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An Exploration of the Technological, Technological-Pedagogical, and Technological and instructional Challenges that Saudi Faculty Face in their Transition to online Education

Mshael Aldakheel
Mshael8080@gmail.com

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ABSTRACT

AN EXPLORATION OF THE TECHNOLOGICAL, TECHNOLOGICAL PEDAGOGICAL, AND TECHNOLOGICAL AND INSTRUCTIONAL CHALLENGES THAT SAUDI FACULTY FACE IN THEIR TRANSITION TO ONLINE EDUCATION

Mshael Aldakheel, PhD
Department of Educational Technology, Research and Assessment
Northern Illinois University, 2021
Wei-Chen Hung, Director

The rapid pace of globalization has contributed to the expansion of fully online programs and course offerings over the past decades. Additionally, the current COVID-19 pandemic accelerated the move to online instruction worldwide. Various challenges have become evident when transitioning to online education. Thus, this qualitative case study explored the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a higher institution in the Kingdom of Saudi Arabia (KSA) faced while transitioning from fully face-to-face instruction to fully online instruction. Three research questions were addressed. Findings indicated participants experienced challenges pertaining to the role of the instructor, the approach to teaching and learning assessment, and the instructional design decisions and strategies used to support student learning in fully online instruction. Findings can guide educational stakeholders to acknowledge the need for training and provide supports to help faculty confidently transition into fully online instruction.

Key words: TPACK; higher education, technological challenges; technological pedagogical challenges; technological content challenges

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AN EXPLORATION OF THE TECHNOLOGICAL, TECHNOLOGICAL PEDAGOGICAL,
AND TECHNOLOGICAL AND INSTRUCTIONAL CHALLENGES THAT SAUDI
FACULTY FACE IN THEIR TRANSITION TO ONLINE EDUCATION

BY

MSHAEL ALDAKHEEL
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Doctoral Director:

Wei-Chen Hung

TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF APPENDICES	viii
Chapter	
1. INTRODUCTION.....	1
Problem Statement	2
Research Purpose	3
Research Questions	4
Theoretical Framework	4
The TPACK Framework.....	4
TK, TCK and TPK: Application to the Study.....	6
Significance of the Study	8
Definition of Key Terms	9
Structure of This Document.....	10
2. LITERATURE REVIEW	11
Challenges in Online Teaching Among Faculty	11
Time Management and Workload	11
Change in Instructor Role	12
Interactivity	13
Online Learning	14
Online Learning in Contemporary Higher Education.....	15

Chapter	Page
	iii
Online Course Design	16
Need for Faculty Development	18
Faculty Attitudes Toward Online Instruction	20
Online Learning in the Kingdom of Saudi Arabia	21
The TPACK Framework	22
Components of the TPACK Framework	23
Importance of TPACK on Instruction	26
Conclusion	28
3. METHODOLOGY	30
Research Design	30
Purpose of the Study	31
Research Questions	31
Data Collection	32
Setting	32
Sampling Method	33
Participants Recruitment	34
Permissions and Ethical Considerations	34
Procedures	35
Data Analysis	39
Initial Preparation and Preliminary Exploration	40
Data Triangulation	41
4. FINDINGS	43

Chapter	Page
Trustworthiness of the Data Collected.....	43
Participants' Demographics.....	45
Results.....	47
Research Question 1: What Technological Challenges Pertaining to Pedagogy Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?	47
Research Question 2: What Technological Challenges Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?	57
Research Question 3: What Technological Challenges Pertaining To Content Do Faculty Members Face During The Transitional Phase To Fully Online Instruction?	65
Summary	71
5. IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS	72
Summary of the Findings.....	72
Discussion of Findings.....	74
RQ1: What Technological Challenges Pertaining to Pedagogy Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?	74
RQ2: What Technological Challenges Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?	78
RQ3: What Technological Challenges Pertaining to Content Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?	80
Implications of the Study	81
Limitations and Delimitations.....	83
Recommendations for Future Research	84
Conclusion	86

Chapter	v
	Page
REFERENCES.....	87
APPENDICES.....	94

LIST OF TABLES

Table	Page
1 Participants' Demographics.....	46
2. Summary of Observational Data.....	50

LIST OF FIGURES

Figure	Page
1. The TPACK framework and its knowledge components (Koehler & Mishra, 2009) ...	5

LIST OF APPENDICES

Appendix	Page
A.SUPPORT REQUEST EMAIL	94
B.INVITATION EMAIL	96
C.CONSENT FORM	98
D.INTERVIEW PROTOCOL	101
E.RUNNING RECORDS	105
F.TIME SAMPLING MODEL	109
G.MEMBER CHECKING FORM	112
H.ALIGNMENT OF DATA COLLECTION.....	114
I.CODING TABLE.....	117

CHAPTER I

INTRODUCTION

The rapid pace of globalization has contributed to the necessity of breaking down geographical and social boundaries to offer distance learning education in the last few decades (Davey et al., 2019; Esani, 2010; Islam et al., 2015; Ruth, 2018), which has resulted in some universities expanding to fully online programs and course offerings (Wright, 2014). The transition from a face-to-face to virtual environment implies that the role of an instructor changes (Esani, 2010). The instructor must adjust their instruction to create a learner-centered environment with a climate of social presence, making emphasis on course design, engaging instructional strategies, and knowledge sharing (Esani, 2010). Additionally, the recent circumstance of the COVID-19 pandemic of 2020 has increased the demand for effective and high-quality online learning, thus intensifying unwanted pressure for faculty in higher education institutions to quickly move to online teaching and respond to the challenges it poses (Islam et al., 2015; Ruth, 2018). In many cases, educators seemed to approach this transition in two different ways: those who were already teaching online or were heavily utilizing online components in their face-to-face classes have adapted quickly and generally effectively, while others who have either not been exposed to any online components of learning or who have resisted online learning have faced numerous challenges.

Online instruction has often been regarded as labor intensive and academics often face great difficulties in managing their time (Esani, 2010; Islam et al., 2015). Online teaching necessitates a different pedagogical approach to instruction design and delivery, mainly when it

refers to interaction and online assessment. The lack of face-to-face interaction in the online setting makes it difficult for the instructor to assess students' understanding and learning process, maintain a fluid communication with students, and create a sense of social presence that would promote students' belongingness and motivation (Davey et al., 2019; Esani; 2010; Islam et al., 2015; Kibaru, 2018). In normal circumstances, faculty members have expressed concerns regarding the constantly changing nature of educational technology coupled with the workload implied by the need to constantly remain updated (Kibaru, 2018). It is common knowledge that faculty are already overworked (Kibaru, 2018); thus, developing the skills to design, develop, review and maintain good-quality online instruction may result in an overwhelming working load (Esani, 2015; Ruth, 2018; Wright, 2014).

Online learning is essential to prevent interruptions in learning, and preparedness for such work is needed yet more powerfully in these current circumstances. The dynamic nature of the virtual learning environment pushes faculty to face the challenges of their new role and the implications it has on their pedagogical practices (Kibaru, 2018). Thus, the key challenge for academic staff members is how to transform traditional course design and delivery to meet the current demands of online education (Davey et al., 2019; Wright, 2014). Various technical and pedagogical skills are required for a smooth and effective transition to online teaching (Islam et al., 2015; Mishra & Koehler, 2006).

Problem Statement

Since online classes play a significant role in education nowadays, there have been an increasing number of studies about online learning over the past decades. Additionally, the current circumstance of the COVID-19 pandemic of 2020 has accelerated the move to online education worldwide. Various challenges have become evident to engage faculty in successful

online instruction. Research indicates that faculty are often pushed to online instruction and required to utilize pedagogical and technological skills that they may not necessarily possess (Kibaru, 2018; Wright, 2014); thus, challenges need to be explored in order to provide them with the needed support to develop such skills and knowledge. Literature on online learning often discusses faculty members' attitudes, perceptions, and perspectives about online instruction as well as their experiences teaching synchronous or asynchronous online classes (Kibaru, 2018; Ruth, 2018). Time management, overload work, lack of technical support, and insufficient training are often the main areas that pose difficulties with online teaching among faculty (Davey et al., 2019; Esani, 2010; Islam et al., 2015, Kibaru, 2018; Ruth, 2018).

Little research has been reported on the challenges that faculty members face in the process of transitioning from face-to-face instruction to fully online instruction. The rapid change of online education and technology also intensifies the need for more up-to-date research in self-perceived barriers to assess the obstacles and approaches to improve e-learning instruction (Akbarilakeh, Razzaghi, & Moghaddam, 2019; Luongo, 2018; McVey, 2019). Given this gap, this qualitative research study explored pedagogical and technological challenges that faculty members faced in the transitional phase from face-to-face instruction to fully online instruction.

Research Purpose

The purpose of this qualitative case study was to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a higher institution in the Kingdom of Saudi Arabia (KSA) face while transitioning from fully face-to-face instruction to fully online instruction. The selected Saudi university started the emergency transition to online instruction due to the COVID-19 pandemic in March 2020. The data collection of this study was conducted in March 2021, almost a year after the pandemic hit.

Although the goal of the study was not to look at the emergency or sudden shift to online teaching due to the pandemic, the data collected reflect participants' experiences during the pandemic as well as other prior experiences. With a student population of about 40,000 students, the university's mission is to promote knowledge as well as follow and parallel other nations. This higher education institution has been fostering distance learning, implementing and developing various online learning and training courses, since 2011. However, faculty have expressed difficulties in their online instruction such as online course design, subject matter teaching, and technological challenges.

Research Questions

The following research questions guided this study:

RQ1: What technological challenges pertaining to pedagogy do faculty members face during the transitional phase to fully online instruction?

RQ2: What technological challenges do faculty members face during the transitional phase to fully online instruction?

RQ3: What technological challenges pertaining to content do faculty members face during the transitional phase to fully online instruction?

Theoretical Framework

The TPACK framework was utilized in part as a foundation for this research.

The TPACK Framework

Koehler and Mishra (2009) introduced the framework by arguing that educational technology lacked a formal theoretical grounding. Building upon the framework of pedagogical and content knowledge from the work of Shulman (1986), Koehler and Mishra (2009) introduced

the technological component into the pedagogical and content knowledge mix as a means to examine how teachers were integrating technology into their work.

The TPACK framework captures the capabilities and the knowledge required among educators to successfully integrate technology in the classroom (Koehler & Mishra, 2009). The TPACK framework identifies six constructs for effective teaching with technology: Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK) (see Figure 1). According to Koehler and Mishra (2009), the interactions between the components of the model are as important as the components themselves.

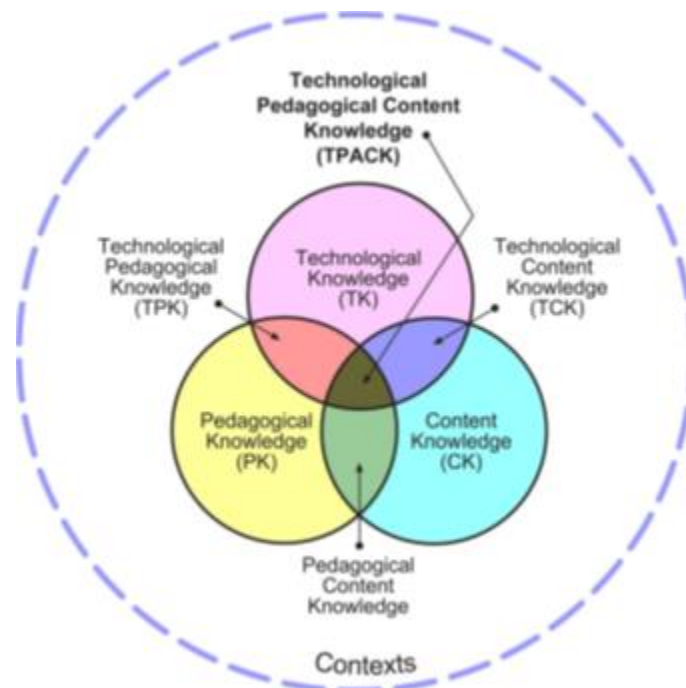


Figure 1. The TPACK framework and its knowledge components (Koehler & Mishra, 2009).

TK, TCK and TPK: Application to the Study

Instructional design for online courses is inherently concerned with the ways to design courses effectively using the given technologies available at the particular educational institution. As with any classes being offered in higher education, online classes possess outcomes or certain goals that instructors are expected to achieve with their students. It has been seen that in some cases, these goals can be hindered by a lack of technological knowledge among instructors who are otherwise considered subject matter experts (SMEs). That is, they possess sufficient knowledge of the subject they are teaching, but not necessarily of the technology being used (Davey et al., 2019). TK can facilitate instruction by informing faculty of tools to introduce content, ways of engaging students, and strategies to sustain learning during their online teaching. Therefore, this research study was best served by examining the constructs in the TPACK framework that contain the elements of technology: TK, TCK and TPK. These constructs provided a framework for this dissertation study due to the apparent alignment to technology in the shift from face-to-face to fully online course offerings.

As mentioned earlier, TK may have a significant impact on design choices an online instructor makes. Some of the potential challenges that may appear include things as simple as troubleshooting software or hardware issues associated with computer use. Furthermore, faculty members' ability to be a first point of contact for troubleshooting when students face issues with technology is another key feature of technological knowledge; faculty who are not comfortable with the use of technology themselves are likely to be equally uncomfortable attempting to assist students in the use of that technology.

TPK can include ways that pedagogy is both facilitated and constrained by technology; particular to online education, there are certain pedagogical practices that just do not fit, and,

conversely, there are some that can only be achieved in such a setting. Graham (2011) describes this as the knowledge of certain technologies' capabilities and components as they relate to teaching and learning. Some examples of TPK could include a professor's ability to promote interactivity in an online course or create an environment online in which students can build new skills (Archambault & Barnett, 2010). A more specific example that is relevant to the present move to virtual learning relates to the platform Zoom. A professor may know how to host a virtual meeting with their students, but deeper knowledge of the platform could allow them to incorporate formative assessments with multiple-choice polls scattered throughout a synchronous virtual meeting. This informed the current research study so as to explore the ways that faculty members either utilized the knowledge of technology that they possessed to promote certain pedagogical goals or, conversely, instances in which they lacked knowledge and were unable to achieve their aims in terms of pedagogy or had to learn in order to do so.

The technological content (TCK) aspect of the framework represents the final fundamental piece of TPACK for this research study. An understanding of the appropriateness of different technologies based on different content areas is a starting point for recognizing the role of this part of the framework. Teachers must understand their subject matter deeply enough to be able to infer what impacts different technologies may have on the content (Koehler & Mishra, 2009). A simple example of this would be a professor of art who recognizes that using tablets with particular software may function acceptably to simulate painting, but sculpting would not work with this technology. Professors who possess TCK could, for instance, demonstrate concepts within their content area using a variety of possible technological representations (Archambault & Barnett, 2010). For this study, it was of use to explore the ways that faculty members felt constrained by technology as it pertained to presenting the content required to

achieve the desired outcomes of their course. It was of value to investigate what difficulties affected their design and delivery of instruction in the transition to online teaching. Further literature on the TPACK framework is discussed in Chapter II.

Significance of the Study

The challenges that the faculty members are facing during their online teaching encouraged me to perform a study focused on the challenges that faculty members face in the transitional phase from traditional face-to-face classes to fully online classes. The necessity of training is outlined in a significant literature review (Davey et al., 2019; Islam et al., 2015; Kibaru, 2018; Wright, 2014) as a factor that cannot be overlooked when considering ways to engage faculty in the move to online learning. Thus, illuminating that period may serve as literature to help offer better support to faculty members and ensure the quality of the online classes they are offering. Understanding the challenges that faculty face in the transition to online instruction may facilitate the design and implementation of professional development plans (Graham, 2019). Adequate training and preparation for the use of technology can arguably help academics to perform their job tasks more comfortably and effectively. Moving pedagogical concepts to an online course can pose significant problems, so providing pointers and trainings is a necessity (Islam et al., 2015). Solutions to the challenges that may arise can also lead to a faster and easier process of transforming face-to-face classes into online offerings. The stress associated with moving courses online may consequently diminish, mitigating a potential barrier to instructional design.

Findings from this qualitative dissertation study are also hoped to pave the way for higher education institutions, especially those in Saudi Arabia where the study was conducted, to focus on design thinking and devising new and better solutions for effective online teaching and

learning practice. The possibility of providing this benefit to the field of instructional design represented a personal goal because of the ways it may impact my future work as an instructional designer. If better solutions to challenges are designed and implemented, online course offerings can arguably improve in quality, which may have an impact on the quality of learning occurring among students.

Overall, challenges are vital to understand for any institution wishing for a successful online learning outcome (Islam et al., 2015). Despite the literature possessing some insights on the types of challenges that appear when moving online, the current study intended to fill a void nonetheless by addressing several needs. For one thing, faculty members' comfort may improve if they are aware that they are not the only ones who have faced or are facing a particular set of problems when shifting their courses online. The stress of moving online will nevertheless exist, but knowing that others have navigated similar waters previously may encourage faculty members to realize that solutions also exist.

Definition of Key Terms

For the purpose of this study, the following terms are defined as follows:

Faculty member: an educator who has a master's and/or Ph.D degree and works at a higher educational institution.

Transitional phase: process during which instructors move from face-to-face instruction to fully online instruction before and/or during the COVID-19 pandemic.

Fully face-to-face instruction: a form of instruction where course content and learning material are taught completely in person to students.

Fully online instruction: a form of instruction that takes place completely online. It can be synchronous or asynchronous. This study primarily focused on synchronous instruction. It

involves a variety of multimedia elements, including graphics, audio, video, and web links, which all can be accessed through one's internet browser and does not require face-to-face meetings.

Structure of This Document

This chapter provided an overview of the research problem, the theoretical rationale, the background and significance of the study, key terms, and a brief description of the methods to be used. Chapter II reviews the relevant research related to online learning in higher education, online course design and delivery, challenges that faculty members face when shifting from fully face-to-face classes to fully online classes, and current research on the TPACK framework describing the technological pedagogical knowledge, technological knowledge, and technological content knowledge required for online instruction among faculty. Chapter III provides a description of the design as well as data collection and analysis procedures used to explore the technological challenges, technological pedagogical challenges, and technological content challenges faced by faculty members at a public Saudi university in the transition from fully face-to-face instruction to fully online instruction. Chapter IV reports the results of the data collected, while Chapter V provides an in- depth discussion of the study findings, implications, and recommendations for future research.

CHAPTER II

LITERATURE REVIEW

This section provides an overview of the relevant literature related to the challenges that faculty members face in online learning in higher education, online learning, online course design and delivery, and current research on the TPACK framework describing the technological pedagogical knowledge, technological knowledge, and technological content knowledge required for online instruction among faculty and the importance of TPACK on instruction. Finally, gaps in the literature and areas for future research are discussed.

Challenges in Online Teaching Among Faculty

Various challenges have been identified when it comes to online teaching in higher education. Time management, workload, change in instructor role, and interactivity are the main areas that pose difficulties with online teaching among faculty (Davey et al., 2019; Esani, 2010; Islam et al., 2015, Kibaru, 2018; Ruth, 2018).

Time Management and Workload

Online instruction has been regarded as labor intensive as faculty face difficulties in managing the time and effort needed to teach online (Esani, 2010; Hunt et al., 2014; Islam et al. 2015; Wright, 2014). Esani (2010) suggested that online course development and delivery of instruction requires more time and work compared to traditional instruction. Ruth's (2018) study indicated that online teaching demanded a minimum of 14% more time than face-to-face instruction, the majority of which was devoted to introducing content. Some content may be

more challenging to introduce in an online learning environment (Kibaru, 2018); thus, students may necessitate frequent feedback and content clarification (Esani, 2010). Such constant communication with online students as well as online grading of exams and papers and other responsibilities may add to faculty difficulties in managing their time (Esani, 2010). When compared to face-to-face instruction, workload in online instruction is regarded as more unstable (Tomei, 2006).

Research suggests that the difficulties related to workload can have an impact on faculty acceptance and perceptions of online teaching (Graham, 2019; Walters et al., 2017). Researchers agree that faculty are already overwhelmed with busy schedules performing regular tasks such as grading, interacting, and providing feedback to students (Davey et al., 2019; Esani, 2010; Kibaru, 2018). Thus, developing the necessary skills to design, develop, review and maintain good-quality online instruction may often pose challenges for faculty members (Esani, 2010; Ruth, 2018; Wright, 2014). Online instructors are expected to effectively manage online instruction while dealing with emerging technologies (Esani, 2010).

Change in Instructor Role

Faculty need to face the challenges of their new role and the implications it has on their pedagogical practices (Kearns, 2016; Kibaru, 2018). In normal circumstances, faculty members have expressed concerns regarding the constantly changing nature of educational technology coupled with the need to constantly remain updated (Kibaru, 2018). The dynamic nature of the virtual learning environment and the rapid transition to online environments arguably imposes unwanted pressure for an evolving approach to course design and delivery (Kibaru, 2018). Online teaching shifts the focus from teaching to learning and from student-centered learning to instructor centered, placing the instructor as a facilitator or guide rather than a source of

information (Kearns, 2016). Siedlaczek (2004) indicated that some faculty perceived their presence in the online learning environment as “fading into the background,” while others had a more active role.

Academic staff members need to reinvent and refine their traditional course design and delivery to meet the demands of online instruction (Davey et al., 2019; Wright, 2014). Various technical and pedagogical skills are required for a smooth and effective transition to online teaching (Davey et al., 2019; Islam et al., 2015; Mishra & Koehler, 2006; Wright, 2014). Graham (2019) claimed that faculty who lack training in online education often employ face-to-face educational practices in online environments. Baran et al. (2011) suggests that online instructors may resort to traditional classroom practices as online learning environments do not often promote higher order thinking skills among online learners.

Interactivity

Online teaching necessitates a different pedagogical approach to instructional design and delivery, mainly when it refers to interaction and online assessment (Islam et al., 2015). Siedlaczek (2004) emphasized interactivity, motivation, and innovative content implementation as the main differences between face-to-face and online teaching. The lack of face-to-face interaction poses difficulties for the online instructor to assess student learning, maintain a fluid communication, and create a sense of social presence that fosters student belongingness and motivation (Davey et al., 2019; Dumont & Raggio, 2018; Esani, 2010; Islam et al., 2015; Kibaru, 2018; Wynants & Dennis, 2018).

Faculty often face challenges to build rapport with online learners as they find limited opportunities to interact with them (Chatham-Carpenter & Spadaro, 2019; Esani, 2010; Kibaru, 2018). In addition, the lack of proximity to learners poses difficulties to observe students’

learning process and assess practical knowledge (Islam et al., 2015; Kibaru, 2018). However, it is common knowledge that online learning platforms offer venues such as discussion boards, blogs and chat rooms that serve as means of communication between the instructor and the learner. Hunt et al. (2014) suggest that lack of ability to interact with students is mostly expressed among faculty with no experience in online teaching. Thus, Davey et al. (2019) emphasized the need for a different instructional design and development to face the lack of face-to-face engagement. Research suggests that training in online teaching should be provided for faculty to learn how to work asynchronously and promote student interaction in online environments (Dumont & Raggio, 2018; Walters et al., 2017).

Other challenges relate to faculty resistance toward online teaching and implementing course changes to address effective delivery of instruction (Hunt et al., 2014; Orr et al., 2009). Faculty lack of flexibility to instructional change may be associated with faculty experience and interest in online environments (Bower, 2001; Hunt et al., 2014). There are a variety of factors that relate to faculty resistance to teaching online; however, most of them relate to the already identified barriers such as workload, time and effort spent on course design, and lack of preparedness (Bower, 2001). Professional development can help faculty improve their implementation of online programs and overcome some of these barriers (Graham, 2019; Kibaru, 2018). Kibaru (2018) indicated that continuous assessment of challenges faced by faculty in design and delivery of online courses is required to provide training and effectively address the difficulties identified.

Online Learning

Online learning can be presented in a variety of instructional forms, including courses with online materials used as supplemental information to face-to-face instruction, a combination

of supplemental and core material online in addition to face-to-face classes, as well as fully online courses where all materials and interactions are online (Banditvilai, 2016; Salas, 2016; Siedlaczek, 2004).

The first online learning programs in higher education appeared in the 1980s, and they showed a rapid growth and development throughout the 1990s (Lucey, 2018). This rise in online learning has intensified with the advancement of technology that facilitated access and navigation to the internet and many online learning software providers. More and more higher education faculty are requested to teach online (Allen & Seaman, 2016), as higher education students have demonstrated an increasing preference to register for at least one fully online course in recent years (U.S. Department of Education, 2019). However, the necessity of online learning is demonstrated yet more powerfully in these current circumstances of the COVID-19 pandemic as it has required a rapid transition to online learning in many countries around the world. Thus, online learning has demonstrated to be an essential tool for the continuance of learning.

Online Learning in Contemporary Higher Education

In the last decades, the demand for online programs and courses in institutions of higher education in the United States has continued to grow (Elliott et al., 2015; Fredericksen, 2017; Lucey, 2018; O'Hara & Pritchard, 2012; Portugal, 2015). Recent estimates indicate that about 30% of all students enroll in at least one online course, and distance learning options have increased over the last decade, reaching over six million students in the United States alone (Allen & Seamen, 2016). The popularity of online education can be attributed to a plethora of benefits for both the students and the institution.

Research indicates that there are various benefits to online learning (Banditvilai, 2016; Lucey, 2018; Portugal, 2015; Siedlaczek, 2004). Online learning in higher education appears to be an appropriate and flexible option for adult learners who often have busy schedules as it offers students the comfort and flexibility of accessing the course materials and communicating their queries to the course instructor anywhere and anytime (Lucey, 2018; Portugal, 2015). Online education promotes student autonomy as they have control over the learning materials as well as the amount of time and approach to study them (Banditvilai, 2016). In addition, courses designed and delivered in an online environment offer the possibility of enriching student learning experiences by promoting sharing communities that are highly interactive (Siedlaczek, 2004).

Online interaction also facilitates group discussions, accommodations to students with different needs and learning styles, and the opportunity for teachers to explore new ways of teaching and learning (Lucey, 2018; Salas, 2016; Siedlaczek, 2004). Students can create and follow various discussions at the same time while working at their own pace. Faculty can improve their ability to communicate instructions, explain content, and interact with students (Portugal, 2015; Siedlaczek, 2004).

Online Course Design

Online course design often requires faculty to revisit online teaching and learning practices in higher education. Online instruction demands more time in the preparation of instructional materials and student assessment compared to face-to-face instruction (Portugal, 2015). Thus, faculty need to develop new technological skills and knowledge to effectively navigate the online technologies (Kibaru, 2018; Portugal, 2015; Siedlaczek, 2004). The difference in the role of the online instructor, the teaching style, the instructional design

decisions and strategies used to support student learning in an online environment have a significant impact on the effectiveness of the course (Siedlaczek, 2004).

Transitioning to online learning also requires faculty to consider the characteristics of their digital-native generation of students (Davey et al., 2019; Islim & Sevim Cirak, 2017; O'Hara & Pritchard, 2012). The majority of current students around the world are regarded as digital natives as they were born and raised in a technology-rich and interconnected world (Islim & Sevim Cirak, 2017) and they expect it to be utilized in their education (Davey et al., 2019). According to Salas (2016), the various online learning management systems, cloud-based multimedia applications, and mobile apps define the tools and language of 21st-century education.

Some other design features that are relevant in online learning include those that promote understanding of group dynamics as well as individual needs and allow the instructor to understand the work that is being produced by the students (Turvey, 2008, as cited in Islam et al., 2015). The two main differences between face-to-face and online instruction are that participants do not share the same physical space to interact with one another or with the course material and, thus, interaction shifts from primarily verbal to primarily written. Therefore, the online learning environment necessitates the development of new ways of interaction with the instructor, peers and the course materials (Lucey, 2018; Siedlaczek, 2004). Lucey (2018) suggests that online courses in higher education can be more enjoyable and effective when students not only can learn on their own but also from others.

Course design should provide opportunities for students to work on their own and with others (Herring, 2004; Lucey, 2018). Thus, an online learning environment for peer mentoring and learning community is needed to enhance meaningful and successful interaction among

students and with the instructor in the online classroom (Portugal, 2015; Siedlaczek, 2004). The role of the teacher shifts from that of a leader to a supporter or facilitator as students are expected to become autonomous and self-directed (Portugal, 2015). Thus, scaffolding and support from the instructor are key in the online environment to promote the successful academic development of the learner (Siedlaczek, 2004; Windes & Lesht, 2014).

O'Hara and Pritchard (2012) developed a series of recommendations for online course design to mainly guide faculty who are novice technology users in an online environment. The researchers suggested (1) considering technology as a tool having the content drive the use of technology; (2) utilizing the right tools to ensure the delivery of online educational content, which are usable and offer enough functionality to achieve the goals of the program; (3) creating faculty teams where faculty who are technology experts mentor and share expertise with novice faculty as well as offering opportunities for co-teaching for faculty to teach courses together; (4) developing authentic tasks; and (5) taking ownership and sharing input into the content and structure of the program developed. O'Hara and Pritchard (2012) agreed that one of the main challenges in faculty development is preparing novice technology faculty to face the online environment. Instructional design for online courses is inherently concerned with the ways to design courses effectively using the given technologies and support available at the particular educational institution. Access to quality support when using technology also relates to this because, coupled with successful training, it can be a fundamental part of building technological knowledge and expertise.

Need for Faculty Development

Current literature indicates that faculty development, training and support are among the main concerns in online education (Fredericksen, 2017). The rise in the demand for online

courses and programs on university campuses requires better preparation and support to faculty for the effective delivery of online courses (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012).

While a variety of format and content focus can be offered for faculty development, funding and resources can limit faculty development opportunities in many higher education institutions (Elliott et al., 2015). Programming, lack of time, and scheduling constraints can often present barriers for faculty participation; thus, institutions must consider professional development that is meaningful to their faculty members (Carré, 2015; Elliott et al., 2015). Portugal (2015) proposed that institutions should not only provide training on technology-related issue, but also offer development specifically in improving faculty patience and diligence to mentor students with different learning difficulties.

Effective faculty development can promote a sense of connectedness and collegiality among faculty (Carré, 2015; O'Hara & Pritchard, 2012). Carré (2015) suggested a simplified design approach in a learning group is promoted in which more creative and talented faculty document and share best practices, having them become a source of inspiration among other faculty and lecturers. Loague et al. (2018) indicate that faculty hold positive views on how technology can support learning; however, there is an expressed concern for greater support to integrate technology into their instruction. Faculty preparation can also provide effective ways to reduce faculty anxiety and empower faculty, especially those who are less technologically knowledgeable, and which nearly all institutions of higher education have identified as a priority in recent years (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012). Thus, training can be further considered a means to reduce faculty frustration and negative attitudes toward online teaching (Esani, 2010; Wingo et al., 2017).

Faculty Attitudes Toward Online Instruction

Faculty perceptions and attitudes toward technology integration can depend on many factors such as faculty members' professional and demographic characteristics. It is often assumed that younger faculty can be more receptive to technological innovation while senior faculty are often more reluctant to change their instructional style (Islim & Sevim Cirak, 2017). Research also suggests that faculty decide whether to integrate technology or not based on its perceived value (Islim & Sevim Cirak, 2017; Salas, 2016).

Recent studies referred to the role of faculty as agents of change and the value of their opinions, thoughts, and attitudes toward technology to maximize the integration and benefits of online learning (Portugal 2015). Understanding faculty perceptions of online teaching can help institutions promote faculty satisfaction and acceptance of online delivery methods (Wingo et al., 2017). Salas (2016) stated that open channels of communication are necessary to assess faculty-perceived usefulness of technology. Research suggests that various extrinsic factors for instructors such as better compensation and job security can be effective to engage faculty in online teaching (Wingo et al., 2017). In addition, the flexibility of teaching online courses was found to be one of the main factors in faculty's satisfaction with online instruction (Wingo et al., 2017).

Hamdan (2014) found that faculty members at a Saudi higher education institution had favorable views toward online education and preferred online instruction over traditional face-to-face teaching approaches as online learning promoted a more active role of students. However, the literature suggests the need to raise awareness among faculty members regarding the advantages of online teaching and how to face the challenges it poses as well as further faculty

support and professional development to build their technological and pedagogical knowledge (Alshangeeti et al., 2009; Hamdan, 2014).

Online Learning in the Kingdom of Saudi Arabia

The technological advancement in recent decades has emphasized the potential of online learning as a mode of instruction (Allen & Seaman, 2016; Bakia et al., 2012; Lucey, 2018). Online education was recently introduced in the academic environment in the Kingdom of Saudi Arabia (KSA); however, there is strong consensus among educational stakeholders that online education will guide the future of the educational system in Saudi Arabia (Al-Asmari & Khan, 2014; Hamdan, 2014). In the 1990s, the KSA started integrating the use of computers in teaching and learning in schools in the KSA, and in 1996, the Ministry of Higher Education (MOHE) established the Computer and Information Centre (CIC) providing technological support and various ICT services to schools and educational centers (Al-Asmari & Khan, 2014). In 2000, the MOHE introduced an ambitious online education initiative that aimed to cover all schools in the KSA, design a new curriculum, and develop the technological capabilities of both teachers and students, which brought about significant changes to the learning experience (Al-Asmari & Khan, 2014; Alshangeeti et al., 2009). Many universities, including King Saud University (KSU), have agreed to introduce online learning schemes into their curricula and move to online learning materials; they have also equipped their lecture rooms with advanced academic technological resources such as interactive whiteboards, data shows, e-podiums, Polycom video conferencing solutions and multi-media centers (Al-Asmari & Khan, 2014).

The effective implementation of online learning in the KSA requires the consideration of certain cultural factors (Adham et al., 2018; Alamri et al., 2014). Alamri et al. (2014) examined Saudi users' cultural factors using Hofstede's 1980 analysis of the Arab world. Their findings

suggested that the Arab cultural heritage of masculinity-femininity and collectivism-individualism has a predominant influence on the acceptance, attitude and motivation toward web-based education. Alamri et al. (2014) further concluded that Hofstede's (1980) cultural model of the Arab world can be used to design strategies to implement online learning in the Saudi educational context. The individualism-collectivism cultural orientation refers to people's preference to be part of a group or act individually (Alamri et al., 2014). The Saudi culture is a collective culture, which implies students' willingness to learn and work with others (Alamri et al., 2014). Sheerah and Goodwyn (2016) suggest that the implementation of online learning in the KSA requires a balance between the conservative Saudi culture and providing appropriate materials online. Online learning in the Saudi institutions supports and encourages learners from rural areas, where the lack of access to higher education poses an increased need for online learning (Al-Asmari & Khan, 2014; Hamdan, 2014).

The TPACK Framework

Numerous authors have contributed to the field of technology in education, particularly as it relates to online and distance learning. Distance learning has been examined since before the practice became so ubiquitous, going back even to the late 1990s. Significant contributors to the field include Mishra and Koehler, whose TPACK framework came into existence with the emergence of a greater reliance on technology in education during the early 2000s. Koehler and Mishra (2009) argued that educational technology lacked a formal theoretical grounding and developed the TPACK framework which summarized the capabilities and the knowledge that educators need to effectively integrate technology in the classroom (Koehler & Mishra, 2009). Koehler and Mishra (2009) claim that teaching and learning can be either facilitated or constrained by technology depending on how it is used. Graham (2011) describes the TPACK

model as the knowledge of certain technologies' capabilities and components as they relate to teaching and learning. Teachers must understand their subject matter deeply enough to be able to infer what impacts different technologies may have on the content (Koehler & Mishra, 2009). Professors who possess TCK could, for instance, demonstrate concepts within their content area using a variety of possible technological representations (Archambault & Barnett, 2010).

The TPCK framework examines the nature and development of teacher knowledge as well as the entire process of technology integration for teaching subject matter content (Harris et al., 2009; Koehler & Mishra, 2009). TPACK describes effective teaching with technology by “understanding the interactions among content, pedagogy, and technology knowledge” (Davey et al., 2019, p. 3). The interactions between the components of the model are as important as the components themselves to understand the processes of integrating technology with subject matter content (Harris et al., 2009). Carré (2015) agrees that professors who effectively use technology in their classes necessarily have content knowledge, instructional knowledge, and technological knowledge.

Components of the TPACK Framework

The TPACK framework is comprised of seven constructs: Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Pedagogical content knowledge (PCK), and Technological Pedagogical Content Knowledge (TPACK) (see Figure 1).

Content Knowledge (CK)

CK refers to the teacher's knowledge about the subject matter that is to be learned or taught (Koehler & Mishra, 2009). Content knowledge is essential since it varies from subject to subject and teachers must know and understand the subjects they teach. According to Shulman

(1986), CK includes knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge. Teachers should also understand knowledge and the nature of inquiry, as the lack of this base of CK may result in the misrepresentation of the subject matter (Ball & McDiarmid, 1990).

Pedagogical Knowledge (PK)

PK refers to the teacher's deep knowledge about the processes and practices or methods of teaching and learning (Koehler & Mishra, 2009). PK includes knowledge of overall educational purposes, values, and aims. Teachers should know about how students learn, classroom management, lesson planning, and assessment as well as teaching methods and assessment strategies. A teacher with strong PK has a deep understanding of cognitive, social, and developmental theories of learning and how they apply to their own students (Koehler & Mishra, 2009).

Technology Knowledge (TK)

TK is referred to as a complex knowledge domain to define due to the constantly changing nature of technology (Mishra & Koehler, 2006). However, TK as used in the TPACK involves the knowledge about computer literacy required for people to broadly understand and apply it productively in their everyday lives. Good TK enables people to effectively interact with technology, to recognize when it can assist or hinder in accomplishing a specific task, and to learn and adapt to new technologies (Koehler & Mishra, 2009).

Pedagogical Content Knowledge (PCK)

PCK is generally understood as the combination of different types of knowledge that enables the teacher to adapt, transform, synthesize and represent knowledge to enhance learning

in the classroom (Shulman, 1986). Shulman (1986) defines PCK as the transformation of knowledge into explanations, representations, analogies and examples with the objective of promoting student learning. According to Koehler and Mishra (2009), PCK involves teaching, learning, curriculum, assessment and reporting. Teachers are required to connect content, students' prior knowledge, and teaching strategies, among others, to promote learning in the classroom. Thus, PCK goes beyond understanding the subject matter to understanding why and how to teach it.

Technological Pedagogical Knowledge (TPK)

TPK represents the ways teaching and learning interact with the integration of technologies (Koehler & Mishra, 2009). TPK involves the knowledge about the pedagogical use of a range of technological tools and their constraints to foster student learning. Strong TPK also requires a deep understanding of how the constraints and affordances of technologies relate to the purposes and contexts in which they are integrated (Mishra & Koehler, 2006). Therefore, teachers need to develop forward-looking, creative, problem-solving skills to adapt the chosen technological tools to their pedagogical purposes.

Technological Content Knowledge (TCK)

TCK relates to what educators know about the influences of content on technology and vice versa (Mishra & Koehler, 2006). Some content areas may be well served by the use of a particular technology while others may find that technology does not suit the needs of the content (Davey et al., 2019). An example could be an online driver's education course. A robust, lifelike simulation may prove to be an acceptable technological tool, but audio or video recordings may not adequately take the place of the types of hands-on experiences needed in such a content area. TCK requires teachers to know not only the content of the subject matter

they teach but how the application of particular technologies can help to effectively address subject matter content and how that content dictates or even changes the technology or vice versa (Koehler & Mishra, 2009).

Technological Pedagogical Content Knowledge (TPACK)

The overlap of content, pedagogy, and technology is referred to as TPACK (Koehler & Mishra, 2009). TPACK refers to the understanding of the interactions among the three core components: content, pedagogy, and technology (Koehler & Mishra, 2009). TPACK requires a deep understanding of how technologies can be used to represent concepts; the pedagogical techniques to use technologies to meaningfully teach content; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies build upon prior knowledge, enhance student learning, redress challenges students may face with content, and reinforce or promote the development of new epistemologies. According to Koehler and Mishra (2009), content, pedagogy, and technology are the core knowledge bases of the TPACK framework.

Importance of TPACK on Instruction

TPACK serves as a conceptual model to understand the complex interaction between the three primary forms of knowledge -- content (CK), pedagogy (PK), and technology (TK) -- and to promote the balance and integration among the three (Mishra & Koehler 2006). The successful integration and application of technology in education depend on educators' ability to design and implement instruction that understands and contextualizes the dynamic relationship between all these components of knowledge (Anderson et al., 2013; Linton, 2012; Rienties et al., 2013). Educators are expected to purposefully decide not only when and why to use technology but also within what context (Linton, 2012). The focus of technology integration in the

classroom is on student learning (Koehler & Mishra, 2009; Linton, 2012; Mutanga et al., 2018). Thus, student demographics, prior knowledge, and many other factors are elements that need to be considered when designing instruction that combines content, technology, and pedagogy (Mishra et al., 2010). This blended knowledge requires putting technology into the teaching and learning context considering the pedagogical needs and the subject matter content (Anderson et al.; 2013; Mishra et al., 2010). Mishra et al. (2010) concluded that educators who can effectively combine their knowledge of technology, pedagogy, and content develop greater expertise and impact student learning.

The TPACK framework provides teachers with various skills and values that help them enhance learning and effective classroom management in their classes (Mutanga et al., 2018). TPACK allows maximum utilization of time and resources, promotes collaborative learning and research at a global level among students and teachers, and caters to multiple sensory and learning styles (Mutanga et al., 2018). In addition, TPACK appears to be an important tool for teachers to reflect on their own teaching practices and those of their colleagues (Mutanga et al., 2018). The framework can be also a useful tool for assessing teacher knowledge regarding technology integration (Baran et al., 2011).

Research indicates that educators' TPACK is a complex process to assess due to the various components that comprise the TPACK model, the interplay among them, and the need for classroom-based evidence of those components (Polly & Brantley-Dias, 2009). However, Oster-Levinz and Klieger (2010) introduced a valid and reliable indicator to assess the integration of technology and disciplinary contents in online tasks. Their study found that successful blending of pedagogy and technological tools promotes student access to meaningful and rich information and provides opportunities for students to construct new knowledge.

Similarly, Benson and Ward (2013) used the TPACK framework to examine faculty members' teaching expertise in their higher education online classrooms. Research suggests that professors often understand the content, pedagogical, and technological knowledge as isolated components of TPACK (Benson & Ward, 2013; Mutanga et al., 2018; Rienties et al., 2013). In addition, educators' limited pedagogical knowledge and skills to use technology hinders their ability to deal with challenging students (Mutanga et al., 2018).

Technology can improve instruction and student learning only when it is supported by content and effective instructional practices (Anderson et al., 2013; Linton, 2012); however, educators often lack knowledge to address the integration of the different TPACK components (Benson & Ward, 2013; Mutanga et al., 2018; Rienties et al., 2013). Tai et al. (2015) claim that recent studies have used the TPACK construct to create professional development that promotes successful integration of the individual TPACK components. Baran et al. (2011) agree that TPACK can serve as a framework for designing teacher development that helps teachers develop a more interconnected knowledge, integrating the different components of the conceptual model. In addition, TPACK can inform professional course designers about the knowledge teachers need to effectively integrate technology in their instruction and how to develop this knowledge to improve students' academic outcomes (Baran et al., 2011; Matherson et al., 2014). Sustained professional development in this regard can bridge the gap between what educators are taught and what they are actually expected to do in the classroom (Matherson et al., 2014).

Conclusion

The literature reviewed supported the need for further research to report on the challenges that faculty members face in the process of transitioning from face-to-face instruction to fully online instruction. The existing literature revealed the dynamic nature of technology and online

education which intensifies the need for more up-to-date research in the obstacles encountered to improve online instruction. Given this gap, it was imperative to address the current technological, technological pedagogical, and technological and instructional challenges that faculty members face in the transitional phase from face-to-face instruction to fully online instruction.

CHAPTER III

METHODOLOGY

This chapter presents the methods used to conduct this dissertation study. In particular, it includes a discussion of the research design, procedures for data collection, participants, instruments, and data analysis.

Research Design

A qualitative approach to research was selected because the topic under study involves complex issues related to the subjective perspectives and personal experiences of the participants (Creswell, 2014; Merriam, 1998; Merriam & Tisdell, 2016). In qualitative research, the researcher focuses on reflecting the meaning and multiple views that the participants hold about the phenomenon under study (Creswell & Poth, 2018). Thus, qualitative research aims to understand how people make sense of their lives and experiences (Merriam & Tisdell, 2016). When conducting a qualitative research study, the choice of study design is a fundamental decision as it must relate to the study question (Merriam, 1998).

Six study designs are commonly used to approach qualitative inquiry: basic qualitative research, phenomenology, ethnography, narrative analysis, grounded theory, and qualitative case study (Merriam & Tisdell, 2016). A case study was selected as the research design for the current research study as case studies in particular are suitable for collecting data regarding lived experiences related to a specific phenomenon (Merriam & Tisdell, 2016). The focus of case studies is not on the phenomenon itself but on the unit of analysis and how the phenomenon

interacts with the context (Merriam & Tisdell, 2016). Case studies are defined as an in-depth description and analysis of a particular program, student, classroom, event or activity (Creswell, 2002; Merriam & Tisdell, 2016). Using a case study design allows one to study the phenomenon with greater detail using a smaller number of participants (McLeod, 2008).

Qualitative case studies data is gathered through the use of different data collection methods such as interviews, observations and document analysis (Merriam & Tisdell, 2016). Attitudes, beliefs, ideas, and opinions of the participants may emerge as part of the findings of qualitative case studies, allowing the researcher to further analyze, interpret and dive into the data collected from the participants of the study (Creswell, 2014; Merriam & Tisdell, 2016).

A case study design was deemed suitable for this dissertation study since the main purpose of this study was to uncover and understand the lived experiences of faculty members at a public Saudi University related to the technological, technological pedagogical, and technological content challenges faced in the transitional phase from fully face-to-face instruction to fully online instruction, thereby contributing to the literature on this current phenomenon.

Purpose of the Study

The purpose of this qualitative case study was to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction before and/or during the pandemic.

Research Questions

The following research questions guided this study:

RQ1: What technological challenges pertaining to pedagogy do faculty members face during the transitional phase to fully online instruction?

RQ2: What technological challenges do faculty members face during the transitional phase to fully online instruction?

RQ3: What technological challenges pertaining to content do faculty members face during the transitional phase to fully online instruction?

Data Collection

Various methods are frequently utilized with qualitative case studies, such as interviews, observations, focus group discussions, and document analysis (Creswell, 2014; Fraenkel & Wallen, 2006); however, no data collection or analysis methods are specifically associated with them (Merriam, 1998). This qualitative research study involved the use of in-depth semi-structured interviews that lasted between 60 and 90 minutes each and a two-hour classroom observation of synchronous online classes of each of the five participants.

Setting

The target population of this qualitative case study was faculty members from a public university located in Riyadh, KSA. This public university was the first institute of higher education in the Saudi Arabia, founded in 1957. Its mission is to “Disseminate and promote knowledge in the Kingdom for widening the base of scientific and literary study, and for keeping abreast with other nations in the arts and sciences and for contributing with them discovery and invention, in addition to reviving Islamic civilization and articulating its benefits and glories, along with its ambitions to nurture the young virtuously and to guarantee their healthy minds and ethics.” The university has a student population of about 40,000 students and offers courses in the natural sciences, the humanities, and professional studies (World University Ranking, 2020).

English and Arabic are the languages of instruction in undergraduate programs. Since 2011, this public university has been fostering distance learning, implementing and developing various online learning and training courses.

Sampling Method

Homogeneous purposeful sampling was used to select participants. Purposeful sampling is utilized to obtain information-rich cases that reflect the purpose of the study (Merriam & Tisdell, 2016). Thus, purposeful sampling guided the selection of participants based on their knowledge of the phenomenon under study as the participants recruited were expected to provide deep understanding of the study problem (Creswell, 2014; Merriam & Tisdell, 2016). In the present study, the participants selected were information-rich cases with in-depth understanding of the challenges faced by faculty in the transitional phase to fully online instruction. For this, the homogeneous sampling technique was utilized to ensure that the participants comprising the sample for the study shared the same or very similar characteristics (Creswell & Plano Clark, 2018). Therefore, participants had to comply with the inclusion criteria: participants were faculty members at the selected Saudi university, held a PhD degree, and faced challenges in the transition from fully face-to-face to fully online instruction. Homogeneous purposeful selection of participants who could provide rich, meaningful data was necessary to obtain an increased understanding of the challenges studied.

An invitation email was sent to the gatekeeper at the Saudi university (Dean of the College of Education) requesting his support in providing the contact email of those instructors at the College of Education who complied with the study selection criteria (see Appendix A). The Dean of the College of Education provided a total of 60 faculty email addresses based on the PhD criteria. All 60 faculty members were contacted via email and invited to participate in the

study; the email outlined the inclusion criteria as well as the research problem and research questions (see Appendix A). Twelve instructors contacted the researcher for further information, seven of whom agreed to participate in the study and signed the consent form. However, only five instructors actually participated in the interviews and observations due to scheduling constraints.

Participants Recruitment

Sample sizes for case studies are recommended not to exceed five cases, as this number should provide enough information (Creswell, 2014). Thus, a sample of 5 out of 12 faculty at the selected public university were recruited via an email, including a description of the study and an informed consent letter (see Appendix C). The invitation email was sent to the prospective participant asking for their participation and outlining the study purpose and interview questions. Consent was sought prior to the interview and observation.

Permissions and Ethical Considerations

Before the data collection stage, IRB approval was obtained since human subjects were involved. Gatekeepers at the Saudi university were identified, and support was sought to promote recruitment (see Appendix B). Upon obtaining the needed approvals (IRB and gatekeepers), a sample of five faculty at the participating university were recruited to participate and contacted via email, providing them with a description of the study and an informed consent letter. The signed consent form allowed the researcher to use any data yielded during the data collection process. The consent form also informed participants of their voluntary participation in the study and that no penalty would be enforced in case of withdrawal from the study. Confidentiality and protection of participants was a priority in this study; thus, pseudonyms are used as a means to

this end. After submitting their consent, the interview and observation were scheduled. Records and transcripts are securely saved in a hard disk and stored in the researcher's personal laptop.

Procedures

For this qualitative case study, one semi-structured interview and one online synchronous observation was conducted per participant. Interviews provided in-depth data about the participants' self-perceived technological, technological pedagogical and technological content challenges faced in the transition to online instruction. Observations helped triangulate emerging findings (Merriam & Tisdell, 2016). Observations were conducted after the interview to better understand the difficulties the participants described and how they face them in their online teaching. Research experts and graduate students reviewed the data collection tools prior to their implementation to check for clarity and alignment with research purposes (Creswell & Miller, 2000).

Participants were requested to meet online 10 minutes before the actual interview to test the software and internet connection, thus preventing some possible technological problems. Prior to the interview, participants received an email with instructions on how to access the conferencing software and outlining the interview protocol. I responded to clarifying questions when necessary. Interviews and observations were conducted online due to the current COVID-19 restrictions. The participants received the interview protocol (see Appendix D) and the instructions to access the interview meeting on Adobe Connect three days prior to the interview. Adobe Connect was selected as it is regarded as a user-friendly software. Voice-to-voice interviews lasted between 60 and 90 minutes and they were all audio recorded and later transcribed using Scribie audio transcription service.

Interviews

I conducted one online semi-structured interview with each participant to shed light on the challenges they faced in the transition from fully face-to-face classes to fully online classes. An interview protocol consisting of 20 major items was developed to guide the interview and ensure the exploration of specific issues (see Appendix D). At the time of the interview, the order of questions or wording was slightly modified depending on the development of the conversation. Thus, semi-structured interviews allowed me to better respond to emerging topics or ideas not accounted for in the previously developed list of questions (Creswell & Poth, 2018). Interviews were conducted online and synchronously (in real time). Online interviews helped solve the geographical constraint of reaching the participants while adhering to the measures adopted to stop the spread of the COVID-19 virus. Interviews provided an opportunity for me to build the needed rapport with the interviewee when conducting qualitative interviews (Merriam & Tisdell, 2016). Additionally, the sound recordings were helpful for further transcription and analysis of the data collected.

The first question inquired about the participants' professional background, thus collecting demographic information and helping establish rapport with the participant. The primary interview questions addressed the research questions (see Appendix E) and focused on the participants' challenges, difficulties and barriers experienced during the transitional phase from fully face-to-face to fully online courses. Questions 7, 9, 10, 13, 14, and 16 addressed RQ1 about the technological challenges faced pertaining to pedagogy. Questions 6, 11, 14, 15, and 17 collected data to answer RQ2 about the technological challenges faculty members faced during the transitional phase to fully online instruction. Finally, Questions 8, 9, 11, and 12 addressed RQ3 about the content-related technological challenges faced in the transition to fully online

instruction. Each interview lasted between 60 to 90 minutes approximately and notes were taken as the interview developed.

Observations

Observations are a suitable data collection method for this study since they provide an opportunity for systematic, selective attentiveness to aspects of the participants' teaching as they relate to TPACK (Merriam & Tisdell, 2016). I observed a two-hour online synchronous lesson per participant one to two weeks after conducting the interview. While in the online classroom, I had the role of an observer as participant. The observer as participant's role and activities are known to the group and the primary role is to collect information rather than to actively participate in the classroom (Merriam & Tisdell, 2016). Thus, I joined the online classroom at the beginning of the lesson and remained until the end with my camera and sound off to avoid becoming a distraction.

Recording is an essential component of observation (Creswell, 2014; Merriam & Tisdell, 2016); thus, an observation protocol was developed considering the literature reviewed and the interview preliminary data (see Appendices E and F; Jablon et al., 1999; Merriam & Tisdell, 2016). The observational protocol was comprised of running records (observational notes and reflective notes; Appendix E) and time samplings (see Appendix F). I recorded information in specific categories in the observation protocols as it occurred. After completing the observation, the researcher spent about 20 minutes on each adding or clarifying information in the running records and time samplings. These data informed about the difficulties related to the technological, technological pedagogical and technological content challenges that faculty members face. I collected data regarding the implementation of online instruction which may

yield data on the difficulties faced. Thus, the observational records served as supporting evidence of the faculty 's elf-perceived challenges in their transition to online instruction.

Running records. Running records are recorded in a sequential manner, exactly as they take place, with no omissions to provide detailed narrative accounts of events or actions (Irwin & Bushnell, 1980). In this study, the purpose of the running records was to gather as much detailed data as possible to contrast with the interview data and reflective notes obtained, thus providing a more complete picture of the phenomenon under study. Running records included observational and reflective notes that were taken to collect data about the online setting (date, time, number of students, materials and tools used, and topic of the lesson), classroom interactions, lesson transitions, instructor's use of platform and tools, technical difficulties, content and technology integration, and any other additional useful information about the online setting and lesson delivery (see Appendix E). For example, instructor's confidence was recorded considering the instructor's assertiveness or hesitation in the use of the tools, ability to handle the platforms smoothly, or need for assistance. Observation occurred in the middle of the Spring 2021 semester. The students were with this professor for at least nine weeks. The professor looked confident and relaxed using different types of technologies and flipped from one to the other easily and the students are following with no problems Running records were collected for events or activities relevant to the challenges observed pertaining to the instructor's TK, TCK, and TPK. Running records were recorded while observing the lesson and about 20 minutes were devoted to clarifying or adding information after the observation was completed.

Reflective notes. I recorded reflective notes for later theme development, including about the educational process, reflections on the activities, and a general impression of the lesson. The observational protocol allowed me to focus and reflect on the study's research questions by

paying attention to the online classroom environment, lesson implementation, and challenges related to the instructor's TK, TCK, and TPK. Both the observational and reflective notes included detailed descriptions, direct quotations, and my comments. Reflective notes were also recorded as the observation occurred and about 20 minutes were devoted to go over the notes and add or clarify information immediately after the observation was completed.

Time sampling. Time sampling entails tallying the number of times a specific behavior is manifested or not exhibited during predetermined time intervals (Irwin & Bushnell, 1980). A behavior must be apparent to the observer at least once every 15 minutes to be considered for a time sample (Ferguson et al., 2018). Based on the preliminary data obtained from the interviews, I observed the lesson delivery and selected a specific behavior or event to be sampled: instructor's use of specific online tools and strategies to introduce content. The time intervals applied were 10-15 minutes. Notes on the selected behavior or event were recorded during the observation based on these intervals (10-15 minutes) and behaviors (instructor's use of specific online tools and strategies to introduce content). The use of running records and time samplings yielded separate datasets regarding the same context that were contrasted for a more complete and objective analysis of the participants' TK, TCK and TPK and the related difficulties.

Observational records and interview data were recorded electronically to create a codebook for ease in the preliminary analysis process (Creswell & Plano Clark, 2018). The data collected was coded to identify common themes among the participants' experiences as they related to the theoretical framework of the study.

Data Analysis

Data was analyzed using constant comparison. I coded the data to identify themes across the participants' individual responses. Constant comparison analysis was utilized to determine

the themes and to cross-reference them with domains from the literature. The constant comparison process allowed for coding of the data based on meaningful parts of the text and comparison of the codes to form themes (Glaser & Strauss, 1967). Formatted transcripts were run in the NVivo qualitative data analysis software seeking commonalities and patterns in the data (Creswell & Plano Clark, 2018). Identified patterns were grouped to find broad themes.

After initially coding interview and observation data, a number of categories were grouped thematically across cases and compared to incorporate all relevant data and ensure they were related to and supported by the TPACK theoretical framework used. The TPACK framework guided the data analysis to answer the research questions; thus, the identified themes fit the proposed theoretical model and existing literature on the topic. For this, data was analyzed considering challenges related to TK (e.g., use and selection of technological tools, management of online platform, and troubleshooting technological issues), TCK (e.g., technological tools and strategies used to present or reinforce subject matter content), and TPK (e.g., technological tools or strategies used to engage students and implement instruction).

Initial Preparation and Preliminary Exploration

Scribie transcription software was used to produce the initial transcript of each interview. I reviewed the initial transcripts and made some minor corrections to ensure accuracy and clarity of the data by identifying and correcting transcription errors or omissions, clarifying or providing omitted information, etc. I carefully read the transcripts and created a preliminary analysis, identifying possible trends in the data. To promote credibility, participants were contacted and provided the interview transcription and a summary or preliminary analysis of their responses to confirm accuracy of the summary and transcription (see Appendix G). Each participant confirmed their interview transcript was accurate and no corrections were needed. Finally,

approved transcripts were formatted to be run in the NVivo data analysis. Using NVivo data analysis software, various themes were identified through the coding process (see Appendices H and I).

Data Triangulation

Data triangulation refers to the combination of two or more data collection methods to enhance the credibility and validity of the findings drawn from data analysis (Creswell, 2014; Merriam & Tisdell, 2016). Triangulation helps to reduce researcher bias by providing a more comprehensive picture of the phenomena explored. Also, gaps present in the dataset gathered using one method of data collection can arguably be filled by data gathered from another method. The limitation of one method of data collection may thus be reduced or eliminated by the strengths of another (Maxwell, 2013).

This qualitative study used observational data to provide additional detail about the challenges faced in online instruction and their frequency to support the data obtained from interviews. The observational records were compared with data drawn from the interviews and findings from the literature to identify themes and patterns as well. Observation records provided additional detail to the kind of challenges faculty faced during the transition and still face in their online teaching. Observational data was also used to help determine future recommendations that can reduce faculty members' transition to online teaching, providing information on the knowledge and support needed.

Interview data generated descriptive narratives of the faculty members' transitional experience and self-perceived barriers related to TK, TCK and TPK they faced in the transition to fully online instruction. This data provided a series of broad themes reflecting faculty members' technological, technological content and technological pedagogical challenges that

were compared to the data obtained from the observations of their actual online instruction. The observational records provided further information on how faculty handle technology and blend it with content and pedagogy, giving a clearer picture of missing knowledge during their transitional phase from face-to-face to fully online instruction.

Data collected from the interviews and observations indicated faculty at the participating university identified technological, technological pedagogical and technological content challenges in their transitional phase. Thus, data was triangulated to ensure the validity and quality of information collected. This data was contrasted with the literature reviewed to further identify patterns. The data triangulation of observations and interviews provided sufficient data to answer the study research questions.

CHAPTER IV

FINDINGS

Chapter IV reports the results of the data collected in this qualitative case study. This chapter first addresses the trustworthiness of the data collected, followed by a reporting of the participants' demographics and the study results. The identified themes are organized within each of the three research questions for this case study. Finally, a summary of the findings is discussed.

Trustworthiness of the Data Collected

This qualitative case study aimed to explore participants' understanding of their experiences when transitioning from face-to-face to fully online instruction. Thus, the considerable teaching experience of the participants and their direct involvement in the study topic supports the credibility of the data collected (Bloomberg & Volpe, 2018). All five participants were asked via email whether they were faculty members at the selected Saudi university, held a PhD degree, and faced challenges in the transition from fully face-to-face to fully online instruction. All five participants confirmed they met the inclusion criteria, which were used to increase trustworthiness of the data and detail-rich data collection that would provide representative data of current practices and experiences among faculty. Thus, the data collected supports transferability to recent and future studies exploring faculty perspectives of challenges in transitioning into fully online instruction (Bloomberg & Volpe, 2018).

After each participant signed the consent form (see Appendix C) agreeing to participate in the study, the semi-structured online interview and the online classroom observation were

scheduled. Interviews and observations were conducted online due to COVID-19 restrictions. The participants received the interview protocol (see Appendix D) and the instructions to access the interview meeting on Adobe Connect three days prior to the interview. Interviews lasted between 60 and 90 minutes each and they were all audio recorded and later transcribed via Scribie audio transcription service. During the semi-structured interview, follow-up questions were used for participants to elaborate on or clarify ambiguous responses pertaining to the challenges faced when transitioning into fully online instruction. The use of open-ended and follow-up questions aided the collection of rich and detailed data (Creswell & Poth, 2018; Merriam & Tisdell, 2016). Additionally, each participant was emailed a copy of their interview transcript and requested to check accuracy (see Appendix G) to promote credibility. Each participant confirmed their interview transcript was accurate and no corrections were needed, which helped ensure researcher bias was not present in the transcript (Bloomberg & Volpe, 2018). I utilized the assistance of the NVivo computer software for interview transcriptions and coding and analysis of observational notes. Using a coding software helps to manage the data, identify cases, detect coding errors, and interpret data (Johnson et al., 2020).

To promote trustworthiness of the observational data, I triangulated it with interview data and drew conclusions grounded in persistent behavior (rather than on a single event) witnessed during the observation. Observational data quality and trustworthiness were also promoted through the use of protocols guiding what to observe and how to record, minimizing the influence of potential bias (Johnson et al., 2020). I also recorded detailed and complete notes during and immediately after the observation to improve accuracy and rigor.

Participants' Demographics

This case study gathered data from five participants. Three of the participants were female instructors and two were male. All of them held a doctoral degree in an education-related field and were employed as faculty members at the selected Saudi university. Four of them were assistant professors and one was an associate professor at the public university selected for this study. All five participants had teaching experience in higher education, and two of them had experience in secondary education as well. Participants' years of teaching experience ranged from 5 years to 21 years. Regarding their teaching experience in online instruction, two of the five participants had taught both hybrid and fully online for two years; two other participants had one year of fully online teaching experience, and the remaining participant had four years of teaching experience in hybrid instruction and two years in fully online instruction. During the study data collection, participants were teaching at least one course fully online. Table 1 provides more detailed demographic information for each participant, including gender, educational background, position at the university, teaching experience, teaching experience in online instruction, and courses taught at the moment of the study.

Table 1
Participants' Demographics

Pseudonyms	Amal	Dalal	Munirah	Suliman	Fahad
Gender	Female	Female	Female	Male	Male
Educational background	PhD in Instructional Technology; MA in Computer Education and Technology; BA in Computer science.	EdD in Instructional Technology.	PhD in Education.	PhD in Education; MA in TESOL; MA in Research Methods; BA in English.	PhD in Education (Language, Literacy and Technology); MA in TESOL; MA in Research Methods; BA in English.
Position(s) at the university at the moment of the study	Assistant professor in the Department of Instructional Technology.	Associate professor in the Department of Instructional Technology.	Assistant professor in the Department of Art Education.	Assistant professor in the Department of TESOL.	Assistant professor in the Department of TESOL
Teaching experience	Higher education.	Secondary Education, and Higher education.	Secondary education, and Higher education.	Secondary education, and Higher education.	Higher education.
Years of teaching experience	5 years.	10 years.	6 years.	21 years.	14 years.
Years of online teaching experience and type of online teaching	One year in fully online instruction.	Two years in both hybrid and fully online instruction.	Two years in both hybrid and fully online instruction.	Four years in hybrid instruction; two years in fully online instruction	One year in fully online instruction.
Courses taught fully online at the moment of the study	E-learning.	Designing Digital Multimedia.	Four courses in Art Education.	English language courses (reading and writing skills).	English Grammar II.

Results

The purpose of this qualitative case study was to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction. The data collected from five semi-structured interviews and five online lesson delivery observations were analyzed through constant comparison to identify themes and patterns. Using NVivo data analysis software, various themes were identified through the coding process (see Appendix I). TPK-related challenges were identified when the participants mentioned how technology was used to implement instruction. TCK-related challenges were identified when teachers were asked about how they use technology to teach and practice specific subject matter content. The identified themes were organized within each of the three research questions proposed for this qualitative case study. Quotes are included from each of the five participants to better illustrate the results presented.

Research Question 1: What Technological Challenges Pertaining to Pedagogy Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?

The emerging codes from the interview and observation data produced three themes related to TPK challenges: (1) instructional approach to teaching, (2) student assessment, and (3) teacher preparation.

Theme 1: Results Seem to Show Concerns Among Participants Related to the Change of Instructional Approach Required During the Transitional Phase to Fully Online Instruction

Three participants agreed that they felt compelled to review and modify their teaching philosophy when moving from face-to-face to online teaching. Participant Suliman explained, “This [transition to online teaching] challenged everything we know about teaching and learning,

and now we have to figure something out.” Throughout the interview, instructor Suliman referred to how he struggled to plan his lessons, “blindly” preparing materials, unsure how to engage students online or whether they understand instructions. For example, he mentioned he had “to shift to writing everything very clearly labeled, and I post it in the screen or in the chat so the students are able to follow. But also, I don't know if they're following or not.” In this regard, instructor Fahad mentioned, “The most challenging thing is I needed to change my whole teaching philosophy to adopt technology and to accommodate technology into my own teaching philosophy”. However, Amal said that “there wasn't enough time for us to pause and think about how we can transition using the same philosophy. So, I use online teaching as if I'm teaching in the real classroom.”

When diving into the changes in the instructional approach to teaching, the participants referred to differences in classroom interaction. Four participants emphasized that the lack of face-to-face interaction prevented them from planning various activities that were effective in their traditional classrooms, such as hands-on activities, group work, or one-to-one discussions. In this sense, Suliman said that “in the classroom, students used to talk together, and they pumped each other, and they motivate[d] each other.” However, he expressed his uncertainty about achieving the same result when moving online. Fahad added that participation is key in his regular instruction; however, he wondered, “If a student doesn't have a microphone, how would he or she participate?” He explained that he needed to consider various factors (e.g., the use of cameras, students' shyness to participate online, and logistics at home that made their interaction comfortable and possible) when planning how to approach his instruction. Similarly, Amal explained that she had to rethink how to “make [students] work together, collaborate more, communicate with each other more,” because unlike online instruction, “the students in face-to-

face instruction ... meet each other. They can work in class.” Interview data also indicates that instructor Munirah agreed that the lack of face-to-face interaction in online instruction required them to provide more detailed instructions and be more explicit about task or lesson objectives.

Munirah explained:

You have to work more on their online instructions, prepare the homework icons where they can drop their homework there and to type more instructions and send them to the students. Because you can't see them anymore, you have to make sure they got everything.

The observational data from running records and reflective notes taken during the classroom observation seemed to confirm these instructors' difficulties to promote different ways of interaction among students as all participants used whole-class discussions to promote student participation and communication. During the observations, interaction in Munirah and Dalal's classes was mostly based on teacher-led whole-group discussions, while participants Fahad, Suliman, and Amal seemed to use more open-ended questions to individual students to either express their feelings and thoughts concerning the class topic or build on other students' ideas.

These teachers' concern pertaining to students' understanding could be observed in the online classroom observations. For example, instructor Suliman constantly encouraged the students to talk and share their own experiences about the topic of the class; whereas instructor Amal used an online phone tool (Menti.com) for students to submit instant comments and responses to the questions posed. Classes consisted of 6 to 15 students each (see Table 2 below). Additionally, participants used closed and open-ended questions to check students' understanding, such as, “Is this clear?” “Do you have any question?” “What do you think about...?” “How can you explain...?” and “What is...?” Students were active and responsive with the professors; although students' cameras were always off, they used the chat box and their microphone to respond to questions and interact with the instructor. In general, students were

able to sign onto the online platform and in some cases present slides for 5 to 10 minutes of the class without technological difficulties.

Table 2
Summary of Observational Data

	Suliman	Munirah	Dalal	Amal	Fahad
Number of students in class	6	13	9	10	15
Platform used	Zoom	Zoom	BB collaborate	BB collaborate	Microsoft Teams
Topic of the lesson	Advanced reading in English language	Art and globalization	Advanced reading in educational technology	E-learning design	Poems and cultures

Participants addressed the challenging aspect of delivering lessons using technology to design and implement materials that enhance learning as it implies a modification in the delivery of the lesson and the role of the teacher. The participants' responses describe the role of the teacher as a provider of information online and the student in charge of processing such information more autonomously. Participant Suliman referred to the need for developing self-taught material that the student could study on their own. Participant Suliman mentioned that the use of technologies posed difficulties in designing online activities, explaining that "the most important [challenge] was designing quizzes, tests, through Blackboard. It's difficult in many aspects in designing. It takes time to learn." In summary, the observational data from running records and reflective notes seem to align with the interview data collected showing participants' agreement that the differences in the approach to online teaching compared to face-to-face

instruction made their transition difficult.

Theme 2: Participants' Responses Indicated Concerns During the Transition to Online Teaching Regarding the Design and Implementation of Online Student Assessment

Four participants addressed the main difficulties they had during the transition to understand and design student assessment online. Participants Suliman and Munirah expressed their concerns about the selection of an appropriate platform to assess student learning online. The selected Saudi university utilizes Blackboard as its LMS; however, some faculty used different platforms to introduce their lesson for reasons I did not inquire further about. Both participants showed lack of technological knowledge to assess students online. Although this study focused on purposeful transition to online learning pre-pandemic, participant Suliman explained that his lack of technological and pedagogical knowledge generated much uncertainty when moving to fully online learning during the COVID-19 outbreak. He explained:

I remember in March last year; we were panicking about how we're gonna assess the student learning through such things. And the challenge is, first of all, which platform that is very secure and can be used for assessment.

Additionally, participant Munirah's description provides a deeper understanding of the limitations she perceived about selecting the most appropriate technological tools to assess student progress. Munirah noted:

We had to change the methods of assessment that we are not used to. Then when it comes to classes, the artwork classes, it's hard to see them while they are working the art, because I can teach them, I can show them videos, I can send them videos, but when I ask them to show me their work, it's not enough to see the sketch or the photo of the last step.

When asked about the technological challenges they encountered regarding student assessment, participants Fahad, Suliman, and Munirah shared a common concern about how to design assessment that truly reflected students' own learning in online instruction. These participants specifically referred to designing and implementing online assessments that could

prevent students from cheating. Participant Fahad opted for assessing student learning based on their class participation and longer writing assignments, assuming that they would reduce the chances for student cheating. However, this professor agreed, “It was not the perfect solution, but it was possibly done.” The running records, time sampling, and reflective notes taken during participant Suliman’s classroom observation showed the use of open-ended questions to check whether students were following instruction (e.g., “So, what do you think about ...?” and “What are your thoughts after seeing the video?”) as well as understanding the content discussed (e.g., “How do you explain...?” and “Tell me about...”). The running records indicate that the instructor sometimes asked specific students and other times asked the whole class, waiting for volunteers to start the discussion.

In their interviews, participants Munirah and Suliman briefly described their approach to in-person assessment to better illustrate their views on students’ cheating behaviors. Their responses suggest they perceive their students are more likely to engage in cheating in online instruction compared to in person due to the lack of teacher presence and monitoring techniques.

Participant Munirah explained:

For art history, when it's face-to-face, you make sure that the student is in front of you and she can answer the questions without using any references. When it's online and it's the same type of questions, even if we changed them, even if we put certain time for each question, they still can open their books and [use] their phones, and we're not there, we can't open their cameras.

Instructor Suliman said:

We normally would sit down and assess how the student would learn and give them exam paper and monitor and make sure that they don't cheat, but now with online [instruction], you would shuffle all the questions, so to make sure that no one would have similar question, but the student can share screen and create groups online [with other students].

In this sense, the running records taken during the classroom observations showed that all students present in the class had their audio on and their cameras off throughout the lesson,

which could make their assessment of students' understanding and presence in class even more difficult. Along these lines, participant Munirah also expressed her concern about fairly assessing students online learning. She noted, "We had to change the plan, we had to think about how to finish the semester, how to evaluate assessments, tests, homework, and you have to rethink [assessment] and make sure that you do it fairly." In this sense, Munirah's classroom observation showed the use of a specific strategy to reduce student cheating and promote fairness. The instructor proposed a competition in the class, encouraging the students to participate and collect points through Menti.com, which is an interactive presentation tool. This tool requires students to submit real-time instant responses to questions. According to the running records taken, students joined from their phone application or website and responded in real time to the questions that were shared by the instructor. Their responses were instantly shared and commented on as well, thus possibly reducing the chances of searching the web for information or interacting with their peers to discuss the possible answers.

Participants also agreed that the sudden move to online learning due to COVID-19 posed time constraints to the design and implementation of online assessment. Amal explained that the university mandated sudden changes in grading and types of assessments (e.g., traditional pen-and-paper midterms had to be modified to meet the teaching and learning constraints that the transition to online learning posed). Amal said, "You had to make some adaptations on your assessment ... and there wasn't time, to be honest, to change anything." Participant Fahad referred to the time-consuming aspect of transitioning into assessing students online compared to traditional pen-and-paper assessment: "At the beginning, making quizzes online, on Blackboard, is a very tiring task. It takes me hours to do it and then probably two hours to post it as opposed to just printing."

Overall, results show that these teachers' technological knowledge created difficulties in the selection of platforms to assess students' learning process and in design and implementation of fair and appropriate assessments during the transition to online instruction.

Theme 3. There Seemed to Be Pedagogical Challenges During the Transition to Fully Online Instruction That Stemmed from Teachers' Perceived Lack of Preparation

All participants suggested that they felt unprepared and unconfident to teach online when moving from face-to-face to fully online instruction. Participant Suliman explained that his poor confidence in his online teaching skills were due to “lack of knowledge about how online things should work” and added, “I wasn't sure about my ability to teach. I was certain about how to help to support the student to learn online, but not my ability to teach online.”

Participant Fahad said, “The problem is that we [were] not really prepared as being physically there in class.” Amal simply expressed, “It was chaos, to be honest at the beginning. We were not prepared,” and participant Dalal explained that “university support is one of the main drivers of success while transitioning. What was challenging is the sudden transition. For some, it was scary because they didn't have enough time to be trained on that mode of teaching.” When asked about their confidence in their technological pedagogical knowledge when moving online, participant Munirah noted, “I don't have any knowledge. Because we were not prepared and we had short time to prepare ourselves.” Additionally, Munirah expressed her willingness to be trained and use different types of technology during the interview.

These interview responses seem to indicate that such lack of TPK negatively affected their confidence in their teaching skills. Furthermore, observational data were used to expand on interview data pertaining to participants' perceived need for training and knowledge. For example, running records from Munirah's classroom observation showed Munirah delivered a

teacher-centered lesson through the Zoom platform, revolving mostly around her speaking and showing no opportunities for student-student and whole-class interactions. Hence, Munirah's poor use of technology to promote interaction among students and student centeredness may expand on interview data suggesting the instructor's need for training that improves their knowledge and confidence in the use of tools to approach online instruction.

Furthermore, participants Suliman, Amal, and Fahad specifically addressed the need for training and guidelines from their institutions and other educational stakeholders to tackle pedagogical difficulties when moving fully online. Participants did not specify whether this need stems from the COVID-19 pandemic emergency move. Participant Suliman said, "Institutionally, I was not supported enough to move to online. The education department should have [brought teachers] back for at least 15 to 20 days training on how to use online." Similarly, Amal referred to the lack of policies to guide her transition to fully online instruction, explaining that "the university didn't have the right policies for this move. We did not know what to do. There was a lot of new decisions every day. It was hard for teachers ... we were not ready." Participant Fahad added that training is needed to support teachers' transition to fully online instruction, as "learning about teaching content online is somewhat different" compared to face-to-face instruction.

Finally, participants Amal, Fahad, Dalal, and Munirah highlighted experience as an indicator of successfully transitioning into fully online instruction. Participants Amal, Fahad, Dalal, and Munirah said they felt unprepared to deliver online instruction during the transitional phase because they lacked experience in online instruction. Regarding the need for experience, Amal expressed the importance of putting into practice the knowledge acquired in training. She said:

I can't say I was that confident because I didn't have experience. I had the knowledge, but when it comes to application and real experience, it needs experience to be honest. We learned a lot about how to teach online, how to design your course, what are the best practices, but we didn't practice them ourselves as teachers.

Along these lines, participant Fahad explained that despite having explored materials and attended workshops and webinars pertaining to online teaching, he still felt unprepared and lacking knowledge to successfully deliver online instruction in the transitional stage because he did not have experience teaching fully online. He stated:

I have very, very limited knowledge in terms of teaching content or using content online. I've used a few things, a few tools, I had a class in which I learn[ed] some technological tools. It really helped me. We learned a few tools, designing online pages and also blogs, assessment online, probably a little bit, but when we came to reality, it's different. Learning about teaching content online is somewhat different than when you actually ... shift 100% online, it's different. It's a different experience sharing content, and having content, teaching content, online is different to a great extent from teaching physically to students. This is my first experience, and I had limited knowledge about this.

Furthermore, participant Dalal explained that while she felt unprepared due to her lack of experience teaching online, her prior use of the educational platform selected to teach online helped support her transition into fully online instruction. Participant Dalal, who is an instructor in educational technology, explained:

I consider myself a professional in online teaching because of my profession; however, I haven't tried teaching fully online until the outbreak when we have suddenly pushed into that mode of teaching. Fortunately, my university had acquired full license of Blackboard Learn long time before the outbreak and we as faculty of the Instructional Technology Department were using it mostly for discussions or assignments or document sharing. So, we have been exposed to the platform before and that gave us an added advantage over other departments.

Furthermore, participant Munirah clearly summarized the importance of experience to acquire TPK by saying, "I didn't learn it from courses or from reading. I learnt with experience." She further explained that her experience teaching online allowed her to see what worked; she said, "What I learn during one class makes me in the next class use it to make it differently and it works." Running records and reflective notes taken during these teachers' classroom

observations align with these teachers' concerns regarding the importance of experience to reduce technological pedagogical challenges when moving to fully online instruction. For example, Amal's classroom observation showed the instructor's confidence and good management in the use of different technological tools (Blackboard, PowerPoint presentations, websites, and Menti.com application) as well as students' comfort working with them. The students seemed to be used to the tools used as the instructor did not provide much explanation of the step by step to access the different websites, to go back and forth from one application to the other, and to use the Menti.com app. The transitions from one tool to the other were smooth from the beginning to the end of the class. Thus, I can assume that the teacher's regular implementation of these tools helped promote a smooth and confident online lesson delivery.

Research Question 2: What Technological Challenges Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?

The emerging codes from the interview and observational data produced three themes related to these teachers' technological challenges: (1) use and knowledge of technology to support students' learning, (2) time constraints, and (3) technological and logistical issues.

Theme 1: Results Indicated Concerns During the Transition to Fully Online Instruction Among Participants Related to Their Use and Knowledge of Technology to Support Students' Learning

Participants Suliman, Fahad, and Munirah stated they had no knowledge about what technological tools to select nor how to utilize them when moving to fully online instruction. Participant Suliman explained that, at first, he was uncertain about what platform to use to deliver online instruction. Additionally, he recalled struggling to use the platform and said that, once he started teaching, he had the support of his wife to learn how to navigate and use various features of the online platform he selected to deliver his lessons. He mentioned:

My wife told me that there is this room that you can create in Microsoft Teams and then you move through, you can open each room and then sit there for a second or whatever time you want, and then move to the next one.

Observational running records from Suliman's online classroom was used to support interview data as the classroom observation records revealed Suliman used the rooms feature on Microsoft Teams and helped students access their assigned room smoothly and with no technological issues observed during the lesson.

Participant Fahad also expressed concern about his technological knowledge when transitioning to fully online instruction. Fahad said, "Everybody knew exactly what to do except me 'cause ... I had no experience teaching online." Due to his lack of technological knowledge, he felt very unprepared to navigate the transition to fully online instruction and use of technological tools to target student learning. Fahad explained, "I had to ask [about how to] manage accounts ... Even changing my name. I had technical issues. So, when I finished with them, I moved to actual teaching." Participant Fahad added that he perceived some tools had limitations to support a smooth transition as well as student learning. Although he did not expand on the limitations, he said that "some tools are not fully developed." For example, he said that "Blackboard [had] limitations in terms of assessment," while "Microsoft Teams is better maybe in terms of voice and sharing content." Additionally, participant Fahad explained that during the transition to fully online instruction he continued using tools he used in face-to-face instruction such as Microsoft Word, PowerPoint, and Blackboard, but he also learned to share content through Microsoft Teams and how to record videos of lectures for students. In this sense, observational data were used to support Fahad's interview data as running records revealed Fahad efficiently and comfortably shifted between three different tools (Microsoft Teams, pdf, pictures, Microsoft Word) and shared his screen without issues observed.

Participant Munirah also commented that during the time of the transition to fully online instruction she did not know how to use Blackboard, which was the platform selected by her institution to deliver online instruction and communicate with students. Her responses seemed to suggest that poor technological knowledge hindered her use of a wider range of tools to support students' learning. In this sense, she described, "I would say Blackboard was enough. I didn't feel like I need[ed] more over here 'cause once I learned about it in the beginning and then I learned how to use it, it was just what I needed." Observational data was used to expand on her interview responses. Interview data revealed that Munirah used Blackboard to deliver instruction during the transition to fully online instruction; however, at the time of the observation, she used the Zoom platform. Although running records did not yield data on the reasons for using Zoom instead of Blackboard in the observed online class, observational records showed Munirah used only one technological tool to deliver instruction and relied on a lecture approach to teaching during the lesson observed. The running records revealed she only used basic features of the tool (host a meeting and share screen on Zoom). During this class, Munirah welcomed students, discussed the topic of the class (art history), and demonstrated how to be a host on Zoom and how to share screen since students would be presenting in the following classes.

Amal, however, referred to a smoother transition due to her prior experience and training in the use of technological tools to support instruction. When asked about the selection of specific tools to support students' learning, Amal explained that she did not have difficulty in selecting the tools as there are plenty of options to choose from. She added, "It's easy, and I just need to make sure it goes along with my objectives with my learning [and] with the target audience." She further explained that her prior experience and training in the field of educational

technology helped her smoothly transition to online instruction. In this regard, Amal commented:

I know a lot of [instructors] who struggled because they never used [the tools]. I used to train ... faculty members in the educational technology in the college. And I saw that some people never opened and used Blackboard. But for me, it was easy ... because of our specialization.

Furthermore, interview data indicated some differences in the self-perceived confidence of participants Suliman, Munirah, and Dalal to use technology to support their students' learning when moving to fully online instruction compared to the observed comfort during the observations. When asked how confident they felt about using technology to support students' learning during the move from fully face-to-face instruction to fully online instruction, participant Suliman said that he did not feel very comfortable and added, "I know how to use it, basic use, but not comfortable." However, during the observation that was conducted no later than two weeks after the interview, instructor Suliman demonstrated confidence in the use of different tools. As mentioned earlier, he was seen to smoothly transition from one tool to the other and even provided technological support to students who could not access their online group's room. Similarly, Munirah's interview responses showed her lack of confidence in the use of technological tools during the transitional phase, but observational records show that Munirah seemed confident using and explaining how to use the technological tool selected. Also, the instructor helped one student to be a host of the session during the lesson. However, this instructor's perceived comfort could be due to her use of only one tool and basic features of such a tool as well as not having to deal with any on-the-spot technological difficulties.

Interestingly, interview data shows that participant Dalal felt very confident about using technology to support students' learning in fully online instruction. Dalal added, "I feel myself to be moderately knowledgeable about designing and managing effective online learning

experience. I am also improving my knowledge on that especially when trying to utilize new tools and strategies.” However, observational data fails to indicate Dalal’s use of new or varied tools. Although the instructor seemed confident in shifting between many features of the Blackboard Collaborate tool when delivering the lesson online, she used only Blackboard Collaborate, which she said she had used a long time before transitioning to fully online instruction.

Theme 2: Findings Indicated Time Constraints as a Concern During the Transition to Fully Online Instruction

Participants Amal, Munirah, Fahad, and Suliman explained that the sudden move to online instruction due the current COVID-19 pandemic posed time constraints to improve their use and knowledge of technology to support students’ learning during the transitional phase to fully online instruction. Participants Amal and Munirah suggested that their main technological difficulty was time. Amal said, “It was really challenging to find the time to learn and to find support for myself, but somehow we did it,” while Munirah also commented, “It wasn't as simple as much as it was hard to learn, it took time to learn, but there [were] no obstacles per se.” Participant Fahad added, “It's time consuming because we have been learning tool after tool after tool after tool.”

Furthermore, instructor Suliman explained, “Even if the students suggested something new, I wouldn't take it because ... I didn't have the time to go and explore it.” Suliman also suggested the difficulty in keeping up with the rapid pace of changes in the technological tools that instructors were expected to use in their online instruction. He explained:

But also the other challenge also sometimes, because of the pandemic and stuff, the companies that are operating those software are developing it rapidly, to the extent sometimes when you look for something online, try to understand from the YouTube or

anything, try to understand the software you find that they've changed it already, it's something else. It's hard for me to keep pace with the rapid development of online [tools].

Theme 3: There Seemed to Be Concerns Among Participants Regarding Technological and Logistical Issues That Hindered Their Use of Technology During the Transition to Fully Online Instruction

Participants Fahad, Suliman, Amal, and Munirah referred to concerns regarding the internet connectivity and stability during the transition to fully online instruction due to the size and connectivity requirements of the platforms as well as the number of people moving online. Participant Fahad said that “simple things like internet connection is a barrier sometimes.” Additionally, Suliman explained that “Microsoft Teams is a heavy program” and “it consumes lots of width band, and that [slows] down the quality of the voice.” Additionally, Amal suggested that an unstable connection was due to “a lot of people using the LMS at the same time.” Munirah added that she had difficulties connecting to the learning platform due to the students’ home internet speed as well as the high demand of Blackboard at the time. Observational records did not reveal internet connectivity issues like the ones mentioned in the interviews.

Furthermore, participants Amal and Fahad expressed their concerns about the difficulties encountered to access technological tools during the transition to fully online instruction. Instructor Amal commented that during the transition to fully online instruction she had difficulty accessing some materials because they required payment. She said, “I can't ask [students] to pay for [the resources]. We needed more free tools.” Similarly, participant Fahad explained that students had difficulties logging in to the platform or they were logged out while completing a course assessment. However, participant Fahad mentioned that the IT department at his institution maximized their efforts to provide them with access to a wide variety of resources that would support faculty transition to fully online instruction. He explained:

They've given us some resources, online resources, websites and even tools, and access to some tools and then websites. So, we've been helped actually to transition to online teaching. Blackboard, Microsoft Teams, and also workshops and all of that, especially access to research also has been provided to us. We've had problems in terms of accessing research articles before.

Furthermore, participants Munirah, Fahad, and Dalal commented on the troubleshooting strategies they developed during the transitional phase to deal with possible technological issues in their online instruction. Participants Munirah and Fahad mentioned the use of supporting tools as a troubleshooting strategy. Munirah explained she planned to use a supporting tool to deliver instruction and communicate with students when the main platform posed inconveniences. She said:

When things didn't work well for us [on Blackboard Collaborate], we moved to other programs like Zoom. And from what I heard from my friends, sometimes they use[d] even WhatsApp. Sometimes they use[d] other programs just to make sure that they are connected and move on.

Similarly, Fahad mentioned he had a backup computer device and internet provider in case his laptop stopped working or the internet connectivity at the university failed. He had access to various platforms to deliver instruction. He explained:

I prepared. In terms of tools and technologies, I had to have the Blackboard account and also the Microsoft Teams. So, I had... I needed to have more than one option, more than one technological option in case I missed anything, or something that happened.

Fahad also mentioned that he checked the tools before using them. While delivering instruction, he said he relied on students to inform him whether there was a connectivity or technological issue (e.g., the content not being shared). Along these lines, participant Dalal said that she relied on “planning ahead and being prepared for sudden changes [like] connection problems or technical failures” to deal with technological issues. Although Dalal did not expand on her troubleshooting strategies, running records revealed the instructor was able to diligently explain

and model how to share screen on Blackboard Collaborate when a student expressed concerns about it.

Additionally, participant Munirah expressed she felt somehow confident about solving technological issues and related such confidence to her experience in the use of technology to support instruction, her curiosity to learn about computers, and her reliance on professional technological support from a family member. Munirah said:

I would say I'm not a professional, but because I work a lot with computers, and I like to depend on myself to learn about my computer and how to fix it, how to use it, so this was not a big issue, and at the same time, I have a brother who was a professional. So, if I had any issues, he would be there, but I never had any issues during the online teaching.

However, Suliman felt reluctant to help students troubleshoot technological issues due to his lack of technological knowledge. He said he relied on the IT department to help both his students and him. He stated that if students had any hardware or software issues, they had to contact the IT department. He also suggested that “the teacher [should] not be assigned for this.” However, running records from Suliman’s classroom observation revealed Suliman was able to help two students get into their Microsoft Teams meeting by quickly using a different option to invite them.

Finally, only participant Munirah expressed concern related to logistical issues during the transition to online instruction. Munirah referred to the difficulty of creating or finding a place to work from home. She said, “You have to be in a quiet place, not to be interrupted by your family”. Although no logistical issues can be observed in the classroom observations conducted, it is fair to say that students’ cameras were off in all the sessions observed.

Research Question 3: What Technological Challenges Pertaining to Content Do Faculty Members Face During the Transitional Phase To Fully Online Instruction?

The emerging codes from the interview and observation data produced two themes related to TCK challenges: (1) knowledge of tools to support subject matter content teaching, and (2) use of technological tools to adapt content format during the transition to online instruction.

Theme 1: Findings Seemed to Indicate Teachers' Concerns Regarding Their Knowledge of Technological Tools to Support Subject Matter Content Teaching During Their Transition to Fully Online Instruction

Participants Suliman, Fahad, Amal and Munirah referred to their lack of technological knowledge to select technological tools to deliver content in fully online instruction. Participant Suliman said he had no knowledge about what technological tools to use to deliver subject matter content fully online during the transition from face-to-face to fully online instruction. Suliman explained that most of the materials he traditionally used were in paper, which made it difficult for him to select tools to present the subject matter content online. He said, "The material itself was a book. So, most of our knowledge exist[ed] in books, they didn't exist in software form. So, moving online with such kind of material was absolutely difficult."

Similarly, participant Fahad suggested that although he knew the content he was expected to teach, he was unsure about what tools to use to introduce such content to his students in a fully online learning environment. Fahad mentioned he relied on his colleagues to deal with technological difficulties pertaining to the teaching of content in fully online instruction that he faced during the transition to fully online instruction. He said:

Content selection is not a big thing here, so it's already been selected here. You know exactly what to teach. You sometimes can select extra things. But I didn't have a lot of knowledge actually. I relied on other [colleagues] for help. I didn't have a lot of knowledge on the ways to select tools and technologies related to my teaching.

Instructor Amal said that she had to find and explore a wide variety of tools to select those which she considered could be beneficial to introduce content to her students. Amal explained that she was concerned about the effect the selected tool for content delivery in fully online instruction could have on her content delivery and students' learning. She said, "At first I thought, if I'm using PowerPoint, then it's just me talking, [students] listening." However, once she explored the tools, she said she learned how to use the interactive presentation tools that she expected to promote students' engagement with the content. Participant Amal noted, "[PowerPoint slides software] even has some gamification element inside of the presentation tools." Observation records were used to expand on the interview data. Running records from Amal's classroom observation showed the instructor used three technological tools to deliver content; she used various features in each of the tools and was able to transition smoothly (no issues) from one tool to the other. Notes suggested that at the beginning of the class, the instructor utilized Blackboard Collaborate to orally welcome students and introduce the topic, then switched to PPT to review content worked in previous classes, and after that, she moved to Menti.com for the remaining of the class.

Participant Munirah, on the contrary, said that her experience using technology (images, videos or PowerPoint slides) to introduce content in her face-to-face history classes allowed her to select a wider variety of tools during the transition to fully online learning. Regarding her face-to-face art history class, she said, "I would use the PowerPoint to explain certain things, and then I want[ed] them to see artwork [I would use] YouTube." Running records revealed that Munirah selected Zoom and PowerPoint slides to deliver content about art history during the

observation conducted. The instructor welcomed students on Zoom and she then demonstrated how to be a host on Zoom and how to share their screen because students would do classroom presentations in the following lessons. The instructor finally shared her screen and relied on a lecture approach to introduce subject matter content.

Participants Fahad, Suliman, Munirah, and Dalal referred to the concerns pertaining to their use of the technological tools selected to support the teaching of subject matter content. Participant Fahad said that educators need to have good knowledge of both the technological tool and the content to thrive in fully online education. Fahad added that the transition to fully online instruction during COVID-19 pandemic was challenging for educators “because you had to try to use the content and the tool at the same time while you figure out things by yourself.” Similarly, participant Suliman mentioned that his use of tools to deliver content was “minimal” due to lack of training and experience and he referred to the lack of time to explore the tools used to teach content online caused by the sudden move to fully online instruction during the COVID-19 pandemic. He said:

When you are trained and you practice something for long time, you're able to become creative. But with this online thing, it's something that happened abruptly, and we did not have the time to be innovative and creative about it. So, we were doing the bare minimum, scan the book, PDF it, and share the screen with the student, end of the story.

Observational running records were used to expand on use of technological tools to deliver content online. Records showed that Suliman utilized Microsoft Word and YouTube to introduce content during the online classroom observation. However, Suliman only used basic features of each tool (word entry on Microsoft Word and video play on YouTube). What is more, the instructor orally introduced the content addressed in the YouTube video because the audio of the video did not work, and he was unable to solve the audio issue. Participant Suliman said, “I'm still, like I say, amateur. I'm still like I'm feeling like I'm a tier one,” which suggested he did

not feel confident in his technological knowledge to deliver content in fully online instruction during the transitional phase.

Similarly, Munirah expressed concerns regarding her use of technological tools to deliver online instruction during the transitional phase. Additionally, Munirah suggested that her lack of technological knowledge may be due to her lack of experience in the use of technology to deliver content. Munirah noted, “I didn't have any knowledge,” and explained, “We've never tried it before, and I wasn't sure if the students will connect and [if I] will be able to deliver the knowledge to them as I aimed to.” Specifically, she did not feel confident in her abilities to deliver online instruction through the use of technology during the transitional phase “because it's a new experience.” Running records from instructor Munirah's online classroom observation showed her basic use of the Zoom meeting platform (hosted the meeting on Zoom and shared her screen) and PowerPoint slides to introduce content (used slides content as support while orally delivering content to students).

When asked about her knowledge to use technology to teach content online during the move to fully online instruction, instructor Dalal, who specializes in educational technology, responded that “understanding the affordances of the technological tools available and trying to utilize these tools in a way to support the content, its delivery and application, is the key to creating effective online learning experiences.” Dalal also added that her focus was on “the content itself and how to enhance its delivery and application by using technology, not the other way around.” Observational running records seemed to align with interview data as they revealed how instructor Dalal utilized a wide variety of features from Blackboard Collaborate to introduce and review content (real-time annotations and text, live chat, file sharing).

Theme 2. There Seemed to Be Concerns Among Participants Pertaining to Use Technological Tools to Adapt the Format of Subject Matter Content to Online Instruction During the Transition to Online Instruction

Participants Amal, Munirah, Dalal, and Suliman mentioned that the materials used to teach content at the time of the transition were not designed to be used in fully online instruction. In this regard, Amal said, “I didn't design it to be taught online, I had my textbook and stuff. So, it's not like that, it's not just, ‘Okay. I'll tell my student just to do the same, I'll just teach the same way.’” Similarly, instructor Munirah said that “the content was almost the same,” comparing the content taught in fully face-to-face instruction and fully online instruction. Dalal said that she used the same content taught in her face-to-face instruction, but she explained that she used technology to enhance her content teaching in fully online instruction. Dalal illustrated, “If the content needs visual explanation of a particular point, then annotation tools and whiteboards can be of a great help in the online environment.” Additionally, participant Suliman said he needed help in the design and adaptation of the content during the transitional phase to fully online instruction. He said he had access to material that was designed “as a supplementary material” for online instruction, and thus he tried to adapt such material “to make it work as a main material for the class.” Instructor Suliman explained:

If you notice around Riyadh, most of the bookshops or the photocopying place, they were in business. Why? Because they had all the teacher[s] come in to cut down the books from the back, the spinal of the book, and to transfer them into PDF material so they can present it online. So, the content we're talking about now, we're talking about content, that is not meant to be for online [instruction], but it is used online.

Suliman added:

I know how to use PowerPoint, I know how to use Word, I know how to use Excel, but how to develop [content] to be used online? No, I had no idea. And even now, I still have no idea. I would imagine that I should be able to fiddle with Blackboard, for example, and create content, and then after that, create activities and relay the activities to them.

Participants Suliman, Amal, Dalal and Munirah referred to the concerns faced when adapting and selecting content to fit the online instruction context. Amal suggested that in face-to-face teaching content is fixed due to the use of a textbook: “Everyone learns the same way, they all learn the same things.” However, she suggested that the adaptation of materials to be taught fully online requires much technological knowledge. She said, “Sometimes we get resources on the same day, like while we're teaching.” Additionally, participant Munirah made changes such as reducing the content taught and thus the assessments conducted. She said, “At the beginning, we had to do some changes because we couldn't deliver everything at the time. I remember we had to [remove] the tests.”

Participant Suliman mentioned that he had little knowledge about adapting content to fully online instruction during the move to fully online instruction; thus, he decided to use the tools he already knew to introduce or reinforce content taught such as Google Forms and the polling feature on Microsoft Teams. He said, for example, “I'll put a question and get students' vote on it, stuff like that. Just to enhance, to make sure you're maximizing the chances for students to understand what you're trying to get across.” Finally, participant Dalal explained that she faced challenges when using technology to adapt content for fully online instruction during the transitional phase. However, she said these obstacles did not last long as she learned some of the skills needed to select content to deliver online. She noted:

Selecting content is based on the instructor's ability to correctly evaluate the validity and quality of the online content. By having solid search skills and having the critical eye and knowledge to evaluate chosen media, the instructor can accomplish this easily. Another important skill in this area is having the proper knowledge of copyrights and using it correctly.

Summary

Chapter IV reported the results of the data collected from five participants through the use of online individual interviews and classroom observations. The themes identified were presented to address the three research questions of the present study. The results of this study provide insight into the technology-related challenges that faculty faced during the transition from face-to-face to fully online instruction. Chapter V provides an in-depth discussion of the study findings, implications, and recommendations for future research.

CHAPTER V

IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

The purpose of this qualitative case study was to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction before and/or during the COVID-19 pandemic. This study aimed to answer the following research questions:

RQ1: What technological challenges pertaining to pedagogy do faculty members face during the transitional phase to fully online instruction?

RQ2: What technological challenges do faculty members face during the transitional phase to fully online instruction?

RQ3: What technological challenges pertaining to content do faculty members face during the transitional phase to fully online instruction?

Chapter V summarizes the findings for each research question and provides an in- depth discussion of the study findings and implications. This chapter also includes recommendations for future research.

Summary of the Findings

In summary, RQ1 revealed the technological challenges pertaining to pedagogy participants faced during the transition to fully online instruction. Findings indicated that participants found it challenging to modify their teaching role and approach, promote interaction,

and also design and implement student assessment when moving to fully online instruction. Participants expressed lack of confidence in their teaching skills when transitioning to fully online instruction and indicated their need for training and experience in adapting their instruction, designing and implementing assessments in fully online instruction, and promoting interaction.

RQ2 revealed technological concerns regarding the participants' knowledge of technology to support students' learning. Findings also indicated the lack of time due to the sudden move exacerbated by the COVID-19 pandemic as a concern to acquire the knowledge and expertise necessary to effectively transition to fully online instruction. Furthermore, results revealed participants had concerns regarding internet connectivity, finding tools, accessing and using technological tools, and finding a room in the house to deliver lessons online without family interruptions during the transition to online instruction.

Finally, RQ3 findings revealed participants' difficulties in using technology to deliver subject matter content online during the transition to fully online instruction. Results suggested participants had difficulty adapting the available materials because they were not designed for online instruction. Observational data was used to support findings referring to these participants' lack of technological knowledge to introduce content in fully online instruction. Few tools were selected, and basic use of such tools was observed to support subject matter content delivery.

Discussion of Findings

RQ1: What Technological Challenges Pertaining to Pedagogy Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?

This study found that participants expressed they felt compelled to review and modify their teaching philosophy when moving from fully face-to-face to online teaching. Specifically, participants found the transition to fully online instruction challenging because it required them to rethink their role as teachers. They described their role as providers of materials online while their students played a more active and autonomous role processing such information. Students in online learning have control over the learning materials as well as how they work and how long they work on them. These study findings are in agreement with the literature. The literature reviewed suggested that faculty need to reinvent and refine their traditional course design and delivery to meet the demands of online instruction (Davey et al., 2019; Wright, 2014). For example, Portugal (2015) explained the role of the teacher shifts to that of a supporter or facilitator as students are expected to become autonomous and self-directed. Kearns (2016) added that the instructor acts as a guide in online instruction, shifting the focus from teaching to learning.

This study also found that the faculty with more years of teaching experience seemed the most supportive of the change, expressing their need to improve their knowledge and skills to meet the demands of online teaching. This study finding seems to contradict Islim and Sevim Cirak's (2017) literature review, which suggested that senior faculty are often more reluctant to adopt instructional and technological innovation while younger faculty appear more receptive to it. Although Islim and Sevim Cirak (2017) found no difference in faculty age and rank and their adaptation to technology, the present study found that faculty with more years of teaching

experience expressed more enthusiasm and openness to learn and adapt to these new technologies. This finding may relate to both the lack of choice due to the COVID-19 pandemic and the cultural context; however, further research is needed on this matter.

The faculty who participated in this study indicated that the lack of face-to-face interaction prevented them from designing activities that were effective in their face-to-face classrooms, such as hands-on activities, group work, and one-to-one discussions. The participants used whole-class discussions to promote student participation and communication. Additionally, they provided very detailed instructions and were explicit about the task objectives. These study findings align with the literature reviewed as research on online instruction indicated that the lack of face-to-face interaction poses difficulties for instructors to promote interaction, keep fluid communication with students and create a sense of social presence that fosters student belongingness (Davey et al., 2019; Esani, 2010; Islam et al., 2015; Kibaru, 2018; Siedlaczek, 2004). Esani (2010) revealed that the transition from a face-to-face to an online environment requires instructors to create a learner-centered environment with a climate of social presence. However, this study's findings showed that instructors used teacher-centered or traditional practices to promote engagement and participation in their fully online classes, which could relate to their expressed self-perceived lack of training to teach fully online. Similarly, Baran et al. (2011) found that faculty often utilize traditional classroom practices as they lack training on how to promote higher order thinking skills in online learning environments.

The instructors participating in this study also faced challenges to review, design, and implement student assessment in online instruction. They expressed concerns regarding the lack of face-to-face interaction and their lack of knowledge to select and use technological tools to assess student learning online. These findings align with the literature suggesting that instructors

feel challenged to assess students' understanding and learning process due to the lack of face-to-face interaction in the online setting (Davey et al., 2019; Esani, 2010; Islam et al., 2015; Kibaru, 2018). The lack of proximity to learners poses difficulties to observe students' learning process and assess practical knowledge (Islam et al., 2015; Kibaru, 2018). Most instructors participating in this study were particularly concerned about student cheating behaviors in online assessment, expressing that their students are more likely to engage in cheating in online instruction compared to in person due to the lack of teacher presence and monitoring techniques. These instructors' perceptions on student cheating relate to their teaching context and experiences. They explained that in class they like to walk around, monitor students' behaviors, and check on students' use of external or prohibited supporting materials when doing an in-class test or exam. However, fully online instruction prevents them from using any of those strategies, which may affect their perception of an increase in cheating behaviors when moving to fully online instruction. No literature was found to expand on this finding.

This study's findings revealed that these instructors' technological knowledge posed challenges in the transition to online instruction regarding the selection of tools to design, implement, and assess instruction online. The instructors participating in the study felt unprepared and thus unconfident to teach online during the transition to fully online instruction. Similarly, the literature reviewed indicated instructors have expressed the need for intentional training that provides them with resources such as online teaching strategies to foster student engagement and learning in online courses (Berry, 2019; Fredericksen, 2017; Grabowski et al., 2016; Hunt et al., 2014). This study's findings align with the literature referring to the need for further faculty support to build their technological and pedagogical knowledge (Alshangeeti et al., 2009; Hamdan, 2014; Hunt et al., 2014). Most instructors participating in this study

specifically indicated the need for training to support their transition to fully online instruction and improve their knowledge and confidence in the use of tools to approach online instruction as it requires a different approach compared to face-to-face instruction. They expressed their willingness to be trained on how to use different types of technology to improve their instruction. Loague et al. (2018) indicated that faculty hold positive views on how technology can support learning; however, there is an expressed concern for greater support to integrate technology into their instruction. Faculty preparation can provide effective ways to reduce faculty anxiety, frustration and negative attitudes toward online teaching (Elliott et al., 2015; Esani, 2010; Islam et al., 2015; Wingo et al., 2017). Matherson et al. (2014) found that when faculty are provided with sustained professional development, we can bridge the gap between what educators are taught and what they are actually expected to do in the classroom.

Overall, the response to the first research question addressed the study problem and purpose by providing an in-depth understanding of the technological challenges pertaining to pedagogy that faculty faced during the transition to fully online instruction. The findings offered an indication of the differences in the role of the instructor, the approach to teaching and learning assessment, and the instructional design decisions and strategies used to support student learning in fully online instruction. The findings can guide educational stakeholders to acknowledge the need for training and provide supports to help faculty confidently transition into fully online instruction. Training is necessary as various technical and pedagogical skills are required for a smooth and effective transition to online teaching (Davey et al., 2019; Islam et al., 2015; Mishra & Koehler, 2006; Wright, 2014). This study's findings are an important contribution to existing literature indicating that continuous assessment of challenges faced by faculty in design and

delivery of online courses is required to provide training and effectively address the difficulties identified (Kibaru, 2018).

RQ2: What Technological Challenges Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?

The study's findings indicated that instructors lacked knowledge to identify and use technological tools when moving to fully online instruction, which limited their design and implementation choices to support students' learning, as well as their ability to troubleshoot technological issues. Davey et al. (2019) suggests that technological knowledge can facilitate instruction by informing faculty of tools to introduce content, ways of engaging students, and strategies to sustain learning during their online teaching. This knowledge is necessary for instructors to create online classrooms where students can develop and reinforce knowledge and skills (Archambault & Barnett, 2010).

Faculty participating in this qualitative case study faced difficulties in accessing online materials and platforms as well as internet connectivity and stability during the transition to fully online instruction. Technical knowledge and support are necessary for faculty to troubleshoot technology-related issues such as blocked websites, bandwidth, and non-working computers (Martin et al., 2019; Portugal, 2015). In this sense, this study showed that the participating instructors developed a series of troubleshooting strategies such as the use of supporting tools and additional devices as backup options during the transitional phase to online instruction to deal with possible technological issues in their online teaching.

Furthermore, this study's findings found the instructors had difficulty in keeping up with the rapid pace of changes in the technological tools they were expected to use in their online instruction. Most instructors expressed that the rapid transition to online environments due the

current COVID-19 pandemic posed time constraints to improve their use and knowledge of technology to support students' learning during the transitional phase to fully online instruction. This study's findings are aligned with the literature, as recent studies suggest that the COVID-19 pandemic intensified these concerns as it pushed faculty in higher education institutions to quickly move online (Islam et al., 2015; Ruth, 2018). Additionally, many studies found that faculty face challenges to manage their time to design their online instruction (Esani, 2010; Hunt et al., 2014; Islam et al. 2015; Wright, 2014). Esani (2010) explained that online course development requires more time and work compared to traditional instruction. Kibaru (2018) found that, in normal circumstances, faculty feel overwhelmed with the rapid and constantly changing nature of technology in education as they are expected to remain updated. Such dynamic nature of the online environment requires an evolving approach to course design and delivery, imposing unwanted pressure on instructors (Kibaru, 2018).

This study found that the participating instructors only used basic features of the tools regardless of their experience prior to the move to fully online instruction. Participating instructors suggested that such lack of time and knowledge had a negative impact on their confidence to select and use technological tools. Thus, quality support when using technology can be a fundamental part of building technological knowledge and expertise, reducing faculty anxiety, and empowering faculty, especially those who are less technologically knowledgeable (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012).

The response to the second research question and study problem sheds light on the technology-related challenges that faculty face during the transition to fully online instruction. Findings offered an in-depth understanding of the limited technological knowledge to support student learning in fully online instruction expressed by the participating faculty. These findings

support current research recommendations for higher education institutions to provide technical training and support to improve faculty knowledge and skills to deal with technical problems (Portugal, 2015).

RQ3: What Technological Challenges Pertaining to Content Do Faculty Members Face During the Transitional Phase to Fully Online Instruction?

Findings suggest that the instructors who participated in this study showed confidence in their knowledge of the subject matter content; however, they expressed concerns about their understanding of the affordances of the technological tools available to support content teaching fully online. This study's finding aligns with the literature as current research found that online instructors possessed sufficient subject matter knowledge but had limited knowledge of the technology being used in online teaching (Davey et al., 2019). Koehler and Mishra (2009) explained that teachers must know their subject matter deeply enough to make informed decisions about the tools they can use to deliver content online and to better understand the impact of these tools on their content delivery. O'Hara and Pritchard (2012) recommended that instructors consider technology as a supporting tool to drive content delivery.

The present study found that while instructors acknowledged the need to utilize technology to enhance content delivery and application, they reported minimal use of technology to support content delivery in fully online instruction due to their perceived lack of technological knowledge and challenging adaptation of materials. Furthermore, the participating instructors agreed that the materials traditionally used in face-to-face instruction were not adapted or suitable for fully online instruction, which hindered their innovativeness for content delivery. Along these lines, Siedlaczek (2004) and Lucey (2018) found that online teaching requires

innovative content implementation as students and teachers no longer share the same physical space to interact with the course material.

Most instructors participating in this case study suggested that the adaptation of materials to be taught fully online required knowledge of technology that they did not have at the moment of the transition to fully online instruction. Thus, participants expressed that training and expertise were needed for them to understand how to use technology to enhance their content teaching. Existing literature suggests training is needed to improve instructors' TPK and support their move from face-to-face to online instruction (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012). Archambault and Barnett's (2010) study confirmed that instructors with strong TCK utilize a wide range of technological tools to introduce content in online instruction. Rienties et al. (2013) found that training radically enhanced faculty's perceived technological pedagogical content knowledge skills required to teach online.

The response to the third research question referred to the study problem by indicating content-related technological challenges that higher education instructors face when moving from face-to-face to fully online instruction. Findings provided an in-depth understanding of the limited technological content knowledge that faculty had during the transition and the lack of suitable materials to be used for content delivery in fully online instruction. These findings support current research recommendations for higher education institutions to provide technical training and support to improve faculty knowledge and skills to enhance content delivery (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012).

Implications of the Study

This qualitative case study addressed three research questions pertaining to the technological challenges, technological pedagogical challenges, and technological content

challenges that faculty members face during the transition to fully online instruction. The five participating higher education instructors' views and experiences of these challenges were collected through in-depth semi-structured individual interviews and online classroom observations.

Two main implications for practice were identified. First, higher education institutions need to provide their faculty members with pedagogical training, technical support, and established guidelines to help them smoothly transition into fully online instruction. As suggested in the literature reviewed, training is the main concern in online education (Berry, 2019; Elliott et al., 2015; Fredericksen, 2017; Grabowski et al., 2016; Hunt et al., 2014). The demand for online instruction requires better preparation and support to faculty for the effective delivery of online courses (Elliott et al., 2015; Islam et al., 2015; O'Hara & Pritchard, 2012). This study helps us understand that fully online instruction requires educators to understand how content, pedagogy, and technology interact and influence one another. Technical support should be addressed as a main concern for faculty to develop their technological skills when moving to fully online instruction. Faculty members need to have good knowledge of both the technological tools available and the influence they may have on their instructional and content delivery to thrive in fully online education. Sufficient training and preparation for the use of technology will help instructors design, deliver, and assess fully online instruction more confidently and effectively.

Second, understanding the technological, pedagogical, and content challenges that faculty face in the transition to online instruction is essential to develop and provide adequate and effective professional development. Awareness of existing challenges is vital for understanding any institution's wishing for a successful online learning outcome

(Islam et al., 2015). Similarly, the literature suggests the need to raise awareness among faculty members regarding how to face the challenges it poses (Alshangeeti et al., 2009; Hamdan, 2014). The findings of this study contribute to the understanding that professional development should be based on the needs of the faculty member. This is a modest, yet significant, contribution to the existing literature on the challenges faculty face during the transitional phase to fully online instruction.

Limitations and Delimitations

The study limitations were mainly related to its qualitative nature. Researcher bias was an important concern prior to collecting data as researcher-induced bias can influence the stages of collection, analysis and interpretation of data (Creswell, 2014; Patton, 2002). Therefore, biases, beliefs, and values should be explicitly stated up front in the study (Janesick, 2011). There were also concerns about the amount of data collected and analyzed as it could become time consuming and labor intensive for the researcher considering that the study mainly consisted of interview data (Creswell, 2014). Participant withdrawal from the study during the data collection stage was also a concern prior to the study, so data collection continued until saturation was reached. Additionally, recordings of observations could potentially be helpful to clarify and confirm records. Observing single synchronous online classes may pose limitations in terms of data saturation.

Other limitations referred to generalization, credibility, and reliability (Maxwell, 2013; Patton, 2002). Credibility and generalizability are commonly regarded to be disadvantages in a qualitative research design as it cannot be used for testing propositions and results cannot be generalized to the wider population (Creswell, 2014). In addition, basic qualitative studies are considered time consuming and difficult to replicate (McLeod, 2008). Thus, this study used

triangulation to enhance credibility and mitigate the researcher's biases as it provided corroborating evidence through the use of multiple sources and theories of the phenomena under study (Creswell & Poth, 2018). Also, a combination of qualitative research strategies was used to mitigate this limitation such as extensive field time, a thick description, closeness of researcher with the interviewee, and clarification of ambiguous responses during the interview (Creswell, 2014; Creswell & Poth, 2018; Maxwell, 2013; Patton, 2002).

Other limitations refer to the use of online interviews, mainly related to confidentiality, internet and computer access, and problems with the software, audio or voice, all of which can cause frustrations to both the researcher and the participant. These concerns were addressed by getting informed about Adobe Connect and piloting the software; conducting a sound check with the interviewee prior to the interview, and considering possible backup conferencing venues to use such as Skype or Google Hangouts. Finally, this case study was limited to faculty perspectives making the transition to fully online instruction during a pandemic and not broadly for all faculty making the transition to online education. Thus, the findings may not reflect the challenges faculty face in normal circumstances.

Recommendations for Future Research

Results and implications of this qualitative case study align with existing research on the same subject of study. However, future research that includes a larger sample and also faculty from various online universities is strongly recommended to determine if they hold similar views and experiences pertaining to the challenges faced during the transition from face-to-face to fully online instruction. Furthermore, it is recommended to audio or video record observations to potentially clarify and confirm records.

In addition, future research could consider investigating challenges during the transitional period utilizing different research designs to improve the current qualitative study as this study was limited to the insights of five faculty members. Researchers could potentially support qualitative data with the collection and analysis of quantitative data. For example, an online Likert scale and/or closed-ended question survey can be designed to further explore technological, technological pedagogical, and technological content challenges that faculty face in the transition to online instruction.

Each response to this study's research questions suggested the need for further training, supports and guidelines for instructors when moving to fully online instruction. Thus, it seems imperative to investigate faculty perceptions on the supports needed. Future research could explore the type, length, and focus of the professional development opportunities needed to expand faculty members' TK, TPK, and TCK. Moreover, researchers could investigate how the articulation of supports, guidelines and training improve faculty knowledge and confidence to teach online when transitioning to fully online instruction. Also, researchers could examine the relationship, if any, between faculty seniority and willingness to adapt to change when moving to online instruction. This field of study would highly benefit from current studies exploring such relationships as this study's findings showed a contradiction between previous literature and other current studies. Further research is also needed to examine instructors' perceptions of the relationship between students' cheating behaviors and fully online instruction. This study's finding showed faculty members perceived students' cheating behavior increased in fully online instruction compared to fully face-to-face instruction.

Finally, although it was not the goal of this study, this dissertation study was conducted during a unique and extraordinary global pandemic that pushed instructors to suddenly move to

fully online instruction and allowed no time for educational stakeholders and policy makers to prepare and plan accordingly for the move. Thus, future research could replicate this study to help determine the challenges faculty have in normal circumstances. Overall, this study's findings serve as a pathway to keep exploring the challenges faced by faculty members and the opportunities to reduce such difficulties when moving to fully online instruction.

Conclusion

The purpose of this qualitative case study was to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a higher institution in the Kingdom of Saudi Arabia (KSA) face while transitioning from fully face-to-face instruction to fully online instruction. Three research questions addressed the purpose of this study and helped bridge a gap in the existing literature. Findings from this qualitative dissertation study aim to support higher education institutions, especially in Saudi Arabia where this study was conducted, to thrive in their online education.

Faculty members' knowledge, confidence and expertise are essential components to successful online instruction. If current challenges and recommendations are considered, institutions and other educational stakeholders may be able to effectively design and implement adequate solutions to positively impact the delivery of online education and student learning. Addressing the existing challenges faced in moving to fully online instruction can support a smoother process of transforming face-to-face classes into online offerings and meeting the current demands for online education. Additionally, solutions to these challenges can help faculty reduce anxiety and boost confidence in designing, delivering and assessing online instruction, thus improving faculty experiences in transitioning into fully online instruction.

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APPENDIX A
SUPPORT REQUEST EMAIL

Dear (*Dean of the College of Education/ Dr. Alshaya*),

I am Ms. Mshael Aldakheel, former instructor at the University of King Saud in the Department of Educational Technology and a current doctoral student in the Department of Educational Technology, Research and Assessment at Northern Illinois University in DeKalb, Illinois, the USA. I am currently working in my dissertation study titled “*An exploration of the technological, technological-pedagogical, and technological and instructional challenges that Saudi faculty face in their transition to online education.*” The purpose of this study is to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction. I am writing to request your support in providing the contact email of those instructors at in the College of Education that may comply with the following selection criteria: be a current faculty member at the (selected Saudi university), hold a PhD degree, and have faced challenges in the transition from fully online to fully face-to-face instruction.

This is a voluntary research study. All faculty members currently working at the college of education at King Saud University have been invited to participate in this study. The data obtained from this survey will be used for educational purposes. Thus, their participation in this study is greatly appreciated and will provide helpful input for exploring the challenges that faculty members face in the transitional phase from traditional face-to-face classes to fully online classes.

The records of this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password protected file.

If you have further questions or concerns, please feel free to contact the researcher, Ms. Mshael Aldakheel at amshael@ksu.edu.sa or by telephone at: +966553323808. You can also contact my mentor faculty Dr. Wei-chen Hung at whung@niu.edu.

Thank you for taking the time and consider supporting me in conducting this research study.

Sincerely,

Mshael Aldakheel

APPENDIX B
INVITATION EMAIL

Dear faculty member,

I am Ms. Mshael Aldakheel, a graduate student seeking a doctoral degree in the Department of Educational Technology, Research and Assessment at Northern Illinois University in DeKalb, Illinois, the USA. As part of my dissertation study titled “An exploration of the technological, technological-pedagogical, and technological and instructional challenges that Saudi faculty face in their transition to online education”, I would like to invite you to participate in my study. I am looking for current faculty members at the (selected Saudi university) who hold a PhD degree and have faced challenges in the transition from fully online to fully face-to-face instruction. The purpose of this study is to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction.

If you agree, you will be expected to participate in an audio-taped online interview of approximately 45 minutes. Interview questions will be emailed to you prior to the interview meeting. In addition, I am requesting your permission to observe one of your online sessions. I will join the online classroom at the beginning of the lesson and remain until the end of the lesson, without becoming a distraction to you or your students.

If you comply with the inclusion criteria and are interested in participating or if you have any further questions about this study, please contact me via email at amshael@ksu.edu.sa you can also contact my mentor faculty Dr. Wei-chen Hung at whung@niu.edu.

Thank you for taking the time and consider assisting me in this research study.

Sincerely,

Mshael Aldakheel

APPENDIX C
CONSENT FORM

Northern Illinois University

Consent to Participate in a Research Study

Dear participant,

As a graduate student seeking a doctoral degree in the Department of Educational Technology, Research and Assessment at Northern Illinois University in DeKalb, Illinois, the USA, I am conducting my dissertation study titled "*An exploration of the technological, technological-pedagogical, and technological and instructional challenges that Saudi faculty face in their transition to online education*". The purpose of this study is to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction

If you agree to participate in this research study, you will be expected to participate in an audio-taped online interview of approximately 45 minutes. Interview questions will be emailed to you prior to the interview meeting. In addition, I am requesting your permission to observe one of your online sessions. I will join the online classroom at the beginning of the lesson and remain until the end of the lesson, without becoming a distraction to you or your students.

This is a voluntary research study. All faculty members currently working at the college of education at King Saud University have been invited to participate in this study. The data obtained from this survey will be used for educational purposes. Thus, your participation in this study is greatly appreciated and will provide helpful input for exploring the challenges that faculty members face in the transitional phase from traditional face-to-face classes to fully online classes.

The records of this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password protected file. Your personal responses will not be singled out but reported as a whole. The researcher will not keep any names or identifiable information after the project ends. Only aggregated data will be reported.

No compensation is offered for your participation in this research project. You may refuse to take part in the study at any time. Your decision will not result in any loss of benefits to which you are otherwise entitled. You have the right to skip any question or research activity, as well as to withdraw completely from participation at any point during the process.

You have the right to ask questions about this research study and to have those questions answered before, during, or after the research. So, feel free to contact the researcher, Ms. Mshael Aldakheel at amshael@ksu.edu.sa or by telephone at: +966553323808. You can

also contact the mentor faculty Dr. Wei-chen Hung at whung@niu.edu. If you have any questions about your rights as a research participant that have not been answered by the investigators or if you have any problems or concerns that occur as a result of your participation, you may contact the Office of Research Compliance, Integrity, and Safety at (+1) 815 753-8588.

Sincerely,

Mshael Aldakheel

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Participant's Signature

Date

I give my consent to be observed during one online session.

Participant's Signature

Date

I also give my consent to be audio recorded during the 45-minute interview.

Participant's Signature

Date

APPENDIX D
INTERVIEW PROTOCOL

Time of Interview:

Date:

Interviewer:

Interviewee: (*coded name*)

The purpose of this case study is to explore the technological challenges, technological pedagogical challenges, and technological content challenges that faculty members at a public Saudi university face while transitioning from fully face-to-face instruction to fully online instruction.

1. Please tell me about yourself.
 - What is your position at the university at the moment?
 - What teaching experience do you have?
 - How many years have you been teaching at this university?
 - What courses do you teach?
 - How many years of traditional face-to-face classroom teaching experience do you have?
 - How many years of online teaching experience do you have?
2. Tell me about the current situation. How has the COVID19 pandemic impacted your teaching experience?
 - How have you modified your instruction?
 - Was your transition to online teaching impacted by COVID19? How?
 - Has your teaching and classroom environment been impacted by COVID19 pandemic? How?
 - Has the current pandemic posed new educational challenges in your own experience?
3. How do you stay informed about the state of online learning? (peers, methods, research, technologies, vendors, etc.)
4. Tell me how a regular online lesson currently develops.
 - How do you describe your online environment?
 - How does interactivity look like in your online environment?

As I mentioned before, this research explores the challenges faced in the transition from fully face-to-face instruction to fully online instruction. So, I would like to focus on this transitional phase in the following questions.

5. When did you start teaching online?
 - What was the process of transitioning to online instruction?
6. What technological tools do you use in your online classroom?
 - How did you learn about these tools?
 - What was the process to decide to use them in your online instruction?

Did you have any difficulty learning to use these tools?

7. When moving to online teaching, how confident did you feel about moderating and encouraging interaction among students online?
 - How did you learn to promote interactivity in the online environment?
 - What knowledge did you have about promoting interactivity in the online classroom?
 - What barriers did you encounter?
8. When moving from face to face to online instruction, what was your knowledge to teach content online?
 - What knowledge did you have?
 - What knowledge were you missing?
 - What obstacles did you face?
9. What adaptations of content, instruction and assessment were necessary when transitioning from F2F to fully online instruction?
 - How do you plan your online lessons differently from your F2F lessons?
 - Why were these adaptations needed in the first place?
 - How knowledgeable did you feel about adapting the content, instruction and assessment when transitioning to fully online instruction?
 - What were the main difficulties you faced when planning these changes?
10. When moving to online instruction, what was the process of selecting strategies to use in the online classroom to encourage and ensure quality participation that are different from F2F instruction?
 - What challenges did you face selecting effective strategies to teach online?
11. How does technology influence the content of your teaching activity?
 - When transitioning from F2F instruction, how knowledgeable did you feel about using technology to design and produce your own materials to use in the online environment?
 - How confident did you feel about using technology to support student learning?
 - When moving online, what was your knowledge of technology to select content to teach online?
12. When transitioning from F2F to online instruction, how did you decide on the ways to integrate content and technology?
 - How confident did you feel about using technological tools to enhance content in an online lesson?
 - How did you think that technology could enhance the teaching of this content?
 - What obstacles did you face when deciding how to integrate content and technology during this transition?
13. During the transition to online learning, how confident did you feel about implementing your course curriculum in an online environment?
 - Why did you feel that way?

Can you provide some examples that illustrate such confidence/lack of confidence?
What were the main obstacles you perceived?

14. When designing online instruction, what were the main challenges you faced?
How did you manage your time?
What time management strategies did you use during the transition?
How do you handle students who challenge your facilitation style, methods, and strategies?
15. When transitioning to fully online instruction, what was your knowledge troubleshooting computer hardware or software related problems?
How confident did you feel about assisting students in troubleshooting technological related problems?
16. When moving to online instruction, what was your ability to meet the overall demands of online teaching?
How satisfied were you with your ability to teach online?
How did you plan to measure the effectiveness of your online instruction?
What areas did you feel you needed improvement on?
What areas were challenging? Why? Can you provide examples to illustrate them?
17. What technological tools and other resources were available to support your transition to online instruction?
What was challenging about the use of these tools and resources?
How well did you use the software required for online teaching?
What further resources can you use to develop your knowledge of technology?
18. Overall, what has been challenging about transitioning to fully online instruction?
What has been easy?
What is the most important thing you have learned about the transition to online teaching?
What do you still want or need to learn about?
19. What advice do you have for other instructors or university administrators to make the transition to online instruction more effective for faculty members?
What technological and instructional practices should the instructor master to be most effective in the transition to the online environment?
20. Do you have any additional comments or questions?

Thank you for taking the time to assist me in my academic and scholarly endeavors. All information will remain confidential. All data will be stored on a password-protected hard drive that no one other than the researcher can access. A summary copy of this study will be provided to you for review.

APPENDIX E
RUNNING RECORDS

Instructor's use of platform and tools:

**Does the instructor show good management of tools? How?*

**Does the instructor look confident in the online environment? (Does the instructor look assertive/hesitant in the use of tools? Does he/she request help from students?)*

**How does the instructor deal with difficulties that arise?*

Technical Difficulties:

**Were there any questions asked regarding the use of certain tools of the platform? (Write down examples of questions)*

**Do students or the instructor experience any technological issue? How does the instructor resolve it or guide students to approach the issue?*

Classroom interactions:*Description of interactions**Teacher to Student**Teacher and Student**Student to Student**Student to Teacher***Does the instructor promote student participation?***Do students initiate interaction?***Does the instructor promote student engagement in the class lesson and/or activities? How?*Content and Technology integration:**What technological tools does the instructor use to introduce content?***Does the instructor show confidence in their use? (Does the instructor look assertive/hesitant in the use of tools? Does he/she request help from students?)***Does the instructor use a wide variety of tools?*Online Classroom setting:**How does the online classroom setting look?***Are students' cameras and/or audio on?***Are there options to "raise hand" when doubts arise?*

APPENDIX F
TIME SAMPLING MODEL

Notes:

APPENDIX G
MEMBER CHECKING FORM

1. After looking at the transcript of your interview, does my analysis make sense? Does it agree with your thinking?
2. Is there anything I misunderstood? Anything I should change or rethink?
3. Any final questions or comments?

Participant's signature:

Date:

APPENDIX H
ALIGNMENT OF DATA COLLECTION

The table below articulates how the data collection was aligned with 1) RQs, 2) Theory, 3) Data to be collected, and 4) Coding scheme to match with TK, TCK, and TPK, in order to answer the RQs.

	Interview Questions	Observations/Checklist
RQ1: What technological challenges pertaining to pedagogy do faculty members face during the transitional phase to fully online instruction?	Q7, Q9, Q10, Q13, Q14, Q16	Online setting; interactions; assessment/feedback; lesson transitions; implementation of activities; teacher-centered vs. student-centered approach; and any other relevant information.
RQ2: What technological challenges do faculty members face during the transitional phase to fully online instruction?	Q6, Q11, Q14, Q15, Q17	Instructor's use of platform and tools; Technical Difficulties and resolution of technical issues; and any other additional useful information.
RQ3: What technological challenges pertaining to content do faculty members face during the transitional phase to fully online instruction?	Q8, Q9, Q11, 12	Activities proposed during the lesson and integration of technology; content and technology integration difficulties; and any other additional useful information.
Theory	Mishra & Koehler (2006) TPACK framework; current literature on challenges related to TK, TCK, TPK.	
Data to be collected	Current state of their classes, prior TK, TKC and TPK and experience, impact of pandemic on	Online setting; interactions; lesson transitions; activities proposed during the

	instruction, challenges before, during and after transition; lessons learned.	lesson and integration of technology; and any other additional useful information. :
Coding scheme to match with TK, TCK, and TPK	<p><u>TPK-related challenges</u>: selection of pedagogy based on technology limitations; technological barriers in lesson preparation; organization of materials and lesson delivery; challenges in the use of technologies to promote learning.</p> <p><u>TK-related challenges</u>: technology selection; troubleshooting; tools use, technology affordance.</p> <p><u>TCK-related challenges</u>: difficulties in the application of particular technologies to effectively address subject-matter content; difficulties to have content dictate the use of technology.</p>	

APPENDIX I
CODING TABLE

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

Theme	Key Words/key phrases	Sample Quotes	Observational Records
<i>RQ1: What technological challenges pertaining to pedagogy do faculty members face during the transitional phase to fully online instruction?</i>			
(1) Changes in instructional approach to teaching	- Review and/or modification of teaching philosophy.	<p>Suliman: This [transition to online teaching] challenged everything we know about teaching and learning, and now we have to figure something out.</p> <p>Fahad: The most challenging thing is I needed to change my whole teaching philosophy to adopt technology and to accommodate technology into my own teaching philosophy.</p> <p>Amal: There wasn't enough time for us to pause and think about how we can transition using the same philosophy. So, I use online teaching as if I'm teaching in the real classroom.</p>	n/a
	- Differences in/concerns about classroom interaction.	<p>Munirah: They don't interact as much as when they were face-to-face. So, this was at the beginning that made me not confident about what's happening, and then I had to change the way I was teaching and then I had to create discussions.</p> <p>Dalal: Students in online learning feel very disconnected and sometimes alienated from the learning process. Therefore, engagement and clarity are integral factors for their success.</p> <p>Suliman: In the classroom, students used to talk together, and they pumped each other, and they motivate[d] each other.</p>	<p>M's class: teacher centered, teacher-led whole-group discussions.</p> <p>Z, S and A used open-ended questions to individual students to either express their feelings and thoughts concerning the class topic or build on other students' ideas.</p> <p>Student-student interactions not present in any observation.</p>
	- Students' understanding.	<p>Munirah: They will participate and ask questions about any artwork they see in the slideshows. However, online, you can't know if they're focused or not, and sometimes you think they might be sleeping.</p>	<p>Checking students' understanding: A used Menti.com for students to submit responses.</p>

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

		Suliman: one of the also modifications, that I have to shift to writing everything very clearly labeled, and I post it in the screen or in the chat, so the students are able to follow. But also, I don't know if they're following or not because there's no way to check the information.	Use of closed and open-ended questions to check students' understanding. M and S: "Is this clear?", "Do you have any question?", "What do you think about...?", "How can you explain...?" and "What is...?".
(2) Student assessment	-Understanding and designing student assessment online.	Suliman: I remember in March last year; we were panicking about how we're gonna assess the student learning through such things. Munirah: We had to change the methods of assessment that we are not used to. Then when it comes to classes, the artwork classes, it's hard to see them while they are working the art, because I can teach them, I can show them videos, I can send them videos, but when I ask them to show me their work, it's not enough to see the sketch or the photo of the last step. Fahad: one of the issues that we're experiencing in online teaching is assessment. So, this is all over, it's not a personal or for certain people. So, assessment is still a big topic in online teaching.	M' uses Menti and an in-class competition to assess students' understanding. Use of closed and open-ended questions to check students' understanding. M and S: "Is this clear?", "Do you have any question?", "What do you think about...?", "How can you explain...?" and "What is...?".
	- Students' cheating	Suliman: The assessment was a challenge because normally, we are used to assess the students in front of us in a classroom. That's what we used to do. So we normally would sit down and assess how the student would learn and give them exam paper and invigilate and make sure that they don't cheat. Munirah: when we go online, we had to change that. So you have to rethink that and to make sure that you do it fairly with the students.	M's uses Menti, instant responses are submitted. Use of questions directed to individual students in A, S and Z's class.
	- Time constraints to	Amal: You had to make some adaptations on your assessment ... and there wasn't time to be honest, to change anything.	

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

	the design and implementation of online assessment.	Fahad: At the beginning, making quizzes online, on Blackboard, is a very tiring task. It takes me hours to do it and then probably two hours to post it as opposed to just printing.	
(3) Preparation to teach online	- Felt unprepared to teach online	Suliman: I wasn't sure about my ability to teach. I was certain about how to help to support the student to learn online, but not my ability to teach online. Fahad: The problem is that we [were] not really prepared as being physically there in class. Amal: It was chaos, to be honest at the beginning. We were not prepared. Dalal: What was challenging is the sudden transition. For some, it was scary because they didn't have enough time to be trained on that mode of teaching.	Example: M delivered a teacher-centered lesson through the Zoom platform, revolving mostly around her speaking, and showing no opportunities for student-student and whole class interactions.
	- Need for training/ guidelines from institutions and other educational stakeholders	Suliman said, "Institutionally, I was not supported enough to move to online. The education department should have ... get [teachers] back for at least 15 to 20 days training on how to use online". Similarly, participant A referred to the lack of policies to guide her transition to fully online instruction explaining that "The University didn't have the right policies for this move. We did not know what to do. There was a lot of new decisions every day, it was hard for teachers ... we were not ready."	
	- Lack of experience/ experience needed for successful transition.	Amal: I had the knowledge, but when it comes to application and real experience, it needs experience to be honest. Fahad: I have very, very limited knowledge in terms of teaching content or using content online. I've used a few things, a few tools, I had a class in which I learn[t] some technological tools. It really helped me. We learned a few tools, designing online pages and also blogs, assessment online, probably a little bit, but when we came to reality, it's different. Learning about teaching content online is somewhat different than when you actually ... shift 100% online, it's different. It's a different experience sharing content, and having content, teaching content, online is	A's classroom observation: the instructor showed good management in the use of different technological tools (Blackboard, Power Point Presentations, websites, and Menti.com application) as well as students' comfort working with them. students seemed to be used to the tools used as the instructor

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

		<p>different to a great extent from teaching physically to students. This is my first experience, and I had limited knowledge about this.</p> <p>Munirah: I didn't learn it from courses or from reading. I learnt with experience.</p>	<p>did not provide much explanation of the step by step to access the different websites, to go back and forth from one application to the other, and to use the Menti.com app.</p>
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AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

Theme	Key Words/key phrases	Sample Quotes	Observational Records
<i>RQ2: What technological challenges do faculty members face during the transitional phase to fully online instruction?</i>			
(1) Use and knowledge of technology to support students' learning	- Knowledge to select and/or use technological tools.	<p>Suliman: We were scared, to be honest, we were very scared of the platforms. My wife told me that there is this room that you can create in Microsoft Teams and then you move through, you can open each room and then sit there for a second or whatever time you want, and then move to the next one.</p> <p>Fahad: I thought using online tools would actually enhance my teaching. It did, but sometimes in very very rare occasions it didn't, when I had a problem or an issue. I thought the online tool was actually not good, not helping me, not responding to my needs.</p>	<p>S used the Rooms feature on Microsoft Teams and helped students access their assigned room smoothly and with no technological issues observed during the lesson.</p> <p>Z knew the details about each tool that he was using, shifting between different tools smoothly and sharing screen. He looked comfortable/confident.</p>
	- Confidence to use technology to support their students' learning	<p>Suliman: I know how to use [the tools], basic use, but not comfortable. As I said, I'm a person who just learned how to drive and I've been assigned the responsibility to drive a whole bus with 40 students inside. I might crash it, I'm driving with my hand over my heart that at any moment something would go wrong. I can't see the whole dimension of what I'm doing. I feel like something really much bigger than me that I'm trying to mobilise, and that's how I feel using this new platform is about.</p> <p>Dalal: I feel myself to be moderately knowledgeable about designing and managing effective online learning experience. I</p>	<p>S demonstrated confidence in the use of different tools. He smoothly transitioned from one tool to the other and provided technological support to students who could not access their online groups' room.</p>

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

		am also improving my knowledge on that especially when trying to utilize new tools and strategies.	D used Blackboard Collaborate during the observation and confidently shifted between many features of the Blackboard Collaborate tool.
(2) Time constraints	- Lack of time to improve use and knowledge of technology to support students' learning	<p>Amal: It was really challenging to find the time to learn and to find support for myself, but somehow we did it.</p> <p>Munirah: It wasn't as simple as much as it was hard to learn, it took time to learn, but there [were] no obstacles per se.</p> <p>Fahad: It's time consuming because we have been learning tool, after tool, after tool, after tool</p> <p>Suliman: I didn't have the time to go and explore it. But also the other challenge also sometimes, because of the pandemic and stuff, the companies that are operating those software are developing it rapidly, to the extent sometimes when you look for something online, try to understand from the YouTube or anything, try to understand the software you find that they've changed it already, it's something else. It's hard for me to keep pace with the rapid development of online [tools]”.</p>	
(3) Technological and logistical issues	- Concerns about internet connectivity and stability	<p>Amal: But there was technical problems because of the... A lot of people started using the LMS at the same time. And this was, if we talk about technical, maybe obstacles.</p> <p>Suliman: When I came to Microsoft Teams, it was chaotic because of the stability of the Internet, so you feel like people are talking over each other. But also, Microsoft Teams itself is a heavy program. It's not as light as Zoom. Zoom was lighter but Microsoft Teams is heavy, so it consume lots of width band, and that would slow down the quality of the voice.</p> <p>Munirah: Technological, is that to connect all at the same time without having any issues, that everyone will be able to enter the class. Sometimes only with the high demand, even, I think, it's</p>	No internet connectivity or stability issues were observed.

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

		not only about the Blackboard, even in... They say in our houses there, because they use, the students, they use the 4G internet, and it doesn't handle the Blackboard well and then... So it's too much for them.	
	-Difficulties to access technological tools	Amal: maybe one of the most annoying things that I had is that, I used to use some tools and then it wasn't for free anymore, so I couldn't use them with my students anymore because I can't ask them to pay for it. We needed more free tools. Fahad: Sometimes you have difficulties with students, some students just log out or just have a technical problem and they cannot go back to the test.	A used Blackboard, PowerPoint, QR code, and Menti.com. S' classrooms some student were not able to access the platform at first.
	-Troubleshooting strategies	Dalal: Planning ahead and being prepared for sudden changes is very important. By sudden changes I mean connection problems or technical failures. Munirah: When things didn't work well for us [on BlackBoard Collaborate], we moved to other programs like Zoom. And from what I heard from my friends, sometimes they use[d] even WhatsApp. Sometimes they use[d] other programs just to make sure that they are connected and move on. Suliman: I didn't have any knowledge. Normally, I would say, "Hey, contact the IT department and they should be able to help you with that."	D's observation: The students asked the professor how to share screen on Bb Collaborate and the professor helped them on how to do so. M helped one student to be a host for part of the class. In S' classroom, some of the students could not get to the meeting at first and he quickly invited them in a different way.

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

Theme	Key Words/key phrases	Sample Quotes	Observational Records
<i>RQ3: What technological challenges pertaining to content do faculty members face during the transitional phase to fully online instruction?</i>			
(1) Knowledge of tools to support subject-matter content teaching;	-Lack of technological knowledge to select technological tools to deliver content.	<p>Suliman: The material itself was a book. So, most of our knowledge exist[ed] in books, they didn't exist in software form. So, moving online with such kind of material was absolutely difficult.</p> <p>Fahad: Content selection is not a big thing here, so it's already been selected here. You know exactly what to teach. You sometimes can select extra things. But I didn't have a lot of knowledge actually. I relied on other [colleagues] for help. I didn't have a lot of knowledge on the ways to select tools and technologies related to my teaching.</p> <p>Amal: At first, I thought, if I'm using PowerPoint, then it's just me talking, [students] listening.</p>	<p>S used Microsoft Word and videos to support content teaching on the Zoom platform.</p> <p>A used various tools to support content teaching. At the beginning of the class, A utilized Blackboard Collaborate to orally welcome students and introduce the topic, then switched to PPT to review content worked in previous classes, and after that, she moved to Menti.com for the remaining of the class.</p>
	-Use of tools to support content teaching	<p>Fahad: It's challenging. You have to understand the tool and the content. And then try to use the content and the tool at the same time as you figure out things by yourself.</p> <p>Suliman: When you are trained and you practice something for long time, you're able to become creative. But with this online thing, it's something that happened abruptly, and we did not have the time to be innovative and creative about it. So, we were doing the bare minimum, scan the book, PDF it, and share the screen with the student, end of the story.</p>	<p>S utilized Microsoft Word and YouTube to introduce content during the online classroom observation. S used basic features of each tool (word entry on Microsoft Word and video play on YouTube).</p>

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

		<p>Munirah: I didn't have any knowledge. We've never tried it before, and I wasn't sure if the students will connect and [if I] will be able to deliver the knowledge to them as I aimed to.</p>	<p>M's used basic features of the Zoom meeting platform (hosted the meeting and shared screen) and PowerPoint slides to introduce content (used slides content as support while orally delivering content to students).</p>
<p>(2) use of technological tools to adapt content format during the transition to online instruction.</p>	<p>- Materials not designed for online teaching.</p>	<p>Amal: I didn't design it to be taught online, I had my textbook and stuff. So, it's not like that, it's not just, 'Okay. I'll tell my student just to do the same, I'll just teach the same way'.</p> <p>Dalal: I planned to use the same content. If the content needs visual explanation of a particular point, then annotation tools and whiteboards can be of a great help in the online environment.”</p> <p>Suliman: If you notice around Riyadh, most of the bookshops or the photocopying place, they were in business. Why? Because they had all the teacher[s] come in to cut down the books from the back, the spinal of the book, and to transfer them into PDF material so they can present it online. So, the content we're talking about now, we're talking about content, that is not meant to be for online [instruction], but it is used online.</p>	

AN EXPLORATION OF THE TECHNOLOGICAL CHALLENGES

	<p>- Adapting/designing content to fit fully online instruction</p>	<p>Amal: The design of the online material, that's one area I thought that I need some kind of help with. That's one thing. Munirah: At the beginning, we had to do some changes because we couldn't deliver everything at the time. I remember we had to [remove] the tests Dalal: Selecting content is based on the instructor ability to correctly evaluate the validity and quality of the online content. By having solid search skills and having the critical eye and knowledge to evaluate chosen media, the instructor can accomplish this easily. Another important skill in this area is having the proper knowledge of copyrights and using it correctly.</p>	
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