



## ONLINE TEACHING WITH M-LEARNING TOOLS IN THE MIDST OF COVID-19: A REFLECTION THROUGH ACTION RESEARCH

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### ABSTRACT

Aim/Purpose	In the midst of COVID-19, classes are transitioned online. Instructors and students scramble for ways to adapt to this change. This paper shares an experience of one instructor in how he has gone through the adaptation.
Background	This section provides a contextual background of online teaching. The instructor made use of M-learning to support his online teaching and adopted the UTAUT model to guide his interpretation of the phenomenon.
Methodology	The methodology used in this study is action research through participant-observation. The instructor was able to look at his own practice in teaching and reflect on it through the lens of the UTAUT conceptual framework.
Contribution	The results helped the instructor improve his practice and better understand his educational situations. From the narrative, others can adapt and use various apps and platforms as well as follow the processes to teach online.
Findings	This study shares an experience of how one instructor had figured out ways to use M-learning tools to make the online teaching and learning more feasible and engaging. It points out ways that the instructor could connect meaningfully with his students through the various apps and platforms.
Recommendations for Practitioners	The social aspects of learning are indispensable whether it takes place in person or online. Students need opportunities to connect socially; therefore, instructors should try to optimize technology use to create such opportunities for conducive learning.

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Recommendations for Researchers	Quantitative studies using surveys or quasi-experiment methods should be the next step. Validated inventories with measures can be adopted and used in these studies. Statistical analysis can be applied to derive more objective findings.
Impact on Society	Online teaching emerges as a solution for the delivery of education in the midst of COVID-19, but more studies are needed to overcome obstacles and barriers to both instructors and students.
Future Research	Future studies should look at the obstacles that instructors encounter and the barriers with technology access and inequalities that students face in online classes.
Keywords	COVID-19 transition, online teaching, UTAUT, web app, participant-observer, action research

## INTRODUCTION

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“The sudden and unprecedented shuttering of our nation’s school buildings due to the COVID-19 pandemic forced educators to face the most jarring and rapid change of perhaps any profession in history.” wrote Heubeck (2020) in an online article on *EducationWeek*. On short notice, university campuses were shut down, and faculty had to move their classes online. The abrupt transition caused many to scramble to recreate a learning environment that was entirely online.

COVID-19 pandemic affects not just in the United States but many other countries confront with the threat from the outbreak. Around the world, the lock-down order forced schools to shut down. Teaching was transitioned from traditional face-to-face meetings to remote online mode. As challenging as the mandate was, the situation represents perhaps the best-case scenario where technologies were quickly adapted and developed and where innovative minds and resilient spirits were quick at work.

Schools have implemented different online approaches and learning solutions to support this abrupt change (Van Lancker & Parolin, 2020). Among the most popular was video conferencing via Zoom or Google Meet. Others include live-streaming lectures, the use of Massive Open Online Courses (MOOC), and the use of worksheets and animations. Other more novel approaches include some educational gamification simulations and computer applications adapted to support online learning (Dicheva et al., 2015). More boldly, Basilaia et al. (2020) proposed that with a combined use of today’s technology, it is possible to set up an online platform where (a) video conferencing with at least 40 to 50 students is possible, (b) online discussions with students can be done to keep classes organic, (c) internet connections are good, (d) lectures are accessible in mobile phones also and not just laptops, (e) possibility of watching already recorded lectures, and (f) instant feedback from students can be achieved and assignments can be taken (Basilaia et al., 2020). This online teaching platform as an immediate response to COVID-19 was aimed at replacing the traditional face-to-face learning form at universities.

In this paper, we would like to share our own approach to this challenge of teaching online classes. The focus is on the use of M-learning tools to support online teaching and exam administration. The paper is organized as follows. The first section provides a contextual background of online teaching. The next section describes an overview of mobile learning (M-learning). The focus is on adopting and using different M-learning tools to support our online teaching. To guide what tools to use and how to use them, we turned to the conceptual framework called the unified theory of acceptance and use of technology (UTAUT) model. The work associated with UTAUT is extensive; hence, the intention in this section is basically to provide sufficient background of the UTAUT model and point the readers to an appropriate article for further reference. The next section describes what led us to teach

online and how we managed this abrupt change. During the process, we were actual participants of the research process. Thus, this paper followed a qualitative tradition. This section described our research background, the setting, and the method of data collection and interpretation. The most practical part is perhaps the narrative of different tools that we used and the novel approach we followed to administer online exams in our classes. It is then followed by the discussion and ended with a conclusion.

## CONTEXTUAL BACKGROUND OF ONLINE TEACHING

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The practice of online teaching has been around long before the COVID-19 Pandemics. As technology advances, online teaching gains more attention. Many universities embrace it for number of reasons. The last two decades have marked a significant growth of online education in U.S. higher education (Kennedy & Archambault, 2012; Watson et al., 2013). Most higher education institutions believe in many advantages of online education because of the accessibility of the internet and the flexibility of online courses (Li & Irby, 2008). This method of teaching plays an increasingly larger role in higher education (Allen & Seaman, 2014).

With the pressure from budget reduction as well as students' demands for flexibility, many universities turned toward the online education option (Limperos et al., 2015). Given the advantages that online education provides for faculty, students, and institutions, the amount of interest has continued to grow even before the 2020 COVID-19 pandemic hit (Konetes, 2011). Unexpectedly, it is the COVID-19 Pandemics that has necessitated online teaching especially during the lock-down period in Spring 2020.

At the end of 2019, the COVID-19 pandemic swings higher education into uncharted territory. As lock-down orders were issued, schools around the world were forced to transition to an online teaching mode (McMurtrie, 2020). This abrupt change left faculty as well as students anxious, confused, and uncertain (Fan et al., 2020). Among the major issues during the COVID-19 online teaching were limited students' access to technology, faculty's inability to master technology, insufficient availability of technical support, and guidance for faculty, and diverse attitudes towards completely technology-mediated teaching and learning experience (McMurtrie, 2020). Furthermore, some field and lab-based courses such as those in biology, chemistry, performing arts faced even more challenges in an online mode because they depend on experiential learning (Berger et al., 2021).

The literature on online education is rich with many empirical studies that examine different aspects ranging from quality to best practices, from technology to delivery, from issues to solutions. Therefore, it is a challenge for a researcher to sift through an immense amount of literature to identify what he/she needs (Mayes et al., 2011).

There was a need for a systematic review of the literature. To respond to this need, the paper by Kebritchi et al. (2017) came out with a very comprehensive review of the vast literature and synthesize it into an easy-to-follow classification. The focus was to inform educators about the major issues and strategies that affect the quality of teaching online courses in higher education. More specifically, the authors followed Cooper's (1988) to (a) formulate the problem, (b) collect data, (c) evaluate the appropriateness of the data, (d) analyze and interpret relevant data, and (e) organize and present the results. At the end was the proposed model to show the issues affecting the teaching of online courses and the relationship among these issues (Kebritchi et al., 2017).

This work conducted from action research is designed to document the lived experience of the author in teaching online during the COVID-19 pandemic. A better understanding of the experience may help in the preparedness for possible future disasters (Xia et al., 2020). The Lessons learned may help in guiding the improvement of handling the repeat of another extended transition to online teaching (Berger et al., 2021). This study focused on the use the conceptual framework of unified theory of acceptance and use of technology (UTAUT) to guide the use of M-learning to support online-teaching. To provide a conceptual background of this study, the next section discusses the M-

Learning capabilities that served as a platform for this study's online teaching approach. Then, it continues with the description of the conceptual framework UTAUT. This is the framework that guided the use of M-Learning capabilities and the interpretation of this action research.

## CONCEPTUAL BACKGROUND

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### *M-LEARNING*

In the last two decades, the E-learning paradigm has evolved from computer-assisted learning to computer-mediated learning, web-based learning, and now to M-learning (Chao, 2019). The widespread use of mobile technology makes it possible for the rise of M-learning. Mobile devices and apps have become an essential part of online learning platforms. M-Learning is appealing because of the following capabilities:

- Learners can interact and learn online without being together as in a classroom (Hamidi & Chavoshi, 2018).
- Learners can access class materials and engage in class activities from anywhere at any time through their mobile devices (Yousafzai et al., 2016).

Based on those capabilities, M-learning can be characterized as a learning process across various locations, time, and other environmental factors. Furthermore, in an M-learning environment, learners are expected to have readily available learning resources, easy access to information, real-time interaction through different channels, and no restriction in space and time. Learners can learn and do work through mobile devices such as smartphones and tablet computers rather than from printed textbooks and classroom lectures.

Even before the COVID-19 pandemics, M-learning is recognized for its potential to enhance learning quality and students' test results (Nikou & Economides, 2017). Due to the COVID-19, colleges and universities had to transition to an online learning/teaching environment. This abrupt transition accelerates the integration of M-learning into the technology infrastructure for the delivery of higher education. It represents an innovation that has moved from the margins to the center of many education systems. Online learning platforms now include mobile services and applications to meet students' demands. There is an opportunity to identify and develop innovative strategies to help students learn in the changing times.

As defined by the Brookings Institution (Vegas & Winthrop, 2020), education innovation is "an idea or technology that is new to a current context, if not new to the world". It has the potential to leapfrog education. The broad menu of options for delivering such transformation includes these four approaches:

- 1) Innovative pedagogical approaches to help students learn not only to remember and understand but also analyze and create;
- 2) New ways of recognizing learning alongside traditional measures and pathways;
- 3) Crowding in a diversity of people and places alongside professional teachers to help support learning in school; and
- 4) Smart use of technology and data that allowed for real-time adaptation (Vegas & Winthrop, 2020).

In the context of this education innovation, this study explores the smart use of technology, specifically M-learning tools, to enhance and facilitate the transition to online teaching. Although there are many tools available, this paper explicitly describes the following M-learning tools: the use of responsive web design (RWD) websites, custom-designed web apps, and tools from Google Suite. These M-learning tools are what we had adopted and used to support the transition to online teaching.

## ***UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY***

Although there are different conceptual frameworks to guide the implementation of instructional technologies, we chose the UTAUT (unified theory of acceptance and use of technology) model to guide this study. The unified theory of acceptance and use of technology (UTAUT) has been used extensively in information systems (IS) and other fields, as a large number of citations to the original paper introduced the theory evidence. For a complete review of UTAUT, readers can refer to this excellent article “Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead” by Venkatesh et al., published in the Journal of the Association for Information Systems in 2016.

A complete review of the UTAUT model is beyond the scope of this paper. The body of work associated with UTAUT is extensive. Therefore, the intention in this section is primarily to provide sufficient background for the basic understanding of the UTAUT model. It is essential to be familiar with the model in order to make sense of the narrative. Hence, in this section, we provide the UTAUT model’s highlight, focusing on its origin, strengths, and key constructs.

For years, the concept of user acceptance is recognized as one of the critical factors in effective technology implementation, especially in information technology/information systems (IT/IS) (Davis et al., 1989). In the past three decades, many conceptual models have been developed to predict and explain IT/IS user acceptance. Among them, the best known is perhaps the technology acceptance model (TAM) (Chao, 2019). According to TAM (Davis et al., 1989), two primary factors influencing an individual’s intention to use new technology are perceived ease of use and perceived usefulness. Over the years, many studies have been conducted using TAM as a framework. New insights led to modification and extensions of the original TAM model.

According to Venkatesh et al. (2007), research on individual acceptance and use of information technology (IT) is one of the most established and mature streams of information systems (IS) research. Other studies focus on groups and organizations’ adoption of technology (Sarker & Valacich, 2010; Sia et al., 2004). One of the key findings from these studies confirms that to achieve desired outcomes using technology, either an individual or groups must first adopt and use that technology.

Several extended models based on TAM and models based on the theory of planned behavior were proposed to explain and predict user acceptance and use of IT. Venkatesh et al. (2003), synthesized these models into the unified theory of acceptance and use of technology (UTAUT). UTAUT is proposed as a complete model with more variables in order to address the weaknesses in TAM (Chauhan & Jaiswal, 2016; Šumak et al., 2017; Venkatesh et al., 2003). The main strengths in UTAUT (Venkatesh et al., 2003) are its breadth and depth through its incorporation of various different models.

However, in 2012, Venkatesh et al. proposed and tested UTAUT2. Initially, UTAUT consisted mainly of four factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. Over the years, more constructs were incorporated, including gender, age, experience, and voluntariness of use. UTAUT2 was extended by adding hedonic motivation, price value, and habit factors to the model. These constructs offer new theoretical mechanisms in a consumer context (Bagozzi, 2007; Benbasat & Barki, 2007; Venkatesh et al., 2007).

Now, UTAUT2 is presented as a unified model with many different constructs for use in various research contexts. Among them are these key constructs: Performance Expectancy, Perceived Community Building Assistance, Perceived Interaction, Online Course Design, User-Interface Design, Effort Expectancy or Perceived Ease of Use, Social Influence, Facilitating Conditions, Hedonic Motivation, Quality of Life, Price Value, Habit and Experience, Behavioral Intention, Technological Experience, Perceived Usefulness, Previous Online Learning Experience. With these constructs, UTAUT2 was able to explain 74 percent of the variance in consumers’ behavioral intention to use technology and 52 percent of the variance in consumers’ technology use (Venkatesh et al., 2016).

## RESEARCH APPROACH

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This section along with the subsequent two sections “M-Learning Tools” and “Administering Online Exams” contain the narrative from one of the authors because this researcher actually engaged in his teaching practice. The narrative is presented from a practitioner’s perspective and therefore we will use “the researcher” and “he” in the recount of his experience. The research approach could be classified as an “action research” because the researcher embraced what Rufous Jones said about how “quiet processes and small circles [are where] vital and transforming events take place” (Religious Society of Friends, 2013, ch.24.56). To observe and reflect on these processes, the researcher embraced Stenhouse’s definition of action research as the systematic, critical inquiry made public (Stenhouse, 1975, 1981, 1983). In the context of this study, action research happened when the researcher involved in researching his own practice. The purpose was to improve it and to come to a better understanding of the practice situations. This is consistent with Feldman’s characterization as action research when a researcher acts within the systems he or she is trying to improve and understand (Feldman, 2007, p. 242).

Guided by this form of action research, the researcher developed a narrative to describe what he had done in his classes and interpreted what he observed from the action researcher’s perspective.

The narrative based on the researcher’s own perspective will include the description of the background in the study, the research setting and methods, and the recount of the technology being used to support our teaching. After the narrative is the discussion section, where we present our interpretation of what we had done and what they meant.

### **RESEARCH SETTING**

The spring semester of 2020 was significantly disrupted by the spread of the Coronavirus. More than 1,300 colleges and universities in all 50 states had to cancel in-person classes or shift to online-only instruction (Smalley, 2020). According to tracking from the College Crisis Initiative, there were 44% of institutions with wholly or primarily online instruction, while 21% of institutions turned to a hybrid model and only 27% relied on wholly or primarily in-person instruction.

At Southeastern Louisiana University, it was an unprecedented time during the Spring 2020 semester, and the challenge was extended into the Fall 2020 semester. Due to the surge in COVID-19 cases in March, the university had to make a hard decision. That was to shut down the campus and to transition everything to go online, including classes. The swing of changes moved at a swift pace. On Monday, March 16, 2020, when the upper administrators met with the department heads, the focus was the discussion of different scenarios and the best course of actions to take.

Then four days later, on Thursday, March 19, 2020, the shutdown order was issued. All classes were destined to move online, so everyone was told not to come to the campus. Administrative work was conducted remotely. Only essential workers were to be present on campus. In less than a week, the entire university had moved from a face-to-face operation to almost entirely online operation for an indefinite period. This abrupt change was completely unexpected, and the impact of COVID-19 struck at the core of Southeastern’s mission; perhaps it was the same case at many other higher-ed institutions.

In Spring 2020, the researcher taught two sections of OMIS 350 - Introduction to Management of Information Systems. This course is required for all business students in their 3rd and 4th year in the program. He had about 40 students in each of his OMIS 350 sections.

In the Fall, he taught two different courses. The first one was OMIS 350 with 40 students and the second OMIS 360 - Web Design with 11 students. This OMIS 360 was an elective course for business students.

When Spring 2020 began, his OMIS 350 sections were set up to teach as a regular face-to-face class. After March 19, 2020, both of his classes became online. In Fall 2020, although both of his classes were scheduled as 50% online and 50% face-to-face, students indicated that they wanted to attend classes online. Therefore, he taught them online as well. The transition to 100% online teaching opened an opportunity for him to conduct this exploratory research into the use of mobile technology in both a face-to-face classroom and an online environment.

## ***RESEARCH METHOD***

The research methodology that the researcher used was qualitative action research. Action research, or participatory action research, is practiced as “a reflective process of progressive problem solving led by individuals working with others in teams or as part of a ‘community of practice’ to improve the way they address issues and solve problems” (Koch & Kralik, 2006).

This research methodology was the most feasible option for him to pursue, given the sudden campus shut down due to COVID-19. The data collection method was participant observation. The researcher was actively involved in the research process. His observation was recorded in field notes.

The class sessions were in Google Meet, so they were recorded on video. The insights were obtained from reviewing and reflecting on the actual occurrences and the notes. As a participant in the research process, the researcher realized that his interpretation was not wholly objective. Therefore, the researcher attempted to make sense of the phenomenon through the theoretical lens of the UTAUT model, a well-established framework in IS/IT research literature.

The research setting was the classes that the researcher was assigned to teach in Spring and Fall 2020 semesters. Because they were his own classes, the researcher had full access to all of students. He also had much control over the materials, activities, interactions, and technologies in use. All of these conditions lend themselves well to the research method that he chose. In the design of the research process, he went through the following four phases as suggested by Howell, 1972: establishing the rapport, entering the field, recording observations and data, and analyzing data.

- Establishing the rapport and entering the field phase: In this study, the researcher was assigned to teach his classes. Therefore, through meeting with his classes, he was able to establish rapport quickly with his students. Each time he met with his students, whether face-to-face or online, he was actually in the field of his study.
- Recording observations and data phase: As the transition occurred, the researcher began to keep notes on his observations and thoughts. These artifacts became the data for his interpretation and self-analysis in the next phase.
- Analyzing data phase: At the end of the semesters, the researcher reviewed and reflected on his teaching practice and the recordings. Through his interpretation, he made sense of what happened and drew insights from what he experienced. He referred to the chosen conceptual model to guide his interpretation. The results were then described in a narrative format.

## **M-LEARNING TOOLS**

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When the Spring 2020 semester started, the researcher already had a plan to use a Responsive Web Design (RWD) website and his custom-designed web apps to support his classes. The classes were held in a traditional classroom, not a computer lab. However, because there were activities that required the web's use, he wanted students to bring their own devices to the classroom. The majority of them brought along their mobile devices such as iPhone, tablets, or Android devices. A few used their laptops. Initially, the researcher planned to allow students to use their mobile devices in a traditional classroom. He let them take quizzes, write notes, work on assignments, and even do the exam using mobile devices. He hoped to learn from this implementation of mobile devices to support in-class learning processes. However, when the pandemic came, the classes were transitioned online.

The research still went on, but the orientation was extended to a remote learning environment, specifically via Google Meet.

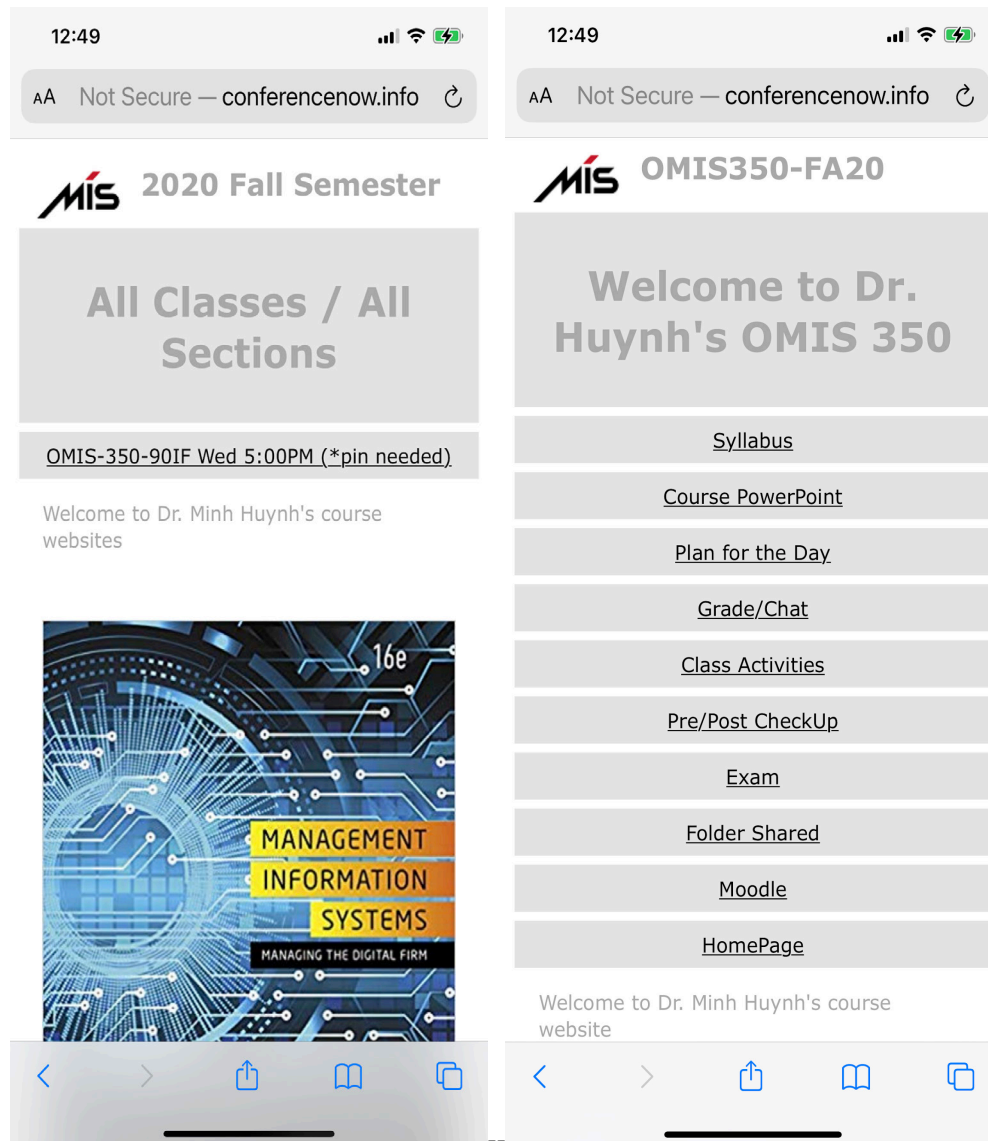
### ***RWD COURSE WEBSITES***

One of the tools that the researcher found very useful in this research was to have his own course websites. Websites are nothing new. However, building and running Websites for mobile devices are something of a challenge. Given that almost everyone owns a mobile device these days, it makes sense to have a well-built and mobile-friendly website. It is a good practice to have a course website as a gateway to class materials from his experience. The researcher applied his knowledge in Responsive Web Design (RWD) to build the course websites. Responsive Web design is the technique to design and develop websites responsive to the user's behavior and environment based on screen size, platform, and orientation. The key to RWD is the deployment of flexible grids and layouts, images, and appropriate use of CSS. It used to be quite complicated, but in recent years W3 School introduced W3.CSS as a modern CSS framework with support for desktop, tablet, and mobile design by default. It is simpler to use than CSS or jQuery.

When students switched from their computer to their mobile devices, the RWD websites could accommodate various resolution, image size, and scripting abilities. Hence, these RWD websites' content was properly displayed on any device ranging from a desktop to a laptop, from a tablet to a smartphone of any manufacturer. The researcher's RWD course websites became frequent places for his students to access, whether during class or outside of class. The websites served as a one-stop place for his students to learn about class activities, receive assignments, submit them, check their grades, engage in online class discussions, and even take an exam. From the course websites, students could also jump to other resources such as Google Meet, Google Doc, Google Sheet, Google Form, Content Management System-Moodle, self-built Interactive Chat. Besides, the researcher also implemented a PIN to limit access mainly to students in his classes.

Students used the given PIN to enter the course website URL. Once, they were inside the websites. They could do different activities as shown in Figure 1 except for accessing Grade/Chat web apps. They had to be enrolled in the research's classes to run Grade/Chat web apps.





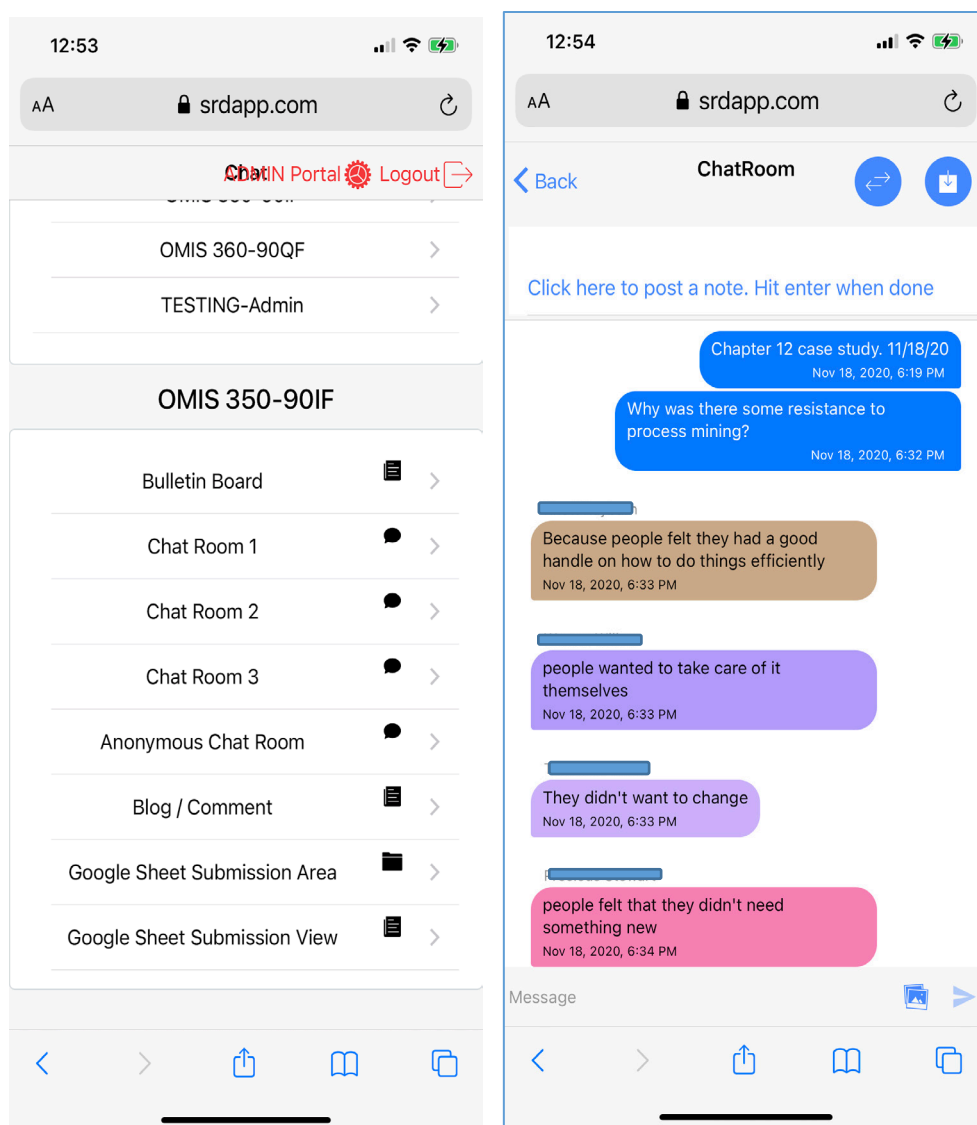
**Figure 1: The home page of the RWD course website secured with a PIN (Left). The different contents and functionalities inside the website including Grade/Chat where students launched the web apps (Right).**

### ***CUSTOM DESIGNED WEB APPS: SRDCHAT, GRADE APP, EXAM REVIEW APP***

One of the innovative features in the researcher's classes was the use of web apps. The researcher developed these apps with his co-author in this research. The purpose of these custom-designed tools was mainly to support the researcher's teaching needs. Together, they used open sources such as Ionic Framework, Angular, and Firebase as platforms for developing these web apps. Among the web apps that the researcher used extensively in his classes were SRD Chat, Grade App, Exam-Review Tool.

While Google Meet offers Chat as an in-app feature, it could be used for quick communication and Q & A during an online session. This Chat, however, lacks the features to support more intensive discussion. To engage students in a more serious and moderated discussion, a custom Chat app was

developed. It is called SRD Chat. Inside this app, the researcher could set up multiple chat rooms. One chat room could serve as the main room, while others could be used by smaller groups or set for a specific topic. There were also other useful features such as a moderator's question posting space, different users' messages being marked with distinctive color, a variety of message types including not just text but also URL, video, and images. This Chat was used extensively to facilitate case discussion and group work. The Chat also supported anonymous mode. The anonymity worked well for controversial discussions or brainstorming sessions. This Chat was also adapted to create tools supporting Blogging, Assignment Submission, and Bulletin posting with minor modifications.

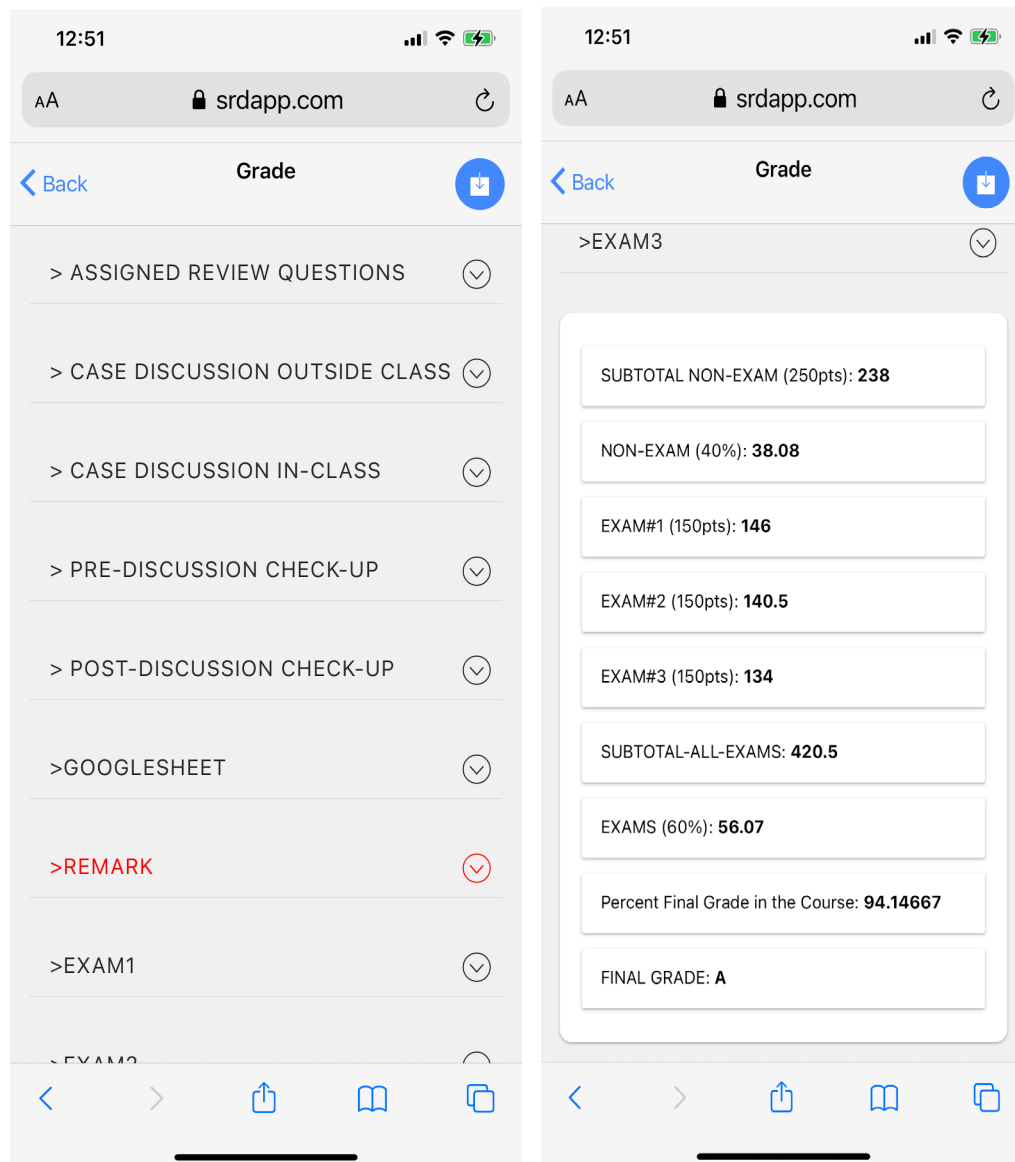


**Figure 2: The setup of different features from SRD Chat, including Bulletin Board, Chat rooms, Blog, and Assignment submission/Review (Left). An example of a Chat with space for an instructor to post a note on top, the instructor's messages on the right in blue color, and students' responses in different colors (Right).**

Another web app that was custom developed was the grade app and the exam review app. The codes inside these two apps were essentially very similar. Their differences came from the data content and structure. Hence, only a few minor modifications were needed to create these apps.

The unique approach here was to design and code the web app once but to use it in many different contexts. The same code could function as different apps based on the data. Hence, the only difference between the grade app and the exam review app was the data that each app processed. For the grade app, student grades were entered into a spreadsheet. This spreadsheet was then uploaded into a Google sheet.

Inside the Google Sheet was the script to link and feed the data to an online database. Once the data was imported into the database, the app then opened the database and retrieved the information. Using the app, students could review their grades. Each could only see their own grade and not the other. Using the code of the grade app, the researcher modified it to work with the exam review data. This exam review app allowed students to look at their own exams, saw the questions from the exams and their answers, and feedback.



**Figure 3: Grades associated with different activities in class (Left).  
An example of the detailed grade for an exam (right).**

## ADMINISTERING ONLINE EXAMS

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This section describes a narrative of what the researcher did in the process of choosing, designing, proctoring, and grading his online exams. This narrative was constructed based on his observation and reflection on his field notes. The narrative aims to provide a context for the process observed and a detailed description of the unfolding events.

One of the challenges in teaching online is how to administer exams with integrity, efficiency, and fairness. With the transition to online teaching, our university strongly discouraged any gathering on campus, including holding a face-to-face class meeting and giving exams in a classroom. This situation simply forced the faculty to find ways to handle exams online. This meant that many things about administering an exam would have to be changed.

One of the researcher's concerns was how to handle the exams online. In his case, it was not practical to follow the same practice of giving an exam online as that of a face-to-face setting. He did explore a wide range of options available for faculty to choose from. At one end is the practice based on an honor system, and at the other end, the use of a rigorous exam proctoring practice. The researcher chose an open note/open-book approach. There are pros and cons to giving an open note/open book exam. Carefully comparing and analyzing the pros and cons led the researcher to adopt this open note/open-book approach. At this point, it was the most practical and logical approach for his classes. The researcher did review what constitutes an excellent open note/open book exam and assess what kind of cheating might occur with this type of exam. From his understanding, the most significant factor in the open note/open book exam is the type of questions that the instructor asks students. They should not be too simple that students could just copy out from the textbook. They should not be basic answers that students could just share. They should not be closely similar to previous exams. The preferred design is to come up with questions that are challenging. The questions should require students to go deeper and think harder to derive the answers. The best questions are those that contain elements of creativity and individuality. These questions should demand from students a higher level of application and understanding of concepts learned.

In the context of this study, since the exam time was limited to the duration of the class meeting time, the researcher could impose the time constraint into the design of exams and thus challenge students' ability to manage their available time wisely. They needed to learn how not to entirely rely on the available resources and end up with not enough time to complete the exams. They had to learn how to balance the time to work on exams and search and use resources such as textbooks, notes, and the web. Therefore, to do well on the exams, students had to be familiar with the materials and not just depend on looking up for every question.

All the measures that the researcher mentioned above seemed to work well. He gave students challenging questions. They needed to attend the lecture, read the textbook, and think critically to do well on the exam. Furthermore, they had to race against time because the exam's duration was the actual class period. To make his exams comprehensive, the researcher gave students an in-class part and a take-home part of the exams. This take-home part required individual thinking and web research and analysis without time constraints. The questions had different levels. One level was to encourage students to read the case and answer basic questions from the case. At the next level, students had to apply their understanding of the materials by responding to more challenging questions. The final level required students to research the web for the more recent development related to the case. Each student had to come up with their sources and address the questions posted based on these sources.

### *EXAM DESIGN USING GOOGLE FORM*

The platform that the researcher used to create his exams was Google Form for the in-class parts. Since the researcher was quite familiar with Google Form, he was able to take advantage of it not

only in the design of exams but also in the process of giving the exams and grading them. Google Form has many good features to support online exams. One, Form offers various types of questions, including multiple-choice, short answer, and the long answer. It also supports images. It is secure, reliable, and always available. Authentication such as email log in could be integrated. Exams can be divided into different sections. Within each of the sections, there is an option to shuffle questions. Hence, each of the students would have a unique exam with questions in a different order. This shuffling feature makes it a little bit harder for students to work together during the exam. After students' submission of the Form, the instructor can receive the answers that are rearranged in the original order in a spreadsheet. There is a feedback feature in the design mode to allow the entry of a correct answer and perform auto-grading and feedback. This feature is a time saver when it comes to grading and providing feedback to students.

### ***PROCTORING ONLINE EXAMS***

Giving an exam online was an unrehearsed experiment for the researcher. The exams were given synchronously during a scheduled class meeting time. Students logged in when class was scheduled to meet. However, the researcher asked students to turn on their video so they and their surrounding could be seen on screen. Some used their mobile devices to display their video. Being able to view students and their environment allowed the researcher the capability to monitor their behaviors during the exam. Everyone would mute his/her mic to keep the room quiet during the duration of the exam. The Chat function in Google Meet was on. When students had general questions, they could post them on the Chat. The researcher would address them. One surprising occurrence was that students responded to other students on Chat if they could help. The researcher encouraged this type of interaction via Chat. For more specific questions, the researcher would ask them to call via phone for a private conversation. The researcher gave out his home number so students could reach him for questions. Several students did call during the exam period. This phone communication channel turned out to be a value-added feature for an online exam. Other useful features that the researcher used during an exam were to record and capture the screen. In Google Meet, the researcher recorded the entire session for reference if needed. On his laptop, the researcher could capture the screen at any time. Screen capture helped him to track who was in the room at the time.

### ***EFFICIENT WAY TO GRADE EXAMS AND TO PROVIDE FEEDBACK***

Since the exams were designed in Google Form, students took the exams online, and their answers were recorded in Form. From Form, the researcher could download all the content in Form as a CSV file. Then, he used Excel to open and work with the CSV file. In Excel, he was able to carry out the grading process quite efficiently. Having the exam answers from students in a spreadsheet was another unique feature in Google Form. It allows efficient grading because the researcher could insert formulas for grading various questions, including True/False, Multiple-choice, matching, short answers, and even essay answers. For instance, the score of True/False or Multiple-choice questions could be tabulated quickly with formulas. It was simple for other types of questions to determine the right or wrong answers when the answers were all in one place.

Furthermore, it also allowed quick comparisons among students' answers. This capability provided a capability to effectively give individual feedback, whether it is a True/False, Multiple-choice, matching, short answer, and even essay question. For longer written answers, the researcher manually looked at each answer, assign points, and provide comments. Since all the answers for a question were all in one column, he could go through the grading very efficiently and thoroughly. Every question had three columns associated with it. The first was for holding the answer, the second for points deducted, and the last for comments. Hence, he could indicate the points that he took off and explain why he took these points off or what the right answers were. Once the spreadsheet was graded, the researcher could upload and run a script to transfer everything to an online database. The spreadsheet contained exam questions, students' answers, and columns for a point off and remark. The

data were obtained from Google Form. After grading, they were transferred over to the online database. The exam review app then connects to the database and retrieves the information for students to review.

### ***EXAM REVIEW APP***

Using the code of the grade app, the researcher modified it to work with the exam review data. This exam review app provided much value to students as well as to the researcher. It allowed students to look at their exams, saw the questions from the exams and their answers, and feedback. Since students had a way to look at their exams, they did not have to contact the researcher for their grade. The researcher noticed fewer complaints from students. The researcher also did not have to explain the points that he took off on their exam with the remark on their answers. Everything was quite transparent. Students seemed to like this feature. The way the exam review app worked was like the grade app. Basically, after the exam, the researcher just downloaded the answers and then graded them in Excel. After grading an exam, he uploaded and transferred all the questions, answers, comments, and points into the Google sheet like the Google sheet in the grade app. Then, he ran a script to transfer the data into an online database like the grade app. Students could then review the exam, their answers, and the correct answers or the remarks.

This simple app allowed students to retrieve the exam questions and their answers for review at any time and in any place. Each student could only see his/her exam but not that of other students. This innovative feature from the app made individual feedback possible and, at the same time, also protected the confidentiality of the exam.

## **RESULTS/DISCUSSION**

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The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003; Venkatesh et al., 2012), were proposed to explain users' behavior in utilizing technologies. We have referred to it as a guide for interpreting and understanding our observation and our own experience in administering online exam processes. Most of the students belong to Generation Z. They grew up with technology, and they are undoubtedly familiar with various technologies accessing the internet. However, it is still essential to understand what their intention to use technical knowledge and adopt certain instructional technologies is (Persada et al., 2019). This is where a model such as UTAUT could help in the interpretation of the field observation and notes. However, a note of caution is when interpreting the qualitative results, it is crucial to keep in mind that the factors affecting the use of technology are often complicated and usually varied based on the environment (Al-Fraihat et al., 2020). Further studies, especially from a quantitative approach, should be conducted. Students' feedback and survey could provide data to verify and support these insights.

Through the lens of UTAUT, the following insights were identified. As described in the narrative, both the RWD course websites, the web apps, and Google Meet were all quite useful in supporting the online learning environment. They made it easy for both the instructor and students to access the course materials, view grades and review exams, and provide a convenient way to connect to a classroom. This shows how technology, when deployed appropriately, can benefit users to perform tasks/activities. Hence, there is evidence of performance expectancy and perceived learning assistance from the technology in this case.

The Google Form provides a versatile platform to accommodate different materials such as flexible text, images, animation, and video. Furthermore, these materials can be accessed through web browsers and mobile apps. Therefore, the quality of the online course design can positively impact why the attendance was better in an online environment. Another observation was on how few students asked to repeat the materials in class. The faculty noted that students seemed to master the materials better in an online environment than in a face-to-face setting. The user-interface design factor may

contribute to this benefit. A better organization and arrangement of the online course content may play a crucial role in the software's success.

Technological Experience represents the skills that students need to use online courses. Martinho et al. (2018) classified Technological Experience into two external variables: Base Technological Experience and Advanced Technological Experience. For the web design class, Technological Experience does play a role. When students were more technical, they could handle the work online better. Their performance was also better. Hence, both the Base Technological Experience and Advanced Technological Experience are essential factors in students' use of technology.

One unexpected observation was in Chat when one student responded to a question posted by another student; it prompted others to do the same. According to UTAUT2, social influence is a construct that captures how other people, such as family and friends, can affect interactions. This observation supports the evidence of such an influence from users' decisions to adopt and use the technology differently (Venkatesh et al., 2012). In this case, it led to freedom for students to help each other without an instructor's intervention.

Another interesting observation is the level of participation and interaction of students in Chat. Students tended to be more expressive. There were more responses in an online instructor-facilitated discussion using Chat. Since this version of Chat supports web links, video, audio, pictures, and text, students were able to post more in-depth responses. This observation strengthens these two constructs: facilitating conditions and perceived service quality. Facilitating conditions are related to the available resources and support that help students' interaction. Perceived Service Quality variable represents all the factors that help the students to use the online resources.

One explanation for more responses from students in an online instructor-facilitated discussion, as observed, is the presence of a hedonic motivation construct. This construct is defined as the fun, enjoyment, or pleasure that the users of technology can have (Venkatesh et al., 2012). When students engaged in something fun and enjoyable, they would respond more to it, and hence more responses were generated.

Another usefulness of Google Form is that it has built-in features to support online exams. For instance, the question shuffling was a good feature to provide students with individualized exams, but grading all of the questions was reassembled in the original order. These features show how technology, when deployed appropriately, can benefit users to perform tasks/activities. Such benefits are related to factors such as performance expectancy and effort expectancy in the UTAUT.

The process of proctoring online exams can be done even with readily available technologies such as Google Meet, Chat, and phone. In the context of this study, the ability to see all students on Google Meet was a very good feature. Chat was available for students to raise questions and get help from each other. Furthermore, providing students an option for a private phone call turned out to be a necessity. All these complimentary technologies help make the online exams feasible and manageable. Such benefits are an indicator of the performance expectancy factor in UTAUT.

The ability to output the exams from Google Form into a spreadsheet is another unique and useful feature. Since most instructors are familiar with spreadsheet, the process of handling the grading part in a spreadsheet requires a lower learning curve and is generally easier and more flexible. More importantly, from this study, it shows that the spreadsheet made it feasible for an instructor to provide individual feedback on each answer. As a result, the effort expectancy factor is reflected with an effective use of Google Form in the context of administering online exams.

Lastly, one of the unique challenges is whether giving an exam on paper or online allows students to review their answers. With a paper-based exam, an instructor could pass the exam back to students. With an online exam, an instructor could email them their answers. However, this is not an efficient approach. Tools such as the exam review app is quite useful because it offered a unique way to return students' online exams. As described, students had to provide their credentials to review their exams.

Only they could see their exams. The development of the review exam app is an innovative step. The app allowed students to see their answers, how they did on the exams, and learned from the feedback/comments from an instructor. This observation reflects the following factors from the UTAUT model: online course design, user interface design, facilitating conditions, habit and experience and perceived usefulness. Online course design refers to the types and quality of online exams. User interface is an organization of the content and visual design. Facilitating conditions help students take and complete online exams. Habit and experience is the users' ability to take online exams without training. Finally, perceived usefulness is the belief that users have in the benefits of using technology.

The web apps such as grade and exam review apps mentioned earlier provide an easy way to view the grade and feedback. Given this capability, none of the students contacted me to ask about grades and argue about points. Although there was no survey from students, their responses, as we observed during and after the exams, were not negative but quite supportive. Students joined in Google Meet and logged on Moodle to access online exams. They opened Google Form to work on the exam. Once done, they submitted it. After the exam was graded, they used the review exam app to see their grade and their exam feedback. Thus, the process was mediated by many different technology tools, but the usefulness of these tools was evident from students' preferences. When we offered students to take the exam in a face-to-face setting, none chose to do so. Instead, they wanted to take exams online. It was more convenient for them. They were more comfortable and seemed to work well with using different technology tools that we offered. When we posted the exams for students to review, we received fewer questions and complaints from them. The remarks and feedback that we provided seemed to clear up many issues that we used to have after giving back exams to students and posting just their grades. These observations imply a certain level of impact that factors such as online course design, user interface design, facilitating conditions, habit and experience and perceived usefulness play in the online exam process.

Based on the observations and notes, we tried to make sense of the phenomenon through the theoretical lens of UTAUT2. As indicated in Venkatesh et al., 2016's article, there is a need for research that examines the technology use at the feature level and the outcomes. Technology features generally refer to the building blocks or components of the technology designed to support user tasks (Burton-Jones & Straub, 2006; Jasperson et al., 2005). The feature-level use, which includes both exploitation (i.e., extent to which a user exploits features of the system to perform his/her task) and exploration (i.e., search for novel or innovative ways of doing things with the technology), as a driver of individual outcomes, particularly individual task performance (Burton-Jones & Gallivan, 2007; Burton-Jones & Straub 2006). The observed outcomes from this exploratory qualitative study provide preliminary evidence for the feature level use. Future quantitative studies are needed to confirm this feature level use and measure the impacts of feature-level use on the various outcomes.

To succeed in online teaching requires a lot of time and resources to build a pedagogical approach that differs from traditional in-person teaching. Hence, it does not make sense to require students to watch hours of lecture on video. A model of flipped classrooms may be needed. In such models, synchronous class time can nurture small-group interactions and facilitate direct instructor-to-student feedback. Social aspects of learning are indispensable whether it takes place in person or online. Students need opportunities to connect socially in ways that promote engagement and active learning. Aware of this, instructors should try to optimize technology to create such opportunities for conducive learning.

## CONCLUSION

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Although the COVID-19 pandemic has brought many challenges to educators, the abrupt transition to online teaching is one of them. There are advantages as well as disadvantages to online teaching. One thing that we all can agree on is that online teaching and traditional face-to-face teaching are not the same. Recognizing the differences and making appropriate adjustments are the key to cope with this transition.



In this paper, we chose to focus on M-learning as an approach to handle the challenge in the transition to online teaching. To provide a theoretical lens for the study, we introduced UTAUT, one of the most well-known IT/IS frameworks. We followed the steps in action research to examine the process that we went through in adopting and using M-learning tools. Among them were the RWD websites, Web Apps, and Google Suite.

From the narrative, we described how the researcher used the RWD websites as the gateway for students to access the course materials and the web apps as M-learning platforms for students to use to interact with the researcher and others. One of the insightful processes in this study is the administration of online exams. We shared the experiences of how the researcher administered online exams using all the different tools available.

One of the contributions from this paper is the narrative on how we had figured out ways to use M-learning tools to make the online teaching and learning more inquiry-oriented, hands-on, and would engage students in the process. We offered ways to connect meaningfully with students through the various apps and platforms. As more educators are shifting to online learning/teaching, this study can serve as a pilot for another project that will do outsider research on teachers engaged in participatory research.

Regarding our research approach, we adopted and followed the path of action research. Although there are different conceptualizations on what action research is. The approach was based on Stenhouse and Feldman's definition, as described earlier in the backdrop of this study. To us, what we have done is perhaps quite personal. It is based on what we had learned from our own experience. Yet, it is not free from bias, but the close-up view of a participant-observer offers a deep and rich examination of the phenomenon. Such perspective helped unfold things as they happened. The results helped to improve the teaching practice and better understand the educational situations. From the narrative that we shared, others could adapt and use various apps and platforms as well as follow the processes to connect meaningfully with students. This is one of the informing values contributed through action research.

In this paper, we shared how to administer online exams through an action research approach. Because of COVID-19, giving online exams was the only option available at the time. Hence, the opportunity arose for us to look at how to handle online exams. The researcher was able to use his classes as a research site. As he made changes for the online transition, the researcher had an opportunity to reflect and examine the processes that he went through. This paper is not intended to represent an in-depth or comprehensive study of the phenomenon involved in the process of administering online exams. It is just preliminary research that focused exclusively on a specific setting and reflected a personal experience in the process. It was not practical to give a typical classroom exam in an online environment. Such an exam had to be adjusted to fit an online environment. In the context of this study, the researcher chose to use the open notes/open books format but with time constraints. This format seemed to work well in this case, but it might not be the case in other contexts. We picked Google Form and used our custom-designed web apps and spreadsheet as tools to design, deliver, and grade online exams. These technologies helped make it possible for us to manage online exams. To make use of these technologies, we also had a process set up to ensure that students had access to exams and could complete them successfully. In sharing our own experience, the motivation is not to call on others to duplicate the exact process and to use the same technologies from this paper. However, our intention is primarily to reflect on this premise that having an open mind, being ready to adjust, learning appropriate tools and using them can make a big difference in coping with abrupt changes. Furthermore, while the results were limited to our own setting, some of the insights might be useful for applications of the process in other contexts. However, they should not be generalized without further research.

The final contribution of this study is to respond to the need for research that examines the technology use at the feature level and the outcomes. The observed outcomes from this exploratory qualitative study provide preliminary evidence for the feature level use, which can serve as a stepping stone for more study in this aspect.

### ***LIMITATION AND FUTURE DIRECTION***

This participant observation method permits the researcher to become more involved in the population. There is a risk of “going native” as the researcher strives for an in-depth understanding of the population studied (Schwartz & Schwartz, 1955). Therefore, quantitative research using surveys or quasi-experiment methods can be carried out to provide more objective findings. Validated inventories with measures can be adopted and used in these studies. Statistical analysis can be applied.

Future studies should look at the obstacles that instructors encounter in their online teaching and come up with the best practice to deliver high-quality online teaching. Measures of quality online teaching should also reflect on students’ performance, especially those who struggle academically. Other issues such as access to technology and inequalities should be addressed because the pandemic is likely to exacerbate these barriers.

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