children with Special Needs

Education for students with disabilities, also known as Special Education, continues to be in a state of transition from the traditional special school's system to more inclusive settings (Blackman, Conrad & Philip, 2017). Barbados has eight primary schools and two publicly funded schools for children with special needs. Persons considered to have disabilities in Barbados include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others (See Davidson, et al., 2017). Children with disabilities and their families constantly experience barriers to the enjoyment of their basic human rights and to their inclusion in society (UNICEF, 2007). During the pandemic, this population in Barbados, was impacted the most. Studies have shown that the disparities caused by the pandemic began in February 2020 when the special schools closed and required students to utilize the blended learning from home. While disparities are prevalent among these populations, the pandemic exacerbated their educational circumstances.

Studies show that these inequities follow the children with disabilities throughout life including their schooling – if they get 'privileged' to be placed in a public or a private school (Berk, 1989). Attitudinal and environmental barriers heavily influenced the level of participation of students with disabilities in schools (Blackman, Conrad & Philip, 2017). Due to the effects of the pandemic, these children may mature while trapped in a social stratification that intentionally hierarchy embodies ableism at the expense of equal opportunities for these children. Access to technology had lagged behind even before the pandemic for children with disabilities. The Ministry of Education, Technological and Vocational Training had previously made some initiatives to establish a task force to examine more tangible suggestions for accommodations in the area of technology, the implementation of the regular education curriculum in special schools and certification for students at special schools. However, these measures are only at preliminary stages (Blackman, Conrad & Philip, 2017).

While there is a plethora of literature indicating that children with disabilities face significant obstacles to access in music education especially in low-income countries like Barbados, there is a dearth of literature on which to develop robust policies that would govern the access to the arts for children with disabilities. Limited availability of music teachers and schools with inaccessibility to music resources such as practice rooms and musical instruments pose challenge a great challenge for many families in a country where the income per capita is only \$ 15,770 (World Bank, 2021). Due to this low income per capita, most families are unable to provide their special needs children with either private lessons in the arts or purchase musical instruments for them to learn and practice on while at home for those privileged to attend school, use these instruments during music rehearsals. The pandemic compounded the problems creative arts educational access that populations with disabilities are faced with day by day. The special needs children from the families that live below the poverty line are especially the ones most vulnerable.

Educational Impact of the Pandemic on Secondary Education

Barbados has 23 public secondary schools, three of which are government-assisted and four are privately owned (Ministry of Education, Technology and Vocational Training, 2021). Secondary education caters to children from the ages of 11 to 16 and mirrors the British education system (Blackman, Conrad & Philip, 2017). Students spend five years in the secondary school after which they sit for the Caribbean Examination Council (CXC) examination. This examination is equivalent to the General Certificate of Education – Ordinary Level (GCE – O levels). GCE-O levels are predominantly exam-based and seem to favor students in part-time or evening education. This exam-based approach offers the student's overall ability without considerations of coursework-based assessments (Christie & Forrest, 1981). In addition, Barbados schools do not typically provide summative certificate of academic completion to students, which means that upon the completion of secondary school, the only way for students to advance their education is based on how well they perform on the GCE—O levels examination. When students complete eleven years or primary education and have passed the Common Entrance Examinations, they proceed to the secondary level.

Due to the required face masks at the beginning of the COVID-19 pandemic, it was impossible for the children in public secondary schools to participate in the creative arts class

sessions. Some private schools however, were able to continue with limited instructions in the creative arts based on their available infrastructure in the schools such as the use of Plexiglas barriers in studios and rehearsal rooms as well as spacious assembly halls where such courses could be carried out safely while observing social distancing.

Educational Impact of the Pandemic on Post-secondary Education

There are currently 11 post-secondary institutions in Barbados. These institutions offer Certificates, Diplomas, Bachelor Degrees, Master's and Doctoral Degrees. Several of these institutions were better equipped in technological infrastructure to continue offering online-blended learning. These institutions also offered other innovative pedagogical approaches to the teaching including take-home assignments. All post-secondary institutions in Barbados were engaged in creative ideas and approaches in dealing with the pandemic. While the use of blended-learning was seamless in some of the study areas such as humanities, social sciences, liberal arts and more, the programs that were affected the most were the creative and performing arts. Post-secondary institutions that's offered Certificates, Diplomas, Bachelor Degrees, Master's and Doctoral Degrees in Creative Arts such as in theater, film, dance and music had to quickly re-invent a pedagogy that would enable students to continue with blended learning (b-learning) from home. Some of these pedagogy measures still utilized limited face-to-face tutorials by providing more in-depth discussions. In the creative subjects the institutions explored offering non-performance-based opportunities such as term papers and the use of media content analysis.

Other approaches included the use of breakout rooms which allow learners to split their Zoom meeting into several separate sessions (Zoom Video Communications, 2021). In breakout sessions, Zoom platform enables the instructor to split the students into separate sessions automatically or manually. However, students can also select and enter breakout sessions of their choice. In addition to Zoom technology, post-secondary institutions also explored other technologies Moodle, and Microsoft Teams. (see Table 1). In other words, the digital world because the new normal with lectures using this tool to work with students either as individuals or in small groups. This was using these resources brings about change in the learning process and students learn in a more informal and pleasurable way as they discover and acquire knowledge of music and they exercise their critical and aesthetic thinking (Akombo & Lewis, 2019).

In general, however, post-secondary institutions Barbados were greatly affected because the institutions had not appropriated funds to invest in these protective measures including providing their students with laptops. Due to the suspension of face-to-face classes and institutional work-from-home policies, the only alternative was to have students utilize online technology without the benefit of studios and laboratories in colleges and universities. This necessitated the use of alternative assessments for courses that normally require a face-to-face delivery such as dance, music and theater. In Barbados' post-secondary institutions, lecturers prepared the student so present virtual performances throughout the academic year 2020-2021. Every student in the creative arts departments was introduced to the labs and a green screen, a recording studio and assisted in creating their videos in form of project-based learning as an approved alternative assessment.

Supporting Students during the Pandemic

Internet access is critical at a time of crisis (OHCHR, 2021). During the pandemic, it was essential that the government of Barbados assist the poor to access internet and broadband. A report by The World Bank (2021) indicates that even though Barbados is already at the top of mobile phone usage with 100.86 mobile phone subscribers per 100 people, obviously, students with access to digital devices, Internet and broadband were not be the majority of the school-age children in Barbados. Therefore, getting support from stakeholders was necessary to have the students get access to the resources they needed while at home. Post-secondary institutions on the other hand, used their internal resources in the Student Support Services to loan out laptop computers to students who could not afford their own computers. The libraries also assisted students at all levels with access to computers in order for them to complete their school assignments while observing COVID-19 protocols such as social distancing, sanitizing computers before and after each use, and hand-washing as well as requiring masks. Access to online education resources from stakeholders freed up institutional capacities and personnel resources in order to redirect their focus on delivering alternative learning methods for the students at home. FLOW, Barbados' Fastest Telecoms Provider, helped provide free online learning for students by providing Faster Broadband Network and Faster Mobile Network. Other companies like Digicel also offered 14-day education plans to institutions (Smith, 2020). All these were aimed at supporting the government of Barbados and the parents as the government assessed different ways to continue educating students during the COVID-19 Pandemic.

Alternative Assessments in Education during the Pandemic

Alternative assessment is a method of assessment that largely emerged in response to the perceived inadequacies of the traditional and conventional forms of assessment due to the shortcomings effective pedagogies available for learners with special needs (Al-Mahrooqi & Denmran, 2018). In the context of the COVID-19 pandemic, the Barbados Ministry of Education, Technological and Vocational Training considered alternative assessment in through multifaceted pedagogical tools of teaching and learning dyad including the online and hybrid platforms that were adapted. In Barbados education system, the usefulness of alternative assessments during the pandemic was centered around innovative approaches such as in incorporating various subjects offered in the curriculum. These were all done against the backdrop of the lack of preparedness and available infrastructure for both teachers and learners. Many shortcomings were soon realized. For instance, creative arts students are generally not accustomed to online learning due to the performance-based requirements in studio or recital hall settings. Therefore, in Barbados, blended learning affected student perceptions of the creative arts by making the students directly responsible for their own learning which made them be accountable on project completions from their homes using e-learning materials provided to them by their instructors. This approach transformed the timetables and original schedules leading to modules for a self-driven teaching-learning dyad in creative endeavors. Modular adoptions eliminated ensemble experience such as choirs, theatre, dance performances and other art forms as they are customarily delivered in the school and post-secondary classrooms.

In Barbados, the general nature of assessment in all subjects but especially in the creative arts has changed accordingly since the onset of the pandemic. Institutions in Barbados that assessed students in coursework in most subjects including both GCSE and A level during face-to-face in-class lessons, now had to switch to online-hybrid with less assessment of practical work, including oral skills in the language laboratories, scientific experimentation in the laboratories, designing and making artefacts for Technology using hands-on experiences and so on. The A - level modular syllabuses took center stage over the linear syllabuses in many subjects from the primary schools to the University levels. Examinations were to be designed to taken online either synchronously or asynchronously.

The use of technology in education has been a part of the school curriculum since the early 20th century. However, in the 21st century, many questions have emerged seeking answers on how to use technology to appropriate an innovative music classroom and to create effective music curriculum (Akombo & Lewis, 2019). However, selecting technology resources suitable for the creative arts during the pandemic was a challenge. In part because effective software in music education for example, should contain elements of cognitive reasoning and that such software should entail capabilities for creativity and problem-solving strategies (Akombo & Lewis, 2019). In Barbados education system, alternative assessment in the arts included authentic, performance-based subjects such as film, theater, music, and dance, through demonstrations that were carried out in online synchronous and asynchronous contexts, while also allowing assessment and instruction to continuously interact. The modality of alternative assessment helped teachers to gain a clearer picture of their learners' abilities. (See Al-Mahrooqi & Denmran, 2018). Table 1 below shows e-Learning resources used in Barbados as described by OECD (Reimers, Schleicher, Saavedra & Tuominen, 2020). An e-Learning is a curriculum that is based on e-Learning tools (see Table 1).

Table 1. E-Learning Resources used in Barbados (modified from Reimers et al., 2020)

e-Learning Platform	Level of usage		
	Primary	Secondary	Post-Secondary
<p>Zoom is a video communications tool with a cloud platform for video and audio conferencing, collaboration, chat and webinars. It can be used across mobile devices, desktops, laptops, and telephones. Its features like chat, screen share, annotate, whiteboard, polling, breakout rooms, raising the hand, and managing participants lend themselves to creating engaging virtual and hybrid classrooms and collaborating on projects. Users have the option to record sessions.</p>	✓	✓	✓
<p>Moodle is an online learning platform designed to provide personalized learning</p>			

environments. It is free and uses open source software. The target users are educators, administrators and learners. Moodle can be used with downloaded software or online, and it is available on a variety of devices. Moodle prides itself on being able to support the needs of small classes and large organizations. In terms of skills, as Moodle is a learning platform it can be utilized to support cognitive as well as socio-emotional skills. It can be used by a wide range of learners, from primary students up until adult learners. It is available in 120 languages.

✓ ✓ ✓

Microsoft Teams (Teams) is an online learning platform designed to provide personalized learning environments. Teams allow students to see resources and be able to interact with the teachers and other students. Teachers can upload homework, documents, presentations, videos and can also teach online classes. Teams can be accessed from a web browser, a desktop app or a mobile phone app (Microsoft Teams, 2021).

✓ ✓ ✓

Mobile Phones are electronic devices for communication equipped with personal digital assistants (PDAs) to cameras and multimedia devices to touchscreens, with much overlap between these tools. Barbados teachers explored the use of Bluetooth to transfer data to help the children access the children. The teachers also explored the use of MP3 function for teaching.

✓ ✓ ✓

The Altered Learning Outcomes during the Pandemic

One of the difficulties faced by learners and those work in the field of creative arts is that the desired outcomes are creative projects that are frequently expected at the end of the school term or semester. However, the usage of blended learning with technology gave a false hope far beyond what it can reasonably support. Generally, the creative arts are traditional face-to-face courses with use of studio apprenticeship and assessments. The sudden pedagogical shift was unprecedented. For instance, the students enrolled in film, dance, theater, and music were given instructional videos and asked to watch them and then create their own short videos to show their mastery of the dance moves, gestures, composition work and film clips. Those enrolled in Film and theater experienced a much more nuanced difficulty because when the government adopted the national pause' for instance, they could not get outdoors to make movies or visit premises to create movies or act in theaters. This hampered the creative process for these students while at the same time making it difficult for departments to adopt industry-led safety measures and allow the students to return to the campus facilities. Since the majority of the schools were unable to meet face-to-face even with restrictions on class sizes, or use of school and campus facilities altogether, most teachers and created videos for their students to mimic during lessons in order to assist the students to create their own miniature skits and accomplish the assessment goals and for grading and meet desired student learning outcomes (SLOs). Cognition-based creative processes and products have also been referenced as most viable pedagogy (Gardner, 1982). Online learning did not provide the benefits of tactile learning. Even if a few students enjoy the comfort of technological innovation, overall, hands-on art making produces confidence, a pride in their creation, enjoyment, and allows children to “self-express” (Gayle, 2018, p.41). The idea of self-expression is embedded in the self-driven teaching-learning dyad philosophy.

Laboratory Experience during the Pandemic

The creative arts courses that are offered in Barbados schools and post-secondary institutions consist of film, dance, theatre, music, and crafts. The best practices in pedagogical tools for these subjects require hands-on experience in the studios where the learners are mentored by the instructor. Active creation is valuable in fostering creativity, inspiring knowledge, and supporting and motivating student learning (Clarke & Cripps, 2012; Quinn 2011). However, since the COVID-19 safety protocols required that students to adhere to the social distance

and wear face coverings, this prohibited studio-based instruction in favor of a home-based online instruction where the learners could have the liberty for example to play a musical instrument or dance without a mask. In their struggle to advance the use of digital technologies in teaching, educators face various challenges that prevent the successful adoption of such technologies in the classroom (Tusiime, et al., 2020). Digital technologies in classrooms have received considerable resistance from educators for almost two decades largely because technology as pedagogy is not necessarily aligned with the teaching goals (Stoilescu, 2014).

Emotional Effects of the COVID-19 and the Emergence of Family Music Ensembles

During the pandemic, since the traditional music bands and ensembles were not able to meet face-to-face in their rehearsal auditoriums, this led to the rise in family music ensembles. Family music ensembles comprise of members of the nuclear or extended family living together or are forced to live together due to a COVID-19 shelter-in-place policy enacted by either a local or state government. A nuclear family is a social unit that consists of parents and children and extended family including mother, father, and their children) and grandmother/grandfather, aunt/uncle, and cousins (Georgas, Mylonas, Bafiti, Poortinga, Christakopoulou & Kagitcibasi, 2003).

Family music ensembles are music groups that emerged during the COVID-19 pandemic. During the pandemic, shelter-in-place policies were enacted for example in Barbados, Europe and other parts around the world. This shelter-in-place policy correlated with heightened anxieties that in the context of this paper, could referred to as health anxiety. Health anxiety is a multifaceted phenomenon, consisting of distressing emotions, physiological arousal and associated bodily sensations, thoughts and images of danger and avoidance and other defensive behaviors (Özdin & Özdin, 2020). These are large-scale outbreaks of medical conditions that lead to, worry, or physical symptoms that cause clinically significant distress or impairment in social, occupational, or other important areas of functioning (Reynolds & Kamphaus, 2013).

In Barbados, the pandemic created situations where children had to be taken away from their caretakers. This was prudent because some of the caretakers may have been exposed to COVID-19. This separation between caretakers and children exacerbated by strains between

the families had the potential to increase mental health issues (e.g. depression, anxiety) for both children and parents (Veiga, Custode & Pinzón, 2020). Depression and anxiety can greatly increase morbidity in children who are already receiving treatment for underlying conditions and also lead to mortality over a wide geographic area and cause significant economic, social, and political disruption (Madhav, N., Oppenheim, B., Gallivan, M., Mulembakani, P., Rubin, E. & Wolfe, N. (2017). Many scholars have also noted that pandemics can cause significant, widespread increases in morbidity and mortality and have disproportionately higher mortality impacts on low- and middle-income countries (Bedrosian, Young, Smith, Cox, Manning, et al., 2016). People experiencing pandemics can also exhibit extreme social isolation which can lead to anxiety (Siu, 2015). Pandemic-induced anxiety is anxieties that are cause primarily due to the outbreak of a pandemic. The creative arts are effective in the reduction of anxiety and depression (Boehm, Cramer, Staroszynski & Ostermann, 2014).

Benefits of Blended Learning in Barbados

Barbados has high quality infrastructure by international standards (Álvarez and Waithe, 2019). However, a recent study on accessibility to transportation in Barbados showed that the level of customer demand for bus services on various routes across Barbados was proportional relative to the level of service provided on these routes (Robinson, 2013). This means that many students are impacted by lack of reliable transportation. Pilgrim, Hornby & Inniss (2018) have noted that students have to take buses to school and change buses at least once on the way to school and then again on the way back home. Pilgrim et al, (2018) also note that students may spend up to four hours a day travelling between home and school with inadequate supervision in unfavorable weather conditions on buses that are not air-conditioned. This is exactly where blended learning becomes a rewarding pedagogy to many students depending on the discipline. Online learning allows students with flexibility to participate in learning in the virtual environment, requiring limited movement (Basilaia & Kvavadze, 2020; Pokhrel & Chhetri, 2021). Hamad (2017) has stated so eloquently that:

Blended Learning can help to solve transport problem of ladies who can't reach colleges, and can make education attainable to every one regardless of age or place, also it can help to solve the problem of few instructors for specific subjects. (p. 15)

Conclusion

This chapter has taken a deep dive into how the pandemic affected the education system in Barbados with a particular focus on the creative arts course delivery. The research achieved this by comparing how learning is typically achieved in the arts-based subjects in the classroom with what the learners had adapt to during the pandemic while at home in an attempt to achieve the same learning outcomes. The chapter also examined the academic standards and goals expected during the pre-COVID-19 or normal face-to-face learning environments as opposed to the pandemic period. This research has shown that the students in Barbados were faced with circumstances where they were warranted to be part of the self-driven teaching-learning dyad that emerged as a new pedagogy in Barbados. Aguanta & Tan (2018) observe that teaching-learning dyad is a cooperative learning based on a dyadic alternative, Licht, where students with good class standing in are paired with those who are not performing well in the subject matter in a series of classroom activities and quizzes. A self-driven teaching-learning dyad is therefore a pedagogy through which a student identifies both with the group the instructor has placed them and his or her own learning pace and continually seeks clarification of unfamiliar concepts during interaction with peers while setting a project completion goal.

The chapter shows learners in Barbados have not yet quite adjusted well to the ‘new normal’ where blended learning is the norm because the infrastructure needed for this delivery is still in its developing stages and hampered by the economic downturn caused by the pandemic. This is attributed to the inherent difficulty of processing and making sense of the devastation the pandemic has wrought to humankind in many parts of the world including Barbados. The chapter illustrates some of the practical and structural difficulties of making sudden changes in educational infrastructure including content and pedagogy without having strategically planned in advance. Many students, teachers, parents and institutions did not have the resources to acquire the needed technology to deliver educational services in Barbados. In addition, the Internet broadband was inaccessible in part due to poor infrastructure, the other being expensive to the majority of families. The end of the pandemic is anticipated with ambivalence because of the impact the COVID-19 has had on the nation-building on Barbados. Once the education sector is revitalized following the interruption on education services delivery, the nation may start to see some creative industry gains in the nation building efforts. Nation-building is understood as the social process of transforming an

underdeveloped, poor and divided society into a community with peace, equal opportunities and economic viability within which individuals enjoy dignity, basic human rights and the prospect to observe their own religion, tradition, culture and language in harmony with other people who may function within other traditions (Vorster 2005:474). It is important for the government of Barbados to support the delivery of teaching and learning of the creative industry through the Ministry of Education, Technological and Vocational Training. The Government of Barbados has identified the promotion of the creative industries as a key pillar of its economic development (Hendrickson, Lugay, Caldentey, Mulder, & Alvarez, 2012). For this reason, it is significant now more than ever, for the creative industries to be developed since the Barbados economy relies heavily on the pipeline of creative talent from schools which is essential in creating the Barbados music industry (Hendrickson, Lugay, Caldentey, Mulder & Alvarez, 2012). Whilst Barbados has faced an unprecedented crisis in arts education, COVID-19 also provides the nation with a pivotal moment for reflection and an opportunity to reset arts education policy.

The Barbados government, through its Ministry of Education, Technological and Vocational Training, needs to ensure that moving forward that measures are in place safe creative arts teaching in schools, community colleges, universities and the broader Barbadian community. The government needs to demonstrate a clear leadership through active retraining workshops for creative arts teachers on the use of technology and alternative assessment in order to encourage students to stay engaged in the creative development of their skills. It is commendable that Curriculum Unit of the Ministry of Education, Technological and Vocational Training has established a program whereby officers visit classrooms and assist the teachers in the development of instructional materials such as lesson plans, classroom observation, methodology deployment through on-site workshops (UNESCO, 2010).

The continuation of providing education to the children is paramount. This is in tandem with Hereward, Jenkins, & Idele (2020) who propose providing the world's disadvantaged and marginalized children with equitable access to learning opportunities as a foundational to creating a sustainable future and must be a priority for the global education sector. When this is achieved, it will contribute to Barbados' historical commitment to human resource development in its creative industry sector through public education.

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SECTION IV: SUBJECT SPECIFIC ISSUES

CHAPTER 16: THE CHALLENGE OF ONLINE CLINICAL EDUCATION IN THE COVID-19 PANDEMIC

Steve Jackowicz 

Chapter Highlights

- The COVID-19 Pandemic challenged educational models worldwide, however clinical education faced unique challenges.
- Clinical education involves both didactic and practical aspects which must be developed in tandem complicating online education.
- COVID-19 demanded clinical training programs to evolve methods which could attain the learning objectives traditionally found in practical on-site education.
- Faculty unpreparedness, lack of existant models, technological limitations, and student access to tecvhnolgy all impacted the development and implementatioon of viable online clinical education.
- National accreditating agencies and standards for licensure needed to be involved in granular implementation of newly developed educational models being advanced quickly during COVID-19.
- This chapter addresses the specific and broader dynamics of online clinical edcation as seen in the Acupuncture Institute of the University of Bridgeport, and evaluates the potentuial for future utilization post-pandemic.

Introduction

The COVID-19 Pandemic has presented challenges to education at all levels. The transition to online learning has required educators to embrace a rapid evolution of pedagogical models to better interface with technology, as well as address the digital divide among students. Clinical education presents a unique set of problems in online education, requiring the attainment of physical proficiency in medical techniques along with the intellectual analytical skills. In that regard, the clinical educator needs an array of innovative approaches to create a virtual clinical experience. This paper examines the techniques developed in the clinical training program in Traditional Chinese Medicine at the University of Bridgeport (Bridgeport, CT USA) to attain the learning objectives and outcomes during the COVID-19 Pandemic within the parameters of the accreditation requirements for licensure.

Parameters of Clinical Education

Clinical education differs from many parts of academia since there is a parallel development of physical competencies with the analytical ones. Thus, in the various fields of medicine the student must develop a tangible and reproducible fluency of applied technique which is utilized by indications parsed and interpreted through the diagnostic lens of the specialty (Conn, 2012). Therefore, in clinical education there has always been a dichotomy between the abstract analytical skill set and the physical performance skill set.

In popular understanding, there is the trope of the clinician who is knowledgeable yet incompetent in technique, such as a doctor who can diagnose the most complex case yet not even draw blood competently. The disparity between the two parts of clinical education has led to a specialized approach to clinical assessment utilizing structured interaction rubrics (SIR) that standardize the evaluation of the clinical student and supervisor interaction regarding patient care, as well as objective structured clinical evaluations (OSCE) which test individual performance skills (Frank, 2012). These instruments stand outside of formalized exam structures such as barrier clinical entrance or exit exams, which serve to assess clinical thought process and the inculcation of a principled differential methodology of gathering and parsing diagnostic data into a useable therapeutic interaction plan.

Due to the varied objectives and quantifiable outcomes inherent in the didactic and clinical spheres of medical education, faculty may be specialized into one type of educational parameter; academic versus clinical, or may need to play the two roles in various courses in the curricular progression. Each of these approaches demands a different platform of thought to support the educational development of the student. The didactic academic side must guide the student sequentially through the thought process of the medical interaction, and teach an appreciation and understanding of the science behind the methodology (Kamel-El Sayed, 2018). Knowing the science behind the sterilization of a needle, or the physics principles behind an adjustment bolster is necessary for the student, yet this information does not enhance the students' ability to draw blood, or accurately to place the bolster for therapeutic effect. Herein lies the fundamental issue in clinical education – understanding versus application, or theory versus practice.

The Challenges of a Virtual Clinical Education

The COVID-19 Pandemic has forced higher education to embrace a virtual delivery system to maintain the educational progression of students while maximizing adherence to social parameters of safety, which limit contagion. Worldwide, since the spring of 2020 educational institutions have moved much of their education onto virtual platforms challenging faculty, students, administrators, and accreditors to adapt existent approaches and rapidly develop new ones to interface with the technology available for the attainment of learning objectives and outcomes designed in a “pre-COVID” educational setting.

In clinical education, the greatest challenge has presented in the transition of learning objectives and outcomes to a virtual platform. Clinical skills, as delineated above, rely on rubric and OSCE instruments to evaluate the development of the student, assessing competency but also allowing remediation in the moment attending to the learning opportunity to retrain and refine physical skills in the unique set of circumstances presented by a given patient at one moment. The nature of virtual education denies this model's validity. It is impossible to create the same immediacy and teachable moment for clinical skills in the virtual setting. Therefore, the necessities of the pandemic force the development of new approaches and an evolution in thought regarding the nature of clinical skills and the process of their attainment.

Objectives and Outcomes Reexamined

In response to the need for virtual clinic training at the University of Bridgeport, the faculty was charged with re-examining the outcomes and objectives within our clinical syllabi and developing approaches using prepared case presentations for analysis, and zoom platform group case discussion to develop a workable virtual clinical training, which could fulfill some aspect of the training requirements. The exigent circumstance required the curricular progression of students towards degree completion, as well as an attention to the accreditation requirements of the Accreditation Commission for Acupuncture and Oriental Medicine (*Comprehensive Standards and Criteria Revised 2017* <https://acaom.org/resources/comprehensive-standards-and-criteria/>). Quickly it became apparent that OSCE instruments could not operate in the virtual format since performance of clinical skills inherently carry risk, which demands on-site supervision. Further, the pandemic lockdown precluded the physical gathering in a clinical setting, while the need for direct supervision denied the student a venue to use a partner to demonstrate skills via zoom. This dilemma halted OSCE administration and stalled some elements of student progress.

The Accreditation Commission for Acupuncture and Oriental Medicine (ACAOM) decided to allow dispensation of some of the formalized skill assessment, if the educational institution endorsed the student as competent, as well as allowing distance education methods to be counted as clinical attendance at the same rate as live educational experiences. These changes were first implemented through the *Emergency Waiver Limitations and Guidance Policy* of May 8, 2020 (<https://acaom.org/2020/05/08/emergency-waiver-limitations-and-guidance-8-may-2020/>). Those measures were revised on May 18, 2020 to address the requisite number of patient contacts during the pandemic. Then on May 27, 2020 ACAOM released *Revisions to the Standards and Criteria* articles 6.02, 6.05, and 7.01 which validated virtual educational experiences as equivalent to live clinical experiences and allowable for the same types of assessment instruments as could be adapted to the online platforms (<https://acaom.org/comp-standards-revision-history/>). This policy allowed the progression of students at the end of the program to graduate but it did not solve the issue of OSCE administration in a virtual setting.

However, rubric assessment, clinical hour requirements, and patient contact requirements were more amenable to virtual platform fulfillment. Structure Interaction Rubrics (SIR) are predominantly an assessment of clinical analytical skills evidenced by the data collection and

differential diagnosis of a live patient, with the communication of findings, assessment, and treatment plan to the supervisor. The SIR does not require complex physical skills or evaluation of therapeutic methods. As such, constructed cases can present information that the student parses and analyses as a thought experiment thereby honing the abstract differentiation and intellectual inculcation of the medical paradigm. This approach became the basis for the virtual clinical experience.

Imaginary scripted cases, modelled on real world experiences from the supervisors, or adapted from clinical case reports, were prepared and presented to the students who could prepare an analysis and then use the zoom interactive platform to discuss them with the corrective assistance of the supervisor. Subsequent to the discussion, the students were required to submit a case note, which was written in the standard charting format to mimic and model the charting done on live patients. The imaginary constructed cases could then be counted as patient contacts, and the time spent in this virtual clinic could be considered as clinical hours. The department's executive committee quickly ratified the use of this methodology for hours and patient contact counts. The ACAOM accrediting body soon followed suit since total clinical hours and the number of patient contacts are included in accreditation standards.

Unexpected Demands

This model serves as a viable way to comport clinic in a virtual setting, yet it does present other unique demands on faculty, and students, especially related to assessment. The virtual clinic requires the creation of narrative patient accounts and follows up narratives, which reflect change over time. Since live clinical encounters include new patient intakes, return patient visits, cases with hidden indicators of a serious underlying emergency, as well as variant patient populations (pediatric, adult, geriatric, etc.) with a range of interwoven pathologies either chronic or acute, the virtual "patients" need to have the same range of variables. There is no simple resource for such created cases. The clinical faculty has to create these resources. This need creates demands of creativity and inductive reasoning in a field based on deductive reasoning. This issue is the first challenge in the development of virtual clinical education.

The lack of published resources taxes the intellectual resource of faculty who have spent their professional careers developing analytical skills intended to be used on live cases that present themselves. Virtual clinical education instead demands the clinical faculty reverse engineer a case presentation so that it leads the student along an analytical path, which must appear to have more than one interpretation allowing the development of the deductive process necessary in live cases. There is a necessitation of storyline thematics and false flags in case dynamics that create analytical tasks which mimic clinical presentations (Charon, 2017). The increased demand of creativity in a discipline that extols adherence to tested and traditional norms of interpretation, elevated the affective filter of the clinical faculty to their workload; effectively virtual clinic is predicated on a different skill set than live clinic, yet the faculty need to simply adapt and develop this new approach without any possible preparatory training due to the circumstances driving this innovative approach.

The second unexpected demand in the development of virtual clinic was the need for professors' intense mastery of permutations in pathology and presentation of both the discipline of treatment and the presentations relevant to disciplines of referral. The clinical faculty member must plan out the changes and developments that could happen in the case, and be familiar with the causations and mechanism of pathology in other medical disciplines to be able to represent those issues in the narrative, which potentially embedding them at such a low level of development as to be false flags unworthy of referral (Kaufman, 2003). These issues result in an increased workload for clinical educators who normally interpret the live cases they encounter. Unfortunately, the COVID-19 Pandemic has necessitated a quick application of this virtual model, denying the clinical faculty time to do the cross training to develop this expanded knowledge base, or the time to reach out to faculty in other discipline to seek their counsel on the created cases. The result of these dynamics is the limitations of virtual clinic as not being real life and having a solution of design metered by the professors' knowledge base, skill level, familiarity and creativity.

Limitations in the Human Technology Interface

Several issues complicate virtual education due to limitations in technology and its utilization by the participants. Inevitably the change to an online learning platform in an accelerated format due to the demands of the COVID-19 Pandemic forced faculty adaption regardless of

the attitudes and predilections of faculty toward online learning platforms. Faculty agency is metered by emotional enthusiasm for the project.

Many faculty members experienced a subconscious resistance to the development and implementation of virtual education in general and virtual clinical education in particular. The “brave new world” of virtual education, often denied the simple application of traditional educational methodologies, instead requiring a new attitudinal posture toward the attainment of the learning objectives. Outcomes need to be measured in new ways, tests and assessment instruments fitted to online delivery, as well as anti-cheating software incorporated to maintain test validity (Schuwirth & van der Vleuten, 2006). These changes would have been challenging in the best of circumstances. The COVID-19 Pandemic created a crucible of alacrity demanding immediate implementation of online variants to allow the continuation of curricular progress. Faculty mental flexibility and technological facility was a delimiting factor to successful online education.

In addition to faculty resistance or insufficiency in the technological sphere, students evidenced analogous issues. The digital divide presented itself clearly. Some students lacked the technology to be able to stay current with online platforms. As the pandemic progressed, the online platforms such as zoom updated themselves. Some students did not have the computing power or the internet provider’s data capacity to support the developing and expanding platforms.

Further, many graduate students with families, as well as faculty, had multiple users pursuing educational endeavors online simultaneously leading to streaming slowdowns and connectivity issues. Some students also had an intrinsic resistance to the switch to online learning. Either due to a dislike of the different formats of interaction, or a perceived self-image of not being able to use technology successfully, some of the student population presented negativity toward the new dynamics. This resistance seemed disconnected to age. The assumption was that older students would be more resistant, but in actuality, the flexibility of thought and behavior presented uncorrelated to age, gender, or educational level. Perhaps, as of yet undefined parameters can typify students who have technology resistant attitudes, and provide educators with data by which to intervene early to avoid disruptions in educational progress.

Another issue, which became apparent over time in online education, was one of limitations in the technology. Discussion dynamics online are inorganic as compared to classroom work. The microphone feedback requires the majority of participants to be on mute while one person speaks. The students can unmute themselves to participate but they easily become disconnected to the class dynamic. In addition, the microphones do not allow people to speak simultaneously and be easily understood. Therefore, students wait for an opportunity to speak at a lull in the conversation, which may not come, or may come at a point well after the topic of discussion has changed.

Students also became dulled to the class on platforms such as zoom experiencing an online class “virtual fatigue.” The video call dynamic is a more passive type of participation, similar in many ways to watching television. Long classes online can lull the student into inattention, such that they gloss over important information. The microphone itself, unless a high quality real sound capture instrument, dulls the highs and lows of the sound wave reducing the speaker’s vocal range thereby reducing the immediacy of the presentation. If the professor uses a monotonous presentation style, the issue compounds.

Pedagogical Issues within Virtual Clinical Education

One of the unexpected components of the shift from live instruction to online clinical education is that in the moment adaptations are harder in the virtual framework. During presentations, the visceral interaction of appreciating student understanding ceases to exist. Understanding must be checked by questioning, or assignment, which denies a range of our perceptive tools used to ferret out the student who is lost or failing to grasp the material (Picciano, 2017). Understanding is reduced to assessment tools, which are very challenging for physical clinical skills. Video-modelled clinical skills are reduced to a single perspective point, which may deny the student’s full appreciation of subtle parameters of the skill set, such as posture, breathing, and practitioner points of attention.

The clinical teacher may not have verbally defined subtle physical dynamics, which were learned traditionally by observation in a physical setting. Many physical skills do not have enumerated and defined procedural dynamics, as they have never been taught online before. The clinical educator may experience difficulty identifying the components of the physical skill, which seem ancillary to the performance; stance, weighting on the feet, angle of hip

placement to the patient, grip strength on the tool in question, etc. Since these factors and many others are “learned by doing,” they carry a personal dimension as each student aligns individual body mechanics to attain an end result. Although the end result performance level is standardized into an agreed level of competency, the student may need to find a unique set of personal internal cues, which allow the attainment of the standard work product. Virtual education cannot carry the necessary holistic presentation to transfer the clinical skill set in its entirety.

Another issue in virtual education is that the lack of shared experience and cognitive space means each student is only partially engaged in a group dynamic. How can the experience be considered a “class” if participants are experiencing varied dimensions and inputs in cognitive construct? A physical class shares the classroom, temperature, lighting, volume, odors, time period, extraneous sounds, etc. The student needs to block out these distractors and create the psychological construct of the class. Though elementary education, students are trained to pay attention to a small range of sensory inputs during the class and follow the instructional thread and transference of knowledge.

The group dynamic lends itself to an inclusive social pressure, which creates a conformity vector, which enables students to shift into the proper cognitive state to participate meaningfully in class. In virtual education the multiplicity of sensory inputs are varied for every student and only the screen images and instructional voice-overs are shared by all. The disparity of these perceptions makes focused attendance to the class material much more challenging for students. They more easily become distracted. The main points of the lesson are missed and need to be repeated. Moreover, the student loses a critical agency to master the material as she must wrestle with simply remaining cognitively in the shared experience of class. This unique virtual education dynamic is highly fatiguing, and accounts for the fatigue and distaste students’ experience, forcing a limitation of length and complexity of presentation.

In clinical education, there is a further difficulty in lacking physical bodies for assessment, requiring instead the use of descriptors – literary or visual (diagrams, images, drawings) to simulate the collection of diagnostic data. The substitution of this limited medium of expression denies the organic intake and development of assessment skills (Wooley 2007). In a clinical setting the student will naturally utilize all senses in the assessment of a patient’s

state. Visual, tactile, auditory, olfactory, as well as analytical interpretive skills combine to diagnose both the ostensive disease pattern and severity metric, as well as the “clinical intuition” which is a summation of the subtle cues and subconscious perceptions that can inform a clinician’s decision-making.

Virtual clinic requires the reduction of the presentation to forms that can be represented through the computer. This changes the operation into a more analytical exercise without the additional components. The learning objective remains the same, but the outcome shifts to a quantitative rather than qualitative measure. There may be long term impact on the skill set and practice models inculcated into those who are educated in a virtual method unlike those educated in a physical one.

Finally, there is the question of assessments. Traditional clinical assessment tools are inadequate to analyze virtual clinical education. Synchronic and diachronic assessment tools can be used, as well as Structured Interaction Rubrics, yet Operational Skill Competency Evaluations (OSCE) cannot. However, the instruments demand that the objectives and outcomes being evaluated be modified to properly assess progress in clinical skills development in a virtual framework. The dearth of experience, feedback, and cross-validated assessment tools, challenges not only the program level implementation of virtual clinical models, but the acceptance by accreditation boards. During the COVID -19 Pandemic the accrediting body for our department allowed a broad range in clinical virtual educational experimentation. However, they limited the clinical hour count to approximately 40% of the total. This number was arbitrary although it reflected an intrinsic understanding that physical clinical skills cannot be attained virtually and OSCE assessments cannot be administered virtually.

Benefits of Virtual Clinical Education

Virtual clinical education has evidenced several benefits. The greatest benefit is the possibility of a more diverse and less common pathology presentation in a virtual clinic as the “patient” is imaginary and can be constructed to represent rare cases or highly underserved populations. The student can be exposed to a virtual patient who highlights important clinical decision nodes, such as hidden emergency patterns that require referral to the emergency room, or issues of child abuse, or self-harm dynamics. The virtual patient presentations can

be structured by the professor to group similar cases and hone the diagnostic skills to differentiate subtle distinctions. Also, the virtual patient can represent a population which is not found in the physical clinic at a given institution due to the social vectors shaping the attending patient body.

Problem Based Learning (PBL) methods can be adapted to the virtual classroom, although they may require multiple parallel narrative lines representing student interventive choices. PBL methods are not new, having been used for over fifty years in medical education with multiple studies that support their educational efficacy (Al-Azri & Ratnapalan, 2014). PBL presents a problem, then allows the students several disparate lines of development based on choices, each line of approach can remediate the presentation to some extent. Although one line may be better, more than one can produce a positive effect. This type of presentation mirrors clinical work, where there is more than one correct answer. However, PBL always requires the development on several narrative descriptive lines of parallel development allowing student choice, the exploration of the result of the prioritization of one set of diagnoses, and the backgrounding of morbid changes for the presentation, which was not treated. PBL holds great potential for virtual education, yet as noted above the skill set required for such virtual case presentation is not usually emphasized in the deductive logical training of clinicians, so faculty may need to expand their educational approaches to embrace this method.

Conclusion

The COVID-19 Pandemic forced online models to the forefront of the educational community. Schools and faculty, which would traditionally not have embraced virtual education, were forced to make online approaches a mainstream method in order to continue the curricular progression of their student body. Clinical education carries unique demands of the mastery of physical skills in concert with the analytical skills, which interweave in the practice of medicine. Although many challenges exist in the use of virtual clinical educational methods, certain components of the clinical model are amenable to the transference into the virtual model. Through virtual clinic, students can be exposed to a range of presentations, which hone their analytical tools.

However, the greatest challenge has come in the creative demands on faculty who has needed to develop non-traditional approaches, which can utilize the emerging virtual technology to surpass the digital divide and adapt learning objectives and outcomes to better suit the online platform. Assessment tools and accreditation requirements have also been adapted to the potential and limitation of the virtual clinical educational milieu. The ultimate impact of these approaches on a post COVID-19 world waits to be seen. However, the necessity of the adaption to the online platforms during the pandemic will certainly have an impact on the evolving pedagogy of virtual clinical education.

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Appendix

The following is a descriptive account of methods applied by the author during the COVID-19 Pandemic at the University of Bridgeport to facilitate virtual clinical education. This selection is excerpted from an email communication on 5/13/2020 to the Assistant Program Director and Faculty Clinic Chair regarding techniques developed and implemented since March of 2020. Student feedback had been favorable to these approaches and they were later considered for general implementation. They may be illustrative of the methods utilized during the Pandemic and may provide insight for other clinical educators in the development of virtual clinical models of instruction.

As for techniques in Zoom, I have employed four major approaches that I feel work.

First, the case is disseminated 24 hours in advance. Then when clinic commences, I allow them 5-10 minutes to review the case and collect their thoughts. Then we jointly analyze the case and I guide the discussion through the Four Inspections. I ask directed questions to students that are leveled to their position in clinic. I discuss the responses and correlate them to the case. We collectively work through the Differential Diagnosis and the Treatment Principles. As we do this, I type a word file with the agreed upon diagnosis and treatment principles. I ask or delineate any biomedical red flags that are present in the case. If there are issues in theory or pathomechanisms I will describe or diagram these points and include them in the word file. Once we have arrived at the treatment principles, I have them generate a “point bank” or herb/formula bank” or “tuina technique bank” or potentially relevant remediation that match the principles. They present and discuss their choices; I record them in the word file. Then we collectively draw from the banks “today’s treatment” and discuss the relevant techniques or adjunctive modalities. We further discuss the suggested treatment plan of administration (time and frequency) and clarify why a certain schedule would be appropriate for the patient. Once we finish and sign off

Zoom, they must write up a soap note of the case that we discussed and email that to me as proof that they paid attention. Then I allow them to submit their 4.25 hours. I email them the word file I generated with notes and diagrams for their reference.

Second, similar to the first method, the case is disseminated 24 hours in advance. Then when clinic commences, I allow them 5-10 minutes to review the case and collect their thoughts. However, the second method has the case written in the words of the patient, as if answering some of the ten questions. The discussion follows many of the parameters of the first method, yet the students must determine what additional questions or information is needed. I have prepared additional material to provide them IF they ask for it. As we develop the differential diagnosis and treatment principles, the coherence or lack of the diagnostic data becomes apparent. The rest of the breakdown and note recording is the same as the first method, however this second method forces them to focus on data collection and relevance even though the cases are not live. As in the first method, once we finish and sign off Zoom, they must write up a soap note of the case that we discussed and email that to me as proof that they paid attention. Then I allow them to submit their 4.25 hours. I email them the word file I generated with notes and diagrams for their reference.

Third, similarly I disseminate the case 24 hours in advance. However, this case is solved when presented with a breakdown of diagnosis and treatment principles. But there are several possible treatment strategies that are based on a hierarchy of pathology. The students are given time to discuss in smaller groups which treatment strategy they will choose and why they prioritize certain parameters more than others. Then we discuss and try to suppose the outcomes of the proposed plan to bring


maximum benefit to the patient. We further discuss possible pitfalls or complications in their plans and how they could be remediated. Again, once we finish and sign off Zoom, they must write up a soap note of the case that we discussed and email that to me as proof that they paid attention. Then I allow them to submit their 4.25 hours. I email them the word file I generated with notes and diagrams for their reference.

Fourth, similarly disseminated 24 hours in advance, I prepare a “speed round” of three cases which have short pertinent data to be analyzed and differentiated. These cases are parsed into acupuncture, dietary treatment, herbs, or Tuina. The students must quickly break them down and determine the diagnosis, treatment principles, technique bank, today’s treatment, treatment plan, and biomedical red flags or concerns. They must meter the “demands/desires” or the patient in the case versus their perception of efficacious treatment (maybe acupuncture seems best but the patient wants Tuina, etc). I use a timer to keep the affective filter high and force a quick analysis. After we discuss them and sign off Zoom, they must write up a soap note of all cases that we discussed and email that to me as proof that they paid attention. Then I allow them to submit their 4.25 hours. I email them the word file I generated with notes and diagrams for their reference.

I believe these methods have produced a higher and more clear understanding for the students. However, I must note that the preparation for the virtual clinic is very demanding and time consuming, more so than regular clinic. I think it attains learning objectives, but if we continue this method after the lockdown, we must consider faculty workload in the assignment of Virtual clinic.

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CHAPTER 17: INNOVATIONS IN THE USE OF ONLINE APPLICATIONS BY A REMOTE INTERNATIONAL FINNEGANS WAKE READING GROUP

Emilio Williams , Julie Boldt , Arthur Kolat , Renee Wehrle 

Chapter Highlights

- The COVID-19 Pandemic forced education online, making clear the need for increased research and experimentation within the digital humanities; virtual classroom environments require new pedagogical approaches to both synchronous and asynchronous teaching.
- Our international *Finnegans Wake* reading group, organized by James Elkins and consisting of scholars, recent graduates, and students, developed various case studies for such digital tools and their pedagogical applications.
- We experimented with various cloud-based applications for annotating, organizing, visualizing, and presenting information about James Joyce's *Finnegans Wake*, one of the most complicated literary works ever written. Using Perusall, Google Drive, Twine, Creately, and Miro, we developed innovative new reading, learning, and teaching methods.
- Members of the group also created a host of new methods for presenting and sharing literary knowledge in intuitive and accessible ways.
- This chapter examines the group's experimental ethos and our scholarly output to present both a model for further inquiry into the uses of cloud-based applications in collaborative textual exegesis and a summative assessment of new tools for collaborative research and online classroom pedagogy.

Introduction

The disruptions to traditional educational models generated by the COVID-19 crisis made more urgent the need to develop new methods of integrating technology into the theory and practice of teaching and learning. Such technological development is in some ways a double-edged sword; on the one hand, the transition to virtual teaching has exposed the digital divide as it exists on a global scale. On the other hand, instructors who have transferred from in-person to online learning have encountered both the frustrations of rapid change and the opportunities to reexamine their pedagogical approach. The authors of the following article understand that not all the lessons learned from their case studies can translate to less-privileged digital environments. Still, we believe that documenting our experiments with online pedagogy and research can inspire other teachers and students to innovate in the fields of pedagogy and literary study.

In June 2020, James Elkins, the E. C. Chadbourne Professor of Art History, Theory, and Criticism at the School of the Art Institute of Chicago, convened an international reading group to study James Joyce's last novel, *Finnegans Wake*. Elkins has for several summers hosted in-person reading groups to study books considered particularly challenging to read. Looking back on our experience as members of this reading group, we recognized that Elkins and his readers put into practice some of the methodologies most urgently needed in traditional classrooms trying to meet the demands of the 21st century. For example, he generated a democratized, student-centered learning environment in which students could develop strategies for shared leadership and empowerment by sharing information along decentralized channels of communication. Such channels, which often incorporated visual and sonic tools for interpreting the text, developed an approach centered around multi-literacies. By offering students with varied capabilities and backgrounds the opportunity to learn with diverse, project-based modes of engagement, this multi-literacy approach produced a model of true classroom inclusion.

This project-based approach also encouraged members of the reading group to follow their own research interests. The four authors of this report utilized cloud-based applications to generate and share both new knowledge about *Finnegans Wake* and innovative approaches to reading the text. In order to contextualize why these new approaches emerged, we will first explore how this text called for the innovations that our group produced. Then, we will

describe and analyze our own use of Perusall, G Suite, Twine, Creately, and Miro to demonstrate the benefits of incorporating digital applications into literature classrooms and online instruction. Finally, we will argue that the use of online applications within virtual and in-person classrooms is an important topic for further inquiry, given the vast capabilities for literary analysis and communication of research that such applications afford students and teachers.

Why *Finnegans Wake*?

As an experimental text interested in pushing the boundaries of language, *Finnegans Wake* prompts its readers to find alternative modes of reading and interpretation. Joyce spent 17 years writing this last work, with some sections undergoing over 20 drafts. With each iteration, he introduced more riddles, word play, obscure references, and other ambiguity-producing devices; consequently, over each revision, the text became increasingly opaque. The intentional density of the text—whether at the level of content complexity or language ambiguity—forces its audience to reevaluate normative forms of reading. *Finnegans Wake*'s inherent structural focus on hyperconnectivity, interactivity, and visuality make its study applicable in the context of educational concerns related to online literacy and literature pedagogy.

A book of constant contradiction, *Finnegans Wake* was intended to be frustratingly impenetrable, and at the same time accessible. Boasting about his text, Joyce claimed, “I’ve put in so many enigmas and puzzles that it will keep the professors busy for centuries arguing over what I meant, and that’s the only way of insuring one’s immortality” (Gray, 1998). But at the same time, he saw his work as perpetually reflective and resonant. Joyce “wishe[d] to originate a flexible language” and wanted “to believe that anybody reading his work gets a sensation of understanding” (McAlmon, 2013). Such local specificity builds nodes of possible connection and access between *Finnegans Wake* and any of its readers. That the text encourages such personal connection with it is important. According to David Letzler (2017), *Finnegans Wake* and other examples of what he terms “meta-novels” tend to modulate attention from “unreadable” informational overflow and toward what a reader finds personally decipherable. Letzler argues that learning to parse the difference between information and meaningful data is a necessary skill for readers living in an age of increasingly vast amounts of data and complexity. In the face of such data and complexity,

our group found online applications to be useful tools for charting, mapping, and otherwise visualizing our own personal interpretations of the text.

Therefore, the process of reading *Finnegans Wake* involves a great deal of interactivity between the text and its readers. In many ways, this interactive quality is the engine that drives meaning production within *Finnegans Wake*. Sam Slote (2014) compares the process of reading *Finnegans Wake* with that of reading *scriptura continua*, the textual byproducts of the early Western tradition of writing without punctuation or spaces between words. He suggests, “the multi-layered complexities of the text invite the reader’s own initiative into a textual negotiation, in effect requiring the reader to provide her own punctuation to her individual act of reading” (p. 33). For Slote, this balance of agency in reading and understanding meaning returns power to the reader so that readers can each “create their own wakes” (p. 37). Here, Slote expresses the notion that each reading of the text produces a different interpretation of *Finnegans Wake*. While this is generally true for any text, *Finnegans Wake*’s form and experience foist a constant imperative to subjectively produce meaning onto the reader, casting light on the need to establish and track highly individual processes of meaning construction.

Despite being one of the most complex novels ever written, *Finnegans Wake* actually places its readers back in the most elemental state of literacy, almost as if its readers must learn to read again. The density of its language and textual references forces readers to parcel/piece together disparate activity; any readerly passivity or illusions of linear motion through the text are dissolved. In response, readers must adapt to—and even create—alternative strategies of reading. *Finnegans Wake* breaks down Saussurean semantics, but importantly, in its dissolution, creates new systems of managing the chaos of language.

In response to complexity and indefinite meaning, *Finnegans Wake* prompts its readers to create their own organizational systems to make sense of its hyperconnected structure of motifs. A lead Joyce scholar, Roland McHugh (1976) argues that “the difficulty of absorbing *Finnegans Wake* results not merely from the highly fragmented nature of its text but also from the fragmented nature of the absorption process itself” because, without the aid of a specialized cataloguing method, readers will quickly forget the individual or isolated moments of meaning or sense that they encounter or produce (p. 1). Here again, an individual’s processing of the text is central to its analysis; as our case studies demonstrate,

Finnegans Wake invites unique approaches to cataloguing information. McHugh’s observations point to the importance of archiving and note-taking to build meaning when research is necessary for the act of reading.

Both historically and within our own reading group, the cataloguing McHugh describes often finds its visual form in "mapping", i.e, a good example of this mapping is Adeline Glasheen’s *Third Census of Finnegans Wake: An Index of the Characters and their Roles* (1977), one of the now classic reference works in *Finnegans Wake* studies, which prefaces its dictionary-formatted material with a chart of characters entitled “Who is Who When Everybody is Somebody Else.” This chart, a sort of cast-of-characters spreadsheet, identifies the general archetypes embodied by each permutation of a character’s name (see Figure 1). By lining up characters in a table, Glasheen relies on graphic tools for analyzing the text (as minimalistic as it may be in this case) to communicate macro connections within the work. Moholy-Nagy’s 1949 diagram of *Finnegans Wake* represents a similar, but more drastic, turn toward visual analyses of the text (see Figure 2). His hand drawing creates a dense, interconnected form that follows roughly the same characters as Glasheen. However, his increased visual structure enables him to expand his study’s scope. Rather than just following the various character avatars and their connections, Moholy-Nagy also embeds them within additional layers of meaning and interpretation.

WHO IS WHO WHEN EVERYBODY IS SOMEBODY ELSE

$E \begin{smallmatrix} \square \\ \square \\ \square \end{smallmatrix} \exists$ HCE	\wedge SHAUN	\sqsubset SHEM	I ISSY	Δ ALP	OTHER
Tim Finnegan	Male guests who	fight at the wake	1) Female mourners at wake; 2) Whisky	Mrs Finnegan	4 are guests at wake who hold down rising Finnegan—not in ballad
Divine and human builder	What, among other things, he builds			Nature	4 are 4 elements, winds, NSEW
Masterbuilder Solness	Younger generation		Hilda	Aline	
Sun, all that fertilizes, now vital, now dormant			Stars, esp. Venus	Moon	
Howth, Dublin, Phoenix Park are the body of the sleeping giant	Left bank of the Liffey, Co. Wicklow	Right bank of the Liffey, Co. Meath	?Chapelized	River Liffey	ALP’s father is Lir, the sea 4 are Irish provinces Ass is missing 5th province, Meath
Invaders of Ireland: Norse, English	Native Irish who emigrates	Alien who becomes Irish	Dark Rosaleen	Ireland Poor Old Woman	Kate is Cathleen Ni Houlihan
Earwig	Ondt (Ant)	Gracehoper	Insect girls		
Fish Sometimes fox, lion, bull, swan, deer, etc.		Ass		Hen	Man Servant is bear 4 are angel (or man), lion, calf (or ox), eagle
	Mookse (Pope Adrian IV)	Gripes	Nuvoletta (cloud)	Moon	

Figure 1. Glasheen’s Chart “Who is Who When Everybody is Somebody Else”

As Glasheen’s and Moholy-Nagy’s diagrams illustrate, there is already a rich and growing tradition of incorporating visual images into studies of the complex language and structure of *Finnegans Wake*. Visual images are useful, in fact, precisely because of their ability to catalogue information and contain aspects of the text’s complexity within simple schemes and gestures. Building on these static, printed diagrams, our various experiments in visual analysis of the text suggest that internet-based platforms and contemporary software solutions can significantly expand the possibilities of analyzing texts with the use of visual charts, diagrams, and maps.



Figure 2. Moholy-Nagy’s 1949 Diagram of Finnegans Wake Characters

Case Studies: Perusall

Perusall, a free online platform that allows students to collectively annotate texts, was our reading group’s home base. It allowed us to comment on indexed, shared PDFs; to add comments, questions, hyperlinks, and images; and to chart the progress of our conversations by displaying those contributions on-screen. Perusall’s interface records and unfurls a discussion at any spot in a scanned text, which allowed our team to perform close readings of selected passages at the same time as it functioned as a repository of past discussions for us to revisit and reference (see Figure 3).

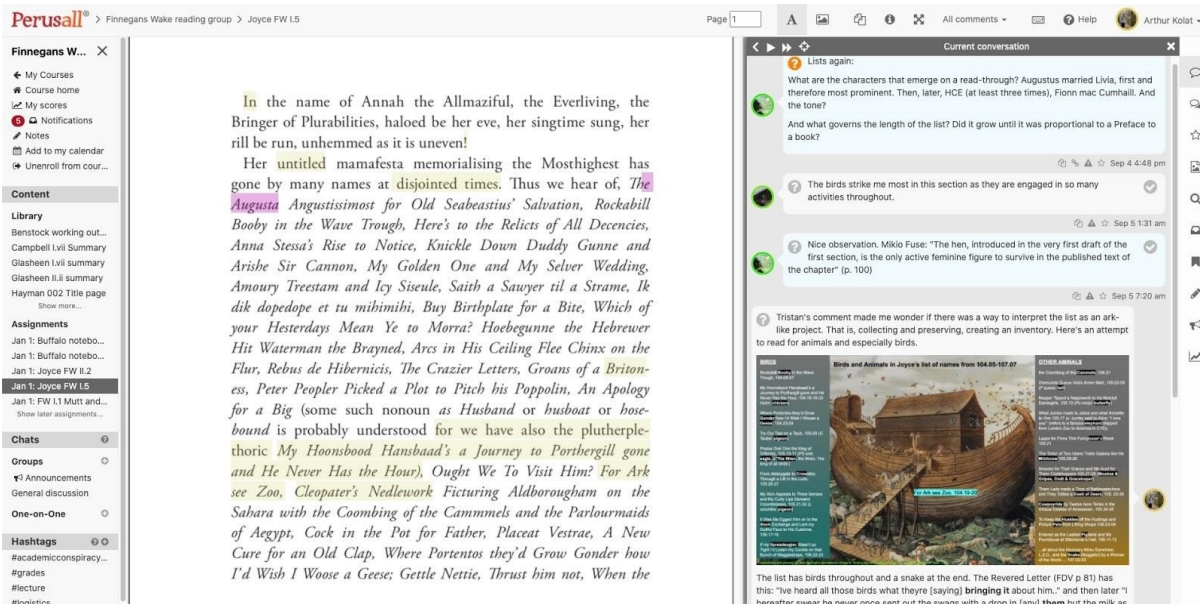


Figure 3. Screenshot of Perusall’s Peer-reading and Comment Function

In fact, there is a growing literature about the use of Perusall in the classroom, most recently because of the practical applications that it offered during the remote teaching emergency caused by the COVID-19 pandemic. Researchers have shared positive results from using Perusall in higher education virtual classrooms (Adams, 2020; Cecchinato, 2020). In addition, philosophy instructors teaching during COVID (Biro, 2021), or physics before COVID (Miller, 2018), have found Perusall to be a useful tool. Research has also confirmed that online collaborative reading increases student engagement in otherwise challenging and discouraging circumstances (Lee, 2018). Additionally, Perusall facilitated better comprehension of *Finnegans Wake*. Our members’ ability to easily access the comments, hyperlinks, and images embedded in the comment bar made the text more accessible and enlivened the often-arduous process of reading this text. By using Perusall we confirmed the “perceived usefulness of a strategy-based peer annotation system for improving academic reading comprehension” that some research has already anticipated (I-Jung, 2016).

Perusall’s comments sidebar or conversation panel functioned for us the way that marginalia had in earlier centuries. Prior to the advent of printed text, marginalia were considered both an aide to reading, operating as a personal form of interaction with the text, as well as a collaborative form of learning (Jackson, 2001). Joyce himself was interested in marginal notation and even incorporated marginalia into the typographic layout of parts of *Finnegans Wake*. So while the incorporation of marginalia into the digital realm presents new

possibilities for organizing group readings, it is still an approach that Joyce would have recognized and is therefore a particularly apposite one.

Google Drive and Google Suite

Perusall allowed our group to engage in asynchronous and real-time conversations in which we could open up the conversation panel for a particular point in the text and find all of our remarks, questions, hyperlinks, and embedded images. This mode of communal textual annotation and discussion had two important consequences in terms of the other cloud-based applications with which our group began experimenting. First, as the repository for materials related to a particular spot in the book, the sidebar could sometimes become quite crowded, especially in places of greater group interest (see the crowded pane on the right-hand side in Figure 1). It therefore became expedient to put hyperlinks in the comments that could direct participants to more space-consuming materials, like spreadsheets or slideshows. Second, the Perusall comments and their threads have the ability to become the birthplaces of more elaborate analyses and interpretations. The confluence of these two factors—the genesis of a project *within* the comments pane and the ability to link to more complex materials *from* the comments pane—provided the impetus for Arthur Kolat’s exploration of Book I, Chapter 5 (I.5) of *Finnegans Wake* using the suite of tools widely available and free of cost in Google Drive.

On October 3, 2020, roughly one month after embarking as a group on I.5, one group member attached a comment in Perusall to the following bit of text from page 121: “which paleographers call *a leak in the thatch* or *the Aaranman ingperwhis through the hole of his hat*” (Joyce, 1939, p.121.11-12). Joyce’s language in this passage is a clear parody of Edward Sullivan’s *Introduction to the Book of Kells*—an Irish illuminated medieval manuscript that Joyce would have known—and this participant’s comment wondered about that: what type of narrative artwork was the *Book of Kells* and to what degree could it be seen as an analogue for *Finnegans Wake*? Besides Sullivan, were the voices of other *Kells* scholars to be heard in Joyce’s satire? A couple of hours later, the group’s instructor replied in the comment thread:

Arthur (since you've made the most thorough survey): what proportion of Joyce's allusions to Sullivan pertain to the text (eg, the 'C' symbol) and what to the Celtic ornamentation? To the extent that the Book of Kells = FW, Joyce seems to be applying design details in the Book of Kells to properties of writing. I.e., what's happened to the

visual in this parallel?” (Elkins, October 3, 2020, 9:36 CDT).

To catalogue Joyce’s allusions to Sullivan and the *Book of Kells*, Kolat set up a spreadsheet in Google Sheets to array these three books together, eventually adding a fourth: *Buffalo Notebook VI.B.6*, which contains the page-by-page chronological notes that Joyce took as he read Sullivan’s *Introduction*. Because Kolat had digital copies of all the books, he was able to cut and paste, extract pages, hyperlink to possible references, align and reconfigure, and ultimately shuffle files into a dense network of hyperlinked reference texts and images. These files span across various facets of Google Drive—Sheets, Slides, Docs, Folders—and culminate in a series of oral readings with visual accompaniments and one lecture, which he published as YouTube videos (<https://tinyurl.com/jajjt6p4>). Overall, this multichannel, synergistic network of materials enabled him to coordinate visual, textual, and audio information to produce original, convincing, and sometimes eccentric interpretations of a famously inscrutable book.

The central feature of the spreadsheet is its ability to juxtapose bits of information, placing them next to each other while keeping them separate. The hyperlink operates similarly, pointing to relevant information and summoning it on demand. The philosopher Bruno Latour posits that there is power derived from this type of correlating and juxtaposing files, or paper shuffling, as bureaucratic processes are sometimes derisively termed. By paper shuffling, Latour argues, domains which are far apart are brought close together. Domains which are “convoluted and hidden become flat; thousands of occurrences can be looked at synoptically...files of files can be generated...until a few men consider millions as if they were in the palms of their hands” (Latour, 1990, pp. 54-55). An analogous operation occurs digitally via the tools in Google Drive: image, text, and audio files are arrayed across a variety of formats—spreadsheet, slideshow, document, and video.

Arranging *Finnegans Wake* materials into a kind of hyperlinked intranet allowed possible meanings to resonate in new constellations. In Google Drive, Kolat brought together far-flung, convoluted, and hidden domains, flattened them, and tried to look synoptically. *The Book of Kells* is case in point. The manuscript resides at Trinity College Dublin, whose website has provided high resolution scanned images for all 680 extant pages since 2013. Kolat was therefore able to page through the book in order to take screenshots of details and place them in a Google Drive folder for later use, not only as the source files for hyperlinks,

but also as the raw generative material of the slideshows. His aim for the slideshows was to put forth plausible visual glosses for the units of text that run roughly from pages 119 to 124, the section in which Joyce's parody of Sullivan rings most loudly. In formulating the visual glosses, he relied heavily on the synoptic ability of the Google Drive app for mobile phones, where he could access his archive of *Kells* screenshots wherever he was, and swipe through quickly if he was browsing for a fit or looking for a particular image or set of images. Scrolling or swiping through images on the screen of a smartphone is now a ubiquitous practice of contemporary life. When those images constitute an archive of hundreds, the ability to adroitly manipulate and manage them becomes integral to the student's ability to shuffle and juxtapose. The functionalities in Google Drive's app for smartphones—the abilities to view thumbnails, swipe quickly, and search—can allow the student, or anyone with a link to the folder, to consider an archive of hundreds or thousands *literally* in the palms of their hands, to paraphrase Latour. Additionally, Kolat archived many single sheets of paper, extracted with Adobe Acrobat from PDFs of Sullivan's *Introduction* and *Buffalo Notebook VI.B.6*. This allows individual pages to be hyperlinked into the relevant cells in the spreadsheet.

In many cases, when taken together, the image and text combinations in Kolat's first slideshow produced strong ambiguities, while at the same time bypassing readings that alternate images might have activated. He presented the slideshows in Zoom, recorded them, and posted his illustrated oral readings on YouTube such that a listener/viewer can take in textual and visual information simultaneously. One such ambiguous reading was the visual gloss for the following line: "the four shortened ampersands under which we can glypse at and feel for ourselves across all those rushyears the warm soft short pants of the quickscribbler" (Joyce, 1939, pp.121.36-122.02). Kolat illustrated this with five images of the illuminated compound letters ET from the *Book of Kells*, a type of ancient elision that evolved gradually into the ampersand of today (see Figure 4). Because of the juxtaposition of text and image, a number of questions arose about what an imagined reader of *Finnegans Wake* might be expected to hold in mind when encountering this textual unit. Linguistically, it is a parody of the way Sullivan describes the *Book of Kells* in his *Introduction*, but do the ampersands refer to the *Book of Kells* or to the fictional letter that the chapter is ostensibly about? Joyce characterizes the ampersands as scribbled quickly, but to hold the *Book of Kells* in mind means understanding the patient labor that wrought such compound letter illuminations as well as their effect on the pace of reading. Kolat explored these and other

ambiguities visually by means of creating further slideshows (see Figure 5). The slides, like the screenshots and the pages of the PDFs, exist also as individual images in a folder for purposes of hyperlinking them to the spreadsheet.

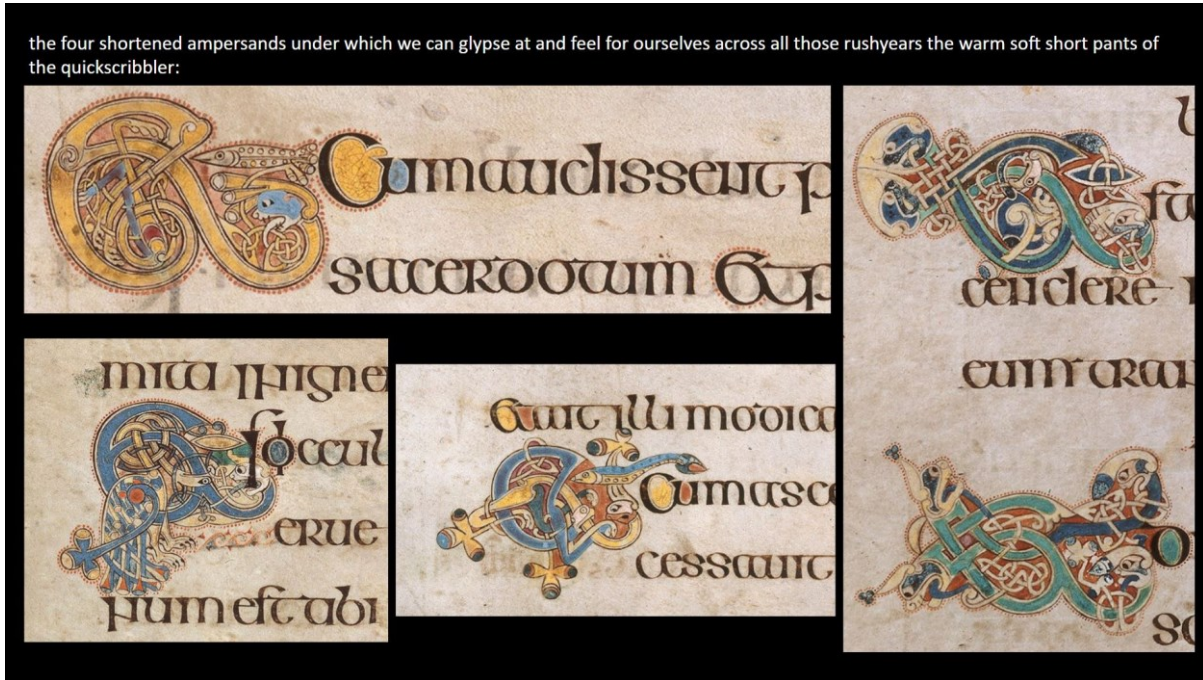


Figure 4. Slide of Visual Gloss of Finnegans Wake, 121.36-122.02

121.36-122.02: the four shortened ampersands under which we can glypse at and feel for ourselves across all those rushyears the warm soft short pants of the quickscribblor

	Reading	Writing	Reason	Joyce's language
FAST	& makes reading fast	& makes writing fast	contraction/ligature	shortened; rushyears; quickscribblor
SLOW	illuminated compound initial ET makes reading slow	illuminated compound initial ET makes writing slow	intricate illumination arrests the eye and takes time to execute	

- the evolution from ET initial to &
- reading FW
- reading the Book of Kells
- copying the Book of Kells (writing)

- compound letters, abbreviations
- the immediacy of handwriting (the ability to identify with the quickscribblor across all those rushyears)

FAST

(Mass.) of the last of the first to Dear whom it proceeded
 ntion Maggy well & allathome's health well only the ha
 ned the mild on the van Houtens and the general's election
 with a lovely face of some born gentleman with a beautiful prese
 wedding cakes for dear thankyou Christy and with gran
 ferall of poor Father Michael don't forget unto life's & Mugg
 well how are you Maggy & hopes soon to hear well & must no
 se it with fondest to the twoinns with four crosskisses for ho
 al holy corner holipoli whollyisland pee ess from (locust ma
 eat all but this sign shall they never) affectionate largelooking
 the sta... a t...rcau

Figure 5. Slide of Ambiguities in Finnegans Wake, 121.36-122.02

Returning to the question at the heart of this research project—what percentage of Joyce’s allusions to Sullivan pertain to the text as compared with the Celtic ornamentation?—it appears that there is no easy answer. It is not certain that Joyce’s allusion to Sullivan at this moment necessarily conjures the illuminated compound letters of the *Kells* manuscript as vividly as Kolat’s visual gloss does. But if it does conjure them at all, then it would have to be decided whether compound initials count as text or illumination or both. In any case, the Google Drive ecosystem can accommodate such ambiguity and uncertainty. On the spreadsheet, at the intersection of the row that deals with this line and the column that holds notes on visibility, Kolat placed hyperlinks to images of both slides. Reading the spreadsheet horizontally, therefore, enables these interpretive configurations of images to always live one click away, alongside other correlated information (see Figure 6).

FW page	FW text	ES page	ES text	B of K page D'Olier	Illuminations v. Script	Visuality	Notes	VI.B.6 page	VI.B.6 unit	VI.B.6 note
119.12	those indignant whiplashoes			41v, 44r, 85v, 90r, 100v, 102r, 103v			FDV has "whiplashoes"			
119.12-13	those so prudently bolted or blocked rounds	35-36	The stops square in shape. Another point, has been overlooked by all palaeographers. None of them seems to have noticed that the dots of which the punctuation is formed are in the Kells volume almost always square in shape, or quadrilateral—not round. In no other manuscript or reproduction that I have seen are there such clear-cut, square-shaped stops as in the Book of Kells.	70	SCRIPT – punctuation (stop)	Slide from visual gloss				
119.13-14	the touching reminiscence of an incomplet trail or dropped final	11	There are many unfinished portions in the whole page: for instance, the small face to the left of the upper limb of the L, the piece of the border of the same limb just above and to the right of the face, and possibly the space into which the right elbow of the upper figure projects. But more noticeable than all these is the unfinished condition of the interlined letters ER in the circle which forms the lower portion of the antique and curiously formed B. The dark line surrounding the red E is only half completed.	29	ILLUMINATION – figures, borders, letters	Slide from visual gloss				
119.14-17	a round thousand whirrigy glorioles, prefaced by (stair) now (ingibe) any plumedights, all liberously amberbellishing the initials magiscule of Eanricke.	16-17	The text of the Gospel according to St. Matthew follows in large uncial and minuscule combined, initial letters of a highly ornamental character being freely used at through, but without any repetition of design.	34	ILLUMINATION – decorative vitrifiggs	Slide from visual gloss		37	VI.B.6.041(k)	a round 1000
119.17	the meant to be baffling chrismon trillithon sign E		"Tunc crucifixerunt XPI cum eo duos latrones." ("Then there were two thieves crucified with him"). The "XPI," which seems to belong to the sentence, is, as pointed out by Sir John Gilbert, probably only the mediaeval note-mark composed of the monograph of "Christ," which was arbitrarily used to call attention to remarkable passages. It was known as the <i>Chrismon</i> .	36	SCRIPT – initials majuscule script	Slide from visual gloss		61	VI.B.6.057(j) - l	uncial > minuscule > initial
119.32-33	the steady monology of the interiors	18	This page of the Genealogy, contains a string of O's with which are interlined a number of droll and impish figures in various grotesque positions, with legs tucked under their arms, and tongues protruding. They pull each other's hair from behind, and one has his toe thrust under the nose of another figure in front. The uppermost of them even carries something resembling the air-bladder of pantomime, yet all the contortions of their limbs are contrived to fall in with the interlocking of the prevailing scheme of the design, a tour de force, as it were, of a big and genuinely human artist in holiday mood after months, or even years, of serious and reverent toil.	124r	SCRIPT – highlighting	Slide from visual gloss		60-61	VI.B.6.057(m)	trumpet XII = Chrismon
119.33.120.01	The pardonable confusion for which some blame the cudgel and more blame the soot but umbilics to which the pees with their caps airy are quite as often as not taken for kevis with their tails in their or are quite as often as not taken for pees with their tails in their mouths	20	Dotted patterns. Dots, too, mostly red in colour, are one of the leading features of the less important details of decoration. Their more usual employment in the Book of Kells is for the purpose of adding as it were a fringe to exterior lines. Their use is very frequently relied on in the case of the smaller initials.	34r (P) 63r (P) 200r (Q)	ILLUMINATION – letter embellishment	Slide from visual gloss		58	VI.B.6.055(j)	some blame [him] / & more – the soot
120.02-04	the curt witty wolly dashes never quite just right at the fore late truth letter	40		36	ILLUMINATION – letter embellishment	Slide from visual gloss		26	VI.B.6.033(p)	svollen pees as often as / not
120.04-05	the sudden spluttered petulance of some capitalised middle					Slide from visual gloss		55	VI.B.6.054(f) VI.B.6.054(b)	splitter 2 kinds of capital
			The Monogram page. Facing the eight-circled cross is what is known as the Monogram page (Plate IX), containing the three opening words of St. Matthew, i. 18. "XPI (Christ) autem generalis—the whole farming, as Professor Westwood rightly remarks, the most elaborate specimen of calligraphy which was perhaps ever executed.			Both the word (Christ) and the Redmoss S os are hiding in the Monogram page. Hiding in plain sight, hiding in the profusion?	That scene on the chi-rho page is distinctive, and very distant			

Figure 6. Spreadsheet FW (I.5) - ES - B of K - VI.6.B

Because of its pervasiveness and accessibility, Google Drive may have a relatively low barrier to entry for many students while also allowing them to put an enormous amount of organized information at their fingertips. This empowers students as finders and producers of knowledge and allows them to collaborate with each other. For example, Kolat gave spreadsheet editor permission to his fellow group members so that they could comb through the materials and propose interpretations. In this way the spreadsheet became a collaborative and interpretive reference work.

Preparing and housing materials in Google Drive also has the benefit of asynchronous

presentation, that is, students can use non-class time to deliver or watch presentations and lectures, leaving class time for discussion or other activity. Finally, our group chose Google Drive as the archive for all our materials. We set up a Google Doc with hyperlinks to our various projects. Now, a link to that Google Doc will allow us to easily share what knowledge we did produce with those who might find it interesting.

Google Earth

It is not frequently discussed that Joyce's writing of *Finnegans Wake* was a very collaborative process. Because of the unconventional nature of his enterprise, the continuous financial woes of the Joyce family, as well as James Joyce's debilitated sight, Joyce depended on his friends, colleagues, and champions to bring his magnum opus to final publication. The cast of characters involved in that project included his pro-bono secretary Paul Leon and his wife Lucy; Maria and Eugene Jolas, publishers of *transition* magazine; and Caresse and Harry Crosby, owners of The Black Sun Press, one of the publishers of early fragments of the Work-in-Progress, which later became *Finnegans Wake*.

This group of helpmates shared with James Joyce a faith in the project at hand, and also a district in Paris right in the shadow of the Eiffel Tower. All of them lived and/or worked in the 7th arrondissement in the Left Bank of Paris. During their Paris years (1920-1939), the Joyce family resided at more than eighteen addresses. The two apartments where they spent the most time were located at 2 Square Robiac (1925-1931) and 7 rue Edmond Valentin (1935-1939). Both were in this arrondissement of Paris and walking distance to the home of the Leons, the office of *transition* and the home of the Crosbys. (Bowker, 2012)

Emilio Williams, who has been researching these sites for a few years, used Google Earth to map the homes and offices of this circle of supporters and champions. The application allowed the reading group to compare Parisian historical photographs with current street views of unmarked locations that were important in the creative process of *Finnegans Wake* from 1923 to 1939. Google Earth is therefore helpful not only in establishing geographical and biographical correlations, but also to present such findings in a virtual classroom in a way that is visually compelling. This feature is, of course, no substitute for a field trip or summer class in Paris, but it served as a small consolation in the difficult times of COVID-19.



Figure 7. Google Earth showing Locations where Joyce worked on *Finnegans Wake*

Twine and Creately

As a text so full of ambiguity, *Finnegans Wake* heightens the necessity of tracking one's progress through sentences, paragraphs, and sometimes even words. Interpretations of Joyce's multilingual puns, for example, can simultaneously open and foreclose possible meanings within the text. This problem of multiple, branching meanings also raises the question of what sorts of meaning a reader can hold in mind as they encounter the text, and it also increases the importance of each interpretive choice that a reader makes. One textual structure that functions much in the same way is the interactive fiction game, a genre of video game that similarly makes players and students alike more aware of the meanings of their interpretive choices (Ostenson, 2013, p. 74). Text-based literary games, like choose-your-own-adventure novels, adapt with a reader's choices in much the same way as the meaning of *Finnegans Wake* sentences can shift once a reader chooses an interpretive path through the text. By making such choices more visible to readers, games and Ergodic texts like *Finnegans Wake* thereby highlight literary structures that produce plot and narrative within a text (Ostenson, 2013, p. 76).

Similarly, a reader's path through a complex text, though initially multiplex, will often narrow as the reader learns the conventions of plausibility that such a text provides. For example, the word "cant" on page 109 of *Finnegans Wake*, could refer to a number of

different possible meanings. It might mean a nook or niche, as it does when it appears within 17th century texts. It might also refer to the side of a cask (from French, *chanteau*) or to a polygon's corner. Then again, "cant" also means a private language or jargon. However, in context, the sentence in which "cant" appears also makes use of another Dutch word, "kwestie." In Dutch, "kant" means "side," and because of the co-occurrence of two Dutch-sounding words in close proximity, meanings of "cant" that relate to the Dutch meaning, "side," are slightly more plausible than meanings that relate to particular trades (like barrel making). Just as *Finnegans Wake* encourages readers to develop a framework for assessing the plausibility of various possible meanings, video games that emphasize problem-solving also require players to synthesize their knowledge and experience to select the most plausible solution from an array of playable options (Dickey, 2006, pp. 252-253).

Within this process of producing meaning from an analysis of plausibility, readers of *Finnegans Wake* produce their own context within the text as a whole. Joyce's language in *Finnegans Wake* is his own sort of hyper-complicated jargon; in the conventions of his language, reading "cant" as an approximation of or reference to Dutch is not only a fairly normal possible option, but it is also a comparatively tame sort of pun. It is not always so simple for readers to determine the conditions of plausibility within a sentence or paragraph, and for that reason, readers also balance minute wordplay against large-scale structural interpretations of the text that cut across chapters, books, and the work as a whole. In this way, readers of *Finnegans Wake* must constantly develop their own context—often based on both formal and structural components of the text—in order to "read" the text. This readerly position of using structural clues such as archetypes or character tropes in addition to small details to comprehend which path through the text is plausible or rewarding for a particular reader is similar to that in which video game players find themselves as they navigate the world of a game to complete their quests.

Because *Finnegans Wake* places its readers in positions comparable those in which video game players find themselves, it provides a compelling argument for incorporating text-based games into its study. Over the course of our reading group's progress through the text, Renee Wehrle used Twine, an open-source tool for producing interactive, text-based games, to produce games based on language from Book I, Chapter 5 and Book I, Chapter 8 of *Finnegans Wake* (see Figure 8). Such games heightened our group's awareness of the cognitive frameworks that we deployed in order to produce meaningful interpretations of the

text, both in relation to narrative and in relation to plausibility. In doing so, they helped Wehrle map her own process of reading *Finnegans Wake* to track which kinds of meanings could be held in mind while moving through the text.

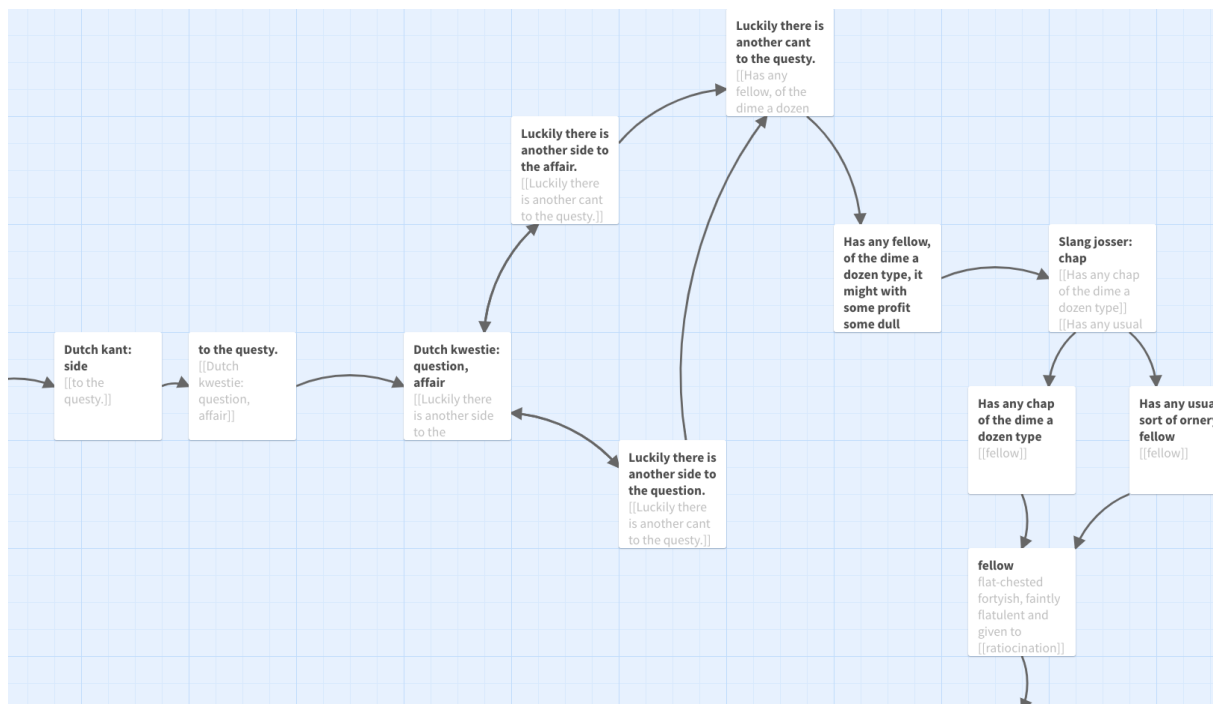


Figure 8. Sample of Twine Code Units

Such a reading method, which builds on digital and process-oriented interfaces to construct arguments about a text, produces a kind of multiliteracy that is necessary for students in 21st-century classrooms. The increasingly globalized nature of the world of communication necessitates, as argued by the New London Group, such multiliteracy. This sort of literacy enables students to navigate growing diversities of culture, language, and medium. Because video games encourage design-oriented, active learning that engages various symbolic systems—whether visual, auditory, digital, or embodied—they allow students to develop a form of literacy that is multimodal (Beavis, 2014, p. 435). By layering words, images, sounds, and other signs into an integrated plot and narrative, video games require the same kinds of multiliterate interpretation that reading *Finnegans Wake* demands.

In addition to studying Twine’s pedagogical possibilities, Wehrle also used Creately, a digital flowcharting software, to depict the processes at work within *Finnegans Wake*, which often engage several simultaneous modes of communication, whether sonic, textual, or contextual. To do this, she analyzed a particularly multimodal line on page 339, which reads (in part)

“Say mangraphique, may say nay por daguerre!” This line is a complex pseudo-transliteration of a comment general Bosquet made during the Charge of the Light Brigade. Referring to a miscommunication in the Battle of Balaclava that resulted in fatally dispatching the brigade in the wrong direction, Bosquet remarked, “C’est magnifique, mais ce n’est pas la guerre.” In English, the statement translates as “It’s magnificent, but it’s not war.” Joyce’s uptake of the phrase, however, can be translated across both the axes of traditional language translation and what Wehrle has termed “auditory approximation.”

On the one hand, bearing Bosquet’s original exclamation in mind, the Joycean phrase can be read as a transcription of the sounds of the French language. “C’est” simply becomes “say,” an English-sounding equivalent, and “mais ce n’est” transforms into “may say nay.” This phrase (“may say nay”) then, could mean that the speaker might literally “say no.” Within this model, the mode of literacy that must be deployed is one that centers around homophonic auditory approximation and representation. In this case, “say” can be understood as a way of beginning communication (as in, “Say, what do you think of this?”). On the other hand, the phrase can be understood, in some ways, as a playful *translation*—and complication—of Bosquet’s quip. According to that understanding of the phrase, “say” in Joyce’s text becomes a reference to the original quote, and therefore, stands in for the meaning of “c’est.” In this case, the transliterated signifiers point back to the original meaning of the quotation so that “may say nay” is meant to indicate the meaning of “mais ce n’est.” Here, the mode of literacy deployed is closer to a kind of symbolic equivalence between languages that can mediate the relationship between misheard French and its transcription. In either case, each step of interpreting this single sentence requires a multimodal approach to translation; readers must both be aware of, and choose between, the possible means of understanding the phrase and then select a possible meaning of the phrase in order to move forward (or backward) with their reading (see Figure 9).

Put together, both Twine and Creately allow readers the opportunity to track their own cognitive processes as they work to interpret a text. Though our group consisted of two professors, a few students with master’s degrees, an engineer, and an undergraduate, our explorations with these digital tools are equally applicable for use in K-12 English classrooms. In addition to offering benefits to classroom learning, such as developing student multiliteracies, incorporating Twine into a classroom can teach students basic coding skills at the same time as it shows them the mechanics of literary structures like plot, narrative, and

meaning in a text. Creately can also empower students to study their own interpretive methods by offering them a visual mode of communicating their interpretations of a text's meaning or development.

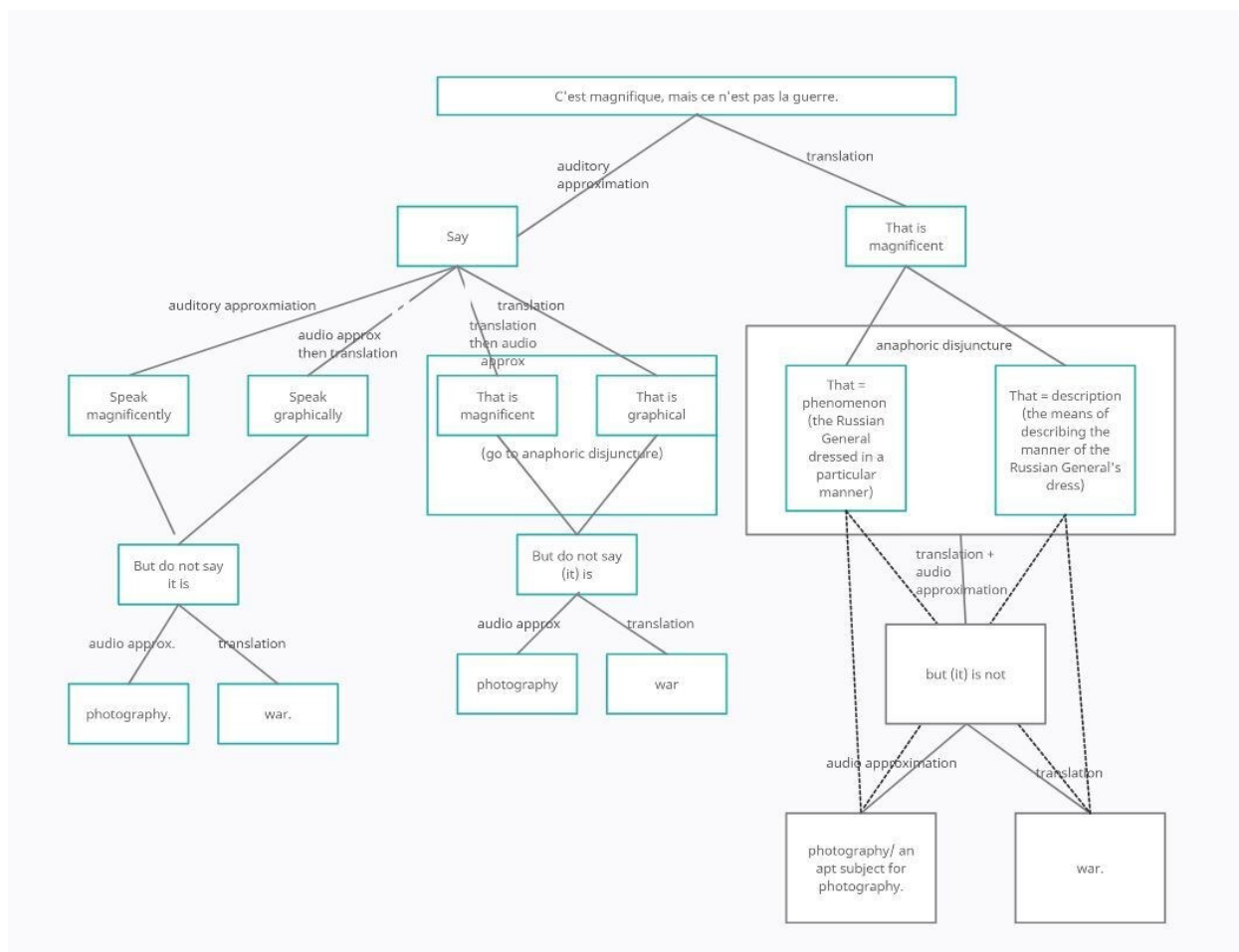


Figure 9. Sample Creately Diagram

Miro

In terms of our reading group, notably, none of our members produced an exclusively textual project; every analysis involved some form of visual presentation. In particular, a large portion of the members gravitated towards various mapping structures via online applications such as Miro and Creately. Though the text we dedicated ten months to tackling is an outlier in its explicit work dismantling and challenging language, the projects point to larger applicability outside of our focused studies. Joyce did not invent complicated, multivariable ideas, but the muddle of his complexity led us to these interactive, visually based applications.

Beyond *Finnegans Wake*, both programs are useful options in classroom instruction, as they allow students to generate their own mental maps or concept maps of ideas and texts without requiring prerequisite training or coding knowledge. They promote an accessible form of construction rather than reproduction, an idea essential to educational digital technologies. Rowsell and Wohlwend (2016) propose a new “rubric based on participatory literacies” to evaluate literacy apps, shifting their focus away from an app's "content" and "ease of operation," and toward its "impact on children's opportunities to develop skills and dispositions as producers rather than consumers” (p. 197). Essentially, it is a rubric designed “based on participatory literacies.” As in *Finnegans Wake*, the notion of interactivity is essential. Among their six criteria for evaluating usefulness, “productivity” was judged by the app’s ability to “enable creative actions or content additions instead of preset components (e.g., make or import own content)” (Rowsell and Wohlwend, 2016, p.197). Miro is well-suited to address these educational needs as it requires active engagement with the material.

In this case study’s four Miro charts (see <https://tinyurl.com/3bnr8666>) Julie employed a series of lenses applied to a common focalized subject, the names of a reoccurring trio. What began as one chart expanded to four. Although the materials are linked by subject matter, they communicated various idea threads differently and thus required alternative modes of presentation. Miro’s custom option, which visually constructs these self-generated systems, encouraged a sense of agency via organization. It allowed form to adapt to the analysis and subsequent content. However, the app also offers a range of predesigned templates. They can be a useful foundation when assigning a specific task but are always amenable to structural editing. Students can alter or abide by the system as much as they would like.

The first Miro chart operates as a birds-eye view by focusing only on the isolated names and their transpositions throughout the entire book. This is in the vein of Glasheen’s chart and Mohloly-Nagy’s diagram, in that it gives a synoptic view of character relations. Beyond *Finnegans Wake*, this chart structure accommodates a large amount of information and serves as a valuable research form.

A major component of reading *Finnegans Wake* involves delving into secondary sources. There is a group of major canonical figures most readers consult when forming their own understanding of a given section; these include, but are not limited to, Adeline Glasheen, Joseph Campbell, Danis Rose, and Roland McHugh. Depending upon the passage, the

glosses can vary vastly in their summaries, hence why consulting multiple sources is necessary. It often becomes difficult to square the various summaries (deciphering tools) with Joyce's omnipresent wordplay, riddles, and obscure references (the cipher). A reader must constantly dart back and forth between various printed texts, online references, browser tabs of multiple draft levels, and PDFs, making McHugh's identified fragmented absorption process even more fragmented today. Boldt's second chart (see Figure 10) addresses this issue, examining the genetics, or draft evolution, of select names from Chart 1, alongside glosses and the original text on the same virtual board. There is a strong focus on surrounding context and nuance and how they relate to Joyce's creative process. The more densely compiled the information, the more of an organizational challenge it becomes to arrange in a way that still allows space for the connectivity among ideas to be explored. Boldt had to find a multi-layered visual system that accommodated the various sources while still providing space to express linkages between passages. This exercise further demonstrated Miro's potential to create user agency through interactive knowledge rather than consumption, as well as its effectiveness as an open-ended platform, another criterion of Rowsell and Wohlwend's rubric (2016).

Boldt's other Miro charts (see Figure 11) integrate text and image to analyze Joyce's preliminary sketches, audio recordings, and notes, alongside secondary scholarship, and personal asides. With their allocated organic stream of consciousness structure, the last two charts assume the form of mind-mapping techniques. They illustrate Miro and other applications' potential use in multimodal idea generation. Even outside of educational contexts, digital content consumption naturally familiarizes children with visual literacy. As Kress (2003) notes, online reading constantly integrates text and image, blurring the line between the two.

Online software applications such as Miro enhance the possibilities of multimodal learning. Unlike physically drawing a mind map, Miro allows students to embed text, image, video, voice recordings, and temporary post-it notes, a quality more in line with online literacy. Without any coding experience, students' research is not confined to what can be written or printed, encouraging them to explore new archives and acquaint themselves with the communicatory logic ingrained in each medium. The ability to quickly assemble and hyperlink various sources both dismantles medium hierarchies as well as allows students to access several forms of research in the same organizational space.

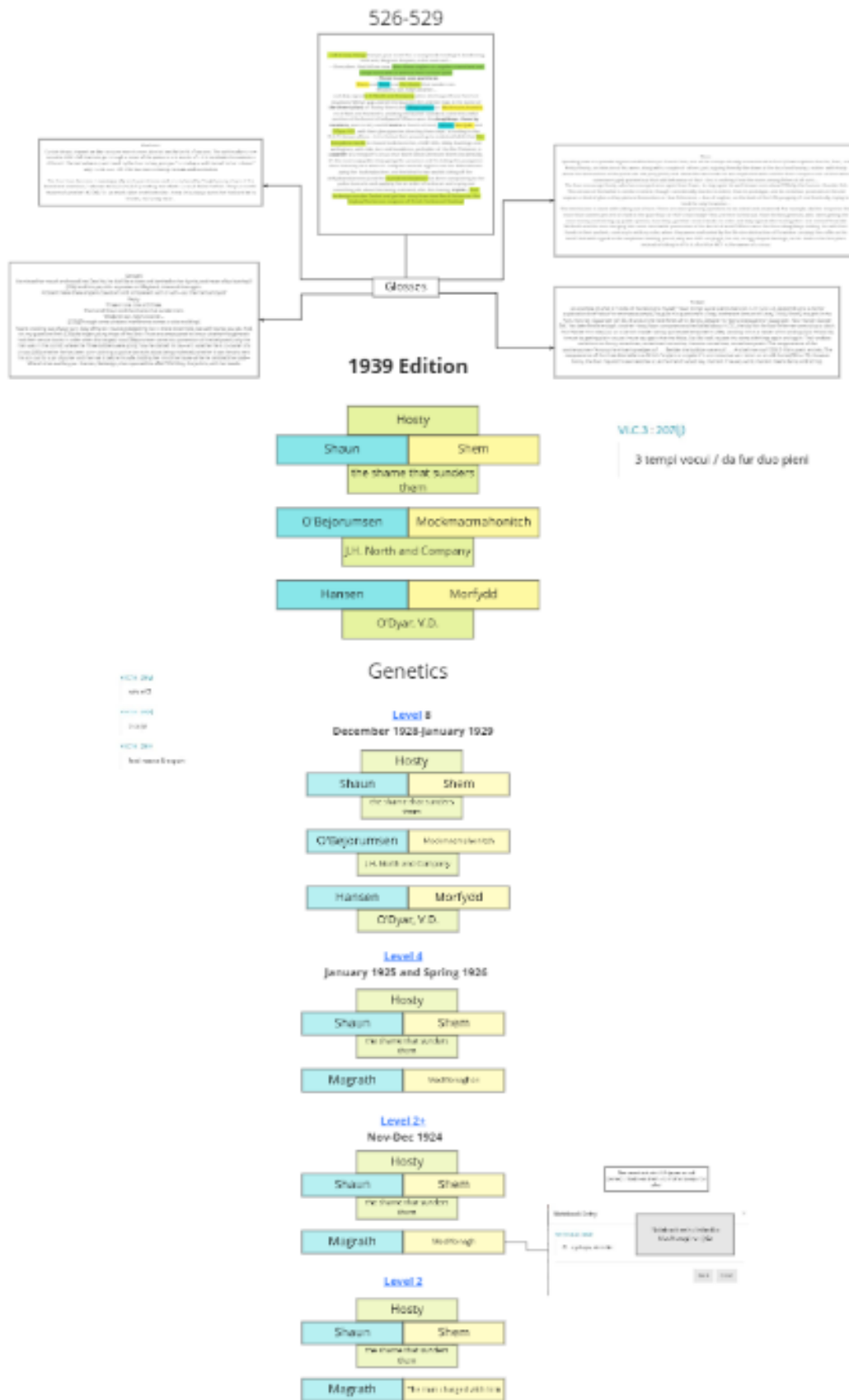


Figure 10. Close up of Miro Chart Encompassing Select Passages' Glosses and Draft Genetics

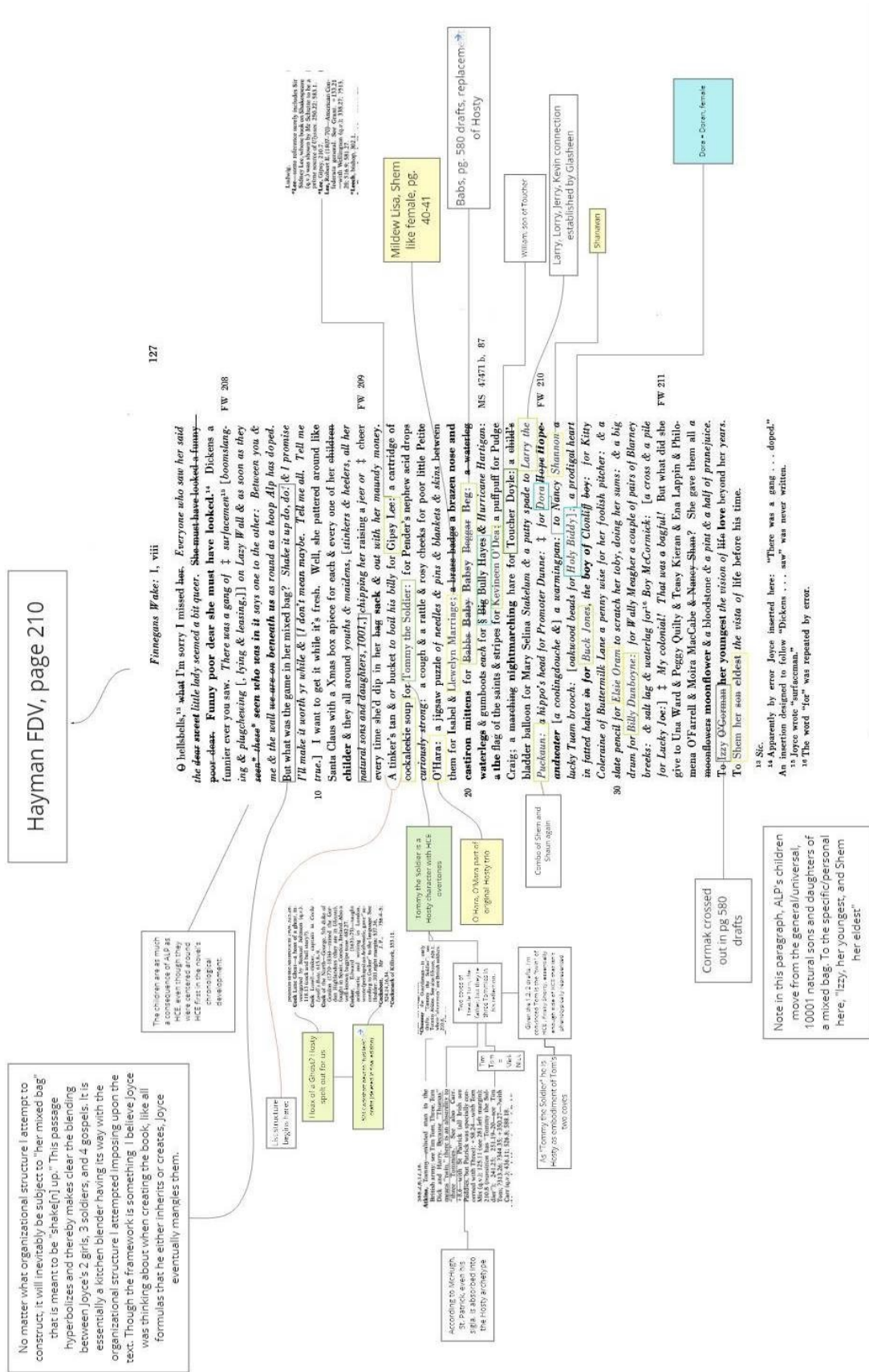


Figure 11. Miro Chart Examining a First-draft Version of p. 210

In Miro's online virtual environment, remote cooperation and cross-platform sharing are instantaneous. Students can also export their charts as jpegs, PDFs, or embedded links, which readers can access without signing up. The software application also promotes participatory learning by offering video communication between participants, chat options, and designated space to make notes and suggest edits. In terms of evaluating project-specific effectiveness, Miro provides teachers with analytics of user activity to give insight into various levels of student engagement.

Conclusion

We conclude by paraphrasing a sentence from page 109 of *Finnegans Wake*: To conclude purely negatively from the positive absence of an in-person reading group and a physical classroom that the level of engagement with the text and the sophistication of research methodologies would suffer, is only one more unlooked for conclusion, leaped at, being tantamount to inferring from the nonpresence of easy intelligibility that *Finnegans Wake* is constitutionally incapable of being understood. In other words, as the COVID-19 pandemic shuttered the classroom, reading groups like ours were forced to begin experimenting with alternative ways not just of convening the group, but of engaging with the material.

Our subject, *Finnegans Wake*, is a work of highly complex experimentation to begin with and has therefore demanded experimental forms of scholarship from its students since the moment of its publication: Adeline Glasheen's *Census*, for example, takes the form of an encyclopedia while Roland McHugh's *Annotations* employs line-by-line notes that typographically overlay the passages to which they refer. As the COVID-19 crisis cast a spotlight on the technologies and techniques of the new remote learning environment, it provided us with a palette of software applications to test in hopes of meeting the challenges of our text. So it was that over the course of ten months we read parts of an extremely weird book at an absurdly slow pace and embarked upon various projects to digitally chart, catalogue, map, gamify, synopsisize, graph, hyperlink, gloss, color-code, and otherwise dissect it.

Our research was born digitally, and questions about its longevity and durability remain. Indeed, we pondered the question of how to create a durable archive without reducing our many fundamentally graphical arguments to mainly verbal ones. COVID-19 era upheavals of

the classroom have placed a renewed urgency on this central question of the digital humanities. It is necessary to continue researching ways to support emerging genres of multimodal, interactive, media-rich digital scholarship with the potential to connect and present vast amounts of related information, and, as we hope we have shown, to generate valuable forms of original research and digital classroom engagement.

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We also have the pleasure of thanking the other members of our reading group: Kevin McKenna, Michael Meeuwis, and Tristan Narbrough. We wish to acknowledge the ten months of lively and engaging conversations about *Finnegans Wake*, the traces of which Perusall's comment panel still records. Finally, thanks are due to Joyce specialists Sam Slote from Trinity College Dublin and Finn Fordham from the Royal Holloway University of London, who visited our group in February and March of this year before our final group meeting in April.

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CHAPTER 18: ONLINE TEACHING OF PHYSICAL EDUCATION AMIDST COVID-19: CHALLENGES FOR PHYSICAL EDUCATION TEACHERS

Awadhesh Kumar Shirotriya 

Chapter Highlights

- Physical education is an important part of the education system it provides ample opportunities for students to learn about bodily movement and engage in physical activity.
- The chapter deals with the challenges of physical education teachers who are also being moved to the online delivery system because of the COVID-19 pandemic.
- Physical education teachers have been trying to improvise their teaching skills to cater to the requirements of students' physical education curriculum.
- Unnecessary challenges confronted by the physical education teachers for planning and conveying the online classes need some cooperation from society.
- Despite the many challenges faced by the physical education teacher, a school along with the parents needs to be patient and calm as it is obvious that when the disaster of COVID-19 passes, physical education teachers may be revolutionized by this experience.

Introduction

The global pandemic, COVID-19, has disturbed the whole world. Needless to say that this epidemic has brought so many changes to our normal life and the same changes will continue with us for a longer period. To maintain the required social distancing guidelines, preventive lockdown had been imposed in many countries and due to this like all the other service sectors teaching is also being affected. The COVID-19 pandemic has created the largest disruption of education systems in history, affecting nearly 1.6 billion learners in more than 190 countries and all continents. Schools for more than 168 million children globally have been completely closed for almost an entire year due to COVID-19 lockdowns (UNICEF, 2021).

In light of this unprecedented COVID-19 global outbreak, the sustainability of effective learning has been identified as a major challenge across all levels of education (Hebebcı et al., 2020; Huang et al. 2020; Dunstan 2020; Zhang et al. 2020; Crawford et al. 2020). Education is a continuing process for the students and if its effects due to any reason the learning will be suffered, and to make the continuity of the education many countries have been adopted online teaching for the time being to cater to the needs of the students. This new model of teaching is being partially enjoyed by the parents, in the recent study Khan (2021) found that parents have given their opinion that online classes can deal with the pandemic situation and is the online option to continue the education.

Being physically and mentally active is a vital element for the health and wellbeing of human beings. It is evident from the various scientific literature that being sedentary is not good for health, so staying active during this difficult time is very important. Global increasing rates of overweight and obesity in children and adolescent populations are considered, now and for the future, among the main threats to individuals and communities.

Why Physical Education Activity is Important during a Lockdown?

Physical education activities including yogic activities such as meditation and breathing exercises are considered to be a holistic healing method to overcome anxiety and panic attacks. In March 2020, USA-based Harvard Medical School has published a blog “coping with coronavirus anxiety” in which John Sharp, a faculty of the school has recommended

doing yoga, meditation, and controlled breathing which are the true ways to relax and get less panic in every worst situation. Along with the battle of COVID-19, parents must also fight with laziness during lockdown because the majority of the children are moving towards a sedentary lifestyle which is not a good indication for their development. The practice of regular physical exercises which may minimize the emergence of problems that directly affect people's behavior should be encouraged, during social isolation in the pandemic period (Pavón D, 2020). There are growing concerns about the long-term effects of the COVID-19 pandemic on children and young people. The pandemic did not only impact physical education but also played a role in the amount of physical activity and exercise undertaken by youth across the nation. The pandemic has led to the implementation of protocols that has changed how teachers teach and communicate with students and families.

This situation makes it necessary to rethink education and, particularly, Physical Education (PE; González Calvo et al. 2020a). Watching television, decreasing regular outdoor activity and exercise leads to an increased risk of chronic health conditions (Owen,2010). The global outbreak of COVID-19 has resulted in the closure of the school, gyms, stadiums, swimming pools, parks, and playgrounds. The results of recent studies in the USA showed that 78.8% of physical education teachers believed their students were obtaining either “significantly less” or “somewhat less” physical activity compared to their typical school day. (Pavlovic et al.,2021). Many students are therefore not able to actively participate in their regular individual or group sporting or physical activity outside of their homes.

Under such conditions, many tend to be less physically active, have longer screen time, irregular sleep patterns as well as worse diets, resulting in weight gain and loss of physical fitness. The ramifications of decreased physical activity, school closures, and social isolation extend beyond declines in physical health. Mental health, specifically anxiety, stress, and depression, are negatively impacted when school-based resources are removed, leading to a worsening of these conditions (Lee, 2020). An abundance of research says that staying home for a long time might lead to sedentary behaviors, such as spending more time on sitting activities, playing games (Dunton,2020).

It is important to note that physical activities and exercise not only maintain physical and psychological health but also help our body to respond to the negative consequences of several diseases such as diabetes, hypertension, cardiovascular diseases, and respiratory

diseases (Owen et al., 2010; Lavie et al., 2019; Jiménez-Pavón et al., 2020). The growing burden of non-communicable diseases (NCDs) especially obesity and diabetes have forcefully changed the choice of many parents to involve their children in compulsory sports and physical activity. Undoubtedly the physical education subject is the best way to amalgamate both activities in a single period.

Physical education is an important part of the education system, it presents the best opportunity for all students to learn about bodily movement and engage in physical activity. Physical education addresses the three domains of learning: cognitive or mental skills related to the knowledge of movement; affective, which addresses growth in feelings or attitudes; and psychomotor, which relates to the manual or physical skills related to movement literacy (SHAPE America, 2014). The practice of regular physical activity should be encouraged during social isolation in the pandemic period. In this sense, the physical education teacher is classified as a professional who can provide guidance and monitoring, so that the practice of physical exercise is done correctly and safely. Among the strategies used to practice physical exercise in social isolation, physical education teachers provide monitoring and information on how to practice physical exercises through the internet.

Physical education is an important subject in the school educational curriculum in many countries. The benefits of physical education activities such as sports, recreational fun events, and structures of physical activity for physical health and wellness are well documented. As parents' willingness to engage in physical education has increased, so has the involvement of children, which in turn has created a ritualized, family-centered engagement with exercises.

Challenges for Delivery of Physical Education

Physical education has been traditionally considered as a practical and 'hands-on' subject in schools, where close proximity and physical contact is common (Varea et al., 2020). The COVID-19 pandemic has presented unprecedented challenges for teachers globally, distance learning, for many teachers and students, will not appear to be as effective as face-to-face learning (Kimmel et al., 2020). However, to play an integral role in student's growth and development now like all other teachers, physical education teachers are also being moved to the online delivery system because of the COVID-19 pandemic.

Due to the various practical components, physical education may well suffer the most in the transition from well-established face-to-face instruction and environments to virtual/online ones. With this new and sudden change in the learning and teaching environment (LTE), forcing students to lessen physical contacts and increase the physical distancing; physical education teachers are challenged to refocus their LTE to online learning where they are challenged to advocate for pedagogical practices in online settings that focus on student-centered constructivist approaches (Rice, 2006), that promote interactive environments and relevant/authentic learning experiences (Beldarrain, 2008).

Physical education teacher instructing students how to play cricket, perform half squats and perform other types of physical activity but that can be a bit challenging during online/remote teaching. Distance learning is a challenge that goes beyond getting every student a computer system, a smartphone, and/or an internet connection. At school, physical education teachers can manage a wide range of outdoor activities for the students to provide them with an opportunity to learn new skills. But this online teaching is the challenge, being faced by the physical education teachers because theory lessons are easy to organize but the practical classes are having several issues/ challenges and these negatively influence students' experiences and learning. Some common challenges are listed below:

Internet Connection

Teachers across the country are encountering a new generation of learners who have never known life without modern conveniences and technologies such as personal computers, mobile devices, streaming media, and the World Wide Web. Poor / slow connection, and frequent connection loss. These issues sometimes break the continuity, especially when the teaching momentum has been picked up by the student and teacher. According to Bhamani et al. (2020), online schooling requires the availability of computers and the internet at exact hours as needed. Any technical issues related to the requirements could result in the child missing out on learning. Students who are living in a rural area are frequently facing a poor connection, and other students who are living in a very interior location lack it completely. Some students may have difficulty accessing and interacting with digital learning materials because they do not have an internet network at home (Filiz & Konukman, 2020). Many parents and family members are also working from home and they are sharing a single internet connection (broadband), it may make it difficult for students to maintain a good

connection for online learning, this is another issue which is been identified during the lockdown.

Less Space

The closure of universities and schools has disrupted the learning of students and has deprived students of opportunities for growth and development (UNESCO, 2020). In physical education classes, learning by doing can be considered as the scientific way to learn a concept easily. Students engaged in online physical education classes often cannot secure enough space to effectively take part in physical activity and also have limited access to supplies and equipment needed to follow online physical education classes (Jeong & Young So, 2020). Physical education teachers are delivering a skill demonstration for physical and sports activity. Finding the space for some physical education activities while at home is quite complex. Sometimes the available space at student's homes is not sufficient to replicate the activities. This situation hampers the experiential learning of the students as is also reported in the United Nations report (2020). On a playground, it is often easier to encourage students to focus on recreational activities at hand and not become distracted but this is not possible with larger variations at home. Low-income families are especially vulnerable to the negative effects of stay-at-home- rules as they tend to have sub-standard accommodations and more confined spaces, making it difficult to engage in physical exercise.

Lack of Confidence in Digital Teaching

The school lockdown confronted teachers, students, and parents with an entirely new situation (Huber & Helm, 2020). Continued teaching and learning were only possible through alternative means of schooling. It is widely recognized that there is a lack of research in the area of physical education pedagogy and digital technology use (Casey & Jones, 2011; Karp et al., 2008; Tearle & Golder, 2008). In order to provide the education teachers, need to change to online teaching, requiring them to use various digital tools and resources to solve problems and implement new approaches to teaching and learning (Eickelmann & Gerick, 2020). The use of digital technology potentially raises a host of logistical issues, such as the time taken to set up applications. Certainly, physical education is behind all other subjects in terms of digital content, especially in middle and low-income countries. Although some good software and other means of promoting physical activity such as pedometers,

fitness tracker watches, and apps are easily available, the issue is with the physical education teachers' familiarity with software/application, as not all the physical education teachers are well versed in digital literacy. The basic competencies in online teaching for physical education teachers can be divided into the following areas:

- Live classes (theory and practical)
- Integration of digital support into the teaching
- Pre-recorded teaching sessions
- Open discussion
- Assessment and feedback

If digital technology is to be embraced by learners, it must be embedded as part of regular learning rather than used sporadically in physical education lessons (Burne et al., 2019). Certainly, physical education teachers have been trying to improvise their teaching skills with the confidence to meet the challenges. However, the focus is needed on the physical education teachers' professional training for the successful integration of digital technologies into physical education.

Lack of Digital Literacy

Due to this pandemic, online teaching has gained popularity. We should be open enough to accept the technology in the education sector because of its wider future scope though the skills to use new technologies take an enormous amount of effort, time, and money. Physical education teachers are central to the implementation of digital technology in physical education. The use of suitable and relevant pedagogy for online education may depend on the expertise and exposure to information and communications technology (ICT) for both educators and learners (Pokhrel & Chhetri, 2021).

To guarantee responsible innovation, teacher training in the physical education course curriculum has an important role. There is little time allocated to information and communications technology (ICT) like the use of video conferencing and movie maker software training within teacher training courses of physical education, which can leave teachers with a limited understanding of how to integrate technology into their teaching and evaluation. The educators (faculty members in a teacher training college) of a new generation

of teachers need to invest in knowledge, didactics, and an innovative climate to sustain blended teaching. Physical education teachers need to be supported through continuing professional learning collaboratively in terms of digital literacy.

Less Emphasis on Physical Education

The Covid-19 situation appeared to amplify the marginalization of physical education, as it became less emphasized as an educational endeavor (Cruickshank et al., 2021). Parents are important teachers and social referents for all children (Raudsepp, 2006) so the role of parents has been crucial to online classes and it requires parents to support the students' learning academically and economically. After having the enormous benefits of physical education, still, some of the parents are compromising physical education and its related activities in comparison to other academic subjects. It is often seen that parents are not giving a chance to attend the virtual physical education class of their children. Sometimes students are also not taking seriously the physical education class because of their parent's negative attitudes towards physical education classes.

Monitoring of Students

Some students have a treadmill or recumbent bicycle at home, some have workout equipment, free weights, friends, and family members who are willing to assist with their fitness goals and assignments (Kane & Wagner, 2007). Varea et al. (2020) detected several changes in the delivery of physical education during online teaching such as a shift to online/video teaching, the shift away from direct instruction, feelings of dehumanization, the role of space, families, and homes in producing learning. Since online physical education usually consists of a computer/smartphone-based activity so when physical education teachers are giving instructions to the students for doing some complex activities, so they generally are in a dilemma to ask students to perform because of the complex nature of the activity.

Students are usually required to be monitored in a practical class of what they're doing. Online activities on their own don't get the same level of supervision and instruction as students who take a real-world class. Physical education teachers can teach the skills but can't monitor the improvement of the skill on video/camera.

Assessment and Evaluation

Using physical education videos is a sensible solution to the challenge of online delivery, but teachers do need to be aware of the time required to give feedback (Cruickshank et al., 2021). Another domain where the online class is becoming influential or even dominant is the student's assessment. Student assessments are carried out online, with a lot of trial and error, uncertainty, and confusion among the teachers, students, and parents (Pokhrel & Chhetri, 2021). Amidst COVID-19 many physical education teachers are extending their teaching through the virtual mode which is partially enjoyed by teachers, students, and parents as well, but the assessment of the students' physical performance is still a debatable issue and for a long time this might not be a beneficial way of teaching physical education. The majority of the coursework (theoretical) will be analyzed easily but practical performance is difficult to assess. Schools have to do some serious planning to put the best assessment systems in place. Sometimes students also feel embarrassed to perform sports and physical activity online, in front of the camera as we know that online learning is new for everyone and it might just become our new normal.

Limited Teaching Strategies

The difficulties of operating online middle and high school PE classes included monotony related to limited environmental conditions and educational content, which ultimately decreased the effectiveness of conveying to students the value of physical education (Jeong & Young So, 2020). Due to the limitation of less space physical education teachers have a narrow scope for instructing the activity and there are not various options for outdoor activities as compared to the real settings. In this condition, they can just repeat the common activities which might be the cause of boredom for students, and sometimes for parents. Although physical education teachers are trying their best as per their capabilities to design some innovative recreational activities to keep their classes interesting.

Challenges of Teaching Special/disabled Students

The WHO recommends that those with a disability should practice at least 150 min per week of moderate-to-vigorous intensity physical activity where possible, or at least engage in regular physical activity according to their abilities and avoid inactivity. Lockdowns, physical

distancing, and shifts in learning formats, as well as other economic and contextual factors related to the pandemic, can have disproportionate effects on vulnerable groups, including children with disabilities and their families (WHO and World Bank 2011; UNICEF 2020). Yucesoy et al. (2020) found in their research that the pandemic has also negatively affected the families of children with special needs, who have had to undertake both the care and the education of their children. Lockdown restrictions had a significant negative effect on both physical activity levels and mental and behavioral health (Theis et al., 2021).

All students have equal access to education, but what access means differs from student to student, depending upon their potential and learning disabilities. It plays a vital role to keep their brain active. In my opinion, they need more attention than other students, so user-friendly software needs to be designed for them to make them feel personally touched. I feel Software designers who are constantly working for technological improvement to revolutionize students' learning in the education sectors must also come forward to support the children with disabilities and help them to learn physical education activities.

Coping with Stress

Besides dealing with distance education, teachers had to cope with the social and psychological difficulties of the pandemic in their own lives. Thus, teachers' well-being should be taken into account, and psychological support should be provided to them when necessary (Yucesoy et al., 2020). While physical education teachers are facing so many problems in online delivery so it's natural to be stressed. Teachers who do not fully embrace technological changes and advancements may find it a struggle to work well in an online environment. As a result of this physical education, teachers are facing difficulties delivering good lessons to the students. This situation leads to severe stress, frustration, and anxiety which also affect the mental wellbeing of the physical education teachers. The intensification of workload for teachers committed to quality physical education through teaching for effective learning strategies (Light, Curry & Mooney, 2014; Pill, 2011; Williams & Pill, 2019) was evident during the COVID-19 suppression requirement for schools to move to online learning delivery.

Transitions to distance learning platforms tend to be messy and frustrating, even in the best circumstances (Aperribai, 2020). Nevertheless, unnecessary challenges confronted by the

physical education teachers for planning and conveying the online classes need some cooperation from society. This is a new challenge in teaching physical education and the physical education teacher will be a resource teacher-personal trainer and coach to all students during the COVID-19 pandemic. Although with distant physical education classes, how much of these values can be inculcated into students is a debatable issue. All these challenges/issues will be taking some time to be sorted out but the policymakers and teacher educators need their actions to find the best solutions immediately because if we don't tackle them, then it's going to be hard to support students' online physical education classes and it may cause another crisis in the future.

Conclusion

This is the time to gravely rethink, revamp and redesign our education system in much demanding need of the unprecedented current situation (Mishra, Gupta & Shree, 2020). Many educators have embraced online physical education while others are not sure about its viability (NASPE, 2011). Online learning can't go at the same pace as in a classroom setup. Despite the progress, online teaching cannot immediately be picked up by the teachers. Physical education is one of the important aspects of the educational and teaching processes, especially in the digital era. Physical education teachers are required to provide physical, sports, and recreational activities for the wholesome development of the students and this leads to making students healthy citizens of the country although a majority of the challenges are being faced by middle-income and low-income countries.

However, the user-friendly digital curriculum across the globe is required to be designed for imparting quality physical education in online teaching. Exploration of the features and functions of new and emerging technologies is an important task for teachers to engage in, particularly during the planning and online delivery of physical education advanced level of digital literacy should be added into the physical education teacher training courses so that the teacher trainee will get trained in a very professional manner. Subject experts must begin to investigate how technology can be used appropriately to support learning within the context of physical education, whilst also maximizing physical activity in lessons. Schools along with parents need to be patient and calm as it is obvious that when the disaster of COVID-19 passes, physical education teachers may be revolutionized by this experience.

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CHAPTER 19: MODELING IN MATHEMATICS AND HISTORY AS TEACHING AND LEARNING APPROACHES TO PANDEMICS

Maria Papadopoulou , Panagiota Argyri , Zacharoula Smyrniou 

Chapter Highlights

- Applying an interdisciplinary lens, with a focus on pandemics, can help shape attitudes by means of inculcating the values of responsible global citizenship, and a high sense of personal and social responsibility. In the midst of the current lock-down due to COVID-19, a teaching approach to pandemics is presented, as an interdisciplinary connection between history and mathematics, based on the methodology of modeling in mathematics and the humanities.
- The main research questions posed: a) can modeling, as analyzed in the scientific literature, be used to interpret pandemics, e.g. in the case of the ‘plague of Athens’ (430 B.C.), as analyzed in the primary sources? b) Can the mathematical tools of statistical analysis be used to understand prevention measures through the centuries?
- This chapter presents the assessment of the effectiveness of this approach, conducted by means of closed and open questionnaires, administered in two phases (pre- and post-teaching) to a sample of 40 students aged 16-17 years.
- The results highlight statistics as a key tool for understanding real-world situations, and record the strengthening of students’ knowledge in history, the raising of their critical thinking skills, as well as their enhanced ability to tackle real-world problems and understand responsible decision-making processes.
- The chapter suggests that such good practices can prepare students for the complexity of globalized knowledge.

Introduction

What follows is a report on a lesson taught remotely soon after school closures in Greece due to COVID-19 which culminated on introducing the interdisciplinary teaching of the mathematics and history of infectious diseases to the curriculum of Greek secondary education. This paper describes an interdisciplinary approach to teaching and learning about pandemics to 16 - 17-year old students at a Greek public high-school, by means of applying mathematical/statistical models for infectious diseases to historical material. The historical perspective emphasized both a critical approach to the diachrony and synchrony of pandemics. The main research questions asked are as follows:

- a) How can modeling, as analyzed in the scientific literature, be used to interpret pandemics, e.g. in the case of the plague of Athens (430 B.C.), as analyzed in the primary sources?
- b) How can the mathematical tools of statistical analysis be used to understand prevention measures through the centuries?

Taking a *longue durée* perspective on history, the students were asked to work on additional cases of pandemics across time and space mobilizing both their mathematical and historical knowledge, process data and information from primary sources, both textual and visual, study graphs and maps, combine and compare elements of the past and the present using mathematical epidemiological models, especially the SIR model, and process real numerical data in order to study and predict the spread of infectious diseases. The effectiveness of the approach was assessed by means of questionnaires administered to the students before and after the teaching. Our effort not to miss out on the opportunity to connect concepts in the Greek secondary school curriculum to the lived experience of the COVID-19 global disease outbreak rounded off with the preparation of the first Greek interdisciplinary curriculum prototype to combine the mathematics and the history of pandemics.

Purposes and Outcomes

When schools and universities across the world transitioned to online instruction (<https://en.unesco.org/COVID19/educationresponse>), in an effort to curb the spread of COVID-19, our research team consisting of researchers from the distinct fields of Classics, Mathematics and STEM Pedagogy in Secondary Education respectively, made the decision

not to miss the opportunity to introduce the topic of epidemics/pandemics for Greek secondary school students. In the spirit of John Dewey (1938) who advocated using the power of lived experience to realize full potential in education, the lessons designed were aimed at teaching pandemics as part of life in the present, as well as the past. By including pandemics, we responded to the relevance of this topic, given that the unforeseen situation of the COVID-19 pandemic had just started to affect everybody's lives. Taking into account the students' set of critical and socio-emotional soft skills (Smyrnaioi 2020, Chatterjee & Duraiappah 2020) and student work on the topic of the spreading of infectious disease (Askouni, Doulopoulou & Argyri 2020) integrating mathematics and biology into biomathematics (Roberts 2011), we aimed to expand the notion of disciplinary literacy as set out by the state-mandated high-school curricular goals in mathematics and history. As pandemics do not respect state boundaries, it is one of the global challenges that students at all levels of education will have to face in the future that they will inhabit (Geelan 2018, 507, 509). Our approach aimed at inculcating the values of responsible global citizenship and the high sense of personal and social responsibility that promotes proactive responses to the current global health emergency on a global level vis-à-vis this global challenge.

The outcomes of this effort are three-fold: first, a set of teaching materials (in Greek) including primary sources, exercises, and activities for the students. Second, an online student questionnaire consisting of 23 items combining a mixed approach (quantitative and qualitative) aimed at getting students to express their views on, as well as evaluate the teaching before and after it took place. Third, a 103-page long syllabus on pandemics / epidemics (in Greek) submitted to the 'Platform 21+ Lab' project of the Institute of Educational Policy (IEP) (Smyrnaioi, Papadopoulou & Argyri 2020). Launched in the spring of 2020 (Asteri & Papadopoulou 2020), it forms part of the 21st century comprehensive European Skills Agenda (2016) and marks the intention of the Greek Ministry of Education both to decentralize, innovate and inform the Greek K-12 curriculum with the skills and literacies needed for the 21st century (Silva 2008; Ananiadou & Claro 2009; Dede 2010; Binkley et al. 2012; Care et al. 2018; OECD 2018; Dibenedetto 2019; OECD 2020).

The Platform 21+ Skills Lab project maps out the skills students need to have in order to survive and thrive in a more complex and interconnected world (skills related to learning, skills preparing for the world of work, life skills and digital literacy skills) and structures them around a number of topics. The submitted curriculum falls under the thematic cycle

entitled ‘I take care of the environment-Prevention and Protection from Natural Disasters). The new curriculum is to be implemented across Greek public middle schools in the following academic year. Our research team will be involved in the teacher training phase of the pilot stage of the implementation. In the pilot stage starting October 2020, this interdisciplinary curriculum is to be openly available on the online platform of the IEP-Greek Ministry of Education and is to be implemented in 80 out of a total of 1823 Greek public middle schools (Hellenic Statistical Authority latest data from 2017/2018, <https://www.statistics.gr/en/statistics/-/publication/SED21/->). The final phase (starting October 2021) consists in the scaling up to the country-wide implementation of the new curriculum.

State-of-art

The COVID-19 pandemic has been a transformative and adaptive challenge to many educational systems (OECD 2020; Ananga 2020; Daniel 2020; ElSaheli-Elhage 2021; Hebebcı, Bertiz, & Alan 2020; Korkmaz & Toraman 2020; Yılmaz İnce, Kabul, & Diler 2020). Since its outbreak, a wealth of COVID-19-related instructional materials in various subjects has been piloted in educational institutions across the world. Our approach is interdisciplinary, situated at the crossroads of cliomath and clioepidemiology. Clioepidemiology, i.e. the research practice of studying the history of past epidemics in order to learn the lessons it teaches, named after Clio, the muse of history (e.g., Olson et al. 2005, Morse 2007, Wilson et al. 2008) is a promising area for designing a data-rich approach to the history of pandemics. There are, to our knowledge, no curricula introducing high school students to an interdisciplinary teaching of pandemics combining mathematics and history.

Interdisciplinary teaching (teaching across subjects) is the multifaceted study of topics and concepts with the contribution of many sciences. Interdisciplinary in teaching and learning incorporates an approach to curriculum design that consciously applies methodology and language from more than one discipline to examine a central topic or problem (Jacobs 1989: 8). Thus, knowledge is treated as a single whole, enabling students to make connections across disciplinary boundaries. Owing to a growing awareness of its inherent value and benefits, interdisciplinary teaching is widely used across the curriculum in many countries. In addition to gaining specific disciplinary knowledge, the students are introduced to the idea of an interdisciplinary dialogue that can contribute to solving real life problems (Vars 1991,

Lipson et al. 1993, Clarke & Agne 1997, DEPPS 2001, Matsaggouras 2002, Lattuca et al. 2004, Nowacek 2005, PI 2011, You 2017). Thematic weaving of topics in mathematics and history enables the teacher to teach them more effectively, while it benefits the students both in terms of disciplinary knowledge and transversal (transferable) skills, e.g., critical thinking, problem analysis, synthesis.

EPEICSE (Epistemic Practices Embedded in Issue Centered Science Education) is a project of the University of North Carolina at Chapel Hill and the University of Missouri puts the focus on teaching what is happening in both science and society at the moment (<https://epiclearning.web.unc.edu/>) and includes COVID-19 as part of broader socio-scientific issues. This ongoing interdisciplinary research project focuses on the interface between science and complex societal issues. The overall aim is to help students make sense of how to respond to the pandemic as they engage in modeling practices. The designed COVID-19 instructional materials (<https://epiclearning.web.unc.edu/COVID/>) focus on teaching about disease modeling and simulations, while analyzing the pandemic through scientific, economic, cultural lenses and include a component on media literacy to help students understand misinformation. They have been incorporated in different subject areas, including biology and English, in five high schools in Missouri. Coronavirus Syllabus (2020) is a list of crowd-sourced resources aimed to provide resources in order to ‘teach the virus’ in higher education. It is openly available online. This initiative was followed by the K-12 Coronavirus Syllabus (2020), which includes articles, books, websites, films, lesson plans etc. created for teachers by teachers (also openly available online) subdivided into discipline specific resources.

Designing the Approach

Rationale

The topic of pandemics was an obvious choice due its relevance to the students’ experience of COVID-19. Instead of remaining untouched by the reality of the ongoing pandemic, we refocused the curriculum to include concepts such as the flattening of the curve and the notion of social distancing in past pandemics. Any reservations whether such a teaching would increase the level of anxiety in the students were balanced out by what was, in our view, an overarching necessity: help the students understand how diseases reach pandemic proportions, help them make sense of the social distancing measures and of the schools lock

down, help them be alert, not alarmed. We aimed at helping students explore modes of spreading and containment, understand the necessity of social distancing as a prevention measure, cope with the emotional strain by highlighting humanity's long relationship with communicable diseases, and empower them to be responsible global citizens in regard to global health issues.

The main goal was to teach about infectious disease outbreaks throughout time using epidemiological models, i.e., combine them in an interdisciplinary way: namely, teach students how disciplinary mathematical/statistical modeling tools can be applied to the study of pandemics in the present as well as in the past. This rationale was clearly set out in the prologue of the materials emailed to the students prior to the teaching:

What is the role of mathematical models that analyze past epidemics/pandemics? The mathematical modeling of epidemics/pandemics of the past and the analysis of data on the morbidity and mortality rates is useful to decision makers in regard to the actions they must take now in order to reduce the future effects of a pandemic. Social distancing measures, including decisions, such as schools' closure/staying at home, are made based on the fact that moments from the past come to life again in the present. On the other hand, experiences from the present can help analyze the past. In any case, taking interest in the history of infectious diseases makes one less vulnerable and better prepared to deal with any emerging pandemic-related risk.

Connection to the Greek National Curriculum

Our interdisciplinary teaching of epidemics/pandemics (as well as the ensuing curriculum that we proposed to IEP) was designed so as to be adaptable to both higher secondary (lykeio) (ages 15-18) and lower secondary (gymnasio) (ages 12-15). In terms of literacy in mathematics/statistics the only prerequisites are percentages (taught in the first year of gymnasio) and functions and their graphs (taught in the second year of gymnasio). The objectives of the curriculum for mathematics in Greek compulsory education explicitly state that the student should a) analyze and throw light on the social environment using mathematics as a tool and b) analyze and explain how mathematics is used to make decisions regarding the social environment (PI 2007-2013).

As far as the history curriculum there are no prerequisites. The topic of pandemics/epidemics can be taught in all years of lower and upper secondary, either in terms of their diachrony, or in the form of selected case studies. For example, the plague of Athens can be linked to the teaching of the classical period taught in the first year of gymnasia and lykeio, the black death can be linked to the second-year curriculum in gymnasia and lykeio, 19th and 20th century plagues can be linked to the third-year curriculum in gymnasio and lykeio.

Key Concepts

Modeling is used as a heuristic strategy both in mathematics and science (Coll et al. 2011; Smyrnaïou & Weil-Barais 2005; Tiberghien 1994) and is no stranger to the Humanities, especially the now flourishing field of Digital Humanities and History (Leff 2003). Modeling is the creative process of thinking and reasoning where meaning is made and negotiated through the creation and manipulation of external representations (Ciula & Eide 2017). A model can, at a given level, be expressed in ‘external representations’ – those versions physically available to others – and in ‘internal representations’ – those versions available mentally to an individual person. The making of meaning for any such representation is ‘visualization’ (Gilbert in Gilbert et al. 2008, p. 3). A mathematical model is a simplified description of a system or process to assist calculations and predictions. As models are centerpieces in mathematics, in the mathematics of disease, par excellence, the concept of modeling was central to the teaching.

Attributed to the work of Ross (1916) and Kermack & McKendrick (1927) (cf. Brauer 2017; Diekmann et al. 1995) and named after its three variables S (Susceptible), I (Infected), and R (Recovered) the SIR model can mimic the way SARS-CoV-2, the virus that causes COVID-19, spreads. This compartmental model can be used to forecast or simulate future transmission scenarios under various assumptions about parameters governing transmission, disease, and immunity: the more people become infected, the faster the disease spreads. The rates of transfer between the compartments are expressed mathematically as derivatives with respect to time of the sizes of the compartments. The SIR model illustrates the importance of social isolation for those infected (see Figure 1). By staying at home until fully recovered, one effectively takes oneself from the infected class straight to the removed class without spreading the virus. This simple action can reduce the size of an outbreak by reducing the opportunities for the disease to pass to susceptible individuals.

One fundamental parameter that governs the spread of diseases is the basic reproductive ratio, R_0 . It is the one crucial number that shows whether an outbreak spreads or dies out. R_0 indicates how infectious a disease is. The higher the value of R_0 , the faster an epidemic will progress. If the average R_0 in the population is greater than 1, the infection will spread exponentially. If R_0 is less than 1, the infection will spread only slowly, and it will eventually die out. R_0 is estimated from data collected in the field and entered into mathematical models. The estimated value depends on the model used and the data that inform it.

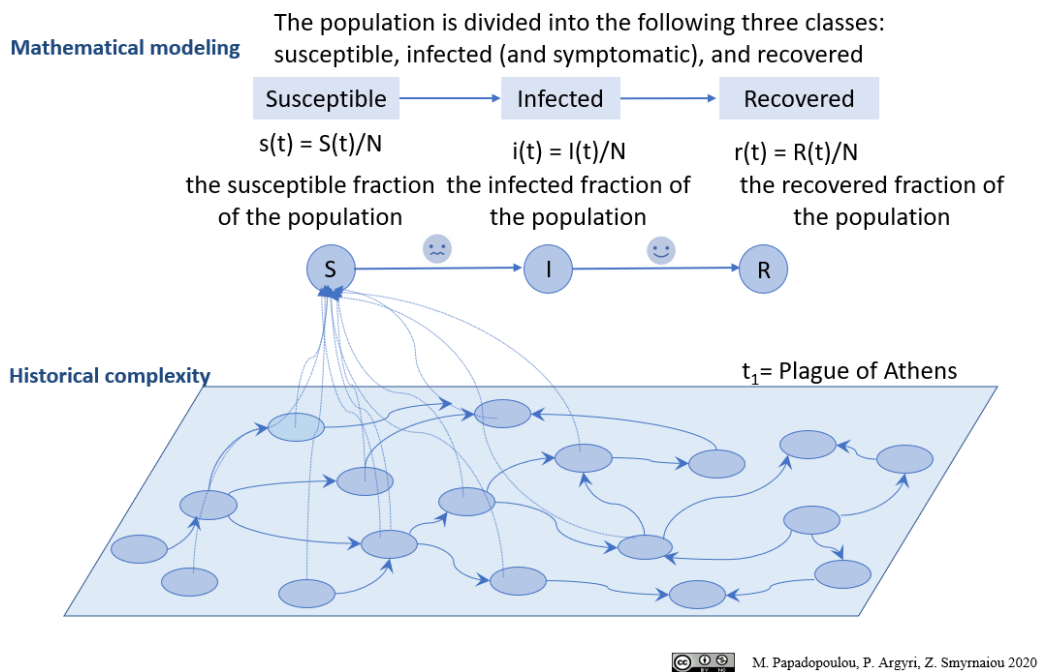


Figure 1. The SIR Model

Process and Method

The teaching method adopted was a discussion-oriented flipped classroom: the students’ assigned homework was to go through the teaching materials, answer the questions, and be prepared to participate in the discussion during the remote class, whose time could, thus, be devoted to critical discussions on the subject. The teaching took place online on the platform of the European School Network on April 1st, 2020. The interdisciplinary teaching of the SIR model was done in the context of a case study on the plague of Athens (430 BC) illustrating the importance of social distancing measures and the catastrophic consequences of lack thereof. The spreading of the plague in ancient Athens at the beginning of the Peloponnesian war against Sparta had devastating effects on the population (see Figure 2). Not only was the

population struck by it, but also the values and institutions of Athenian democracy. The disease caused panic, despair and a huge loss of life. The infectious disease brought Athenian democracy to its knee (Tolbert Roberts 2017, Seaman 2018).

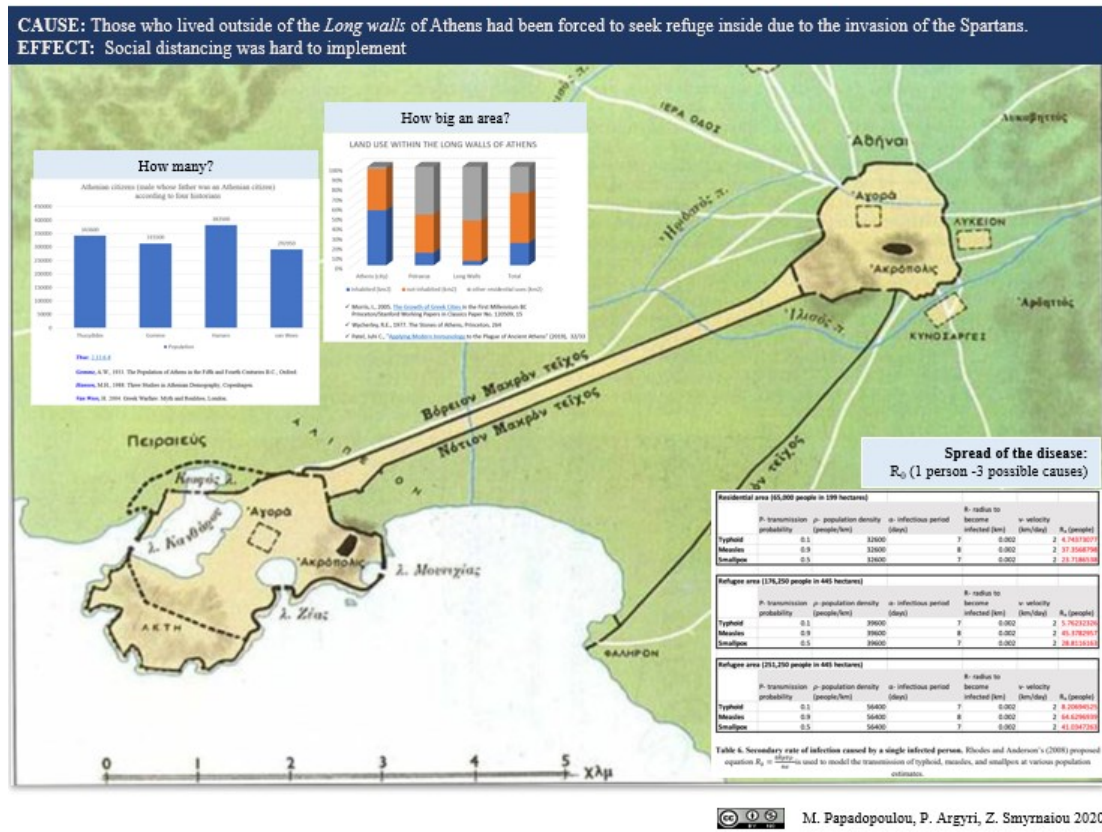


Figure 2. Estimating the Spreading of the Plague

This case study is interesting in many ways: it highlights the disastrous effects of overcrowding, insufficient sanitation systems, lack of knowledge about prevention measures, and the relationship of the spread of infectious disease to factors such as armed conflict and overpopulation. In particular, it shows how a chain of events lead to the worsening of the impact of the disease on the Athenian population. The invasion of the Spartan army had caused a refugee crisis: a great part of the population had been forced to seek refuge inside the walled area. This dramatically affected the rapid spread of the plague. The spread of the disease could have been slowed down through the adoption of social distancing measures.

The students were presented with different estimates regarding the population and the area within the walls inhabited by the refugees (after Patel 2019) and were provided with the text of Thucydides the historian that offers one of the most lurid descriptions of pandemics in

historical literature. They studied the testimony of Thucydides, the historian, who survived the plague, and who clearly states that the plague was at its worst in the most densely populated areas inside the so-called Long Walls where people had sought refuge in order to escape the invasion of the Spartan army. An aggravation of the existing calamity was the influx from the country into the city, and this was especially felt by the new arrivals. As there were no houses to receive them, they had to be lodged at the hot season of the year in stifling cabins, where the mortality raged without restraint (Thucydides & Crawley 2004).

Materials

The types of materials included primary textual and visual sources: infographics, charts, graphs, maps (e.g. the map by Dr John Snow visualizing the spread of cholera in London in 1854), and especially the art inspired by infectious disease, openly accessible via Europeana (<https://www.europeana.eu/>), the biggest digital portal of cultural material containing over 50 million digitized resources from European cultural and memory institutions (galleries, libraries, archives, museums). The materials were organized in such a way so as to enable the students to refer directly to the tasks, when viewing the contents page. Figure 3 shows the contents page of the teaching materials emailed to the students prior to the teaching, as well as their English translation.

Contents page of teaching materials (in Greek) sent to students prior to teaching

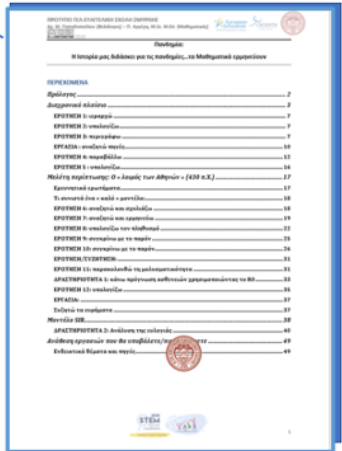
	<p>CONTENTS</p> <p>Foreword 2</p> <p>Time frame 3</p> <p>QUESTION 1: classify 7</p> <p>QUESTION 2: I calculate 7</p> <p>QUESTION 3: I describe 7</p> <p>Assignment 1: I'm looking for sources 10</p> <p>QUESTION 4: I compare 12</p> <p>QUESTION 5: I calculate 16</p> <p>Case study: The Plague of Athens (430 BC) 17</p> <p>Research questions 17</p> <p>What is a "good" model? 18</p> <p>QUESTION 6: I investigate and comment 18</p> <p>QUESTION 7: I investigate and interpret 19</p> <p>QUESTION 8: I calculate the population 22</p> <p>QUESTION 9: I compare with the present 25</p> <p>QUESTION / DISCUSSION: 31</p> <p>QUESTION 11: I monitor the infectivity 31</p> <p>ACTIVITY 1: I make predictions using R0 33</p> <p>QUESTION 12: I calculate 35</p> <p>Assignment 2 37</p> <p>I discuss the findings 37</p> <p>The SIR Model 38</p> <p>ACTIVITY 2: Smallpox analysis 40</p> <p>Topics for assignments 49</p>
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Figure 3. Contents Page of the Teaching Materials

The students were able to navigate the long history of infectious diseases using infographics (<https://www.ancient.eu/image/12023/historys-deadliest-pandemics/>) in order to answer Question 1: “List the three pandemics with the greatest death toll.” Question 2 :”Calculate: What is the average death rate worldwide over the centuries? Is the average rate a reliable measure? What other statistical measures do you propose? What is the average death rate worldwide over the centuries? Is the average rate a reliable measure?”

Question 3 asked students to make connections with visual evidence: “How have people related to pandemics through art? Write your description of the images below: a wax model of a plague scene, 1657” (see Figure 4).

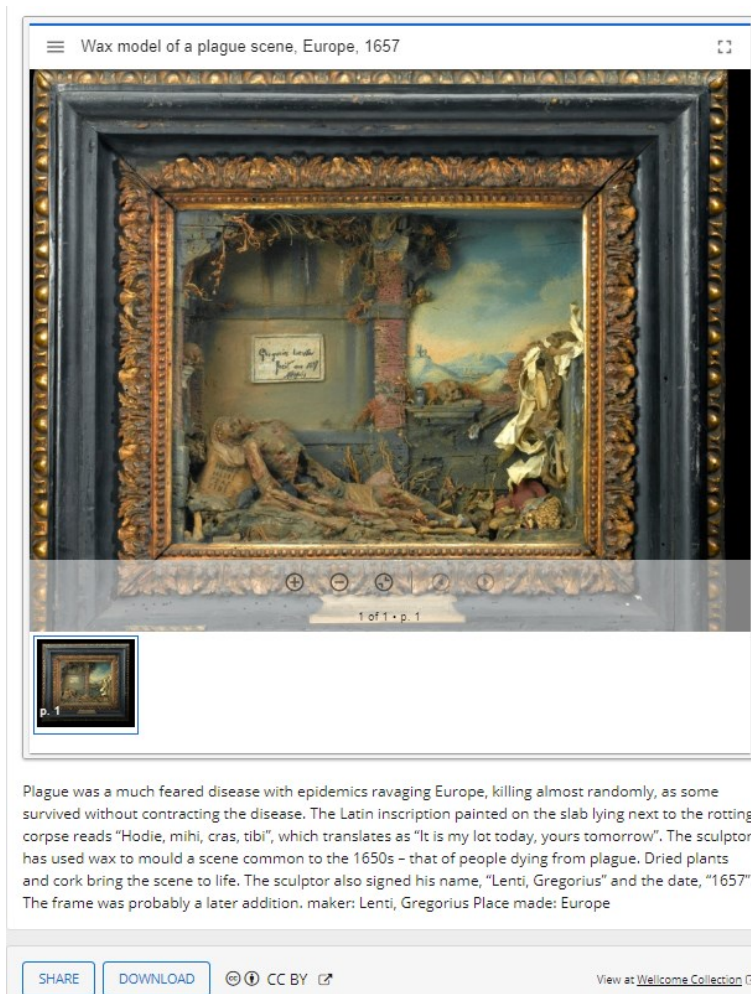


Figure 4. A Visual Source from Europeana

In the same vein, Assignment 1 asked students to search for digital content that provides evidence of global epidemics in Europeana (<https://classic.europeana.eu/portal/en>), the

biggest portal about European cultural heritage aggregating resources from GLAM content providers (Galleries, Libraries, Archives, Museums) across all European Union member states. The students were provided with the contextual information and metadata that helped them track relevant sources in Europeana and in the original collection. Figure 4 is an example of such a source (<https://www.europeana.eu/en/item/9200579/tcz3ahy7>):

Results

This section presents data collected by means of administering an open and closed student questionnaire consisting of 23 items pre- and post- teaching. The population sample was 16- to 17-year-old students of the Model School Evangeliki in Athens. It should be noted that public model schools in Greece recruit only high-achieving students after rigorous examinations. Part 1 of the questionnaire (accessible online here: <https://www.surveymonkey.com/r/7D3XWTH>) consists of seven questions, of which three are closed-ended. Question 1 sought information about whether the students wanted to study a) mathematics/science b) humanities/social sciences or c) Not decided yet. The majority responded that they wanted to study mathematics/science (18.4%). The second choice was humanities/social sciences (7.25%). 11% responded that they had not decided yet. The results are presented in Figure 5.

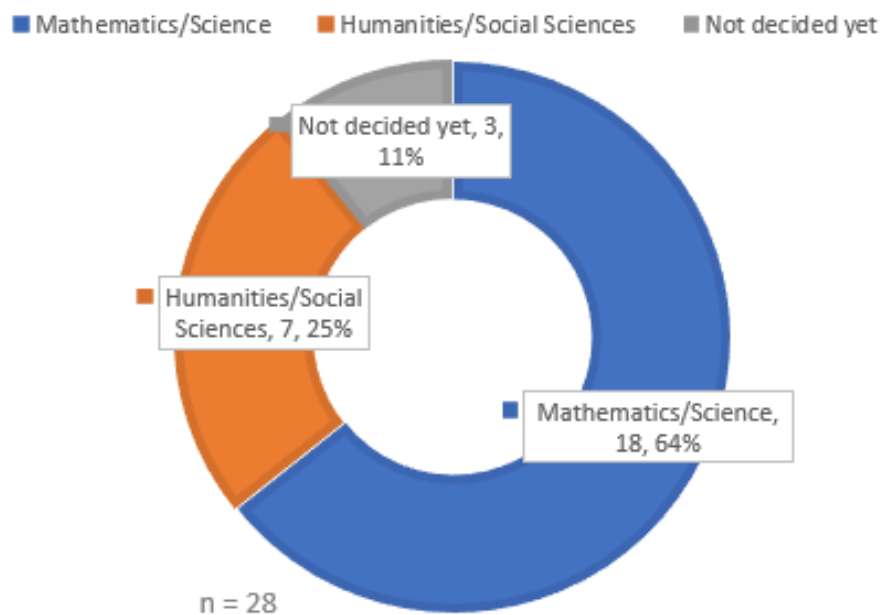


Figure 5. The Students' Preferred Subjects

Question 2 queried in regard to students' expectations. Some of the responses are as follows:

- 'observe how the humanities and the positive sciences are related to each other. At the same time, I expect to be further informed about the condition of the coronavirus'
- 'what relations can be drawn between history and mathematics'
- 'more things on the relation between history and mathematics'
- 'how math links to humanities'
- 'how mathematics is related to history'
- 'application of mathematical elements to historical data'
- 'information about the pandemics that have plagued humanity over the centuries'
- 'cases of epidemics in the past and how they were treated'
- 'how important is the impact of the current virus on humanity in relation to past pandemics'
- 'historical data on pandemics'
- 'the interpretation of pandemics phenomena through mathematical models'
- 'on the mathematics related to the coronavirus phenomenon'
- 'understand coronavirus through mathematics'
- 'application of elements of mathematics to historical data'
- 'mathematical models and statistics or historical data on epidemics'
- 'something new'
- 'things not widely known to the public at large'
- 'elements that correspond to today's reality'
- 'on the science of epidemiology'
- 'how to best protect myself and what will happen after the pandemic'

The following categories have been highlighted based on the responses: a) linking mathematics to the humanities/history; b) historical information about pandemics; c) mathematical modeling/mathematics of pandemics; d) new knowledge e) knowledge about pandemics; f) protection measures against pandemics (see Figure 6).

Question 3 asked the students to state their reason for attending the lesson. 36% stated that it was because they loved mathematics, 14% because they were on good terms with the instructors (the corresponding author for history and the second author for mathematics), 3% said that was because they loved history and 11% for no particular reason (see Figure 7).

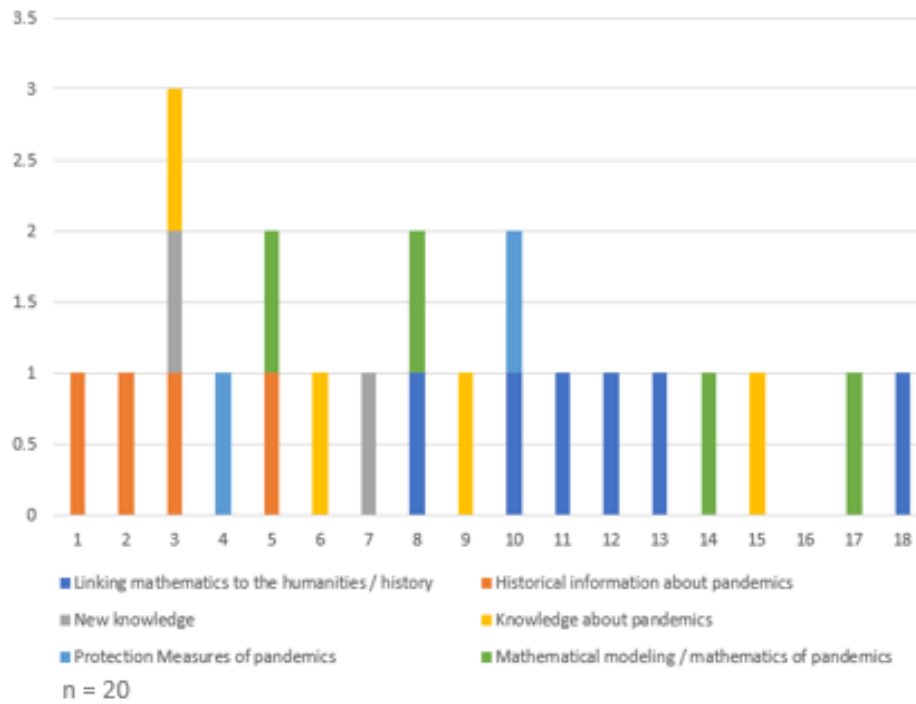


Figure 6. The Students' Expectations Regarding the Learning

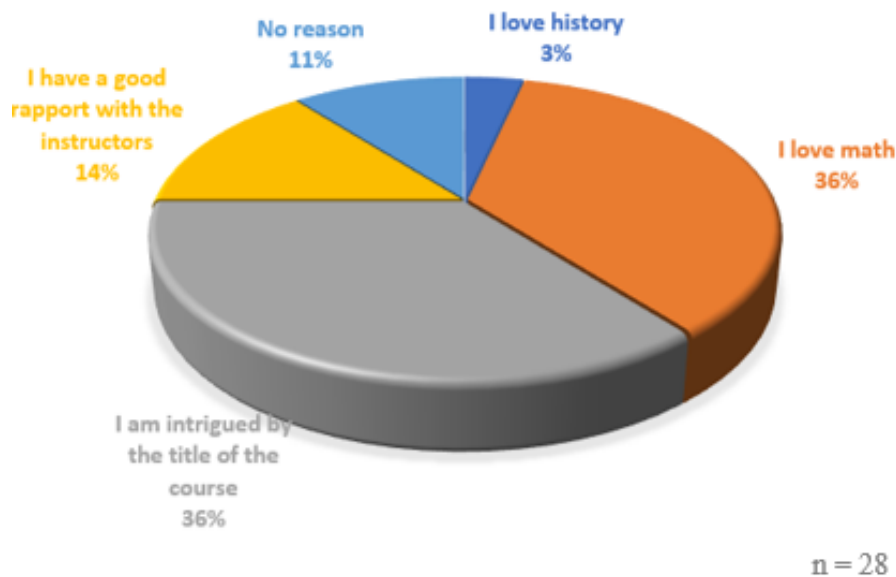


Figure 7. Students' Reasons for Participating

Question 4 asked: ‘How many times have you been taught interdisciplinary/multidisciplinary?’ Most of the students responded that they had been taught interdisciplinary twice before. The second most frequent answer was that they had not been taught interdisciplinary before (Figure 8):

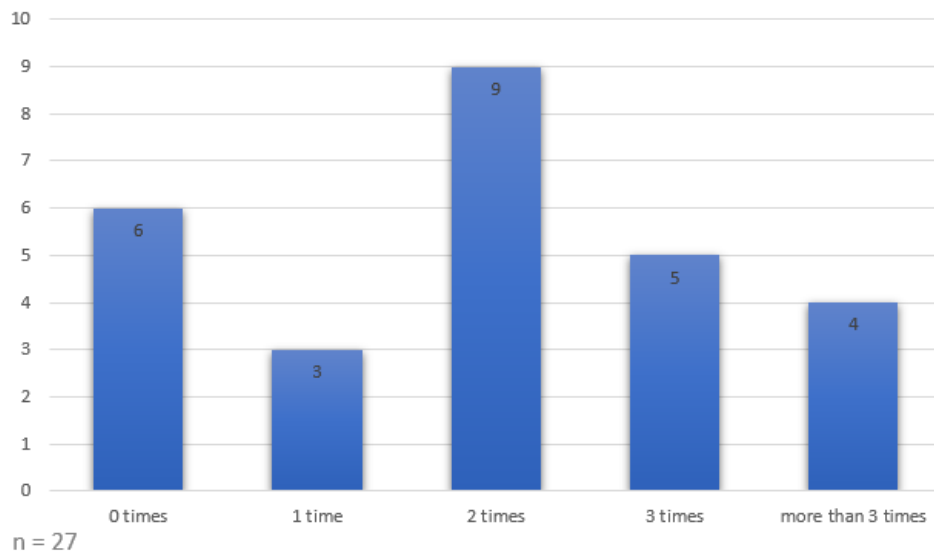


Figure 8. Students' Prior Experience of Interdisciplinary Teaching

Question 5 asked the students to give examples of connections between positive studies (mathematics, physics, chemistry, etc.) with the humanities (Greek, literature, history, etc.). The students' responses highlighted chemistry, radiochronology, in particular, and its relation to archaeology: 'certainly, chemistry is essential for history to date objects, but also physics and mathematics which can be utilized in excavations.'

Question 6 asked for the students' input in regard to cross-curricular connections between mathematics and history. The responses highlighted stereometry, statistics, algebra and analysis (see Figure 9).

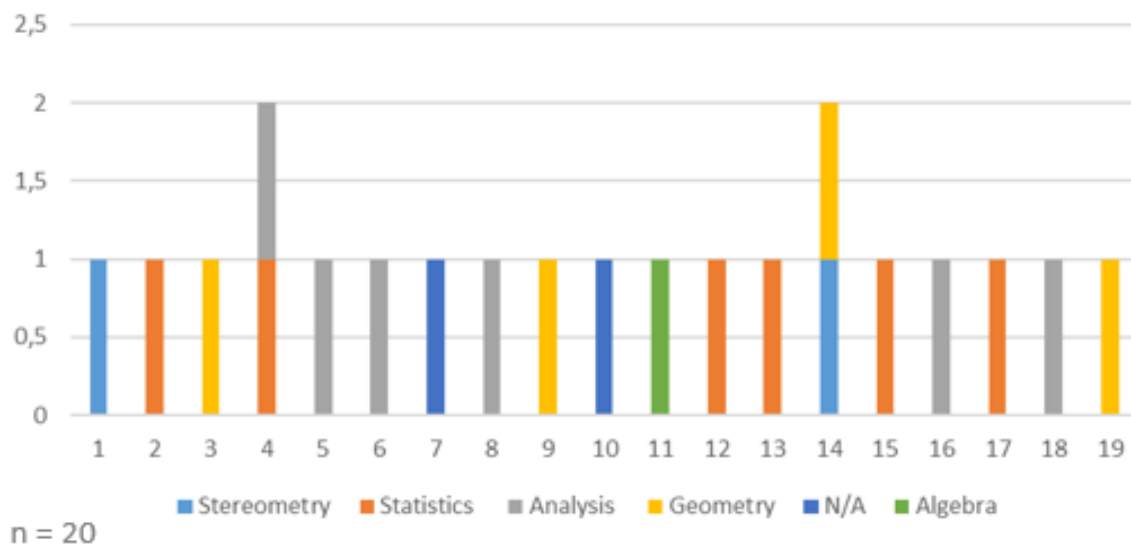


Figure 9. Interdisciplinary Connections between Mathematics and History

Question 7 focused on student perceptions on incorporating more cross-disciplinary content between the human sciences and the exact sciences into their learning. The responses were overwhelmingly positive. They were also very rich in content, quite diverse, long and elaborate, in comparison to the responses to the other items of the survey. They can be found below organized into eight categories:

a. It helps one become well-rounded:

- ‘yes, because a person should not be limited, but have broad horizons’
- ‘yes, because it allows for a well-rounded education’
- ‘it is important in order to achieve a well-rounded and multifaceted education’
- ‘yes, I think it is extremely important to link courses of different fields, as this cultivates well-rounded education and the combination of different thought processes, which is precisely the goal of schooling and, therefore, should be included in the curriculum’
- ‘of course. One must cultivate their spirit universally and must come into contact with all branches of science. One should aim to be like Homo universalis, the Renaissance man of Da Vinci, the scientist who combines natural and human sciences in order to interpret life, its essence and nature’

b. It prepares for real life:

- ‘it is very important to have an interdisciplinary approach in all courses because the modern world is not divided according to the orientations that we have to choose at school’
- ‘yes, it is very important because, in fact, all the sciences, humanities and exact science, are interconnected and do not have such a strict boundary separating them, as they appear to have in school. Also, in many fields of work their synthesis is required and from both is necessary (depending on the profession, a higher level is required in one rather than in the other)’
- ‘yes, because most of the time in our lives we see connections between the humanities and the sciences, even though we do not realize them at first’
- ‘yes, so that students understand that we are not dealing with two completely unrelated areas’
- ‘since there is a direct link between the humanities and positive studies for universal and global knowledge, the combination is necessary’

- c. It helps bridge the gap between the ‘hard’ sciences and the humanities/social sciences.
- ‘for sure. Thus, first, each and every student will realize that these two fields are somehow connected to each other. Also, the "gap" between the exact sciences and the arts, humanities and social sciences will be bridged and mutual respect will be promoted. Furthermore, it is important for the school to offer multifaceted learning (but not in view of the university entrance exams, as with our system the students are forced by the conditions to deal only with the courses of their orientation)’
 - ‘it is certainly important for there to be connections between STEM and the arts/humanities/social science courses, as the courses of both orientations are very important and we will need them in the future’
 - ‘yes, since they are often underestimated and it is important to emphasize the possibility of connection between them and not the exclusivity of each one of the two’
- d. It expands knowledge:
- ‘yes, knowledge and perception expand’
 - ‘yes, because they provide new knowledge’
- e. It promotes better understanding within subjects:
- ‘yes, because otherwise it is difficult for a student to understand the usefulness of all the courses and the fact that they are really combined with each other’
 - ‘sure, because both fields will evolve through interaction and exchange of knowledge’
- f. It enhances skills:
- ‘certainly, because they mobilize critical thinking’
- g. It provides motivation:
- ‘yes, because it is interesting and will motivate students to engage more’
- h. It can provide a link with higher education:
- ‘it is important mainly because this way the students have more areas that can probably be of interest and, if they exist at the university level, it would be good to have them in high school as well’
- i. Yes, but it does not lead to employability:
- ‘yes, since students have different interests and so they can combine them, I think it is important to have a course connecting them, but unfortunately, I do not think that it is linked to employability’

Part 2 of the questionnaire consists of 6 items, of which only 2 are closed-ended. Question 1 asked the students to ‘Record the knowledge gained in history’. The students’ answers are as follows:

- ‘ways of dealing with pandemics from past centuries’
- ‘serious diseases in previous years’
- ‘pandemics’
- ‘on the plague and the epidemics in different times and the ways of dealing with them in different countries (e.g., London)’
- ‘chronology of the epidemics - pandemics that have affected humanity to date’
- ‘use of the map for the first time by John Snow as a tool to study an epidemic’
- ‘the positive effect of popular perceptions about preventive measures against pandemics’
- ‘knowledge of pandemics of the past and ways to deal with them then’
- ‘historical data and ways of dealing with older pandemics’
- ‘I learned about John Snow and how he helped the English people cope with a major epidemic’
- ‘The Black Death, and several other major epidemics in history’
- ‘John Snow and London’

Question 2 asked the students to record the knowledge gained in mathematics. Their responses mentioned the following:

- ‘how to calculate the transmissibility of a disease’
- ‘statistics’
- ‘that there are exponential and logarithmic functions, and that the former have a limit, the carrying capacity’
- ‘greater familiarity with charts, recognition of exponential difference from the logarithmic model’
- ‘I got an idea about statistics and how diseases and pandemics spread’
- ‘which models describe the real situations more accurately and realistically’
- ‘the exponential and accounting function as well as for the normal distribution’
- ‘disease models’
- ‘functions’

Question 3 asked students to qualify the connection between mathematics and history in a 5-point scale and their answers are as follows: extremely interesting 34%, very interesting 33%, somewhat interesting 25%, not so interesting 8%, not at all interesting 0% (see Figure 10):

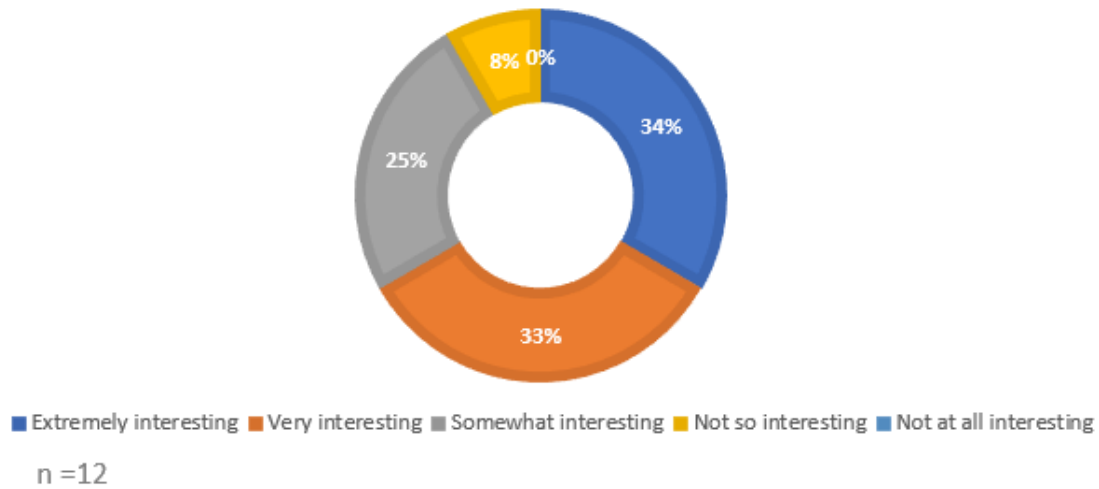


Figure 10. Qualifying the Connection between Mathematics and History

Question 4 asked the students' opinion in regard to the quality of the teaching. Half of them replied that it was of 'high quality' (6/12), one replied that it was 'very high quality' (8.33%), five replied that it was 'neither high nor low quality' (41.67%) (see Figure 11):

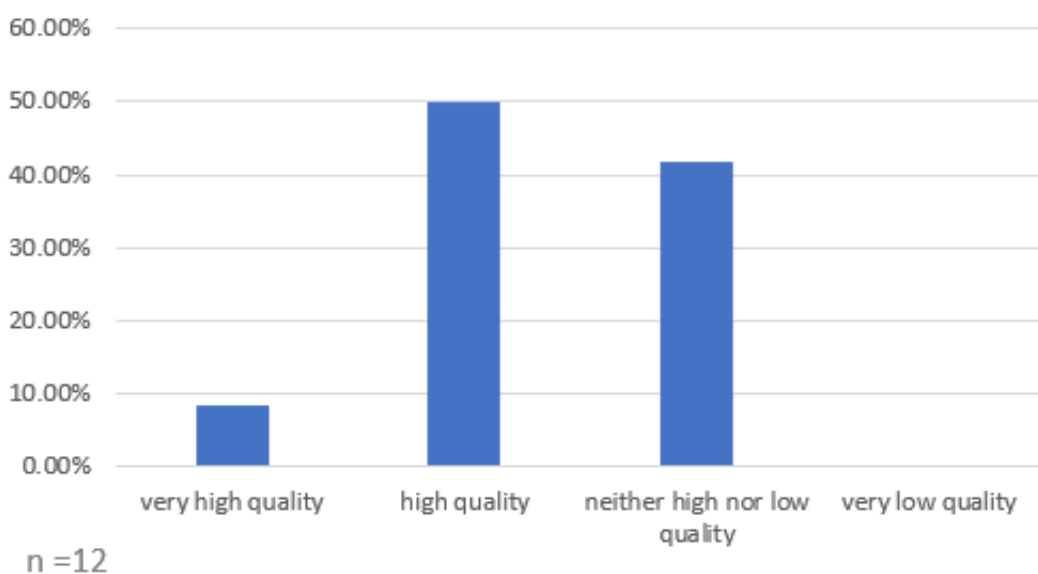


Figure 11. Evaluation of the Quality of Teaching

Question 5 asked the students to write any suggestions for improvement of the teaching. Their replies are organized into quantitative and qualitative suggestions, as follows:

Quantitative suggestions:

a. more material

b. more mathematics

- ‘there should be more statistics, rather than insignificant historical details’
- ‘emphasis on statistical methods’
- ‘perhaps a more thorough explanation of the mathematical models’

c. more case studies

- ‘perhaps a specific event (e.g., the example cited about the London plague) could be presented from a historical and mathematical point of view respectively’

Qualitative suggestions:

a. concerning the teaching

- ‘better coordination in material management (if there is a way for both teachers to access the material at the same time during the video conference)’

b. concerning the platform

- ‘better online platform’

Question 6 asked the students to give suggestions and specific examples as to how the curriculum could include more lessons/topics making interdisciplinary connections between mathematics and history. The students’ replies pointed at the history of mathematics:

- ‘the points where mathematics can be linked to history are parts of history where mathematics played a role or where mathematics flourished’
- ‘the history of mathematics’

Part 3 consists of eight questions on the skills improved (accessible online here: <https://www.surveymonkey.com/r/V6F27WG>). Figure 12 shows how the students evaluate each skill set. According to the students, the skills ranked on a 1-10-point Likert scale, as follows: analyzing information (87%), critical thinking (85%), ability to make reasoned decisions (81%), creativity (81%), intercultural understanding (77%), flexibility-adaptability (76%), organizational skills (69%), self-awareness/self-knowledge (60%) (see Figure 12):

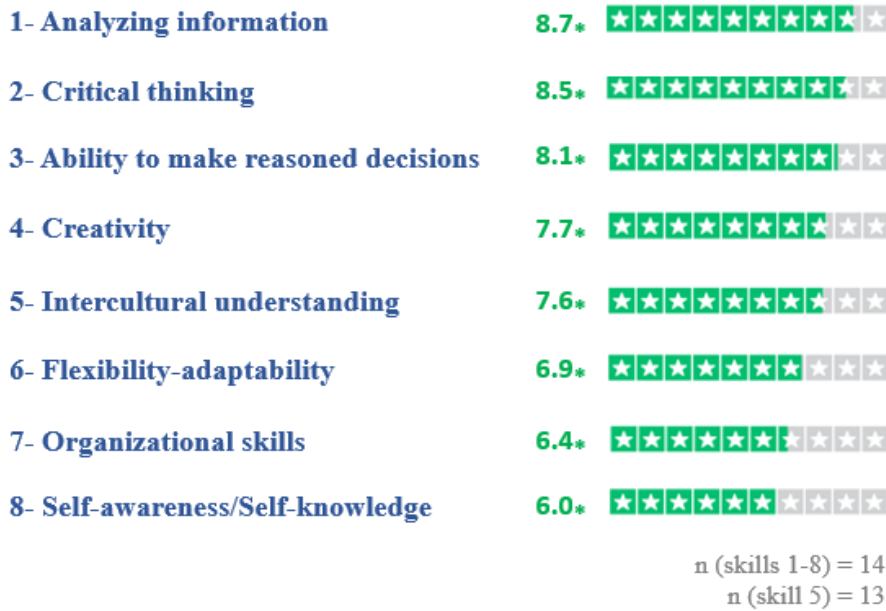


Figure 12. Skills Improved

The following three questions asked the students to rate the improvement of their knowledge in mathematics, history, and in regards to their attitude and motivation toward learning. Their responses are 66% (improvement in knowledge about the mathematics of pandemics), 80% (improvement in knowledge about the history of pandemics), and 86% in terms of their improvement in motivation toward learning (see Figure 13).

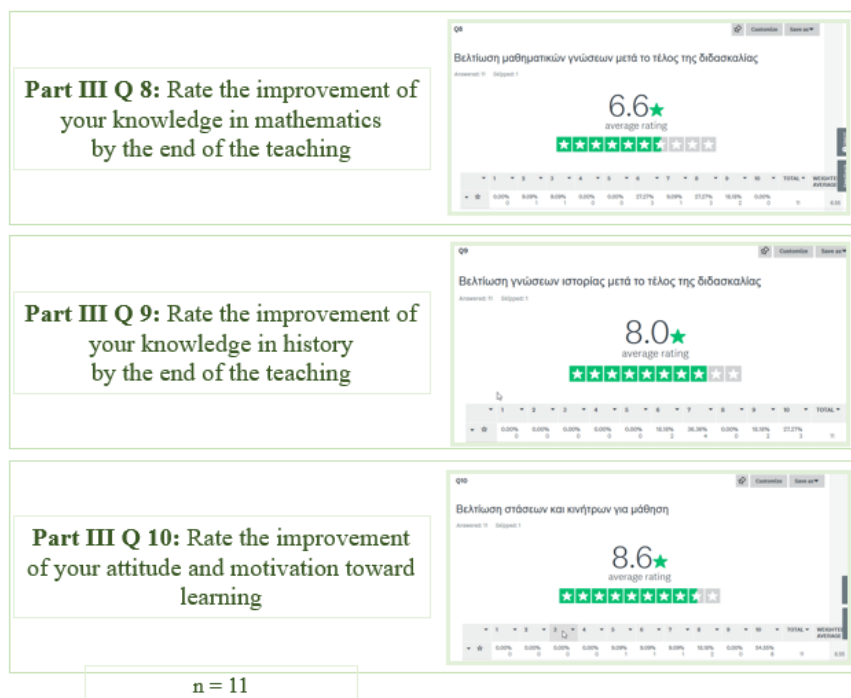


Figure 13. Improvement in Terms of Knowledge & Motivation

Discussion

Although numerous surveys have been carried out on the impact of the pandemic on all levels of education, there are, to our knowledge, no surveys examining student responses to interdisciplinary approaches to pandemics, let alone approaches that combine mathematics and history. Our survey consisted both of quantitative and qualitative items, so as to get deeper and far-reaching results. To all intents and purposes, the adoption of a mixed methods approach combining quantitative and qualitative items increases the usefulness of the findings. The originality of our approach counterbalances the limited number of respondents. This in our view, is the main limitation of the conducted survey in terms of generalizability and external validity of results.

Some of the most striking findings of the survey resulted from the qualitative data collected. These showed that the students were interested in the topic taught before the teaching and that this interest was heightened, rather than lost, after the teaching. Most students expressed their preference to mathematics rather than history. The majority also replied that their knowledge in these subjects had improved after the teaching. Furthermore, they reported that their exposure to case studies using data about historical periods to practice mathematical content knowledge had enhanced learning in both disciplinary areas. Also, according to their answers, they had coped better with the historical knowledge, rather than the mathematical knowledge they acquired during the approach, and they were eager for more exposure to statistical data on pandemics. They specifically asked for a more data rich history classroom (cf. Hull 1914; Siler 2001). The teaching of the historical significance of events, such as infectious disease outbreaks, in combination with a focus on data is a major take-away point of this survey.

The students reported that they were motivated to acquire further information and data on the pandemics of the past and that they were further intrigued to work on case studies approaching past pandemics through mathematical modeling. One possible explanation is that, while data arising from social systems are often highly complex, as they involve non-linear relationships, the linearity of simple models, such as the SIR model in epidemiology, can provide a lens through which history becomes analyzable and more relatable, thus, more engaging. What moment in the history of pandemics did the students want to investigate further? They expressed very keenly their wish to further investigate the case of the cholera

outbreak in London in the mid-19th century and its curbing through its mapping by John Snow. We have no data as to why the students were so interested in this particular moment in the history of pandemics. One can only speculate that it caught the students' interest because it was a success story, as it marked a milestone for the science of epidemiology and also, because it was much more recent than the case study of the plague of Athens, and, thus, more relatable.

What was the students' attitude to interdisciplinary teaching? The students commented on this very positively and gave compelling reasons for the necessity of such approaches. They expressed their enthusiasm with quite lengthy replies making comments which tapped on a central issue of educational systems worldwide: the need for more interdisciplinary curricula that reflect a more unified, less fragmented, approach to knowledge. The key message of their replies was that the real world does not divide knowledge into subjects the way school does.

Some students reflected on the relation of what they perceived as a positive learning experience to the rigorous exams that the students have to take at the end of their third year of lykeio. They mentioned the focus on the advanced placement courses that students who wish to pursue studies in higher education have to take. Their comments are telltale of the negative washback, i.e. the negative impact of this high-stakes exam process and its negative imprint on the exam-centric pedagogy of the Greek education system. Last but not least, in terms of the skills improved, the students reported the greatest improvement in the 'critically engaging with information' category. This is an important message of the survey, given that this skill is especially in demand in today's knowledge-based economies (Chu et al. 2017; Rotherham and Willingham 2009).

Conclusion

This paper presented an innovative teaching approach introducing the topic of pandemics/epidemics in the midst of the schools' lock-down due to the COVID-19 outbreak. The approach was evaluated both quantitatively and qualitatively. The two methods were brought together in order to answer the question whether the integration of an interdisciplinary approach combining the mathematics to the history of pandemics can deepen students' knowledge and help them develop transversal skills.

The main finding was that the combination of mathematical modeling and the history of pandemics is a topic that lends itself for an interdisciplinary approach. The interdisciplinary lens was met with great enthusiasm by the students. The majority of the students were interested in pursuing studies in mathematics rather than history, but responded positively to their exposure to data-rich case studies from different historical periods to practice mathematical content and asked for more.

Most importantly, the students reported that the teaching had helped them improve in eight different sets of skills and enhance their knowledge in both mathematics and history. In fact, they commented that this teaching across subjects helped them improve in both subjects. Despite the limited sample, this finding suggests that such interdisciplinary approaches are good practices that can prepare students for the complexity of globalized knowledge.

This academic year (2020-2021), a new interdisciplinary curriculum will be piloted in selected schools across Greece and will be fully implemented in 2021-2022. It is aimed to equip students with both the knowledge and skills necessary to navigate natural disasters in the 21st century. It is entitled ‘Mathematics teaches...History interprets’ and is based on the materials used for the teaching approach described in this article. To conclude, embracing the multiple challenges of teaching interdisciplinary about pandemics during one, with a focus on resilience and student experience, in in-person socially distanced and remote classes, offers a not-to-miss opportunity. It helps students navigate the history of pandemics, introduces them to mathematical models of the dynamics that govern the relation of these pandemics to the population, and, finally, shows them how past pandemics are teachable moments that inform and guide present decisions.

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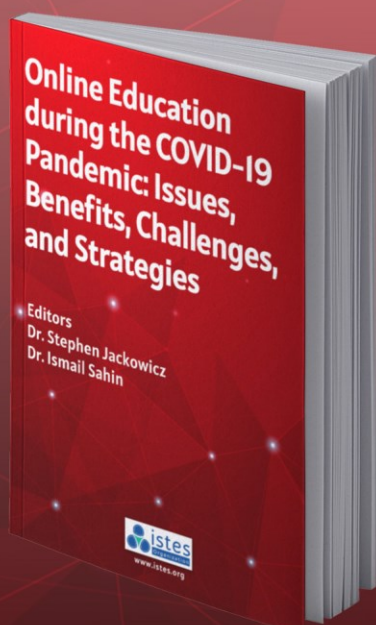
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The COVID-19 Pandemic impacted world society in many ways. The virus rode our interconnected transit systems and exploited a globally connected world where a person can traverse the planet within a day; far shorter a time than the incubation period. The virus challenged our assumptions on communicability of disease and transmission vectors. It challenged our medical systems; in the treatment of the infected, and an evolving understanding of the protocols needed for preserving the health of the vulnerable, and defining who is most vulnerable. COVID-19 challenged our social behaviors, our trust of one another, and the belief we had in our scientific systems to combat such a pandemic. Further, it stalled our educational systems. Unable to hold in-person classes, all levels of education were forced to utilize online platforms. Educators worldwide in disparate disciplines from elementary education through post-graduate study, in every field imaginable were forced to redefine their approaches and learn to adapt the technology we possess to the demands of maintaining progress in education.

This pandemic has been no easy challenge. There is an old Chinese saying, "In the midst of adversity is opportunity." So it has been in this pandemic. Scientists and medical providers around the globe have fought the virus and in record time produced protocols and vaccinations against it. Governments have shared information and pooled resources. Educators have developed new and impressive methods to not only maintain the education of students, but to ignite potentials and inspire the minds of learners despite having a "new normal."

This volume is a collection from educators around the planet who adapted to the changed landscape of education during COVID-19. Each of the contributors refused to accept that education would be stalled, that students would flounder, and that the virus' impact would dim the lamp of learning. Rather each chapter brings a new and powerful adaption, which was implemented during the pandemic. The authors bring lessons, pitfalls, success, and failure to inform the reader of what worked, what did not, and what holds promise for online education long after the COVID-19 Pandemic is resigned to the history books.



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