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Walden University

College of Education

This is to certify that the doctoral study by

Kathy Clarke-Cook

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Earl Thomas, Committee Chairperson, Education Faculty
Dr. Olga Salnikova, Committee Member, Education Faculty
Dr. Anita Dutrow, University Reviewer, Education Faculty

The Office of the Provost

Walden University
2019

Abstract

Faculty Perceptions of Student Experiences Regarding the Use of MyFoundationsLab

by

Kathy Clarke-Cook

MPM, Keller Graduate School of Management

MA, University of Warwick

BA, University of the West Indies

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

December 2019

Abstract

MyFoundationsLab (MFL) was implemented to complement math instruction and increase student performance in developmental/transitional algebra courses. However, student learning outcomes at the college under study demonstrated that some students were still unsuccessful in passing their math course (i.e., Summer 2015:30%, Fall 2015: 27.2%, Spring 2016: 41.6%). The problem addressed in this study explored the learning experiences of students, via a faculty lens, who were unsuccessful in their math course instructionally supported by MFL. Bandura's theory of reciprocal determinism, the technology acceptance model, and the ARCS model of motivational design were used in this qualitative case study to examine the perceptions of 4 faculty regarding student experiences with MFL; faculty were selected through purposeful sampling. The research question explored faculty perceptions of students who failed math while using MFL in addition to the overall learning experiences of students in using the learning system. The major themes that resulted from data analysis through semistructured interviews were student challenges with technology, learning barriers that students experienced, and faculty teaching influences. The emerging project was a faculty professional development seminar emphasizing teaching strategies that supported MFL instruction and faculty in-class teaching. The findings of the study can positively impact social change through affording students positive learning experiences that encourage them to persist in college and ultimately contribute to the economic growth of their communities.

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MA, University of Warwick

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Dedication

This study is dedicated to my family, particularly my father who was unable to witness the achievement of this significant milestone in my life.

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I would like to thank Dr. Earl Thomas and Dr. Olga Salnikova for their guidance and support as I completed this doctoral study. Thank you for sharing this academic and personal journey with me.

Table of Contents

List of Tables

List of Figures

Section 1: The Problem

Introduction

A lack of preparedness in students entering college has not only become a cause for concern, but it has also increasingly become a major topic for research (Moore et al., 2010; The National Center for Public Policy and Higher Education, 2011). By virtue of placement testing, students who are not adequately prepared for college-level study can be required to enroll in developmental coursework (sometimes referred to as transitional or remedial courses) before proceeding onto college-level coursework (Belfield & Crosta, 2012). Developmental coursework is offered to students enrolled at community colleges, 4-year colleges, and universities (Benken, Ramirez, Li, & Wetendorf, 2015; Biswas, 2007). While English and math emerge as areas that students are deficient in, math is regarded as the most common subject area requiring remedial coursework (Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012).

Offering developmental coursework so that underprepared college and university students can meet the rigors of college-level coursework and encouraging them to complete coursework may positively impact student retention. According to Fike and Fike (2012), "Developmental mathematics outcomes have a measurable impact on overall academic outcomes, not just students' success in mathematics courses" (p. 8). Course redesign in mathematics, specifically including technology by way of self-paced computer-assisted instruction (CAI), has become a means of better engaging students in particularly high enrollment classes and enhancing learning outcomes (Ariovich & Walker, 2014; Twigg, 2011). Zientek, Skidmore, Saxon, and Edmonson (2015)

contended that technology has aided the transformation and delivery of developmental education. Nevertheless, agreement has been divided as to whether technology has contributed to students' understanding of math and their successful learning outcomes (De Witte, Haelermans, & Rogge, 2015; Holt, Holt, & Lumadue, 2012; Zavarella & Ignash, 2009). The concern expressed about the inclusion of technology in course redesign of mathematics may be warranted. The inclusion of technology into the math curriculum suggests that students are expected to not only master the components of the curriculum but to also acclimate themselves to the technology that they must use to achieve curriculum objectives.

As technology becomes more inclusive to academic curricula, students may be required to become self-directed, self-motivated, and independent as learners (Caravello, Jimenez, Kahl, Brachio, & Morote, 2015). The inclusion of technology into curricula can change the time, place, and pace of student learning as well as the context in which students learn (Hall & Villareal, 2015). The change in the way that learning occurs for students when technology is incorporated may have its high points and challenges. Students appreciate the flexibility and self-pacing aspect but contend that time management in using technology may be delimiting (Kegley, Toteva, & Wolf, 2016). The aforementioned observations pointed to the facilitating and impeding factors that may be associated with technology inclusion.

Students may not possess an innate capacity to be self-directed or exhibit the self-discipline that e-learning or self-paced computer programs require (Jones, 2013). The integration of technology into the learning process may call for a level of learner

independence and students may prefer a more dependent instructor-led learning environment that reduces the responsibility on them for learning (Broadbent & Poon, 2015). Self-motivation may be compromised if students perceive minimal progress and success in using a self-paced computer program or do not feel comfortable with using technology (Broadbent & Poon). Students may experience math anxiety (Andrews & Brown, 2015) in using technology that accompanies course curricula.

In Section 1, I define the problem of the study along with providing a rationale for the study based on evidence of the problem at the local level and evidence from the professional literature. In addition, the section includes the guiding research question of the study and the conceptual framework, supportive themes, and theories that underpin the purpose of the study are highlighted. A summary concludes the section.

Definition of the Problem

From an organizational perspective at the college under study, there was a lack of understanding concerning how effectively or the extent to which using technology contributed to students' understanding of math. Students faced challenges in terms of their self-directedness and self-efficacy in using MyFoundationsLab (MFL), a "complete online mastery-based resource" (Pearson Education, 2018, para. 1) that reinforced the concept of mastery learning. Mastery learning stressed that "the more time spent instructing leads to a greater percentage of mastery" (Cooperman, 2011, p. 54). As it related to the time factor in using technology, Ye and Herron (2012) reported a positive correlation between computer lab hours and final exam scores for students enrolled in intermediate and college algebra using a computer-based math program. However,

students enrolled in MATH 062, a transitional introductory algebra course instructionally supported by the use of MFL at the college study site, demonstrated a failure rate worthy of review. According to an internal report from the organization under study, the failure rate of students during the following teaching semesters was: Summer 2015: 30%, Fall 2015: 27.2%, and Spring 2016: 41.6%.

I use the terms *transitional* and *developmental* interchangeably in this study because the institution on which the study was based, formerly used the term developmental to describe its skills development courses or courses that served to reinforce appropriate skills so that students could advance to college level courses. As of the November 2014 teaching session, the term developmental was changed to embrace the term transitional, which better expressed the status of students. However, content wise, the transitional level courses still have a skills development function that aligns with how the literature views the function of developmental courses. Additionally, although other colleges have substituted the term transitional for developmental, the literature appeared to be deficient in using the term transitional.

The use of MFL allowed for a personalized learning experience as students worked at an individual pace, and the learning platform has been lauded as a technology that "can positively impact student learning and success rates" (Speckler, 2012, p. 105). Students were expected to develop mastery of mathematical concepts as they worked in MFL. Mastery of mathematical concepts and problems was tracked and monitored through formative assessments built into the learning platform. Formative assessment

assists students in addressing their learning difficulties and mastering the desired learning outcomes (Guskey, 2010).

The inclusion of technology into math coursework assumes that students naturally possessed an equal learning disposition and will all be successful in their math course (Kohler, 2012). However, students should be permitted to master math content rather than fall victim to the *digital divide*, which may hamper their learning (Boylan, 2011, p. 26). Moreover, Dawson, Macfayden, Risko, Fousham, and Kingstone (2012) argued that educational technology, if strategically designed, can engender self-directed learning skills.

MFL complemented the traditional, face-to-face classroom time for students enrolled in the onsite format of developmental math. This teaching format constituted blended learning, which is premised on a combination of face-to-face classroom time and online learning (Allen & Seaman, 2013). MFL was similarly used for students enrolled in the online format, but for the purposes of this study the focus was on students enrolled in the onsite format. In the onsite format, during class time, instructors would deliver a minilecture on a module of a specific concept within the curriculum and students would complete the related assignments, homework, and tests in MFL.

Students' commitment level to earning a passing grade in developmental mathematics may have been challenged by a hybrid learning format, which combined a traditional classroom lecture with MFL, and students may have experienced challenges as they acclimated to self-directedness with learning technology that requires their self-pacing (see Kohler, 2012). In addition to self-directedness and self-pacing, the format of

MFL required a level of independence from students which prompted them to schedule and manage their time appropriately in order to complete task assignments. The diagnostic and adaptive design of MFL further reiterated that students should work independently (Griffiths, Chingos, & Mulhern, 2015).

Moeller and Reitzes (2011) stated that "43 percent of students feel unprepared to use technology as they look ahead to higher education or their work life" (p. 5). In addition, students' progress may be affected by their self-belief or self-efficacy, time management, and self-regulation (Puzziferro, 2008). Students arrive at college with mixed levels of technology expertise that may be influenced by their "gender, socio-economic status, and racial background" (Goode, 2010, p. 583).

The inclusion of technology into the learning curriculum can encourage or discourage learner self-directedness. Hyland and Kranzow (2011) expressed that as technology is incorporated into learning it encourages the self-directed activity of students; however, feedback from students in their study revealed that while technology improved students' performance, it did not specifically drive self-directed learning. Love, Hodge, Grandgenett, and Swift (2014) examined the merits of the flipped classroom whereby students reviewed course materials and concepts outside of classroom time using Web-based online educational tools, and "class time is reserved for more active, problem-based learning and practice activities" (p. 318). The perceived advantages of the flipped classroom model emphasized the self-paced learning of students, their ability to access and review online materials as frequently as needed, and their utilization of class time to engage with each other and the instructor to deepen knowledge and heighten

problem-based learning (Love et al., 2014). The objectives of the flipped model, especially the strategic incorporation of technology into the learning process and the intent for learners to self-pace and assume responsibility for their learning, bear similarity to the teaching and learning paradigm incorporating MFL.

At the private, for-profit university under study, students are enrolled in transitional mathematics coursework (formerly referred to as developmental) as a result of placement testing scores that measure their college readiness. Students are permitted to enroll concurrently in transitional mathematics coursework (e.g., MATH 062 Beginning Algebra) alongside college-level coursework that can give them incentive to complete their transitional coursework and commit to the entirety of their degree program. This method aligns with reforms that recommend concurrent enrollment as opposed to singling out instruction for developmental courses **(**Edgecombe, 2011). Such an enrollment arrangement affords students the opportunity to be part of the mainstream college audience and does not confine them to a developmental or remedial category.

Based on the structure of MFL as a learning platform, students are expected to engage with the technology and perform academically. Students are required to pass their math course with an A or B grade. While there is evidence that students are achieving progress in learning outcomes, I examined the failure rate of students enrolled in this hybrid format at the college under study to explain why some students are unsuccessful in coursework. Table 1 provides a comparative view of pass rates and failure rates in Summer 2015, Fall 2015, and Spring 2016.

Table 1

Comparison of Semester Pass Rates and Failure Rates- MATH 062

Semester	Year	A/B pass rate %	Failure rate %
Summer	2015	46	30
Fall	2015	47.7	27.2
Spring	2016	50	41.6

The value of exploring the failure of students in transitional mathematics can be cast within the context of persistence and college completion (i.e., the need to increase college graduation numbers), which has become a documented concern (Bettinger & Long, 2009; Bonham & Boylan, 2011; Bundy, 2013; Thomas, 2014; Wolfle, 2012). The interest in college completion has been further fueled by President Obama's objective to increase the number of college graduates by 2020 (Humphreys, 2012). It is estimated that 37.9% of full-time students attending 4-year institutions earn a bachelor's degree within 4 years (Dunlop Velez, 2014).

The results of research have highlighted "positive perceptions of online learning across ethnicity and gender" (Ashong & Commander, 2012, p. 105). While Tsai and Tsai (2010) concluded that male students are more comfortable with the use of technology, Johnson (2011) concluded that female students expressed more satisfaction with their experience in using technology. However, there appeared to be a lack of research that addressed students' perceptions of technology in facilitating or prohibiting their success in developmental math, particularly students in hybrid learning courses. In hybrid learning, according to Yang and Chang (2012), "the instructor designs the classroom instruction and becomes more of a facilitator to engage learners through computer-

mediated communication" (p. 128). Elsewhere, Frantzen (2014) described that hybrid courses "offer some combination of online and FTF interaction between the instructor and student" (p. 566). Hybrid learning is sometimes used interchangeably with blended learning, and according to Snodin (2013), when a course management system was incorporated into a face-to-face environment in a move to promote blended learning, learners developed autonomy in learning that was not apparent in the conventional face-to-face situation.

In some studies addressing developmental mathematics, researchers have focused on comparing withdrawal and completion rates based on instructional formats or comparing the academic performance of students based on delivery or learning formats (Ashby, Sadera, & McNary, 2011; Jones & Long, 2013; Lenzen, 2013). While there has been a focus on student perceptions of technology and online learning along gender lines and the effects of delivery and learning formats on academic outcomes, there is a need to explore faculty perceptions of student experiences in using MFL and whether the learning platform prohibits or facilitates their success in transitional mathematics. An exploration of faculty perceptions of how students cope with MFL can add to the existing literature and can provide insight on student experiences with regard to the suitability of the technology impacting learning.

Concern about student academic performance in developmental math coursework has further resulted in state-based redesign programs targeting and realizing improvement in college readiness in math (Abraham, Slate, Saxon, & Barnes, 2014). Efforts geared towards resolving persistence and ultimately graduation rates have underpinned the

redesign of developmental coursework (Complete College America, 2012). Redesign has included combining remedial coursework with college-level coursework, reinforcing support for students enrolled in remedial coursework, and focusing on strengthening students' skills prior to enrolling in college (Rutschow & Schneider, 2011). The National Center for Academic Transformation has been instrumental in promoting math course redesign within colleges via the use of the emporium model, which utilizes "instructional software, including interactive tutorials, practice exercises, solutions to frequently asked questions, and online quizzes and tests" (The National Center for Academic Transformation, 2005, para. 21). However, course design and not the needs of learners can drive the development of the technology for course delivery (Chaney, Chaney, & Eddy, 2010). In this regard, while the move to integrate technology into the curriculum can be a worthy one in enhancing the learning of students, there is an underlying presumption that all students start with similar skills, abilities, and learning capacity as it relates to the effective use of technology.

The extent that students remain engaged by MFL and whether this instructional format potentially presents a barrier to learning or enhances learning can be questioned. Exploring faculty perceptions of student experiences in using technology in developmental math coursework can lead to an increased understanding of how students perceive the technology in facilitating their learning. The growing use of technology within the education arena demands that educators acknowledge the factors affecting students' proficiency with technology (McCoy, 2010). Equally important is the obligation of institutions to consistently investigate the efficiency of learning platforms utilized in

developmental math (Leong & Alexander, 2014). As a best practice, learning institutions should consistently undertake a review and assessment of learner technology that is integral to the curriculum. The review should not only highlight the functionality and efficiency of the technology as it relates to student learning, but the review should also examine the relationship between the technology, student learning styles, student learning outcomes, and instructor teaching styles. To this end, an agenda of improving student learning is fostered and is conveyed as a priority on the part of learning institutions.

Rationale

Evidence of the Problem at the Local Level

Student learning outcomes are continuously recorded for all courses, onsite and online, across the private, for-profit university in this study. While there is documented evidence that students are successfully completing developmental mathematics using MFL, this was not true for all students (Bailey, Jeong, & Cho, 2010). Documented learning outcomes, as in final session grades for enrolled students in MATH 062, demonstrated that students not only fail but also voluntary withdraw from developmental mathematics. The inclusion of technology in mathematics courses should promote equality of educational opportunities for students and aid in their success and completion of math curriculum objectives. However, a gap exists in terms of student achievement due to challenges in student motivation and comfort levels in using MFL.

Table 2 summarizes the failure rates and withdrawal rates of students enrolled in MATH 062 over three sessions: Summer 2015, Fall 2015, and Spring 2016. There may be varied reasons why students fail or withdraw from MATH 062. For example, students

may be challenged in acclimating to the MFL technology or feel challenged by mathematical content in the curriculum. The possible reasons that may explain the failure and withdrawal of students are worthy of investigation.

Table 2

Comparison of Semester Failure Rates and Withdrawal Rates- MATH 062

Semester	Year	Number enrolled	Failure rate %	Withdrawal rate %
Summer	2015	50	30	24
Fall	2015	44	27.2	25
Spring	2016	24	41.6	8.33

A lack of computer literacy, challenges with time management, and maintaining self-motivation may impact student engagement with technology (Kumar, 2015). Academic and dynamic factors can also hinder student persistence in developmental mathematics (Davidson & Petrosko, 2015). Students may encounter challenges in adapting to learning that incorporates face-to-face learning and technology; however, their success as self-directed learners and ability to engage with technology may be achieved if they have well-developed learning processes in the face-to-face context (Lee, Tsai, Chait, & Koht, 2014). In addition to these challenges, the integration of technology with course curricula and, specifically, its potential to be a one-size-fits-all for learners has been examined (Frantzen, 2014; Lichy, Khvatova, & Pon, 2014). While the opportunity to use technology to enhance student learning may have its merits, there appear to be disadvantages to using the technology to engage students. In addition,

whether the inclusion of technology in course curricula suits the varied learning styles of learners may need to be considered.

Increasing the pass rate of students enrolled in MATH 062 would justify the continued delivery of transitional courses and their usefulness to students who arrive at college with deficient math skills. At the organization under study, students must pass transitional math before they can progress to a college level math course. An increase in the pass rate would not only facilitate course progression for students but it could also help to reduce the negative perception that is sometimes associated with transitional courses.

Stewart (2012) noted the meaningful benefits derived from implementation of MyMathLab (MML) (i.e., a learning platform similar to MFL), such as increased attendance "from 40 percent to 80 percent" (p. 12), improved retention, and student performance. Additionally, withdrawal rates for students enrolled in MML classes were lower than those of the traditionally taught classes (Stewart, 2012). The difference in withdrawal rates vis-a-vis MML and traditionally taught classes may be an indirect suggestion or indication that students prefer the MML format. Although the observation does not specifically reference MFL (i.e., the learning platform that informed this study) for practical purposes, it sheds light on the potential of learning platforms and their connection with student learning preferences.

While learning outcomes show variations in students achieving success while enrolled in MATH 062 using MFL®, the significant role that faculty play in acclimating and helping students transition to learning technology platforms such as MFL and

achieving learning objectives should be acknowledged. Authenticating the student experience could possibly be explored through a discussion with faculty who have actually experienced the technology and are privy to student perceptions and experiences.

Evidence of the Problem from the Professional Literature

Sixty two percent of students enrolled in 2-year colleges complete remediation courses, while only 9.5% actually graduate within 3 years; in comparison, at 4-year colleges, 74.4% of students complete remediation courses, while 31.5% graduate within 6 years (Complete College America, 2012). Further, according to the Sparks and Malkus (2013) and based on students' self-reporting enrollment in remedial courses, first-year undergraduates taking remedial courses totaled 26% of course enrollment in 1999-2000, 19% in 2003-2004, and 20% in 2007-2008. The preceding data present the scope of remediation and graduation rates and the potential enrollment of students in developmental or remedial courses. In 2011, 75% of first-year students required remediation in one developmental subject, while a quarter of first-year students required remediation in all three developmental areas: reading, writing, and mathematics (Foderaro, 2011).

While course redesign to include technology in developmental mathematics has prompted improvements in student performance, technology should not only be leveraged to enhance curriculum delivery but should also be used to filter and identify at-risk students enrolled in those courses (Wladis, Offenholley, & George, 2014). Students, nevertheless, have commended the benefits of using technology, specifically a Web-based program, for remedial math (Leong & Alexander, 2014). Ease of accessibility to

the Web-based program, the asynchronous nature of the program, the instant feedback on attempted problems, and the ability to complete coursework "regardless of location" are some of the cited benefits perceived by students (Leong & Alexander, 2014, p. 613).

Disadvantages cited by students regarding their experiences highlighted that the learning technology was more fixated on the correct answer to problems and not process-oriented in solving problems as well as a lack of feedback on problems with incorrect responses (Leong & Alexander, 2014). From a comparative viewpoint, an empirical study conducted by Zogheib, Rabaa'i, Zogheib, and Elsaheli (2015) confirmed that students will utilize MML if they are convinced of its ease of use and ability to support their educational needs. Likewise, students may perceive educational technology in terms of how it contributes to their overall learning. Again, although not specific to MFL®, an empirical study of the topic helped to understand students' attitude towards technology. Fish (2013) found that at least 50% of undergraduate and graduate students favored a "computer-managed homework system over traditional methods" (p. 64). The viewpoint of students is significant and shows that they can have mixed feelings when technology is incorporated into their learning.

The findings of extent studies not only indicate that some students may have varied perceptions regarding the incorporation of technology or a learning system like MFL to support their learning. The results also indicate that some students may prefer one learning method over another or regard the use of technology as a means to an end in advancing their learning. The input of faculty into the learning process of students using MFL may manipulate how students perceive and react to the technology.

Faculty attitudes or perceptions of the learning outcomes of students enrolled in transitional or developmental mathematics using MFL seem to be lacking in the literature. The literature speaks to a range of faculty impressions regarding technology, including perceptions of students using personal technology, perceptions of teaching online, perceptions about innovation in teaching technology, and perceptions of instructional technology practices in developmental education relative to MML (Bayless, Clipson, & Wilson, 2013; Kopcha, Rieber, & Walker, 2015; Martirosyan, Kennon, Saxon, Edmonson, & Skidmore, 2017; Wingo, Ivankova, & Moss, 2017). Therefore, the purpose of this study was to explore how faculty described the perceptions and experiences of students who failed MATH 062 using MFL as a learning system.

Definitions

Computer-assisted instruction: This instruction uses preprogrammed formats, drill-and-practice, and simulation programs to assist students in learning and retaining math content (Gross & Duhon, 2013). The instruction may be used as a tool to supplement learning or as a primary tool for student learning.

Developmental education or remedial education: The terms are used interchangeably in the field of postsecondary education to refer to basic skills and preparatory education. Essentially, they refer to courses offered to underprepared students who enter college lacking the appropriate skills for performing college level coursework. However, some colleges, for example in Tennessee, may use developmental in reference to courses immediately below college level and remedial in reference to students who are overly underprepared (Boatman, 2012).

Experience: According to Kolb (2015), experience "includes in its range perceptual acts and the anticipation of concepts" (xxii). Kolb further explained that experience "involves both the knowledge and evaluation of objects, events, and situations" (p. xxii). In the context of the study, students engage with technology, MFL, and their engagement or experience with the technology can affect how they feel towards it.

MFL: A mastery-based online program and diagnostic tool used in math and other subjects to help remediate student skills. Based on a diagnostic assessment, students develop learning paths that direct them in mastery learning of math (Pearson Education, 2016). Additionally, MFL is adaptive and provides students with an individualized, modular-based learning experience. Interactive exercises and online tutorials assist students in achieving successful learning outcome.

Online learning: According to Means, Bakia, and Murphy (2014), "online learning refers to a learner's interaction with content and/or people via the Internet for the purpose of learning" (p. 6). Additionally, Means et al. contended that in defining online learning and using it to describe a learning format, the proportion of learning that is actually Web based should be considered.

Perception: "The process by which people select, organize, and interpret (recognize) the sensory information, the act of understanding what the sensation represents" (Van Selst, 2014, slide 2). Essentially, perception refers to how individuals personally process and experience the world around them.

Significance of the Study

Developmental education not only contributed to the premature dropout rate of college students, but students have also successfully completed developmental education and completed degree objectives. In terms of significance, exploring faculty perceptions of student experiences in using MFL shed light on the appropriate selection of learning formats for students enrolled in developmental/transitional math, MATH 062, within the organization under study. The benefits and hindrances in using MFL have become clearer from a teaching and learning standpoint involving both faculty and students. The perceptions of faculty have provided an understanding as to what needs to be done in curriculum and instructional development to provide a better learning experience for students.

Findings from this study served as a catalyst for honing in on faculty teaching approaches and strategies for supporting students. Although it has been highlighted that college remediation is more diversionary as opposed to assisting in developing students' skills, it does not necessarily prevent student progress or persistence (Scott-Clayton & Rodriguez, 2014). Further study that includes the direct viewpoint of students and their experiences is necessary.

It is projected that by 2020 there will be 55 million new job opportunities and two thirds of those jobs will require postsecondary education (Carnevale, Smith, & Strohl, 2013). Therefore, the need to ensure that educational opportunity results in course completion and ultimately into degree completion is rather significant (Miller, Valle, Engle, & Cooper, 2014). Given the anticipated increase in opportunities in the labor

market, it would behoove institutions to ensure the efficiency of offering developmental coursework.

Guiding/Research Question

To better understand student interaction and experience with MFL as a primary learning management tool for transitional mathematics, the main guiding research question for this qualitative inquiry was as follows: How do faculty describe the perceptions and experiences of students who were unsuccessful in using the MFL learning system for transitional math? To gain a deeper understanding of the research question, I developed the following guiding questions aligned with the main question:

- How do faculty describe their perceptions regarding students who failed MATH 062 using MFL?
- How do faculty describe the perceptions and learning experiences of students using MFL as a learning system?

Review of the Literature

For the conceptual framework of the study, I used Bandura's (1989) triadic reciprocal determinism. In addition, I used other theories and models relative to the conceptual framework, such as motivational theories, specifically intrinsic and extrinsic motivation and how they may trigger learning, and the ARCS model of motivational design, which advocates motivation as a key component in the development of instructional materials and technologies (Keller, 1987, 2010). The technology acceptance model (TAM) was also referenced as a model.

Conceptual Framework

For the conceptual framework of this study, I drew on Bandura's (1989) triadic reciprocal determinism, sometimes referred to as triadic reciprocity or reciprocal determinism. The model of triadic reciprocal determinism stemmed from Bandura's (1986) social cognition theory, which challenged the tenets of behaviorism and emphasized that learning is socially influenced. In relation to social cognition theory, Bandura (1986) stated that "of the many cues that influence behavior, at any point in time, none is more common than the actions of others" (p. 206). According to Bandura (1989), human behavior was usually explained in terms of "one-sided determinism", which can be affected by environmental or internal disposition factors (p. 1).

However, social cognitive theory is more inclined to promote a model of causation, known as triadic reciprocal determinism, which proposes a culmination of behavior, cognition, and other personal factors as well as environmental variables that interact and influence each other in a bidirectional manner; these interactive influences are mutually influencing (Pajares, 2002). These bidirectional influences, behavior, personal factors, and environmental factors are depicted in Figure 1. See Appendix E for evidence that this material is in the public domain.

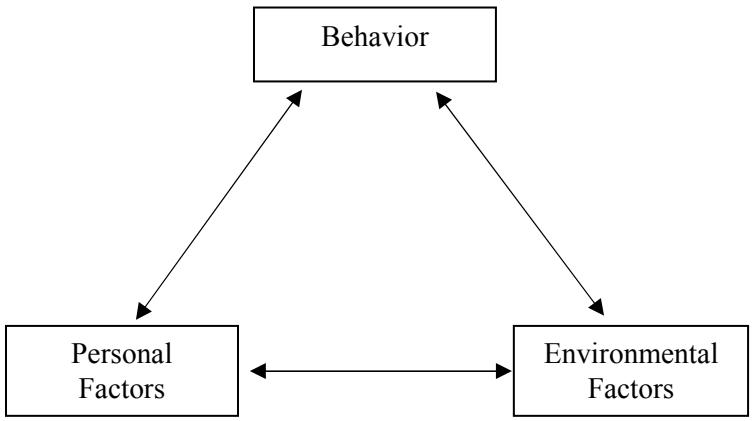

*Figure 1.**Error! Bookmark not defined.*** Triadic interplay in reciprocal determinism. Adapted from Overview of Social Cognitive Theory and of Self-Efficacy by Pajares, F. 2002, Retrieved from https://www.uky.edu/~eushe2/Pajares/eff.html. Copyright [2002] by Emory University. Reprinted with permission (see Appendix E).

Constant dynamic interaction occurs between personal, environment, and behavior variables in the triadic combination, with each variable having the potential to change and impact each other; however, the variables of influence are not necessarily equal in strength or do they happen simultaneously (Bandura, 1989). There is consistent interaction between variables, as "the triadic interplay among one's behavior, the environment, and personal characteristics affect the learning process" (Bandura, 2006, p. 172). In this regard, the environment, whether it be school, family, socio-cultural context, or religious, ties "frames the learning experience" (Thompson, 2014, p. 2). The environmental influences, to some extent, direct which types of behavior are developed and activated. Additionally, responses to the social environment can be actuated by age, race, and sex (Lerner, 1982). Learners, as they engage with their learning environment, may transmit and receive signs that result in them as learning "confidently or awkwardly, or distressingly" (Cash Gee & Khoury, 2013, p. 334).

As a learner's personal factors and behavior interact, "the natural and extrinsic effects of their actions, in turn, partly determine their thought patterns and emotional reactions" (Bandura, 1989, p. 3). In this regard, the bidirectional aspect of the model's sources is reinforced and highlights that the sources do not work in isolation. Later in this section, I examine the influence of thoughts and feelings on learner behavior in the discussion on self-efficacy.

In the behavior and environment dimension of the triadic interplay model, the two sources influence each other and the environment is not influenced unless it is prompted by behavior, and vice versa; therefore, "personal attributes, behavioral experiences, and environmental experiences may be inputs as well as outcomes" (Cash Gee & Khoury, 2013, p. 336). The bidirectional pull between behavior and the environment casts individuals or learners in the role of products and producers of the environment (Bandura, 1989). While social cognitive theory has been used to explain learning, its limitations have been noted in terms of its assumption that changes in the environment lead to changes in individual behavior, the extent to which the variables of person, behavior, and environment factor into individual behavior and its lack of focus on emotion and motivation in current experience (LaMorte, 2018)

Self-efficacy, which also contributes to behavior and academic performance, is defined as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1995, p. 2). The more a person believes that a particular behavior can result in a desirable outcome, the greater the likelihood of increased self-efficacy for that behavior results (Bandura). People hold

particular beliefs about their capabilities and accomplishments and can be mistakenly driven by these beliefs as opposed to being driven by what they can actually accomplish (Pajares & Urdan, 2006). As a result, learners may have wavering levels of self-efficacy as in strong or weak self-efficacy, which will inevitably impact their learning experience. For example, if self-efficacy is strong, challenges may be viewed as tasks to be conquered as opposed to if self-efficacy is weak, challenges may be avoided and viewed as tasks that are beyond capability. High self-efficacy increases the likelihood that goals may be achieved (Devi, Khandelwal, & Das, 2017)

Bandura (1977) asserted that people's self-efficacy is derived from multiple sources, specifically mastery experience, vicarious experience, social persuasion, and psychological responses. With regard to mastery experience, repeated success encourages positive efficacy and self-reflection of past successes can spur learners on and strengthen self-efficacy (Bandura). Vicarious experience occurs as people view the success of others and conclude that their own persistence and intensity can help them improve (Bandura, 1977, p. 197; Bhatt & Bahadur, 2018). While vicarious experience may be regarded as an effective way to develop or raise self-efficacy, Bandura cautioned that its modeling nature may make efficacy expectations weaker and more susceptible to change.

Social persuasion and verbal messages may serve as positive drivers of self-efficacy to encourage learners to succeed, or alternatively, they can serve to dissuade learners from achieving goals and objectives (Bandura, 1977). Hence, learners not only need social and verbal persuasion that reiterates their capability to succeed, but they also require learning contexts that enhance self-efficacy. Raising efficacy expectations

without providing conditions to facilitate "effective performance" may result in failure and thwart a learner's "perceived self-efficacy" (p. 198). Not to mention, failure to provide the appropriate conditions in addition to social and verbal persuasion may undermine the genuine intention of the provider.

Finally, psychological responses may be governed by an individual's anxiety, stress, or mood (Pajares & Urdan, 2006). The authors reiterated that it is not the intensity of the psychological response that is significant, but the manner in which an individual interprets it and the extent to which they allow it to impact personal self-efficacy. High self-efficacy may foster feelings of composure and confidence in resolving challenging tasks, but in contrast, people with low self-efficacy may overestimate the challenge of a task and this may inadvertently generate a negative psychological response (e.g., anxiety and stress) along with "a narrow vision of how best to solve a problem" (Pajares, 2002, para. 23). To this end, a person can recognize the self-fulfilling prophecy that is associated with self-efficacy because individuals limit their accomplishments to only what they believe they have the capability to accomplish.

In the context of students enrolled in transitional mathematics utilizing MFL, Bandura's (1989) reciprocal determinism provided a lens for examining how the interaction of person, behavior, and environment factors may affect learning and the engagement with technology, especially the learning of students who fail transitional mathematics. The interaction of personal, behavioral, and environment factors may have affected the perception of students towards succeeding in mathematics and using MFL. In

reviewing the factors, it would also be interesting to determine whether a particular single factor, personal, behavioral or environment, affected student performance.

Bandura (1989) asserted that the variables in reciprocal determinism are not equal in strength. Given the difference in strength of variables, whether one particular variable has more impact on a student's learning disposition than another variable can be questioned. For example, if learners hold a personal belief that is positive towards math, the consequence may be an equally positive interaction between behavior and environment variables (Cash Gee & Khoury, 2013). Likewise, a negative belief towards math may potentially give rise to a negative interaction between behavior and environment. In comparing the self-efficacy of students enrolled in either developmental math or calculus, Hall and Ponton (2005) determined that calculus students exhibited a "more powerful sense of self-belief in their ability to succeed in a college mathematics course" (p. 26).

With regard to environment, the importance of classroom climate, whether teacher centered or learner centered, which may or may not increase self-efficacy should not be overlooked (Peters, 2013). Students enrolled in developmental mathematics experienced both a teacher-centered and learner-centered climate. The traditionally taught classroom based transitional math course was complemented by integrating MFL technology into the curriculum.

Motivational Theories

While developing the conceptual framework for this study, I examined motivational theories, both intrinsic and extrinsic, along with the ARCS model of

motivational design. The inclusion of a discussion on motivational theories was significant given that students believe that CAI not only assists their self-discipline but also increases their motivation (Aichele, Tree, Utley, & Wescoatt, 2012). Reviewing motivational theories was also essential in terms of understanding student perceptions of MFL.

Intrinsic and extrinsic motivation. Barak, Watted, and Haick (2016) implied that motivation is situational; a person's intention may be governed by their situation (p. 50). Intrinsic motivation can be spontaneous and comes from within learners who naturally derive self-fulfillment from a task or learning activity (Ryan & Deci, 2000). Depending on their goals, people may prioritize intrinsic motivation as it relates to their needs or objectives. "People are intrinsically motivated for some activities and not others, and not everyone is intrinsically motivated for any particular task" (p. 71). This not only underscores how individuals may apply meaning to tasks and how this meaning may dictate the degree of intrinsic motivation, but it also suggests how selective individuals may be about the tasks that they pursue. Intrinsic motivation nurtures academic factors, such as wider conceptual understanding and an in-depth processing of learning materials, both factors indirectly related to academic achievement (Trevino & DeFreitas, 2014). There are links between intrinsic motivation and academic achievement or academic success (Petty, 2014).

Extrinsic motivation, on the other hand, differs from intrinsic motivation in that external sources in the form of rewards, such as good grades and teacher and peer approval, influence learners (Mueller, Yankelwitz, & Maher, 2012). Specifically,

extrinsic motivation is associated with instrumental value relative to tasks and relates to activities that are executed in order to achieve a *separable outcome* (Ryan & Deci, 2000). Ryan and Deci (2000) explained that motivation occurs on a continuum from internalization to integration as individuals transition through different orientations that include external regulation, introjection, identification, and integration. Ryan and Deci, however, cautioned that transitioning to orientations does not necessarily occur in sequence. As individuals encounter the varied orientations, they experience a degree of autonomy that manifests in "greater persistence, more positive self-perceptions, and better quality of engagement" (Ryan & Deci, 2000, p. 61).

The dualistic approach that divides intrinsic and extrinsic suggests that learners, in terms of motivation, fall into either category, and perhaps does not account for a learner moving from a state of extrinsic motivation to intrinsic motivation and vice versa. As it related to students' perceptions regarding the use of MFL, depending on student familiarity with using MFL or previous use of technology, they may have wavered between intrinsic and extrinsic motivation. Significantly, students may thrive better and experience achievement in learning environments that match their motivation orientation (Beenen & Arbaugh, 2018).

ARCS model of motivational design. Keller (1979) developed the ARCS model of motivational design. The model was not only developed to analyze student motivation, but it was also developed for "analyzing learner motivation and designing motivational tactics that are keyed to specific areas of motivational problems and integrated with teaching/learning strategies" (Keller & Suzuki, 2004, p. 230). Keller (2008) also

emphasized how the model could be integrated into the "into the design and delivery of instruction in e3-learning environments" (p. 183). To apply the ARCS model to e-learning or technology, instructional designers must be attuned to the needs of learners and their goals in order to engender motivation in student learning (Hogle, 2017).

The attention component of the design states that learners' attention is gained through arousal or perceptual, while the relevance component states that motivation is more likely to be piqued if learners perceive that the contents of a subject will help them accomplish goals (Keller & Suzuki, 2004). The third component, confidence, focuses on learners having "positive expectancies for success" (Keller & Suzuki, 2004, p. 231), while the fourth component, satisfaction, proposes that learners should have "positive feelings about their learning experiences" (Keller, 2008, p. 177). In order for motivation to be achieved and sustained, the four conditions of the ARCS model of motivational design should be met (Keller & Suzuki, 2004).

All four of the components of Keller's model were relevant to the study given the purpose of the study to explore how faculty described the perceptions and experiences of students who failed MATH 062 using MFL. In addition, the motivational and design aspects of the model made it a suitable option for review. Student engagement with the MFL learning system was assessed in terms of the model's components.

Relevance of the Technology Acceptance Model

The TAM developed by Davis (1989) bore relevance to the study as it emphasized how users perceive the usefulness of technology; and whether there is a perceived ease of use of technology when used for a particular purpose. The model,

although initially applied to a work environment, provided practical background for understanding student perceptions regarding the use of MFL and eliciting feedback and reaction from the end-users of the technology. Students completed the required assignments and tests in MFL which complemented the traditional face-to-face classroom instruction for developmental math.

Student use of MFL was not optional but mandatory since the technology was an integral component of the learning process. Unlike the tenets of the technology acceptance model which is founded on concern for workers not using IT available to them and the ways in which acceptance of technology could be encouraged (Holden & Karsh, 2010), students using MFL as a learning tool do not have a say in choosing whether or not they wish to use it. Rather, the expectation is that they accept and familiarize themselves with the technology in order to complete coursework objectives. Building on the technology acceptance model, Tarhani, Elyas, Akour, and Al-Salti (2016) developed a conceptual technology model using the constructs of "quality of work life, social norm, facilitating conditions, and self-efficacy" (p. 73). The elements of the model were relevant to a review of the technology acceptance model as they could impact student engagement with MFL.

The selected conceptual framework and supporting theories related to and aligned with the study approach. Firstly, Bandura's (1989) triadic reciprocal determinism model provided the background from which to view the behavior and choices of students who failed developmental math, MATH 062. The model, grounded in factors of social, environment, and behavior emphasized the interaction of those factors and could be used

to explain, discuss, or deduce factors leading to why students failed developmental math. Secondly, as it related to developing the interview protocol, the technology acceptance model was used to shape questions directed at participants regarding the ease or difficulty with which students used MFL or the extent to which the use of the learning system allowed them to understand mathematics.

Finally, the ARCS model of motivational design and intrinsic and extrinsic motivation spoke to comprehending whether students were intrinsically or extrinsically motivated, or whether learning MFL was underpinned by attention, relevance, confidence, and satisfaction. The ARCS model is significant given that the design of MFL required students to be independent learners. Also, the extent to which students were motivated had implications for how successful they would be as independent learners.

Review of the Broader Problem

Reviewing the literature involved a range of articles and Internet sources. The articles selected focused on computer-assisted instruction related to developmental mathematics, perceptions of developmental mathematics, in general, and those of students, self-directed learning and technology, self-efficacy, the effectiveness of developmental mathematics on student success, and studies that concentrated on comparisons of learning formats, namely accelerated, traditional instruction (face-to-face lecture), traditional combined with online instruction (otherwise referred to as hybrid), and modular instruction. The Walden University library was used in the process of researching. Several databases were examined for relevant articles: Google Scholar,

ERIC, EBSCOHost, and Sage Premier. A variety of journals, including *Journal of Developmental Education*, *Research and Teaching in Developmental Education*, *Community College Enterprise*, and *Journal of the Scholarship of Teaching* were also reviewed for research articles.

Key terms were specifically used for searching databases along with keyword pairings. Search terms included *remediation* since the term is used interchangeably with *developmental mathematics*, *transitional mathematics*, *MFL*, *self-directed learning*, and *self-efficacy*. In searching, the term *developmental mathematics* or *transitional mathematics* was also paired with *student perceptions* or *attitudes*, *retention* or *technology*.

Purpose of Developmental Coursework

During 2009-2010, 75% of public 4-year institutions, almost all public 2-year colleges, and 66% of private 4-year institutions offered developmental instruction (Williams, Moore-Jackson, & Webb, 2014). While there exists a consensus on the necessity of developmental education and its potential effectiveness, some skepticism has not only promoted a call for rethinking the principles of developmental education, but has also caused scholars to support and refute the arguments levelled about the purpose and nature of developmental education (Brothen & Wambuch, 2012; Goudas & Boylan, 2012; Long & Boatman, 2013). Scott-Clayton and Rodriguez (2014) based on a regression discontinuity study determined that while remediation may not perceivably navigate students towards success, there is a diversionary aspect where students are

incorrectly assigned to remedial coursework, thereby misappropriating the number of students placed in this level of work.

Human Resources Perspective of Developmental Education

From a human resources perspective, one needs to consider the impact of students not succeeding in developmental mathematics and persisting to graduation, and the necessity of ensuring that they do succeed. The cost implication of developmental education, "approximately $1 billion", and the high incidence of student enrollment into developmental coursework influence the decision-making to ensure that students achieve college completion (Pretlow & Wathington, 2013). Data from 2004-2005 showed that in terms of the total revenue of public institutions of higher education, the cost of developmental education declined to 0.48 % (Pretlow & Wathington, 2012). Some state mandates have approved the restriction and elimination of developmental education or made developmental coursework optional for students as in the case of Florida (Cafarella, 2016a; Mangan, 2013; O'Connor, 2013). In spite of the cost incurred in developmental education, failing to support students in developmental education can have an adverse impact not only on the economy, but also on the country's potential to equip people for the demands of the labor force (Zientek, Ozel, Fong, & Griffin, 2013).

While developmental education assists students in building skills, acquiring those skills may bring advantages and disadvantages to them. However, developmental course offerings at colleges present equality of opportunity for students who may have otherwise not been able to start on a college career. "Developmental education represents a human capital investments that may influence labor market outcomes in two opposing ways:

productivity increases from improvements in basic numeracy and literacy skills and a decline in productivity due to decreases in labor market engagement" (Hodara & Xu, 2016, p. 784). Considering the apparent need for remediation as students enter college, institutions cannot eliminate developmental coursework from their offerings (Cafarella, 2016b). In spite of the adverse cost associated with offering developmental coursework and the perceived benefits and drawbacks, institutions cannot ignore the needs of students who stand to gain from developmental education which can facilitate a path to a college education.

Improving Student Success

Successful learning in postsecondary education is typically defined by graduation rates but can also be defined by course grades and students expressing satisfaction when surveyed for a course (Driscoll, Jicha, Hunt, Tichavsky, & Thompson, 2012; Wolfle, 2012). Course evaluations administered to students in developmental courses can yield advantageous information that may be utilized to enhance continued course delivery and ultimately engender student success (Rehak & McKinney, 2015). However, in order to derive maximum benefit from student course evaluations, the strategic timing of administering those evaluations is essential. At the college under study, student course evaluations are administered for each course at the end of each 8-week teaching session. A more balanced view of course content could be derived if evaluations were completed by students and faculty. "Given the fact that many students perform poorly or even withdraw from developmental courses, it is important that colleges consider conducting

faculty evaluations and/or collecting data from students earlier in the semester" (Rehak & McKinney, 2015, p. 201).

To improve the success of students enrolled in developmental coursework, specifically mathematics, varied measures have been explored. Acceleration, a means of expediting students through courses to achieve completion, might not always seem an appropriate method for all students and the lack of empirical evidence substantiating its merits further fuels the debate as to its suitability (Edgecombe, 2011). Despite this contention, Jaggars, Hodara, Cho, and Xu (2014) affirmed the merits of accelerated developmental education for students as a "strong positive boost in terms of their probability of enrolling in and completing college-level math and English" (p. 20). The implication is that a more expedited track through developmental courses encourages students to persist to college-level work.

Technology and Computer-Assisted Instruction

Math teaching has evolved to include and supplement technology into the curriculum and developmental mathematics is no exception. Although the inclusion of technology is deemed to enhance student success, it is also felt that the learning style of students may be compromised by the newer and increasingly favored technology which disregards the preferred or natural learning styles of learners. Some students prefer the option of a traditional face to face (F2F) lecture while others express anxiety about learning math on a computer (Cafarella, 2016b).

Given that MFL requires students to pace themselves and self-regulate when and where they complete coursework, there are possible implications that as an instructional

tool it may not be as effective for all students due to individual learning styles. Historically, most students have graduated from a school system that subscribed to a '*chalk and talk'* teaching tradition for mathematics or a teaching format complemented by the use of a whiteboard. The transition to a student-centered learning environment, complemented by technology, may be more challenging for students, some more than others. As exemplified in the seminal work by Barr and Tagg (1995), transitioning to and achieving a student-centered or learner-centered paradigm is the ultimate objective for successful learning in higher education.

Debate on Teaching and Delivery Formats

Kauffman (2015) examined the effectiveness between online learning formats and traditional classroom environments. The author concluded that emotional intelligence and self-regulation play a significant role in student success in online learning. Spradlin and Ackerman's (2010) quasi-experimental study compared the performance of students using traditional instruction versus traditional instruction complemented with CAI and concluded that students in control and experimental groups performed similarly with females outperforming their male counterparts. Ethnicity, although highlighted in the demographic distribution of the study, did not feature in the resulting analysis of student performance (Spradlin & Ackerman, 2010).

Ashby et al. (2011) using a sample of 167 participants deduced that learning environments are not equally effective and that online and blended students performed worse than their face-to-face counterparts. Learning environment differences were also impacted by age and gender. One can question whether technology inserted into the

curriculum of specific subjects or disciplines, other than developmental mathematics, has any impact on student performance.

A study conducted by Martirosyan et al. (2017) highlighted faculty member views on the inclusion of technology for teaching developmental math. While faculty opinion was generally favorable towards the use of MML, "9.7% of the coded responses offered a mixed view" and expressed preference for MML "integrated with traditional teaching style" (p. 14). Moreover, faculty also expressed concern about the use of technology in teaching as being less beneficial and more of a distraction (Martirosyan et al., 2017). The results of the aforementioned study, although specifically relevant to MML, are useful for shedding light on faculty impressions of technology. Frantzen (2014), nevertheless, determined no major contrast in student learning in a technology incorporated criminology course delivered in hybrid, face-to-face, and online modes. Faculty not only favorably viewed the inclusion of technology in learning, but they also felt that the investment in technology was justified by the gains in student learning outcomes (Straumsheim, Jaschik, & Lederman, 2015).

In comparing student performance in F2F, blended, and online formats in a university junior business statistics course, Simmons (2014) stated that in terms of course grades, F2F and blended students performed better than their online counterparts. In addition, across the three teaching formats there was no significant difference in the exams scores of students in blended and F2F formats; however, there was "a significant difference between those modes and the online mode in the linear combination of the third exam" (Simmons, 2014, p. 194). While Simmons' study was based on the

comparison of student performance in a statistics course, specifically delivered in three different formats, the findings add to an understanding of the impact of varied teaching modes on student performance.

Integrating technology into the developmental mathematics curriculum may not be as inclusive as intended. In fact, the studies that contradict the effectiveness of computer assisted instruction suggest, somewhat indirectly, that incorporating technology may be exclusive and jeopardize successful performance. Although course grades are indicators of student success and this may imply mastery of course content, it is also important to discern how well technology or computer-assisted courses contribute to the comprehension of concepts that will foster success in subsequent courses (Vilardi & Rice, 2014).

Significance of Motivation

Much has been written about motivation and it is important to understand its contribution within the context of learning, particularly in the context of why students may or may not persist with in math course or engage with technology that accompanies the curriculum. According to McMillan and Forsyth (1991), motivation is "purposeful engagement in classroom tasks and study, to master concepts or skills" (p. 39) while Middleton and Spanias (1999) referred to it as the "reason individuals have for behaving in a given manner in a given situation" (p. 66). The former definition limits motivation to achieving a level of mastery while the latter hints at the impetus which may drive individual behavior. Graham and Weiner (1996) simply defined motivation as "the study of why people think and behave as they do" (p.63) and as motivation relates to academic

accomplishment, it should be a concern why certain students successfully accomplish tasks in spite of challenges while other students easily abandon a task or set lofty goals that they would never be able to attain.

Based on the purpose of this study, to explore how faculty describe the perceptions and experiences of students who failed MATH 062 using MFL, understanding student engagement theory is important; that is, to understand the reasons that students may have for engaging in different achievement tasks. These theories relate to intrinsic motivation, interest, and goals. Students may be intrinsically or extrinsically motivated to engage in tasks. If they are intrinsically motivated, they engage based on personal interest and the enjoyment or success derived from the task. On the other hand, if students are extrinsically motivated, they may be driven by the idea of being rewarded, for instance by grades or praise (Alderman, 2004) and not by instrumental value or personal interest. Extrinsic motivation is viewed as being more tangible than intrinsic motivation. Intrinsic and extrinsic motivation underpin student persistence in college coursework and student motivation that was initially extrinsic can translate into intrinsic (Deckers, 2005).

Deci and Ryan (1985) advanced that the basic desire for competence propels individuals to find highly stimulating and challenging opportunities that feed intrinsic motivation. However, the desire for competence may waiver in the face of perceived obstacles or low self-efficacy. Additionally, Deci and Ryan suggested that competence and self-determination also contribute to extrinsic motivation. Engaging in and completing tasks so as to avoid punishment or reprimand is also labeled as extrinsic

motivation. Intrinsic motivation contains a sense of wanting to do while extrinsic motivation infers a sense of having to do (Miller, 2000).

In a learning context, "interest is assumed to derive from learner-content interaction" (Chen & Darst, 2002, p. 251). Interest theories, as it relates to motivation, differentiate between individual interest and situational interest. Individual interest is comprised of feelings-related valence and value-related valence (Schiefele, 1999). Feelings-related valence refers to the feelings that an individual may hold towards an object or activity; value-related valence refers to the personal meaning that an object or activity may hold for an individual. Individual interest is expected to evolve over time due to an individual's repeated interaction with a task or activity in a specific environment (Chen & Darst, 2002). It can therefore be inferred that lack of individual interest towards mathematics or preference for using technology can possibly transform into acute individual interest.

Situational interest in the literature, for the most part, has been examined based on the role of text features in text-based learning (Tobias, 1995; Wade, Buxton, & Kelly, 1999). Text features such as personal relevance, novelty, and comprehensibility engender situational interest (Hidi & Baird, 1986). However, there is a paucity of research on "how general contextual factors, such as the classroom environment or the form of instruction, can promote interest in a particular domain" (Linnenbrink-Garcia et al., 2010, p. 647). This bears relevance for the place of technology as a method of instruction for math learners and whether it promotes interest and ultimate learning in math as a subject.

Goal theory has been examined from various perspectives as it relates to achievement and achievement behavior (Eccles & Wigfield, 2002). Nicholls (1984) differentiated between learning environments such as task-involving and ego-involving. Nicholls posited that task-involving emphasized the goal of accomplishing and mastering a task whereas in ego-involving, the primary goal was to exhibit high ability relative to other individuals. Interestingly, task-involving which emphasizes personal accomplishment and mastery bears similarity to Bandura's (1977) sources of self-efficacy, specifically mastery experience, whereas ego-involving bears similarity to vicarious experience where individuals learn or model their behavior on others.

Task-involving individuals seek to increase competence while ego-involving individuals need to "maximize favorable evaluations of their competence" (Eccles & Wigfield, 2002, p. 115). Therefore, task-involving can be compared with intrinsic motivation and ego-involving can be compared with extrinsic motivation. Students who take a mathematics course complemented by computer-assisted instruction experience task-involving that requires a dual accomplishment; as in achieving competence in mathematics and developing competence or proficiency in using computer software. Goal theory levels vary between students and in addition to test performance and academic preparation they can provide a crucial means of understanding student traits (Fong, Acee, & Weinstein, 2018).

Self-Directed Learning and Self-Efficacy

Inherent in the inclusion of technology in learning or transitioning to technology-assisted learning is a need for students to develop or increase self-directed learning skills

(Kungu, Iraki, & Machtmes, 2010). As it relates to using MFL, the onus is on students to voluntarily choose the extent to which they will assume responsibility for their learning. The extent to which students assume responsibility for learning may be governed by their commitment to learning and enthusiasm for the use of the MFL technology.

From a self-directed learning perspective as it relates to developmental mathematics and integrating technology, there are some linked variables such as self-efficacy and self-regulation. High levels of self-efficacy underpin high academic achievement thereby reducing the incidence of drop out (Jungert & Rosander, 2010). While this may be true, it is necessary to consider the disposition of adult learners who make up the bulk of the undergraduate student population at the for-profit university under study. Although adult learners in comparison to traditional-aged students exhibit lower levels of math self-efficacy, their levels of math anxiety and math self-concept do not differ that much (Jameson & Fusco, 2014). Nevertheless, this does not augur well for adult learners as it suggests that their academic success can be threatened.

Self-regulation, a concept rooted in motivational tendencies, can be affected in online mathematics courses due to lack of interaction with instructors and classmates (Hodges & Kim, 2010). Onsite students using MFL have enough opportunity to interact with an instructor and classmates but could experience reduced self-regulation outside of class time when they must assume full individual responsibility for completing coursework. In the absence of an instructor, and left to their own devices, students may feel less motivated to complete required coursework in MFL. When students are motivated, they are more likely to engage and engagement can result in achievement of

learning objectives (Harandi, 2015). Students must feel self-determined or autonomous, and self-competent in order to thrive and achieve success in their learning environment.

Of equal importance is how students perceive the challenges of achieving success in transitional mathematics along with their perceptions of using technology, MFL in this instance. Success in transitional mathematics may be attributed to students' attitudes toward the subject. Students will avail themselves of available learning resources in order to achieve success, and in the face of failure growth in self-efficacy can propel their commitment to repeat their developmental course (Koch, Slate, & Moore, 2012). Additionally, students may transition from having initial negative viewpoints about mathematics to an acceptance of assuming greater responsibility for acquiring success in the subject (Howard & Whitaker, 2011). Specifically as it relates to using MFL to complete homework, students are divided between completing homework using a paper and pencil option or using MFL (Holt et al., 2012). Students' comfort levels with different learning formats appear to support this opinion.

Perceptions of Technology

Students may have varied perceptions about technology and its contribution to their academic success. The TAM originally developed by Davis (1989), demonstrated the acceptability of an information system or technological tool by users. The model was primarily developed "to predict information technology acceptance and usage on the job" (Venkatesh, Morris, Davis, & Davis, 2003, p. 428). The technology acceptance model highlights two attributes that dictate the use and acceptance of technology- perceived usefulness and perceived ease of use (Mathieson, 1991). The former, perceived

usefulness, refers to the degree to which it is thought that using specific technology will enhance job performance, while the latter, perceived ease of use, refers to the extent it is believed that using technology is effortless (Mathieson, 1991). "Individual reactions to using information technology, intentions to use information technology, and actual use of information technology" are the basic intentions underpinning user acceptance (Venkatesh et al., 2003, p. 427). The model provides a practical perspective for understanding the extent to which students may accept or engage with technology.

Sumak, Hericko, Pusnik, and Polancic (2011), in examining students' perceptions of Moodle, an open learning platform, determined that perceived usefulness was the common predictor of attitudes towards using Moodle. This corresponds with Davis (1989) that users are more predisposed to perceived usefulness. In this case, to students, Moodle may have been a means to an end, hence the perceived usefulness. Likewise, Hsu (2012) in examining user acceptance to Moodle concluded that "it signifies that students' belief in useful-ness and easiness and their encouragement from social members decide their acceptance of the technological tool" (p. 46). Additionally, students' successful use of technology may be dependent upon the actual form of technology. A study conducted by Wang (2015) confirmed students' validation of the multimedia component of an online applied calculus course. Students praised "the step-by-step illustration of the problematic concept or formula through multimedia" and acknowledged that technology was vital to helping them in the course (Wang, 2015, p. 1503).

Law, Sek, Ng, Goh, and Tay (2012) sampled 450 students enrolled in precalculus who used MML. The results of their study indicated that students, in addition to being

satisfied with the use of MML, expressed that "it had provided them with their first experience using online learning and assessment tools" (Law et al., 2012). Krishnan (2016), on the other hand, pointed out that although students liked the hybrid mode of their mathematics course, they much preferred a F2F teaching method. To explain the preference by students for one mode over the other, Krishnan reported "lack of experience in learning mathematics in a nontraditional manner could possibly be one of the reasons for reservations towards online learning" (p.38). In reviewing these examples, one can anticipate the perceptions of students towards technology, specifically MFL.

While students may have varied perceptions of their experiences with technology and how it contributes to their learning, it should be noted that for some students using technology is merely a means to an end which helps in lessening the burden and strain of being a student (Henderson, Selwyn, & Aston, 2017). While technology may be a necessary instrument for learning, it should not merely be perceived as a shortcut to learning. Students should be encouraged to recognize the value of technology and how it may contribute to their academic success.

Mastery Learning

Mastery learning which has been aligned with Web-based or computer-assisted instruction focusing on mathematics was initially developed by Carroll (1963) and later by Bloom (1968). Carroll proposed that students, when given adequate time and practice, could acquire mastery level in a particular task. Carroll (1989), therefore, equated learning ability with time and suggested that learners in spite of individual learning differences could all be successful learners. Mastery learning, basically, as its measure of

success, replaces learning aptitude with learning rate. It presupposes that all students when allotted a suitable amount of time can emerge as successful learners. However, although Carroll's (1963) theory was inclusive of all students as potential learners, it did not recognize that comparatively some students might require more time, effort, and help than others in order to achieve mastery.

Bloom (1968) advanced the premise of Carroll's (1963) mastery learning theory and asserted that mastery learning was not only a matter of the time afforded to students for learning, but that it also required the appropriate instructional strategies. Any learning program that advocated true mastery learning principles should include "the feedback, corrective, and enrichment process, and instructional alignment" (Guskey, 2007, p. 15). The outlined principles of mastery learning undergird the operation and functioning of MFL.

Some of the immediate benefits of group-based mastery learning are student achievement, retention of material, and student engagement in learning. Boggs and Shore (2004) in their study of a Web-based developmental math course using mastery learning found that students who did not achieve the required mastery level on the first attempt were permitted to attempt the material again until "the desired level of Mastery Learning is (was) attained" (p. 217). The opportunity of a second attempt allowed for reinforcement of material which is a characteristic of mastery learning. It should be noted that while mastery learning places a time factor on students and uses corrective feedback to promote successful learning, it may deprive students of the "creative element that is vital in making the learning enjoyable and sustainable" (Subramanya, Smith, & Lonie,

2017, pp. 272-273). By design, mastery learning can be perceived as being scripted and therefore not allowing students to inject their own creativity into the process.

There is a connection between mastery learning and Bandura's (1977) mastery experience, one of the sources of self-efficacy. The combined factors of mastery learning and mastery experience can boost self-efficacy which in turn may prompt students to not only have a positive learning experience, but to also stay the pace of their course and engage with the technology. As students increasingly achieve success and have positive experiences through mastery, they may be motivated to continue with their work ethic.

Implications

There is a continuing trend to shift developmental mathematics course delivery to web-based formats or incorporate CAI. In this regard, students may feel pressed to assume greater autonomy for their learning and may be required to improve their learning strategies to fit with technology. There were various directions for the project study that I considered based on the findings. The three options included an evaluation report, a policy recommendation, or a professional development (PD) seminar for faculty.

An evaluation report could present the current state of learner experiences. Other teaching metros within the organization under study that also teach transitional math courses complemented by the use of MFL could benefit from the findings. While a policy recommendation-position paper was a viable choice, I anticipated that I would need to have buy-in within the organization which would help with lobbying for policy change. My selection of a PD seminar for faculty was based on my past history of delivering training to faculty, the fact that ongoing faculty development was already a high priority

within the organization, and that the idea would be readily embraced. Faculty, as expressed during interviews, were already implementing strategies to support student learning; hence, facilitating a PD seminar for faculty could be beneficial to explore more teaching strategies.

Summary

The focus of this study was faculty perceptions of student experiences regarding the use of MFL. Lack of preparedness for college can place students in developmental coursework. The delivery of math instruction has dramatically evolved to incorporate a dependency on technology or CAI. While research posits successful academic outcomes for students enrolled in developmental mathematics, one must also be cognizant of those students who are unsuccessful in developmental mathematics and who do not persist.

An examination of how faculty describe the perceptions and experiences of students as they engage with technology, MFL, in transitional math coursework can contribute to an institutional agenda of academic success, retention, and increased graduation rates. As major stakeholders in the education process, faculty can furnish institutions with invaluable student perceptions that may assist in prompting future change not only in curriculum development, but also in teaching delivery. In Section 2, I provide a discussion of the methodology used for this study as it relates to participants, data collection, and data analysis.

In the remaining sections of the study, I discuss the specific selected PD seminar, the associated literature review, and theoretical framework. In Section 4, I reflect on the

development of the project in terms of its strengths and limitations along with my growth as a scholar. In that section of the study, I also address the value of the project.

Section 2: The Methodology

Research Design and Approach

In view of the guiding research question of the study, I used a qualitative case study approach. In defining qualitative research, Strauss and Corbin (1990) posited that it is "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (p. 17). Maxwell and Wooffitt (2005) stressed that "Qualitative researchers, on the other hand, tend to ask how x plays a role in causing y, what the process is that connects x and y "(p. 23). While quantitative research is primarily deemed to focus on causal explanations and relationships, qualitative research also asks causal questions, albeit from a different perspective (Maxwell & Wooffitt, 2005).

A qualitative design proved to be the most practical vehicle for documenting faculty perceptions since perceptions and experiences are not necessarily quantitative but rooted more in images and pictures as conjured up by participants' expressions and experiences. Bogdan and Biklen (2007) attested to the descriptive nature of qualitative research and how data collected are narrative in nature assuming "the form of words and pictures rather than numbers" (p. 5). In addition, qualitative research is interpretive (Denzin & Lincoln, 2005), was founded on extracting phenomena based on participant viewpoints, and emphasizes the social context or setting around which the specific research topic revolves (Toloie-Eshlaghy, Chitsaz, Karimian, & Charkhchi, 2011).

Justification of the Research Design

I employed a case study design in this investigation. Four faculty members who taught or had taught the MATH 062- Beginning Algebra course using the MFL learning system were participants, conforming to the concept of a bounded case (see Creswell, 2012a; Stake, 1995, 2005; Yin, 2012). Creswell (2012a) outlined that a bounded case study "is separated out for research in terms of time, place, or some physical boundaries" (p. 465). The selection of a particular group of faculty members teaching on a particular course using a specific learning system or platform adhered to this definition. This boundary conformed to the time, place, activity, definition, and context for binding cases so as to maintain a practical scope (see Baxter & Jack, 2008).

The use of case study, phenomenological, narrative, and ethnographical designs allow the researcher to address the *how* and *why*. While phenomenological, narrative, and ethnographical designs could have fulfilled my objective, they were not as well suited to the context of the research. Phenomenology is used to convey one or more individuals' lived experiences of a phenomenon, in terms of how they construct meaning (Creswell, 2012b). The overarching purpose of phenomenological research, according to Creswell (2012b) "is to reduce individual experiences with a phenomenon to a description of the universal essence" (p. 58). On the other hand, ethnography is not only used to explore a larger issue, but it is also used in the instance of studying a culture-sharing group in terms of their behaviors and beliefs over a period of time (Creswell, 2012b). Narrative research is rooted in individuals chronologically telling their stories, which the researcher consequently reports or expresses in a persuasive literary form (Creswell).

The case study design was appropriate for studying the isolated perspectives of faculty members as it related to student experiences and conducting an in-depth investigation through a discourse with them. The strength of a case study lay in "its ability to deal with a full variety of evidence- documents, artifacts, interviews, and observations" (Yin, 2009, p. 11) and the advantage of addressing *how* and *why* questions. Additionally, I felt the case study design was appropriate as it lent itself to the collection of information rich data.

By comparison, other research designs would have been less suited since my intention with this study was not to examine a cultural perspective as in ethnographical research or a specific phenomenon explored through phenomenonology. Neither was my intention to recount the stories derived from narrative research, albeit that interviews recount in a narrative manner. Additionally, I did not intend to create a theory grounded in the data in this study (see Lodico, Spaulding, & Voegtle, 2010, p. 271).

Participants

The selection of specific participants for the study required that faculty members had taught MATH 062- Beginning Algebra onsite complemented by the use of MFL. Four faculty members voluntarily chose to participate after receiving an e-mailed invitation to participate. The faculty participants had a range of experience in teaching algebra and math-related courses at various levels. Faculty experience included teaching developmental/transitional algebra, college level algebra, and college level statistics. While there was not a specific number of years of experience required for faculty to participate in the study, based on my former interaction with the selected faculty in a

registrar capacity, I can offer that each of them had at least 5 years or more experience of teaching mathematics and familiarity with MFL. Faculty extensive experience in facilitating teaching with the use of MFL and MML used for college level algebra was a benefit in that they brought an understanding of how learning systems functioned. Their experience in using MFL and interaction with students positioned them as valuable participants to the study who could reflect and provide a first-hand account of student perceptions and experiences.

Faculty who taught MATH 062- Beginning Algebra from within a specific geographical group and who taught from January 2018 to July 2018 were included in the sample. In terms of the number of faculty who taught MATH 062 during the specific timeframe of January 2018 to July 2018, this information was not disclosed to me because e-mailing the invitation to participate to faculty was managed by the research partner. Likewise, the selection of faculty from a specific geographical group and teaching timeframe was managed by the research partner and based on available data.

Justification for the Number of Participants

Purposeful sampling permitted the intentional selection of individuals who were *information rich* based on their experiences with students and MFL and who could assist in furthering an understanding of the central phenomenon (Creswell, 2012b). This type of sampling is a frequent component of qualitative research (Miles & Huberman, 1994) and was a means to an end in that I could specifically select and target individuals who I felt could candidly relate their experiences and those of their students. While Marshall, Cardon, Poddar, and Fontenot (2013) suggested that conducting interviews with 15 to 30

participants leads to data saturation, Guest, Bunce, and Johnson (2006) argued that data saturation occurred by conducting as few as 12 interviews.

I fully considered the quality of the sample (Creswell, 2012a) and anticipated the subsequent process of coding, summarizing, and interpreting could have been overwhelming if too much data were collected. My consideration was also underpinned by the fact that I wanted to effectively organize and manage the collected data. A manageable sample would also allow me to keep track of the data in an efficient manner.

Access to Participants

I received research approval from Walden University's Institutional Review Board (IRB Approval # 11-13-17-0379325) and from the university under study. I was granted access to participants through an approved letter of cooperation from the research site. In keeping with the research site's IRB protocol, an invitation to participate was e-mailed to participants on my behalf by the research partner. Information in the invitation e-mail, which had been crafted by me, included a brief research objective, described the interview process as in the expected duration of the interview, and explained the potential benefit of the research to university administration. The invitation e-mail was managed by the research partner who sent out the e-mails from a faculty e-mail list on my behalf. As part of the invitation e-mail, I instructed participants that, if interested, they should respond to my provided Walden e-mail address within a week and that they should provide their e-mail address along with a telephone number. Within the invitation e-mail, participants were advised that only five faculty members would be selected to participate in the interview process, and as a result, not everyone who responded would be selected.

When participants responded to the invitation e-mail indicating their interest to participate, I e-mailed them a copy of the consent form that outlined background information on the study. The consent form provided the voluntary nature of the study, the risks and benefits of the study, and the interview process which would involve an initial digitally audio-recorded interview lasting approximately 45 minutes to an hour and a potential follow-up interview should I need clarification after the interviews had occurred. Also included in the consent form were my contact details, via email and telephone, along with the telephone number for the Walden University research participant advocate.

I received firm responses to participate in the study from four faculty members. I also received an e-mail from a faculty member who could have been a potential fifth participant; however, the body of the e-mail indicated "no message text" because it did not have anything written in the body of the e-mail. I responded to the e-mail querying whether the e-mail had been sent in error or whether the sender was trying to respond to my invitation to participate. I sent another follow-up e-mail again to the sender 4 days after my initial e-mail query, but I never received a response.

Researcher-Participant Working Relationship

In order to establish a researcher-participant working relationship, I conducted interviews at a time and place that was mutually convenient and agreed to by me and the participants. Considering the logistics of participants traveling to the interview location and the fact that their participation in the study was voluntary, I needed to ensure that their convenience was accommodated. Traveling to participants was required in order to

conduct the interviews. To offer a sense of privacy to participants, one option was to use a private room, preferably located at a campus or center location; however, at the suggestion of the participants, 3 of the 4 interviews were conducted in a quiet section of a restaurant. Participants were not teaching on the scheduled day of the interview, so meeting with them at a location of their choice was agreed to. Although a restaurant locale was not a conventional option for conducting interviews, I carefully considered the type of social space, whether it was conducive to conversation, and the power and positionality of my participants. The fourth interview was conducted solely via e-mail as a convenience to the participant.

I was familiar with all four participants having previously worked with them on student attendance-related issues and other registrar-related matters when I was an assistant registrar based at a campus of the college under study. I currently work in an online capacity and I am not campus based, so I do have any direct contact with faculty. Nevertheless, the level of familiarity was not only instrumental in building rapport and trust with the participants but also instrumental in setting them at ease during the actual physical interview process. A common thread of the researcher-participant relationship entailed consistently determining from participants whether they had any questions or concerns about the research study or participating in it. When interviews had been transcribed, each participant received a transcript of their interview, which gave them an opportunity to clarify information or add comments to their original responses that they could e-mail back to me within 2 days. Should have participants not wished to add comments or make any changes to the interview transcript, they were guided to respond

to the e-mail noting that they did not wish to comments or changes. The use of a peer debriefer was beneficial in expanding my thinking and critical analysis. The peer debriefer was external to the study, had experience in higher education, and understood the rigor of collecting and analyzing data having worked on their own qualitative doctoral study.

Ethical Protection

Each of my IRB submissions to Walden and the research site included a list of ethical requirements that I fulfilled. By informed consent, the participants were provided with full disclosure regarding the research study, their anticipated involvement and rights, and a description of any potential risks. Prior to commencing each interview, I reviewed the informed consent form with each participant, and this gave them the opportunity to ask questions and seek clarification. Participating in the study did not pose any risks to the safety or well-being of participants. For privacy measures, I transferred the audio files of each interview from the audio recorder to a password-protected USB flash drive immediately after the interview, and the audio file was deleted from the audio recorder at that time. Interview jottings and notes were saved to a password-protected laptop. Pseudonyms were used for saving participants audio files. I removed informed consent response e-mails from participants from my Walden University e-mail inbox to a password-protected USB flash drive. In keeping with Walden University IRB requirements, all documentation and saved files will be destroyed 5 years after the conclusion of the project study. During the collection of data, no ethical issues arose. In

the event that any ethical issues had arisen, I would have reported them to Walden University IRB for advice and direction.

Data Collection

I used a qualitative case study design to gather the perceptions of math faculty who had experience in using MFL and teaching students who used MFL. Semistructured interviews were used to elicit direct responses from participants that would answer the research questions. By using interviews, I hoped to establish a comfortable setting where participants could share their thoughts and experiences.

Semistructured Interviews

Data were collected using an interview protocol that I developed based on a review of the literature and documented field notes. Jacob and Furgerson (2012) emphasized that "first time qualitative researchers use protocols to assist them in collecting data" (p. 1). Using an interview protocol not only ensured that the interview process was scripted and followed a format, but it also helped guide the interview process. As a first-time researcher, using an interview protocol gave me the opportunity to stay on track and maintain momentum as each interview was conducted. In addition, I maintained a journal for recording reflective thoughts following each interview; a practical way for examining personal assumptions, developing transparency in the research process, and shaping analysis of data (see Ortlipp, 2008). The conceptual framework of the study informed and aligned with the interview questions. The alignment between the conceptual framework and interview questions is shown in Appendix C.

The interviews were appropriate for data collection as they not only allowed direct meaning to be derived from participants, but they also subscribed to the in-depth quality associated with use of a case study design. According to Merriam (2009) "Interviewing is necessary when we cannot observe behavior, feelings, or how people interpret the world around them and "It also is necessary to interview when we are interested in past events that are impossible to replicate" (p. 88).

Initial F2F semistructured interviews lasting 45 minutes to an hour were conducted with four participants. The interview format encouraged individualized responses; probes and prompts, facilitated "unexpected data to emerge" (Jacob & Furgerson, 2012, p. 4). Three of the four interviews were audio recorded and upon completion the interviews were transcribed into a Word document. For the fourth interview, the participant was e-mailed a copy of the interview protocol which was completed with responses and returned to me. After reviewing the responses on the returned emailed interview protocol, I developed some field notes with my own reflections. Field notes were also developed while the interviews were audio recorded and again during the playback process of listening to the interviews. Upon the conclusion of each interview, students were given a debriefing statement that thanked them for their participation, reminded them of the confidentiality of the study, and asked them not to discuss the study with their colleagues who may also have been participants in the study. The debriefing statement was issued in person to the three participants whose interviews were audio recorded; a debriefing statement was also sent to the participant who was e-mailed a copy of the interview protocol.

Role of the Researcher

As the primary researcher during data collection, it was inevitable that I would develop closeness to the data. After all, data collection is a repetitive process that comprises listening to participant responses and writing up the responses. Also, as previously mentioned, I had a former working relationship with the participants when I was campus based and worked in a registrar capacity. While the participants may be classified as my colleagues in that we work for the same organization, I did not have any supervisory responsibilities over them or at the setting in which I worked. Based on my closeness to the data and prior relationship with participants, the onus was on me to ensure that I followed research procedures in a very precise manner. Adhering to a format enabled me to manage bias, to be reflective and to try to assume an objective stance as a researcher. I followed the interview protocol format in the same way while interviewing each participant and in doing so I was able to maintain my professional role as researcher.

Data Analysis

The analysis of data commenced with the transcription of interviews and typing of field notes. According to Merriam (2009), "Data analysis is the process of making sense out of the data. And making sense out of the data involves consolidating, reducing, and interpreting what people have said…" (p. 176). In order to derive comprehensive meaning from the data, the completed interviews were analyzed and interpreted using Braun and Clarke's (2013) seven stage thematic analysis. Although their seven stages reference thematic analysis, their framework provided a sequential and structural process for analysis and interpretation. The stages were comprised of (a) transcription, (b) reading

and familiarization, (c) coding, (d) searching for themes, (e) reviewing themes, (f) defining and naming themes, and (g) writing the report.

Table 3 indicates the seven stages associated with thematic analysis. Appendix D includes permission to republish this table and a copy of the license agreement.

Table 3

Braun and Clarke's Seven Stages of Thematic Analysis

Stage	Thematic Analysis	Description
1	Transcription	Turning audio data into written text (or transcripts) by writing down what was said and how it was said so the data can be systematically coded and analyzed.
2	Reading & Familiarization	Reading and re-reading the data to become intimately familiar with the content (i.e., immersion); analysis begins by noticing things of interest that might be relevant to the research questions.
3	Coding (Selective & Complete)	Identifying aspects of the data that relate to the research questions; can involve *selective coding* where only material of interest is coded or *complete coding* where the entire dataset is coded.
4	Searching for Themes	Identifying salient features that capture something important about the data in relation to the research question; may represent some level of patterned response or meaning within the dataset.
5	Reviewing Themes	Determining whether candidate themes fit well with the coded data; themes should tell a story (not necessarily *the story*) that "rings true" with the data; essentially represents quality control in relation to the analysis.
6	Defining & Naming Themes	Defining themes by stating what is unique and specific about each one; useful because it forces researchers to define the focus and boundaries of the themes by distilling to a few short sentences what each theme is about.
7	Writing the Report	Writing the report by selecting compelling, vivid examples of data extracts, and relating them back to the research question and literature.

Braun and Clarke (2013), pp. 202–203.

Note. From *Successful qualitative research: A practical guide for beginners*, by V. Braun and V. Clarke, 2013, Thousand Oaks, CA: Sage. Copyright 2013 by Sage Publishing. Reprinted with permission (see Appendix D).

While analyzing data, I also referred to Ryan and Bernard (2003) who recommended the inclusion of "repetition, indigenous typology, metaphors, transitions, similarities and differences, linguistic connectors, and missing data" (pp. 89-92) when reviewing for themes. Their recommendation to review data for paralinguistic communication such as speech inflection, changes in tone and pauses in speech made me a lot more conscious of nuances in the data as I completed my analysis. As I repeatedly played back the audio recording of each interview, nuances in the data also became more apparent.

Analysis of Semistructured Interviews

Each completed audio recorded interview along with field notes was immediately transcribed into a Word document. Transcription was an iterative process as I revisited audio recordings and transcripts on multiple occasions to ensure that participant reality had been accurately captured. The option to use popular data analysis computer software such as NVivo was convincing but I preferred to transcribe the audio recorded interviews myself. Leech and Onwuegbuzie (2011) heeded that software cannot on its own merit analyze data; the researcher must utilize the software to advance the analysis. Transcription can reaffirm how immersed the researcher is in the data. Markle, West, and Rich (2011) cautioned that "transcription can result in the loss of pragmatics- the role of context and inflection on speech" (para. 12). However, those elements were retained through information from field notes, journaling, and the nuances of tape recordings.

In reviewing transcripts, I constantly made note jottings, focused on common threads of responses and created themes from those common threads. Breaking down data into codes was an integral part of the coding process which helped to derive meaning. Saldaña (2013) defined codes as "a word or short phrase that symbolically assigns a summative, salient, essence-capturing evocative attribute for a portion of language-based or visual data" (p. 3). Bryman (2012) and Lofland, Snow, Anderson, and Lofland (2006) underscored the importance of the breaking down of data along with sorting and categorizing.

A priori codes developed before examining the data and based on the research question, conceptual framework, and literature review assisted with the coding process.

The a priori codes are based on research questions, conceptual framework, and literature review and can be reviewed in Appendix C. The defined a priori codes were teaching influences, learning barriers or challenges, impact of technology on learning experiences, user convenience and user challenges related to MFL, and satisfaction with technology. In light of the specific research questions that needed to be addressed, a priori codes not only encouraged me to scan for particular aspects within the data, but they also provided initial focus for reviewing the data (Stokes & Urquhart, 2013).

In vivo coding created directly from what participants expressed during interviews also helped facilitate and render an authentic perspective and interpretation in the coding process. Combining as the coding process materialized, I used a Microsoft Excel spreadsheet for tracking and sorting quotes (Dillon, 2013). Salient themes were ultimately summarized and contributed to the narrative of the findings.

Validity and Reliability

Given the interpretative nature of qualitative research, it was imperative to address accuracy or validity during data collection, data analysis, and the overall research process. Noble and Smith (2015) referred to validity as "the integrity and application of the methods undertaken and the precision in which the findings accurately reflect the data, while reliability describes consistency within the employed analytical procedures" (p. 34). In order to maintain validity and reliability, I focused on representing the similarities and differences between participant perspectives, maintained routine record keeping, and followed consistent and precise procedures during the research process.

To validate my findings, I used member checks. Member checking "is a strategy most often used to optimize the validity of qualitative research findings" (Sandelowski, 2012). In using member checking I wanted to make sure that each participant's voice was authentically expressed. The member checking process constituted e-mailing participants a copy of their completed interview transcript for their review. Participants were invited to review the interview transcript and interpretation, and to clarify comments, or to add comments to their original responses in the interview transcript. Any updated comments that were received via return e-mail were logged and updates were made to the original transcripts. Member checking ensured the authentication of my interpretation of faculty perceptions, aided credibility, and allowed participants to self-validate their experiences which they had shared with me.

Evidence of Quality and Procedures

For data collection, the study did not use multiple data sources which are at the core of triangulation. Creswell (2012a) remarked that:

> Triangulation is the process of corroborating evidence from different individuals (e.g., a principal and a student), types of data (e.g., observational field notes and interviews), or methods of data collection (e.g., documents and interviews) in descriptions and themes in qualitative research. (p.259)

Although archived student final grade data was referenced for comparative purposes, this was merely relative to highlighting students who withdrew, failed or received an acceptable letter grade in their mathematics course while using MFL and was not a source to be used in triangulation per se. However, an impartial colleague, peer

debriefer reviewed the interview questions along with data and findings and provided candid and professional feedback.

Discrepant Cases

There were no identified discrepant themes or cases. Lewis (2009) reiterated the necessity of discrepant data or disconfirming evidence in that it underpins the integrity of research being conducted. If any discrepant cases had emerged they would have been reviewed with the same integrity and ethical detail as data that supported the purpose of the study. Anticipating discrepant cases underpinned the idea of my managing any potential bias in the study and accepting that all data were relevant and significant.

Limitations

The study was limited by organization, location and the number of participants and therefore cannot be generalized to a larger population. The findings represent the perceptions of faculty who voluntarily chose to participate and does not account for the views of faculty who did not participate in the study. Also, the findings do not take into consideration the views of faculty who taught MATH 062- Beginning Algebra in the online format. Hence, the findings may not accurately convey an overall view of faculty perceptions.

Data Analysis Results

Faculty members who taught developmental/transitional mathematics using MFL were specifically selected based on their mathematics teaching experience and familiarity with using MFL and their engagement with students who also used MFL. The broad goal of the case study was to better understand how faculty perceived the perceptions and

experiences of students who failed MATH 062 using MFL as a learning system. Data were collected via interviews from faculty members (n = 4) who participated in the study. The data collected from interviews were coded, interpreted, and broken down into categories. While analyzing the data, I strategically looked for themes that emerged based on words and phrases used by the participants.

Two research questions guided the study:

1. How do faculty describe their perceptions regarding students who failed MATH 062 using MFL?
2. How do faculty describe the perceptions and learning experiences of students using MFL as a learning support system?

Interviews were conducted within a 3-week period. After each interview was audio recorded and transcribed, I printed a copy of the interview transcript and coded the hard copy. Codes were assigned based on the research questions. Each transcribed interview was reviewed more than once and I compared the transcripts to determine similar and dissimilar themes.

Study Findings

Multiple themes emerged as I analyzed the collected data. However, I was able to narrow the number of themes down to five main themes. The identified themes provided answers to the problem statement which focused on how effective or the extent to which MFL contributed to students' understanding of math. The thematic findings, as in emerged themes, were built from the problem and research questions as faculty

participants described their personal experiences and the experiences of their students. Figure 2 depicts the five themes that emerged from data analysis.

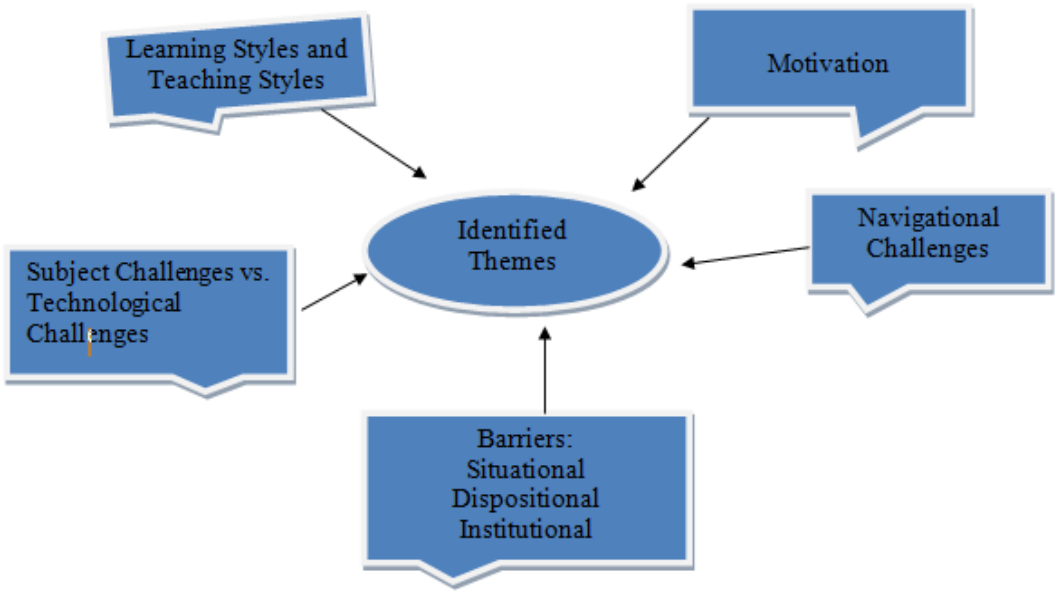

Figure 2.**Error! Bookmark not defined.** Summary of identified themes emerging from data analysis.

Finding 1: Navigational challenges. Based on responses from individual interviews, perceptions of the impact of technology and features of MFL were explained by faculty members. The navigational challenges experienced by students in using MFL were also discussed. At least three faculty members felt that the navigational challenges in using MFL and the features of the learning system hindered students and as a result affected their ultimate performance in their mathematics course. However, there were instances, after developing familiarity with the interface where students became more comfortable with the learning system and came to terms with their navigational challenges.

Finding 2: Learning barriers/challenges. Different barriers to learning were identified through the feedback provided in interviews. The barriers to learning could be classified as dispositional, institutional, and situational. Each barrier, as a single factor, may have affected how students learned, and could have impacted their progress in engaging with MFL and achieving success in their mathematics course.

Finding 3: Subject challenges vs. technological challenges. This particular theme was considered as two sides of the same coin in that both subject (mathematics) and technological challenges may have contributed to student performance. Also individually as components (subject or technological), they could have had some impact on the success of students. The narrative discussion of findings section will explore this finding further.

Finding 4: Learning styles and teaching styles. All four participants spoke to the learning styles of students and how learning styles factored into student engagement with or reaction to MFL. In the same token, as it related to learning styles, participants referred to teaching influences or their individual teaching styles which they adjusted in order to meet student learner styles or learner expectations for engaging with MFL. The adjustment in teaching style or in teaching delivery was on account of the need to promote student success in using MFL and to engender an understanding of the mathematics curriculum.

Finding 5: Motivation. To a lesser extent, and as directly discussed by only two of the participants, varying levels of student motivation were a contributing factor in how students engaged with MFL. Nevertheless, motivation as a theme was important in that if

it was not mentioned directly, it was an underlying factor of the other themes that emerged. Motivation was also important for explaining student experience and interaction with MFL.

Narrative Discussion of Findings

The use of a narrative approach lends itself to comprehensive description as it pertains to "experiences and an exploration of the meanings that the participants derive from their experiences" (Wang & Geale, 2015, p. 195). Narrating the findings of the research study gives voice to the participants of the study along with the researcher. The narrative that follows will detail and expand on the findings of the study.

Finding 1: Navigational Challenges

All interviewees discussed the impact of technology, MFL, on student learning experiences. Responses were couched in terms of how students interacted with the learning platform from a navigational perspective along with the features and functionality of MFL. Through the feedback on students navigating MFL, the merits and limitations of the learning platform were also shared by the interviewees. Responses regarding student navigational challenges and features of MFL were discussed in relation to whether they encouraged learning or possibly served as a deterrent.

When MFL was first introduced for delivery of the mathematics curriculum it appeared that it may have been regarded by faculty as the sole tool for mathematics instruction where students navigated through the platform. However, based on the failure rate of students using the platform for mathematics, it was concluded that it needed to be used in collaboration with faculty instruction and input in order to guarantee success in

student learning. Interviewee Kenneth stressed that MFL should be used as a tool to complement learning as opposed to a singular method of instruction. Kenneth noted "It should be used as a tool, not just the whole experience; should be used as a tool to aid the instruction, not just substitute for the instructors."

Similarly, another interviewee echoed the use of MFL as a complementary tool for teaching. Meaghan positively affirmed 'if it's used it's a great enhancement tool" and "If the teacher is the teacher and the software is designed to enhance what has been taking place within the class, then it is a wonderful tool". Faculty input to enthuse and complement student instruction and learning was certainly a recurring theme in the feedback received from interviewees. Penelope, another interviewee, attested to the fact that "the lessons had to be very professor driven."

In terms of ensuring that students were well equipped for having a positive experience with MFL, faculty found themselves increasingly playing a supportive role to students. The nature of support included creating resources and notes, and providing extra instruction which varied with regard to extending lecture delivery time and one on one instruction with students. Ruby noted that she, along with several faculty colleagues "created numerous videos on how to solve FAQ problems." In providing these components of support, faculty were deploying a strategy for increasing the comfort level of students to succeed in using MFL and exhibiting a diligence in the care of their students.

The navigational challenges as experienced by students were reiterated by participants throughout the interviews. Penelope recognized that MFL was "not a student

friendly platform" as there were not only too many steps for navigating the platform, but it also took time "a week to 10 days" for students to figure out how to navigate the platform and be reasonably comfortable with its use. In her opinion, Penelope felt that "80% of my students had a difficult time with the platform."

MFL is an adaptive type learning technology which personalizes student learning paths and utilizes content mastery. The content mastery aspect of MFL depends on a gated system which determines the speed at which students navigate and progress through the modules of MFL. The format of MFL may have restricted the learning of some students due to its gated nature. According to Kenneth, "The struggling students they would attempt to use the software outside of the classroom but like I said they would get stuck and then even just stop because it was set up, it was gated you couldn't move to the next thing."

The actual navigation of MFL in order for students to progress through modules seemed longwinded and prolonged for students. A screenshot of MFL instructions provided by an interviewee highlighted the repetitive format of instructions within the learning platform. Students may have felt overwhelmed by the magnitude of instructions provided for getting from section to section of the course and therefore may have felt discouraged to consistently engage with MFL.

While it was felt that students experienced navigational challenges, it was also felt that MFL contained enough content to help students familiarize themselves with and navigate their way through the learning platform. The self-contained aspect of MFL was geared towards assisting students in the use of the platform. Interviewee, Meaghan

confidently noted “they have what’s called a wizard which takes them to a tutorial, typically like 30 minutes and show [sic] them how to use the software, how to access all the resources and all the other great stuff.” Not only did MFL guide students in using the platform, but it also yielded enough content to assist student in gaining mathematics mastery.

Merits and limitations. In terms of the specific merits and limitations of MFL, there were varied responses from interviewees, Ruby praised MFL as it automatically graded all assignments, provided numerous instructional videos and animations along with several self-help resources such as ‘Help Me Answer This,’ ‘View An Example,’ and ‘Ask My Instructor.’ Since an objective of MFL was to serve as a diagnostic tool, the Path Builder and Skill Check features of MFL, according to Ruby, afforded students the opportunity to exempt from modules or topics. However, the Path Builder feature, while perceived as an advantage for students unwittingly became a disadvantage to students in the long run as they neglected to continue working in MFL based on their exempted work. Ruby voiced her concern about this feature and noted the impact on students who neglected to continue working on modules. “Since they had been coasting the previous week(s), they were not as prepared time wise as the students who had been tackling the previous modules all along”. Students lapsed into student syndrome as they delayed in applying themselves to continue through the necessary course modules. Failure in their mathematics course was therefore a consequence for some students who delayed in completing modules.

Underlying the procrastination that students exhibited in completing course modules is the idea of student time management. In explaining the navigational challenges of MFL, interviewees directly and indirectly alluded to the time management of students or the significance of time. In the initial stages of using MFL, as students grappled to become comfortable with the learning platform, time seemed to work against them. Penelope observed that for some students their initial encounter with MFL was challenging as they were unsure how to navigate the technology. She also asserted "this course is like really fast paced and you know they can't afford to lose even a day of work". The 8-week accelerated format of mathematics did not give some students enough time to acclimate to MFL and by the time that they did become acclimated, the eight week period had come to an end.

Contrastingly, another interviewee, Meaghan, praised the fact that MFL facilitated "24/7" access to the learning platform. The asynchronous feature of MFL presented the opportunity for students to presumably manage their time as they could access the platform around the clock and not just during scheduled class time. Ironically, though, it was the successful students who used MFL outside of class time as opposed to the struggling students who were challenged in using MFL. Students who were challenged in using MFL, according to Kenneth, "struggled to use it as the sole instructions outside of the classroom." The lack of guidance in using MFL outside of the classroom was a prohibitive factor for some students and impeded their learning.

Other limitations or restrictions in the use of MFL by students were focused on by interviewees. Two of the interviewees addressed the stylistic and customized

functionality associated with the platform that impacted students and faculty alike. While MFL was designed to auto grade students' work, the auto grading did not always align with the symbols and characteristics inherent to mathematics as a discipline. From a teaching perspective, it sometimes meant that after students had completed and submitted their work, faculty had to manipulate the technology and manually change a student's grade due to incorrect auto grading.

Penelope noted "If you did not put in the answer in the exact format that the platform required it would give it to you wrong." Added to that, entering decimal places and variables in response to mathematics questions could be graded incorrectly if not entered in the exact format. This was perceived as a disadvantage of the platform and a possible factor contributing to student disengagement from mathematics. Auto grading may have forced students into a situation where they needed to repeat a test; this was consequently seen as a deterrent and responsible for students losing interest.

Similarly, Meaghan spoke to the requirement of typing in answers into MFL in the exact format. She cited this as a difficulty since students "did not have the freedom to put spaces in or commas; or you know the things that if they had a handwritten assignment it would not have been marked off for." This observation spoke to the way in which technology may not mirror the traditional way of teaching or of using a pencil and paper format that students may be used to. There is an assumption that a learning platform or learning technology will mirror the traditional method of learning but this is not necessarily the case. However, the insertion of learning technology or software into the teaching and learning process is not meant to replicate traditional methods but to

increase learning and teaching efficiency. The increasing ubiquitous presence of learning and teaching technology warrants changes in pedagogical strategies by faculty or instructors. Interestingly, the idea of faculty adjusting their teaching style featured prominently in the feedback from interviewees and will be discussed in another finding in this section.

The volume of work that the MATH 062 curriculum demanded was cited as a deterrent to students. For instance, compared to the number of problems assigned for week 1 for college level courses such as MATH 114/MATH 104- College Algebra and MATH 190- Pre Calculus Math, those required for MATH 062 Basic Algebra seemed quite overwhelming for students. The mentioned college level math courses were taught using MML, a learning platform similar to MFL. Comparatively, the number of problems assigned in week 1 between the three levels of math courses was higher in MATH 062. There were 270 problems assigned in week 1 in MATH 062 compared to only 60 problems in MATH 114 and 49 problems in MATH 190.There was a marked difference in the number of problems assigned in week 1 for higher level college mathematics courses and the transitional course MATH 062. The volume of problems for MATH 062 may have been due to the remedial nature of the course and that students needed comprehensive practice with mathematic problems, hence the scope of assigned problems. Ruby commented that “the sheer volume of problems” was a top complaint from students.

The merits of MFL were also duly noted by interviewees in addition to the limitations. As it related to some of the features of MFL and their contribution to student

learning, interviewees strongly endorsed these. The instant feedback to students, instructional videos, animations, and resources such as 'Help Me Answer This,' 'View An Example,' and 'Ask My Instructor' were some of the features commended by interviewees. Resources such as learning aids were made available to students at crucial points such as test taking in the MFL curriculum. The inclusion of instructional videos in MFL was commented on by interviewees in a complimentary way. Penelope not only felt that the videos promoted student learning, but that they were also "well made and attractive so they kept students' attention."

Finding 2: Learning Barriers

Learning barriers or challenges can assume different forms. Within the literature review, I examined learning barriers relating to MFL which could hinder student learning and potentially result in student failure of their math courses. The learning barriers were not inherent to MFL but may have possibly emerged due to student interaction with MFL as a tool for learning. Learning barriers can be classified as situational, institutional, or dispositional. The former, situational, refers to barriers that may be created by student life circumstances while institutional barriers are deemed to be created by an institution's policies and practices, and dispositional barriers may be created from students' self perceptions or attitudes.

While the identified barriers which affected students were not specifically named by interviewees, the feedback provided by them could be interpreted and categorized into situational, institutional, and dispositional barrier types based on the general definitions obtained from the literature. These barriers undoubtedly shadowed the way in which

students experienced MFL. Explaining barriers is therefore useful for comprehending students' experiences with MFL.

Situational barriers. Situational barriers spanned student challenges with establishing proficiency in the use of computers, personal access to the use of a computer, and developing a comfort level with using computers in general. Interviewees recognized that student challenges in using MFL may have been predicated on age and the circumstances of the student who was returning to the learning environment after a long absence. Older students returning to learning may have lacked a familiarity with the use of computers, and the fact that a large portion of their learning occurred in MFL may have put them at a disadvantage to become proficient in using a computer and as a result using MFL.

Kenneth affirmed "that was the problem with the older students who hadn't been in college for 20 years or something…they're not used to doing learning on a computer." Added to the challenges of lack of familiarity with using computers was the lack of individual access to a personal computer which was seen as a financially induced challenge. In speaking about the increased familiarity of students with the interface of MFL, it was felt that students needed to realize that education and technology had become best friends.

Likewise, Meaghan referenced adult learners who had been out of school for a while and who did not learn well from computers. Not only did students not connect with using computers, but they also tended to struggle with software in general and "stay away from online classes." Her point reinforced the situational barrier associated with older or

adult learners who experienced anxiety, fear, or a reluctance to use computers. By comparison, it was noted that the traditional college student having grown up in technology embraced MFL with enthusiasm and did not exhibit the fear or reserve as exhibited by older learners.

It was noted that while using MFL was intuitive for some students, other students did not know how to proceed and they would "just blindly click on icons." This observation suggests that some students were less directed than others in their learning. Further, the lack of student self-direction could be related to students' preferred learning style. Learning styles as a finding will be later discussed in this narrative.

Dispositional barriers. Dispositional barriers, as in student beliefs, values, and attitudes emerged as interviewees shared their perceptions with me. A common complaint from students was that they paid too much for MATH 062 and if they were able to exempt from some of the module topics the course should be perceived as merely a refresher. Worthy of note is the fact that transitional level courses are prerequisite courses which do not factor into a student's grade point average. Students do not earn credit for these courses even though they count towards their enrollment. Students may have seen this as a disincentive in terms of the effort required on their part to complete the mathematics curriculum but not derive any tangible reward from doing so. The notion of a lack of reward speaks to the place of extrinsic reward in learning.

The scope of work required by students in MFL for the mathematics curriculum in a limited 8-week time frame was overwhelming to students. Although this was seen as a dispositional barrier to students, it could also be viewed as an institutional barrier since

the use of MFL and the 8-week teaching delivery period was an institutional decision. The use of MFL and the successive mastery of mathematics called for students to be self-directed in their learning, and even though struggling students were pointed by faculty to resources such as Khan Academy and Purple Math, they seemed to lack the ability to help themselves. This dilemma resulted in "hand holding" to support students as expressed by Kenneth. Consistently hand holding students through their learning did not encourage students to be empowered about their own learning.

Institutional barriers. Institutional barriers revolve around an institution's policies and procedures and can directly or indirectly affect students' learning or their full participation in learning. With regard to the realm of institutional policies and procedures, students do not have any control over these or the way in which policies are executed or implemented. Along these lines, one can conclude that MFL was within the scope of an institutional academic policy and was implemented in the best interest of students; specifically to enhance the learning outcomes of students in transitional mathematics. The ensuing narrative discusses students' challenges solely from an institutional practice viewpoint.

The mathematics curriculum for MATH 062 was delivered through MFL within an 8- week period. It was felt that the accelerated format of eight weeks for math delivery impacted students' learning curve and subsequent chance to become more familiar with using MFL. Students were not given enough time to acclimate themselves with MFL so as to gain a level of comfort which would augur eventual success in their mathematics course. The demanding curriculum as in "sheer quantity of homework problems" in the

opinion of one interviewee was the top complaint from students and may have been a disincentive for them.

It was expressed by interviewees that students were expected to complete several preliminary activities such as watching videos and finishing practice problems for which they did not receive credit. According to Penelope, "It was frustrating doing all the work and not getting credit; they only got credit for the posttest." It seemed that students were obliged to do "busy work" which was essentially significant practice in math problems to increase their chances of success in math. The aspects of "busy work" and lack of reward were confirmed by Ruby who commented that "It seems (sic) unusual that students must complete the "homework assignments...for no credit." Again, this perception relates to extrinsic motivation and the absence of a tangible reward. From an administrative standpoint, using MFL should have been a means to an end for students to achieve mathematics mastery but it appeared that from the students' perspective there was questionable perceived usefulness.

As part of the mathematics curriculum in MFL, students initially completed a diagnostic test or pretesting assessment, Path Builder. It was felt that if students by virtue of math placement testing had already placed into transitional level MATH 062, then another form of pretesting was only adding insult to injury considering that math placement into MATH 062 was already an indicator of students struggling or being weak in math. Kenneth felt that "The aspect of testing in the beginning to see what they needed to do, that wasn't effective because they've already had bad experiences with learning math." The requirement of pretesting served to reinforce students' fear of math and

seemed counter- productive to the ultimate objective of increasing student learning and success. Nevertheless, it was acknowledged that the pretesting assessment was an inclusive feature of the MFL product.

Finding 3: Subject Challenges vs. Technological Challenges

This particular finding seemed multidimensional in that students' experiences with MFL could be interpreted based on subject challenge as in mathematics or based on technology. Students' experiences could also have been a combination of the two challenges. The challenge of trying to understand the subject matter, mathematics, seemed to be exacerbated by students' struggle with using MFL. Students could have potentially gained a comfort level in using MFL but it may have been that they learned differently or did not have enough time to acclimate with the technology.

Interviewees responded with varied feedback as to whether the student experience with MFL was subject oriented or technologically oriented. Kenneth remarked that a small percentage of struggling students could catch onto using the MFL interface. However, he also saw the situation as a two-fold disadvantage as he remarked "struggling students couldn't catch on to the interface or the math." Penelope backed up Kenneth's idea of the two-fold disadvantage that students experienced in relation to MFL as she felt that most students struggled with math as a course, but the added struggle of a challenging learning platform did not position students to actually pass their course.

In order for students to develop an ease of use in using MFL, interviewees recommended a varied range of time. In terms of developing an ease of use in using MFL, interviewees' responses varied in the amount of time that they recommended for

students working in MFL outside of scheduled class time. The recommended times were mentioned in relation to students who were struggling with MFL or who were comfortable with its use. On the higher end, participants recommended that students should work 3 to 4 hours per day in MFL outside of class time. On the lower end, participants recommended that students could benefit from working at least 30 minutes to 1 hour per day outside of class time. The response provided by Ruby did not quantify a specific amount of time. Nevertheless, she felt that if a student exempted a module, they would spend zero hours outside of class time for that week working in MFL.

Finding 4: Learning Styles and Teaching Styles

Interviewees reflected on the implication of student learning styles or student learning preferences in relation to using MFL. The use of technological tools in learning dictates that students may have to change the way in which they traditionally learn. Moreover, integrating technology into the education environment presupposes that students are well equipped with the appropriate skills for learning with technology. The use of MFL for delivering the mathematics curriculum cast students in more of a studentcentered learning role where they were expected to be active participants and be more self-directed.

On the point of self-direction, the use of and way in which MFL was set up undoubtedly called for student self-direction. The irony is that if students were challenged in using MFL, they would not probably find the capacity to be self-directed. Kenneth spoke to the fact of supporting students in their learning to the extent of “hand holding” which he felt was not effective in allowing students to develop mastery of the

subject matter. The lack of self-direction by students prevented them from empowering their own learning and resulted in the need for personal instruction. Kenneth emphasized that MFL was only "directed in a certain way of learning that may not be their style…you have to have that personal instruction; that's also a learning style". The feedback on the necessity for personal instruction for students aligned with Kenneth's former emphasis that MFL should be used as a tool and not the primary form of instruction; instructor intervention was indeed a necessity.

From a traditional perspective of learning, students have benefitted from the use of a textbook which is symbolic of and supports a tactile learning style. With the use of MFL, students complained about the lack of a designated textbook for download or purchase even though there was a textbook associated with each subtopic. Although this concern may seem of minor import, given that students are encouraged to use an e-book in technology domains, one can infer that this may have contributed to students' lack of learning success or enthusiasm.

The idea of the traditional way of learning recurred in interviewee feedback. Interviewee Kenneth referring to the "old school way" defined the traditional way of learning as "doing homework at home by hand, on paper, with the book to help". Technological intervention (as in MFL could be part of the learning process but students, particularly struggling students, would have a better chance of success if given the option of a traditional method of learning.

In contrast to the idea of accommodating students' preferences for a traditional way of learning, interviewee Meaghan affirmed that MFL addressed all types of student

learning styles in terms of visual learning, auditory learning, and kinesthetic learning. Learning in MFL afforded students options that could be limited if students solely used a textbook for learning. MFL offered students a more interactive environment for learning whereby they could pace themselves and they could see the steps involved in working specific problems and then gain enough confidence to work the problem from beginning to end on their own.

Learning styles cannot be discussed as a separate entity from teaching influences given that students' learning experiences or success in using MFL was reliant upon input from faculty. A successful teaching-learning dynamic should incorporate the appropriate teaching strategies, on the part of faculty, that would stimulate achievable learning outcomes. A continuing theme highlighted in interviewee feedback was the shift in faculty teaching style in order to accommodate student learning. It was evident that all faculty seemed to have adjusted their teaching style and created a learning loop between their teaching and MFL, in some manner, or went the extra mile to help students in using MFL or managing their mathematics curriculum. This feedback suggested how conscious faculty were of student challenges as they experienced MFL. It also conveyed faculty diligence in safeguarding student learning success.

Meaghan revealed that she somewhat changed her teaching style and advised students on how to "chunk down the assignment" so as to make work more manageable for them. She initially guided students to complete mathematics problems without MFL resources. Upon completion of the problems, students were free to use the resources. Meaghan's practice helped to build student confidence and their knowledge retention of

the subject matter. She also revealed that her adjustment in teaching delivery to include giving notes, teaching the material traditionally, and then directing students to complete work in MFL, was on account of her reflecting on her role as an educator and recognizing the needs of her students.

The need for employing a traditional approach to teaching was endorsed by Kenneth who revealed that he incorporated a mini lecture in his teaching which eventually, over time, became longer because students needed more explanation via a step by step explanation process. Notably, students who struggled with MFL and those who were comfortable in using it seemed to derive benefits from the lecture method. In Kenneth's opinion, facilitating learning through the incorporation of a lecture segment helped the student failure rate. Additionally, the aspect of side by side tutoring within and outside of the classroom was very important to student learning to actually get them to be successful.

Although MFL was commended as a great pedagogical tool which provided instant feedback, step by step solutions and numerous media options, faculty were resourceful in creating their own videos for students and establishing open lines of communication with students through e-mail, text message, and chat as stated by Ruby. Importantly, one should note that with the introduction and implementation of MFL as a teaching and learning tool, faculty themselves could also be considered as learners. In this regard as faculty became more adept with using the learning platform, this would be passed on to their students.

Finding 5: Motivation

Although motivation emerged as a theme to a lesser extent in feedback from the interviewees, it underpinned the way in which students interacted with and experienced MFL. This was interpreted through comments from the interviewees. In the literature, motivation is documented as intrinsic and extrinsic, the former referring to motivation that naturally comes from within an individual, the latter referring to motivation that is driven by external sources or derived from external rewards.

The fact that students were deterred by the customized and stylistic features of MFL, as identified by interviewees, spoke to the potential of this to affect student motivation. In describing students' loss of interest or disengagement from MFL, interviewee Penelope repeated the word "frustration" which conveyed a clear sense of the emotion involved in the student experience in using MFL. Her description of students' frustration was in relation to the auto grading feature of MFL and the completion of preliminary activities (e.g. practical problems) in MFL for which they received no credit.

While motivation may have wavered for students, their status in a transitional level of mathematics, otherwise regarded as developmental, may have also contributed to the waver in motivation. Students were placed in transitional math due to their insufficient skill or understanding in math. Also, levels of motivation could have been governed by students' past experiences with math which they could bring to bear on their present experience with math.

It seemed that extrinsic and intrinsic motivation occurred on a spectrum, particularly for those students who had a positive experience with MFL. Kenneth noted

that students who performed well in MATH 062 were more prone to use MFL outside of class time. There was an impression that students who were naturally motivated were the ones who continued to learn. Students who were able to navigate MFL with ease and work in the platform may have possibly felt a sense of fulfillment and achievement which spurred them on to continue working in MFL. This scenario attests to the spectrum of intrinsic and extrinsic motivation for students in using MFL, albeit in relation to students who had ease in using MFL. In comparison to the successful students, interviewee Kenneth noted that failing students did not use MFL that much outside of the classroom given that they struggled to use it.

Ruby's comment about student procrastination if they had exempted from modules or topics hinted at a possible lack of motivation on the part of students. Ironically, being exempted from courses should have served as extrinsic motivation for students and propelled them to maintain their momentum and completion of the required math course modules. However, this did not happen.

Interviewees in their feedback disclosed the range of support that they had provided students with in order to help them acclimate with MFL and resultantly achieve success in the mathematics curriculum. One may infer that these concerted attempts of influence and support, on the part of faculty, were part of a process to fuel intrinsic motivation for students. Although interviewee feedback did not directly articulate that efforts were geared towards stimulating motivation, one can conclude that these efforts may have impacted students in a positive manner to gain control of their learning. Control of learning is a fundamental form of motivation which is rooted in the notion that

the effort that students exert will result in positive outcomes. If students were motivated by faculty support, control of learning would be realized.

Based on faculty emphasis of their efforts to adjust their teaching styles in order to meet student learner styles or learner expectations for engaging with MFL, the selection of a faculty PD seminar as a project flowed from the findings of data analysis. The project focused on teaching strategies that supported students in blended learning, specifically in the F2F component of blended learning. The teaching strategies were viewed as a way to further enhance student learning and achievement in math.

Addressing Discrepant Cases

There were no discrepant cases accounted for during data analysis. Although participants provided their individual experiences, the viewpoints expressed did not differ. Levitt, Motulsky, Wertz, Morrow and Ponterotto (2017) emphasized that discrepant cases can enhance the coherence in findings. This study used four participants who taught at the same location and who not only had considerable math teaching experience but who were also very familiar with MFL.

Evidence of Quality

Member checking was the main method used for ensuring the quality and accuracy of data. Given that interviews were the sole means for data collection, it was imperative that participants were allowed to authenticate their experiences and validate the information that they had shared with me. Member checking was completed after each interview was transcribed. Each participant received a copy of their interview transcript via email to review and examine. Additionally, I used a peer debriefer who also

reviewed the interview transcripts; the impartial perspective helped with the credibility and validity of information.

Summary

In data analysis I discussed the findings from data that were collected on faculty perceptions of students' experiences in engaging with MFL. The data from interviews were transcribed and developed into themes. Five themes emerged: (a) learning styles and teaching styles, (b) subject challenges vs technological challenges, (c) motivation, (d) navigational challenges, and (e) learning barriers. The outcomes relate to the conceptual and theoretical frameworks that underpin the research study. Bandura's (1989) bidirectional influences of behavior, personal factors, and environmental factors align with the themes that emerged. For example, learning barriers which are a result of personal circumstances can govern environmental factors, and can affect behavior.

The TAM (Davis, 1989) in terms of its usefulness of technology and ease of use components relate to how faculty described student experiences with MFL; specifically how students viewed the use of MFL and whether or not they felt challenged in using the learning system. Student motivation was mentioned in relation to the extent that students felt encouraged or discouraged to engage with MFL. Since students' motivation wavered in the use of MFL, the components of the ARCS model (Keller, 1979) were minimally observed by faculty.

The project deliverable was a PD seminar. The PD seminar was selected based on the outcome of the results of the study. Faculty were already employing teaching strategies to support student learning and could further benefit from a professional

development seminar that exposed them to more teaching strategies. Offering a PD seminar that focuses on faculty teaching strategies could help faculty reach a wider audience of students, enhance student learning outcomes, and aid in student persistence.

Section 3: The Project

Introduction

In this study, I focused on faculty perceptions of the student experience in using the MFL learning platform. The findings of the study confirmed the need for a PD seminar for faculty on teaching strategies that support blended learning. The timely offering of PD would not only expose faculty to additional teaching strategies, but it would also augment their existing teaching strategies. In this section, I elaborate on the goals and rationale for the selected PD, present a literature review demonstrating and justifying the genre appropriate to the problem, and detail the implementation and timeline of the project. Other areas that are addressed in the section include potential barriers to implementation of the project, project evaluation, and the implications of the project related to social change.

Description and Goals

The specific genre of project is a PD seminar for faculty who teach MATH 062, a developmental/transitional course, using the MFL learning platform technology. The seminar will span 3 days, each day covering an 8-hour period. The delivery of the seminar will rely on a collaborative approach that will draw on active engagement from participants. Participant engagement will be encouraged through daily presentations, group discussions, and opportunities for participants to reflect on teaching practices and sharing best practices.

The purpose of the PD seminar will be to explore more teaching strategies with faculty that they can use in F2F teaching with students. While the main goal of the PD

seminar offering will be to highlight teaching strategies that faculty can employ to support students as they use MFL to learn mathematics, it is anticipated that the reinforcement of teaching strategies can aid in increased successful learning outcomes for students. Students enrolled in developmental/transitional level mathematics may require more teaching support than students enrolled in college level mathematics given that the teaching delivery for the two levels may differ. Researchers have showed that students enrolled in developmental/transitional courses would better benefit from teaching that draws on active learning (Bollash, 2013). Making connections to real life may also help with improving learning for students who are enrolled in developmental offerings (Alexander, 2013; Cafarella, 2013).

In terms of goals, the PD seminar will serve as a vehicle for (a) enriching the learning experience for students in a blended learning environment, (b) heightening the faculty/student dynamic, (c) augmenting the existing teaching strategies of faculty so as to meet student learning needs, and (d) improving the overall academic success of students in achieving mathematics curriculum objectives. The daily agenda items of the PD seminar were specifically designed to emphasize techniques for a learner oriented environment. The components of the PD seminar with regard to a summary of the seminar, timeline, activities, materials, and daily delivery of training can be found in Appendix A.

Rationale

In order to gain faculty perceptions of student experiences in using MFL, I conducted a qualitative case study using interviews for eliciting faculty perspective. The

participants' interview responses described student engagement with MFL. Technological and navigational challenges were mentioned as challenges to student performance.

The data emerging from the study highlighted the following crucial areas and themes: the impact of technology on learning experiences, learning barriers and navigational challenges, subject and technological challenges, learning styles and teaching styles, and motivation. Upon reflecting on the existing themes, it became clear that I had no control in addressing any challenges that were related to the use of the actual MFL technology. Any challenges with regard to the technology were beyond my scope because the use of MFL was an institutional choice.

However, the theme of learning styles and teaching influences was an area where my attention could be directed and I could provide some input given that it focused on the teaching and learning dynamic between faculty and students. More importantly, based on feedback from faculty during the interview process, it was apparent that they were already using teaching strategies to support the teaching of students and that they could benefit from PD that explored more teaching strategies. As students intermittently struggled with navigating and using MFL, faculty notably complemented student learning with different teaching strategies.

Therefore, a PD seminar on teaching strategies that supported blended learning (i.e., a hybrid of using MFL and F2F classroom instruction) was the best approach for enriching the student learning experience and, by extension, improving the success of students in developmental/transitional mathematics. Kennedy (2016) stressed "content

knowledge" and "collective participation" (p. 27) as required features of PD programs. For these reasons, a PD seminar was a fitting method to present new and beneficial information to faculty that they could respond to and discuss. In addition, targeting faculty through a PD seminar would not only impact teaching practices but could also influence student learning outcomes (see Darling-Hammond, Hyler, & Gardner, 2017).

Review of the Literature

The findings of my qualitative research project guided me to consider a PD seminar for faculty on teaching strategies. The focus on teaching strategies would complement their current teaching practices and support rendered to students in a blended learning environment. While faculty would be the direct beneficiaries of a PD opportunity, its by-product would be an eventual improvement in student learning outcomes.

As mentioned, in data analysis, participants referred to their frequent adjustment of teaching to support students as they used MFL and received F2F instruction. To summarize, as students experienced challenges with MFL, personal instruction became a necessity to help them cope. In class, F2F instruction was strengthened through the use of more traditional learning methods, such as one-on-one tutoring, lecturing, and assigning homework. In addition, participants stressed the need to make work more manageable and accessible for students. Therefore, I considered these factors in the selection of a PD seminar and they informed the direction in searching the literature.

Condon, Iverson, Manduca, Rutz, and Willett (2016) confirmed the positive connection between faculty PD and student learning outcomes. Not only did the authors

underscore the connection between faculty PD, but they also noted instances that where "multiple faculty efforts coalesce, productive cultures of teaching and learning identified" (Condon et al., 2016, p.11). Therefore, faculty cohesion and collaboration after the delivery of PD can be anticipated. Similarly, Brener, McManus, Wechsler, and Kann (2013) endorsed the idea that PD promotes sharing and collaboration among educators along with boosting their confidence.

The literature review included peer-reviewed journals and academic journals along with theses and dissertations as sources. I drew the review from current and recent articles, specifically within the past 5 years, and in the event that articles fell outside of the required 5-year period, a justification was provided for their use; this happened when a historical perspective needed to be highlighted in the context of current trends. The primary search engines used were ProQuest, Google Scholar, Google Search, Education Resource Information Center, and EBSCO research databases, accessed through the Walden University Library. I conducted searches, based on the following words or terms: *professional development*, *faculty development*, *professional learning,* and *faculty training.* Additional search terms included *self-directed learning*, *organizational learning cultures*, *learning cultures*, *differentiated instruction*, *student-centered learning*, and *blended learning*. The word and term searches were exhaustive so as to garner an understanding of the context for PD and the student audience as learners.

Theoretical Framework

As bastions of education, it is perhaps a given that universities should be underpinned by an organizational learning culture, and for this reason, strongly promote

the development of all employees and not just their faculty members. While the organization under study is committed to providing quality education to its students, its mission and purpose also allude to its commitment to fulfill a training and development mandate for faculty. This commitment in itself made the selection of a PD seminar for faculty the most practical and obvious choice for a project.

The overarching theory that guided the development of my project was grounded in the idea of an organizational learning culture, which is sometimes used interchangeably with the term learning culture. PD is a critical component of an organizational learning culture. Theoretically, an organizational learning culture thrives when the values, systems, and practices of an organization intricately combine to value the continuous improvement of employees (Blackwood, 2014). According to Senge (1990), a successful learning organization or learning culture assimilates the five disciplines of systems thinking, personal mastery, mental models, building shared vision, and team learning. These five disciplines provide "a vital dimension in building organizations that can truly 'learn', that can continually enhance their capacity to realize their highest aspirations" (Senge, 1990, p. 6). While each discipline, as proposed by Senge (1990), bears importance for the development of a learning culture, certain disciplines, such as personal mastery, mental models, building shared vision and team learning, strike a chord as it relates to faculty PD.

Personal mastery is achieving proficiency and ensuring that individual personal goals and vision are aligned with those of the organization (Senge, 1990). There should be "reciprocal commitments between individual and organization" (p. 8). Organizational

opportunities to participate in PD can lead to achieving proficiency for faculty and realizing personal and organizational goals. Mental models refer to challenging the ways of thinking (Senge). Individuals may function based on embedded beliefs and may accept those beliefs as the status quo for guiding their actions. Faculty may have embedded beliefs as to teaching delivery. A PD seminar would create a forum for challenging beliefs and sharing best practices that could shift entrenched beliefs and develop new ways of thinking for teaching.

Organizations are customarily guided by or shaped by a vision that directs its purpose. Building shared vision relates to the collective engagement of organization and individuals (Senge, 1990). "The practice of shared vision involves the skills of unearthing 'shared pictures of the future' that foster genuine commitment and enrollment rather than compliance" (p. 9) and implies that individuals are reminded of the vision and the vested role that they play in the vision of the organization. Commitment on the part of individuals is not just merely conforming to the vision but also feeling that they are part of the vision. PD can signal to individuals that the organization has a vested interest in their growth and makes for an inclusive perception of the organization.

The final discipline, team learning, refers to the cohesive nature of a team's ability to learn together, create ongoing dialogue, and elevate the intelligence of the organization. Blackwood (2014) summed up that the ability of a team is "greater than the sum of its individual member's talents" (para. 6). Essentially, thinking together is the core of team learning.

While Senge (1990) made a convincing argument for organizational learning culture and its derived benefits, organizations have been slow to assume its attributes. True learning cultures are still the exception and not the norm and are not as common as they should be; only "10% of organizations have managed to create them, with just 20% of employees demonstrating effective behaviors at work" (Chammaro-Premuzic & Bersin, 2018, para. 3). Nevertheless, it could be possible that a learning culture exists within organizations, but it is not part of a formalized structure. The learning culture may possibly develop organically within the organization based on the interest of employees.

While learning cultures are deemed a necessity, there may be obstacles in the actual enactment and implementation (Feffer, 2017). Therefore, the suggestion of perceived obstacles sheds light on the hesitance of organizations to willingly embody organizational learning cultures. Nevertheless, organizational learning cultures are important for promoting organizational performance and require that the appropriate structure and mechanisms are in place.

A debate has developed as to whether learning organizations are still relevant in or alive in organizations. Pedler and Burgoyne (2017), building on Senge's (1990) theory, contended that the learning organization still exists but has evolved into different contexts (p. 6). Their observation of the change in context as it applies to learning organizations may be based on organizational culture and how learning is perceived and encouraged by the organization.

In terms of what specifically constitutes or defines a school as a learning organization, Kools and Stoll (2016) advanced that the components include shared vision

for emphasizing learning for students, providing learning events for employers, engendering collaboration between staff, promoting knowledge and learning exchange, and consciously "learning with and from the external environment and larger learning system" (p. 63). These cited components are apparent within the organization on which this study was based. The latter component of being responsive to the "external environment" underscores the idea that change is not only imminent within higher education but that a learning organization can be used to counteract the forces of change (Kools & Stoll, 2016, p. 63). The ongoing volatility in higher education institutions necessitates that they continually seek to transform their status through becoming a learning organization (Henning, 2018).

Sternberg (2015) drew on Senge's (1990) theory and reiterated the need for universities to assess themselves as learning organizations in order to maintain change. In order to learn universities must be willing to change creatively. Universities must have the ability and courage to change along with the belief that change can occur (Sternberg, 2015). With the uncertainty of the higher education business environment and the rapid pace of knowledge economy development, universities should seek opportunities to become learning organizations (Prelipcean & Bejinaru, 2016). Although transitioning into a learning organization may be viewed as a challenging venture, universities can evolve incrementally into learning organizations.

Taking into account the constituents of an organizational learning culture and the emphasis on individual growth, for the purposes of discussion, faculty development will be evaluated within the broad scope of organizational learning culture. The discussion

will include views on PD and professional learning. Additionally, the scope of the discussion will include a review of blended learning, differentiated instruction, and self-directed learning as these topics informed the content of the proposed faculty PD seminar.

Faculty Development

As institutions transition through great change in higher education, PD for faculty becomes more of an essential requirement and less of an ad hoc offering. Faculty after completion of the PD seminar would have more strategies for facilitating teaching and student learning. A study completed by Gurley (2018) confirmed the benefits of faculty training for teaching in blended and online courses given that teaching in hybrid formats requires different pedagogical approaches. In order to promote student learning and create effective change in the classroom environment, PD is a necessity. In order to validate the successful delivery of PD, faculty buy-in is an important component in addition to faculty having their voices heard (Alshehry, 2018).

Saroyan and Trigwell (2015) asserted that there are a number of descriptors in use for explaining "the formative processes intended to foster improved pedagogies and teaching" (p. 93). The wide range of descriptors used to denote the development process includes faculty development, educational development, academic development, instructional development, PD, and instructional competence (Saroyan & Trigwell, 2015). These descriptors tend to be more like labels and perhaps do not best convey the idea of PD.

Van Schalkwyk, Leibowitz, Herman, and Farmer (2015) in a bid to give applicable meaning to the varied terms suggested the use of professional learning in place of PD as it more appropriately connotes activities that involve teaching and learning. There seems to be a trend to differentiate between PD and professional learning, the former referring to one-off seminars and workshops, and the latter referring to improving teacher performance and student learning outcomes (Scherff, 2018). While the term PD tends to be more general in nature, professional learning is considered as being customized to needs. There is also the idea that PD is inflicted or done to its individuals, while on the other hand, with professional learning individuals assume responsibility for their learning.

McKee and Tew (2013) defined faculty development "as an intentional set of educational activities designed to equip faculty to grow in their professionalism with the result of being partners in advancing all segments of the institution" (p.13). Therefore, the implications of faculty development are far reaching in that it suggests faculty's shared responsibility and acceptance to elevate the status of the institution through acquired knowledge and skills. Adding to the discourse on what defines faculty development, Nandan and Shefali (2012) also perceived faculty development as being activity based and inclusive of seminars and conferences.

While discussion revolves around labeling and defining faculty development, it is also imperative to focus on what faculty development should entail or include. According to Dennis, Lias, and Holdan (2017), faculty development programs should not only be creative, but they should also contain current information which ultimately urges faculty

to apply the information to their teaching. The creative input into faculty development offerings and the need for participants to quickly apply newly learned skills and knowledge are of paramount importance.

Continuing in the line of thought as to what faculty development should entail or include, those who facilitate faculty development should be current with up to date ideas and philosophies, and present chances for faculty to engage and reflect (Webb, Wong, & Hubball, 2013). Interestingly enough, Webb et al. (2013) made a compelling case for the professional development of adjunct faculty and how it should proceed given that adjunct faculty have specific needs and circumstances. Content wise, Webb et al. expressed that development for adjunct faculty should not only be "grounded in educational theory and practice" but it should also prepare faculty for "developing self-directed learners and critical thinkers", and consider the academic discipline that faculty are skilled in (p. 233). The case that Webb et al. built for the PD of adjunct faculty is most sensible given that budget cuts by universities have veered more on the side of employing adjunct faculty (Caldwell, 2018). Also, adjunct faculty may not be as well versed as full time faculty in pedagogical strategies. Making PD an all-inclusive venture also seeks to not marginalize but engage adjunct faculty in development activities.

Kleisch, Sloan, and Melvin (2017) suggested that faculty development lends itself to the attributes of andragogy and as such, training and development activities should focus on "pedagogical methods to interact with students through both the adaptive learning technology and other more traditional structures" (p. 94). The suggestion is important as the PD seminar participants would have experience in using the MFL

technology and linking student learning to more traditional type teaching. PD should be systematically arranged and presented so as to connect theory with practice (Valiandes & Neophytou, 2018). PD cannot be an isolated activity that does not acknowledge the experiences of participants.

In addition to the discourse on what faculty development should contain as an activity, the literature has also highlighted whether faculty development should be delivered as a F2F option or as an online activity. The theme of active and full participation of participants has swayed the discussion on what would be a suitable format. Cho and Rathbun (2013) concerned that the traditional F2F format affected active participation, developed an online PD program using problem-based learning (PBL); the use of PBL emphasizing self-directed learning that would result in increased active participation. In comparison, Moore, Robinson, Sheffield, and Phillips (2017) developed a four-phase professional development for teaching in blended learning environments.

The results of Cho and Rathbun's (2013) research pressed for communicating the objectives of the activities of the online PD and communicating the expectations of participants and the amount of time that they should invest. The facilitator of the online PD should also play an active role in the program as this appeared to help with monitoring participant activity. The asynchronous nature of an online professional development program may suit the time constraints of faculty as they are able to log into their online program on their own time. Bates, Phalen, and Moran (2016) applauded the delivery of PD in an online format but cautioned that "professional development becomes

dangerous when the learning is too independent and isolated" (p. 72). Online delivery may not promote the supportive and collaborative environment that is required for PD.

However, the format of a classroom based seminar suits the purposes of the proposed PD seminar as the faculty centered approach will draw on the best practices of faculty which can be shared and discussed in real time. Further PD could possibly be followed up via an online arrangement. The idea of a faculty centered approach for a professional development seminar is echoed by Gunersel and Etienne (2014) whose study of a faculty development program reiterated that the success of a PD is predicated on the basis of knowledge and expertise sharing by faculty. Cooperation and collaboration should be the key tenets of professional development as they improve instructional capacity and advance a sense of teaching community (Stosich, 2016).

Baran and Correia (2014) addressed the need for a PD framework for online teaching specifically in higher education. Their concern surrounded the idea that faculty need guidance as they transition into teaching in online environments. In Baran and Correia's (2014) opinion, "the interaction of supports at three different levels: teaching, community and organization" (p. 98) are components for serious consideration and recognition for a PD framework for online teaching. Teaching support focuses on technology, pedagogical, and design and development; community support focuses on communities of practice and peer support; and organizational support focuses on the organizational culture. Although the intended PD seminar for faculty will be delivered as a F2F offering, this article is included here as the components of support for online PD are equally applicable to a F2F PD environment.

When faculty development is implemented, there will be expectations for positive changes in faculty teaching and student learning. Lancaster, Stein, MacLean, Van Amburgh, and Persky (2014) addressed how the impact of faculty development should be assessed or measured. Faculty development programs should be measured by a multidimensional assessment plan which is crafted while the program is being developed. The assessment of development programs while they are being developed can aid in ensuring that program objectives remain a priority.

There are also certain preexisting conditions or features that may foster the realization of change when faculty development occurs. Kirkpatrick's conditions of change (as cited in Kamel, 2016) highlight elements that should exist prior to faculty development. Those conditions consist of individuals being desirous of change, having the knowledge of what to do and how to do it, having a supportive work environment, and benefitting from a potential reward for change. While these previously mentioned conditions should exist in order to effect change, Kamel (2016) advised that the first two conditions of change can actually be accomplished through the implementation of faculty development activities. To achieve success in PD, faculty must be willing to assume "adaptive expertise" which challenges their mental models and the assumptions that they bring to teaching (Smith & Starmer, 2017, p. 25).

As it relates to the faculty who will participate in the proposed PD seminar, they possess vast knowledge of teaching in their discipline and in a blended learning format. Additionally, there is an in built peer support between faculty members and ongoing support for their development from an organizational perspective. Faculty are inherently

characterized by a need for change and may be motivated to teach and utilize new strategies of teaching. A study conducted by Stupinsky, BrckaLorenz, Yuhas, and Guay (2018) examined how faculty motivation for teaching was a determinant of whether they explored best teaching practices and if motivation differed across higher education institution levels, e.g. doctoral, master's, and bachelor's. Stupinsky et al. (2018) reported that faculty demonstrated "identified motivation for teaching" (p. 23) based on beliefs of importance of teaching, and that faculty who taught based on the enjoyment and value derived, were more prone to teach in effective ways.

As a final point, faculty development is not only significant for enhancing PD but it should also be a mechanism for improving student outcomes (Guskey, 2017). To this end, Lim and Choy (2014) conducted a study investigating the impact of PD for new staff in a PBL environment. The staff reported that they were better able to respond to students with their newly acquired degree of knowledge by promoting active learning and collaborative learning, two constructs associated with PBL (Lim & Choy, 2014).

Blended Learning

The content of the faculty PD seminar included topics such as blended learning, differentiated instruction, and student self-directed learning. The topics were relevant given the need to review the context in which teaching and learning occurred that being blended learning, and teaching strategies which faculty should be cognizant of and could use to improve student success. The teaching strategies were addressed from the perspective that faculty could use them in a F2F classroom setting.

In blended learning designs, students are afforded an integrated learning experience using online Web based programs or content, along with a F2F classroom component. The concept of blended learning advocates that students have "control over time, place, path, and/or pace" (Maxwell, 2016, para. 3). Mekhitarian (2016) explored the skills and best practices that teachers should adopt in blended learning and emphasized the relevance of adequate teacher training in blended learning which results in its more effective implementation. While faculty participants had already been exposed to blended learning approaches when they originally began their teaching tenure with the organization, revisiting blended learning as a learning approach and topic served as reinforcement.

Tang and Chaw (2016) asserted that in blended learning, "the basic premise is to complement F2F classroom learning by giving students the learning flexibility as enabled by digital technology" (p. 55). However, in instances, for some students using MFL, their learning flexibility is hindered as they face challenges with technological intricacies in using MFL. Special value is placed on the technology constituent of blended learning as students are expected to be digitally literate. Nevertheless, Benson and Kolsaker (2015) singled out that technology is merely one component of blended learning and that a greater understanding of the pedagogical advantages is required. Although technology is undoubtedly one component of blended learning, it is a significant component. Therefore, students who possess a higher level of digital literacy will fare better with technology (Mohammadyari & Singh, 2015).

Differentiated Instruction

Boelens, Voet, and De Wever (2018) proposed that blended learning "holds great potential for organizing differentiated instruction in higher education" (p. 198). The results of a search for literature on the use of differentiated instruction in higher education is relatively limited and shows that research has been somewhat focused on secondary education. But, this does not negate the potential for using differentiated instruction in higher education classrooms, or as a means to complement teaching in a blended learning environment. Dosch and Zidon (2014) purported that the lack of research on the use or existence of differentiated instruction at the tertiary level may be a result of the largeness of class size, fewer class hours with students, and problems with creating assessments and fair grading. While there are differences between the teaching environments of secondary education and higher education, the differences can be a starting point for considering how differentiated instruction may be implemented in higher education (Turner, Solis, & Kincade, 2017).

In differentiated instruction, faculty adjust teaching based on content, process, product, and affect so as to match classroom instruction to students' individual learning. Content refers to the information that students are required in order to achieve their learning objectives; process refers to the ways in which students process information and learn new skills; product refers to the ways in which students show what they have learned after instruction; and affect refers to how students feel about their classroom environment. In summary, the parts of differentiated instruction focus on the input and

output of student learning and the environment in which teaching and learning should occur.

Whereas all of the components of differentiated instruction are significant, process is particularly relevant to a discussion on developing teaching support strategies for use with students. Process capitalizes on devising learning opportunities through shifting between group, individual and larger class instruction and activities. In doing so, more learners are included, reached, and catered to. An emphasis on process also suggests that student engagement may increase as a wider student audience is catered to through differentiated instruction.

Self-Directed Learning

Rashid and Asghar (2016) examined the connection between technology usage, student engagement, self-directed learning, and academic achievement among undergraduate students. The authors concluded that although students may be technologically savvy and motivated in using technology, the actual designed technology should allow for student engagement and self-direction which results in improved academic performance. Rashid and Asghar's conclusion aligns with the findings of this research study which highlighted how the design of MFL may not always support student learning. Some students may engage better than other students; the equality of student success in engaging with technology should be a principle concern.

The insertion of technology into learning dictates that students should be self-directed learners given the need to navigate time, place, and pace of their learning. Sumuer (2018) studied the relationship between student self-directed learning readiness,

the use of Web 2.0, student self efficacy, and computer efficacy. These factors explained the "limited proportion of college students' SDL with technology" (p. 39). While the use of technology by students demands a proportionate amount of self-directed learning on their part, self-directed learning readiness which is an equally important factor tends to be overlooked as an integral element underpinning self-directed learning and its relationship with technology.

Self-directed learning readiness is defined as the degree to which students have the character traits, abilities, and attitude necessary for self-directed learning. If students possess the requisite self-directed learning readiness, they would be better positioned to utilize technology. Sumuer's (2018) observation about the need for self-directed readiness as it underlies self-directed learning can be used to explain why some students experience challenges in using MFL, but the idea warrants research among MFL users so as to prove the validity.

Project Description

The project will be a PD seminar derived from the data analysis in Section 2. The seminar will be delivered over a 3-day period during the spring break and will be comprised of faculty, full time and adjunct who teach developmental/transitional mathematics, MATH 062 using MFL as a main learning system for students. The PD seminar will explore teaching strategies that faculty could use to support students as they switch between using MFL and engaging in class time. The main goal will be to enrich students' learning experience and thereby increase the academic success of students.

Potential Resources and Existing Supports

In terms of needed resources, these will be coordinated through the dean whose input is necessary for scheduling classroom space at a campus location for the seminar, approving the inclusion of a faculty member to deliver an agenda item on day three of the seminar, and confirming the budget which will include preparing and printing seminar material, and providing breakfast and lunch for participants. The use of faculty expertise for delivering an agenda items in the seminar will make for an inclusive approach.

I will coordinate and facilitate the seminar based on my familiarity with the proposed contents of the seminar and my prior experience in delivering training to faculty and staff within the organization. My sole tasks will be to organize the agenda items for each day, to prepare all necessary materials to be used, and to email the pertinent objectives of the seminar to faculty along with the agenda for each day of the seminar. Faculty will need to bring their laptops to each session so as to conduct searches when they convene for the small group sessions.

The selection of the overall project was based on the findings that emerged from data analysis. The emerging themes, therefore, informed the content of the faculty PD seminar. The emerging themes were learning styles and teaching styles; motivation; subject challenges vs technological challenges; learning barriers (situational, dispositional, institutional); and navigational challenges. Table 6 shows the alignment of themes that emerged from data analysis and themes in the professional development seminar.

Table 4

Alignment of Data Analysis Themes and Themes in Professional Development Seminar

Data Analysis Themes	Themes of Seminar
Learning styles and teaching styles	Blended learning Differentiated instruction Self-directed learning Student learning styles-VARK
Motivation	Self-directed learning Student learning styles- VARK Constructivism and technology
Subject challenges vs technological challenges	Constructivism and technology Differentiated instruction
Barriers- situational, dispositional, institutional	Blended learning Self-directed learning
Navigational challenges	Self-Directed learning Student learning styles- VARK Blended Learning

Potential Barriers and Potential Solutions

The PD seminar is intended to serve as a catalyst for sparking changes in faculty teaching methods along with facilitating increased student success in their mathematics course. However, faculty may resist the attempt at enhancing their teaching as they may feel that their current teaching practices were being questioned. With this in mind, self-reflection will be adopted as a major approach throughout the seminar as it will allow participants to retain ownership of current knowledge and build new knowledge.

While the organization remains committed to ongoing faculty development, the timeliness and interest to sustain further development of faculty may lose priority to other ventures or programs that the organization is invested in. Due to this, faculty may need to demonstrate initiative by sustaining their own development through ongoing communities of practice as suggested by the session review on the final day of the PD seminar. As previously mentioned, given the convenience of technology for accommodating the delivery of faculty development, prospective information materials could be set up online for faculty to access on their own time.

Implementation Plan

The seminar sessions will be delivered over 3consecutive days; each day consisting of 8 hours duration. All three days of the seminar will be delivered F2F giving faculty an opportunity to build rapport and to network with each other based on the commonality of their mathematics discipline. F2F sessions will also accommodate the objective of creating a community practice at the conclusion of the 3-day seminar. The venue, a campus classroom, will be confirmed by the dean at least 1 month before the scheduled seminar.

Participants will receive an initial e-mail from the dean about 3 weeks before the scheduled date of the seminar alerting them to the professional development seminar being hosted for them. A week before the seminar, as the facilitator, I will e-mail the participants details of the confirmed agenda, dates and times, along with the confirmed location. Over the 3-day period for the seminar, the delivery format of topics will

encourage discussion among participants, generate self-reflection on teaching practices, and encourage the sharing of best practices.

Roles of Participants and Facilitator

As the seminar facilitator, my main task will be to ensure that the seminar is delivered to schedule. Faculty participants will need to commit to attending the seminar for the 3-day duration. Their roles and responsibilities will extend to their engagement in and sharing of expertise while attending the seminar. Their sharing of faculty best practices will be pivotal to the success of the seminar in that sharing their experiences will render an idea of the present state of teaching and future avenues for teaching that may be explored. Although as facilitator I may not be regarded as a full participant, I will have the responsibility to encourage faculty to ponder on their teaching practices.

Project Evaluation Plan

The project, PD seminar, was developed to provide faculty with a forum to reflect on their teaching practices and consider alternative or additional teaching practices that could complement teaching students in a blended environment and the use of MFL. The primary goal of the project was to highlight certain teaching strategies that faculty could employ to support students with the intention of increasing student learning outcomes. The PD seminar emphasized teaching strategies used in a F2F teaching environment.

In reviewing the goals of the PD seminar from an evaluation perspective, the key stakeholders were faculty and students. As it relates to students, outcomes of student performance will need to be tracked post the seminar. Comparatively reviewing student outcome grade data in their mathematics course is a way for assessing whether strides

have been made in student learning outcomes. Although the alignment between teaching practices and student learning outcomes has been cited as being unclear (Nasrallah, 2014), it will be necessary to revisit whether current student assessments match course objectives. End of course student evaluations also can assist with the evaluation of faculty teaching practices and this in a wider sense would benefit the organization.

Given that formative and summative evaluation are administered at different stages to determine quality and outcomes (Aziz, Mahmood, & Rehman, 2018), I opted to, administer a summative evaluation to participants on the last day of the seminar. The summative evaluation is located in Appendix F. Phillips (2018) wrote that evaluations serve a multifunctional purpose as they are used for decision making or assessing the usefulness of educational programs. Participant feedback will determine the effectiveness and value of the professional development seminar, whether seminar objectives were met, and whether similar development opportunities should be offered in the future.

Summative evaluation is typically conducted to derive conclusion feedback regarding the value of a training program and whether the program has met the expectations of participants (Amua-Sekyi, 2016; Kibble, 2017; Mavropoulos, Sipitanou, & Pampouri, 2019). Over the 3days of the seminar, cumulative self-reflection will serve as a trigger for faculty self-assessment. I therefore chose summative evaluation because it would give participants the opportunity to reflect on the overall seminar at the final stage.

The overall goals of the project were to increase the teaching strategies of faculty so as to meet student learning needs; to enhance the faculty and student dynamic in the classroom setting; to enrich the learning experience of students in a blended learning

classroom; and to improve the overall success of students in achieving mathematics curriculum objectives. The overall evaluation goals will rate the usefulness and relevance of information presented in the seminar, the pace and structure of delivery, the scope of information, and the convenience of the seminar.

The final two questions on the evaluation will be openended questions permitting the participants to freely pen their thoughts. The inclusion of the two openended choices will give the participants a chance to add any other information that they think is relevant and does not place any limits on the way in which they respond. Also, the option for freely responding will show that their opinions are of value. The responses from the evaluation will be compared with the objectives of the PD seminar. The information from the evaluations will be shared with leadership and has the potential to influence the delivery of future faculty development seminars.

The key stakeholders are faculty who teach developmental/transitional mathematics using MFL, the university administration, and students. Faculty will utilize the teaching strategies recommended during the professional development seminar and will witness students' improvement in learning outcomes. University administrators are important as stakeholders as their endorsement of the professional development activity and future development seminars will play a crucial role. Students are essential stakeholders given that they will be the beneficiaries of enhanced teaching which is expected to bring about their improved academic success.

Project Implications Including Social Change

Local Community

The project addresses the needs of learners in a transitional/developmental mathematics class via the delivery of faculty development. It is anticipated that reinforcing faculty teaching methods will ultimately transfer to improving the academic success of students. The project of enhancing faculty teaching in itself can be viewed as an academic intervention for students albeit in an indirect way. Learners pursue college programs with varying skill levels in mathematics which sometimes means that they do not commence their college career in college level courses. Students who are committed to pursuing a college degree opt to enroll in transitional/developmental courses that will provide them with a solid foundation for persisting to their college level courses.

As a result of completing transitional/developmental courses, students feel better empowered to cope with college course work and ultimately to persist in college. Social change is accomplished if students persist in college as they are better positioned to contribute to the economic growth of communities. If students complete their degree programs, they are better equipped to enter the workforce, likely to earn a higher income and to be in a position to experience a better quality of life.

Far-Reaching

In the larger context, as it pertains to completing mathematics course work, success in mathematics contributes to the numeracy skills of society. Numeracy skills are not only limited to mathematics but are necessary for managing finances, functioning at work, and solving routine numerical related problems in daily life. Also faculty, as local

stakeholders, would be better prepared with a wider set of skills for teaching and incorporating technology.

Students have evolved into consumers of education and their expectations of colleges and universities have been raised. Education has become a commodity to be purchased; if students are not satisfied with the teaching or care that they receive from an institution, they do have the option to take their business elsewhere. Therefore, faculty development may serve as the bargaining factor that can help with student retention.

Conclusion

The above section outlined a faculty PD seminar on teaching strategies that support blended learning. While data analysis revealed students' challenges in using MFL, a recurring and prominent theme expressed by faculty alluded to the teaching support that they offered to their students in order for them to be successful in their mathematics course. A faculty PD seminar was therefore warranted to increase faculty teaching expertise and improve the academic achievement of students in developmental/transitional mathematics. A reflective view on the implications of developing the project and my journey as a scholar is provided in Section 4.

Section 4: Reflections and Conclusions

Introduction

In Section 4, I provide a reflective view on the development of the project as detailed in Section 3 of this study. The purpose of the study was to explore faculty perceptions of student experiences in using the MFL learning platform. While students engaged with the technology, MFL, and may have had positive learning experiences, they may also have experienced challenges in using the technology. Math faculty have strived to make adjustments in their teaching strategies in order to sustain student engagement and motivate student success. In this section, I also show the strengths of the project and its accompanying limitations. The context of leadership and change from my perspective as a developing scholar is also referenced along with my academic development as scholar, practitioner, and project developer. Finally, the impact of the project on positive social change and its implications for future direction for research are discussed.

Project Strengths

The results of this study emphasized the necessity for a PD seminar for faculty on the use of teaching strategies that support blended learning. The major strength of the project was to reinforce teaching strategies that faculty could employ in supporting students enrolled in developmental/transitional mathematics using technology in a blended learning format. The need for the effective PD of faculty teaching developmental/transitional mathematics is underscored by the number of students who do not successfully complete college level mathematics (see Edwards, Sandoval, & McNamara, 2015).

A second strength of the project is that the gathering of faculty to articulate and share best practices provided a forum for initiating an ongoing community of practice among them (see Pedersen, 2017). A third strength of the project is that faculty were encouraged to rethink their teaching delivery and to become receptive to adopting a variety of teaching strategies to help students accomplish learning (Clement, 2018). Providing targeted PD in teaching strategies for math faculty complemented their existing teaching strategies, widened their teaching expertise, and added to ongoing PD for faculty.

Recommendations for Remediation of Limitations

The main limitation of the project is there may be a disinterest or lack of commitment on the part of faculty for participating in a PD seminar. Added to that is the fact that faculty are full time and adjunct in status, and this may impact scheduling the seminar. Delivering a PD seminar to faculty during the week may pose a challenge for adjunct faculty who are otherwise employed during the working week. Remedying the limitations could be addressed through identifying champions and establishing buy-in as well as achieving communication that promotes the inclusive voice of faculty (see Henderson & Lawton, 2015). Faculty who already have a vested interest in PD can canvass the interest and involvement of other faculty members. Greater success in PD and resultant change can be achieved when "fence sitters also embrace the project" (Henderson & Lawton, 2015, p. 16).

Continuing PD is a critical component for faculty growth and an expectation of higher education institutions (Haras, 2018), and given that ongoing PD is an expectation

of the local study site and contributes to performance review, it can be anticipated that faculty will respond and welcome the opportunity. Other ways in which limitations could be addressed are through considering different delivery formats for presenting the seminar and offering stipends to faculty, both full time and adjunct, in order to increase participation (see Lowenthal, Wray, Bates, Switzer, & Stevens, 2012).

The preparation and presentation of the PD seminar needed to consider that faculty could clearly see the purpose and benefit to be derived and that content wise, they would also be able "to see the application for their practice in order to be active participants" (Beavers, 2009, p. 27). The content of the PD seminar was aimed at maximizing the engagement of faculty during delivery of the seminar. With regard to scheduling the PD seminar, it was planned to be delivered during the scheduled spring break period, which could be allotted for faculty development.

Recommendations for Alternative Approaches

An alternative approach for addressing the problem under study would have been to still use a qualitative design but to conduct interviews with students instead so as to hear their direct perceptions. Another approach would be to use a qualitative study that would compare and contrast the perceptions of students and faculty to determine the similarities and differences in their perceptions of student use of MFL. Instead of a PD seminar, I could have developed a curriculum manual. The manual would be a best practices curriculum plan of teaching strategies that faculty could complete within a set timeframe. The self-directed, module-based manual would be situated online for faculty

to complete. The organization under study already uses a brand of Web-based application for training, which could facilitate online faculty development.

Online professional training would be beneficial in terms of flexibility, access, and cost effectiveness. An online PD offering would need to be interactive in nature with means to track and record faculty progress. Providing PD in an online format reduces geographic obstacles and can help overcome participant challenges with attendance (Elliott, 2017).

The original problem of the study focused on the lack of understanding of the extent to which MFL contributed to students' success in developmental/transitional mathematics. An alternative definition of the problem could be defined in terms of how math test placement scores place students into different levels of math. A review of data, specifically math scores for students placing into developmental/transitional mathematics, could assist in providing a solution to the alternative problem.

Scholarship

As a doctoral student conducting research, I have broadened my understanding of the workings of higher education, expanded my research skills, and reinforced my writing skills, all of which I see as contributing to my continuing academic journey. During the research process and development of the project, I developed skills from the initial proposal stage through the completion of the study. I learned to collect and analyze qualitative data as well as identify credible, peer-reviewed sources to strengthen the argument that I presented. In addition, in following the research process, I not only learned to be methodical and sequential, but I also learned to be in close proximity with

data, but at the same time, develop the reserve to not become too attached to it or let any bias prevail.

Through discovering new information related to my research and to my project, I learned that offering PD to faculty not only adds value to their teaching delivery but that it also strengthens their ownership of their teaching process. Although I previously had experience in delivering training to faculty, my experience had been limited to training that was ad hoc in nature. With the experience of collecting faculty opinions, I was able to create a PD seminar that built on faculty's previous knowledge and experience.

Project Development and Evaluation

The project emanated from a qualitative case study focusing on faculty perceptions of students as they engaged with MFL to achieve mathematics curriculum objectives. I learned to start with a broad concept based on the analysis and collection of data and to narrow a concept down to a manageable and doable project. Upon review of the data findings and literature, I selected a PD project as the appropriate genre. I learned that the format of a PD project must engage participants and provide them with opportunities for articulation and reflection.

Finally, I learned the significance of evaluation in PD, specifically summative evaluation as used in the project. Evaluation is critical to determining whether the goals and objectives of PD programs have been achieved. I learned that evaluation can be used as a basis for not only future decision-making but also for improving subsequent programs.

Leadership and Change

The selected topic for my project study made me more consciously aware of the challenges that students may have faced and face when engaging with technology. Based on the findings of the project study, there is an imminent need to create a level playing field that would give all students the opportunity for a meaningful and successful learning experience; a successful learning experience that is not hindered by the intricacies of a learning platform system. Since the completion of my project study, my organization has implemented a new Web-based learning system for delivering transitional mathematics. While this new implementation is to be highly commended, this does not necessarily address the challenges that some students may encounter in using learning platform technology or Web-based learning and how they may learn.

Although my position within my organization is not a leading one per se, in that I do not have any authority with regard to decision-making, in the future I can commit to making a contribution by articulating my concerns and opinions. Through effectively voicing my concerns, using my existing relationship with administration, and forging new relationships, I can become a champion for change. Because change in higher education has become a constant and, therefore, is inevitable, my institution is always attuned to change that serves the best interest of its students and the institution as a whole. As a result, opportunities emerge for becoming involved in projects that are part of my organization's change agenda. Therefore, I will actively seek opportunities to become involved and I will need to try to move from a peripheral role to one where I can become more of an agent of change.

Analysis of Self as Scholar

As a doctoral student, I am confident that I have honed my critical-thinking skills in identifying a local problem, reviewing documented literature, and streamlining my thought processes. Initially, I was challenged and overwhelmed by the range of information that I examined, and this led to some frustration on my part. However, as I became more immersed in the doctoral process, I consistently revisited the purpose of my project study, and this practice helped me to stay on track with my topic and I was ultimately able to review information that was relevant and could genuinely contribute to my topic. Frequently, I would channel some of the advice that I had given to my students when I had previously taught a college first-year critical-thinking course.

One of the major lessons that I learned as a scholar was how to deal with setbacks and the resulting anxiety. Admittedly, there were instances where the setbacks served as motivators for me to push ahead in spite of the challenges, or they served to demotivate me, consequently leading to procrastination on my part. However, the key realization was to not allow personal issues and anxiety to derail my efforts or force me to come to a grinding halt in my academic endeavors. Personally, I have always been an organized individual who was able to meet objectives, deadlines, and goals. This characteristic was advantageous as I progressed through the different stages of the doctoral process. Nevertheless, I must give credit to my committee chair who provided constructive criticism, addressed my many questions, and provided guidance throughout the doctoral process. Sometimes, it was difficult to accept the feedback and critique of my submitted work; nevertheless, I understood that feedback was not only necessary for my growth as a

scholar but was also necessary for achieving the requisite academic quality of my project study.

Analysis of Self as Practitioner

The role of a practitioner is like a two-edged sword; as in making sure that I stay abreast of research in higher education that I am interested in and resolving to see where I can specifically implement best practices, which are innovative and beneficial. Although I had no direct relationship to students who used a learning platform technology for mathematics learning, I was able to reflect on my own experiences as an adult learner when I was first introduced to eCollege and Blackboard, two Web-based applications predominantly used by higher education institutions. It would be remiss of me to assume that my academic quest has concluded with the completion of my doctoral project study. As a practitioner, I have learned that an individual must be equipped with information in order to challenge what is readily accepted as the status quo or the right way of doing things. Challenging the status quo or what is perceived as the only way is necessary for pushing boundaries and agitating in areas where the administration may become complacent. To ensure that I can fulfill my role long term as a practitioner, my career goal is to transition into a role where I can possibly have more contact with or oversight of students. A role with more direct contact with students will better position me to serve student interests and possibly advocate on their behalf.

Analysis of Self as Project Developer

The selection of the type of project emanated from the findings of data collection. While conducting the interviews and completing the subsequent analysis of the collected

data, it increasingly became clear that the project study should benefit both parties involved; faculty and students. Although the actual PD seminar was directed at faculty, students would also be the longterm beneficiaries in the dynamics of the teaching and learning process. The actual delivery of the project, PD seminar, needed to be faculty centered in order to ensure their full engagement. Therefore, the content of the project needed to be interactive in nature and carefully selected.

The development of the project was an enjoyable and challenging experience for me as I was presented with a chance to devise a project from the beginning and monitor how it took shape. I had had previous experience in contributing to projects; however, my expertise was more by way of making a contribution based on previously established instructions and following guidelines. The success of the project would be an important contribution to social change as it is anticipated that augmenting teaching strategies will positively assist students to achieve success in their mathematics course.

Reflection on the Importance of the Work

The purpose of this study was to explore faculty perceptions of student experiences in using the MFL learning platform. During the data collection process of conducting interviews, math faculty provided enlightening information on student engagement and challenges in using MFL. A recurring theme emerging from data analysis demonstrated the need for faculty to frequently adjust their teaching strategies to support student learning in addition to students utilizing MFL.

The PD seminar on teaching strategies that support online learning or learning in a blended environment as previously explained in this chapter provided a refresher for

faculty. Pedagogical strategies used in teaching in blended and online environments differ from those used in the traditional F2F environments; adjustments therefore need to be made in teaching strategies (Baran & Correia, 2014). Students in receiving faculty support that is increasingly attuned to their learning will not only feel more confident about using technology but also more confident about achieving math curriculum objectives and academic success; the overall result being that students are more poised to pass their mathematics course and in due time persist in their college program given the low rate of persistence of students enrolled in development mathematics (Davidson & Petrosko, 2015).

Implications, Applications, and Directions for Future Research

The potential impact for positive social change exists at the individual, organizational, and societal levels. The impact at the individual level relates firstly to faculty and secondly to students. Faculty are better skilled to engage a diverse audience of students based on their wider skill set for teaching and incorporating technology; as a result, students in being engaged will benefit from an improved learning experience that can contribute to their continuation and completion of their mathematics course. At the organizational level, satisfied students who have enjoyable learning experiences may be more likely to remain at the institution which can help boost retention rates.

The project can be applied to other metros within the organization under study where developmental/transitional mathematics is taught using MFL. The implementation of the project within other teaching metros could contribute to the equality of delivering

PD across faculty. Also, the implementation of a similar PD program in other teaching metros could increase the scope of creating best practices among faculty.

The implications for future research lie in conducting the research study with faculty in teaching metros within the organization under study. The qualitative research study was based on a small sample of four participants. Future qualitative research could be conducted across a number of teaching metros and would involve a larger sample of faculty to potentially yield a greater volume of data. As opposed to a qualitative study, a quantitative study could be conducted which administers a survey to faculty that solicits their perceptions of students experiences in using MFL. Levene's test could be used to evaluate the variances of the faculty population.

Conclusion

The project acknowledged the significance of a PD seminar that will allow faculty to widen the scope of their teaching strategies and their contribution to improving student learning outcomes. The project contributed to the field of education on several levels. Faculty perceptions provided data on faculty experiences and the experiences of students as they engaged with technology, MFL. Interview data from this qualitative case study confirmed that faculty were already directing their efforts at enhancing their teaching practices so as to ensure student academic success, hence why a professional development seminar was selected. The expanded skill set of faculty derived from their participation in the seminar will permit them to complement teaching practices as they navigate between the use of technology and F2F classroom instruction.

Faculty are the linchpin of student academic success; the context of learning that faculty create can induce positive learning experiences for students. The project adds value as it emphasizes the role of PD in reinforcing faculty teaching expertise which can improve the learning outcomes of students. However, faculty PD must not be limited to single, ad hoc occurrences. To ensure success in student learning outcomes and to encourage the retention of students toward degree completion, faculty PD must be an ongoing initiative and the measurable impact of effective teaching must be tracked.

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Appendix A: The Project

Teaching Support Strategies for Faculty: A Professional Development Seminar

Faculty Professional Development Seminar

Designed by: Kathy Clarke-Cook

May 2019

Seminar Title: Teaching Support Strategies for Faculty

Seminar Location: Designated campus classroom with Wi-Fi

Seminar Duration: The seminar will be delivered over a three-day period. A total of twelve topics will be presented throughout the seminar, each day covering four topics presented over the morning and afternoon sessions. The third and final day of the seminar will include an additional topic session which will function as an ultimate opportunity for faculty to share best practices and reflect on the overall content of the seminar. The seminar will be a F2F delivery, each day consisting of 8-hours duration.

Objective: The proposed professional development seminar is devised to expose faculty to options for additional teaching support that they can use with students, particularly in a classroom setting, as students transition between using MFL® and receiving F2F in class instruction.

Professional Development Goals: (a) to augment the existing teaching strategies of faculty so as to meet student learning needs; (b) to heighten the faculty-student dynamic in a classroom setting; (c) to enrich the learning experience for students in a blended learning environment; (d) to improve the overall academic success of students in achieving mathematics curriculum objectives

Seminar Prerequisites: Participants should be faculty who teach the blended learning version of MATH 062- Beginning Algebra which uses MFL and F2F in class instruction.

Seminar Resources: Participant laptops for conducting research for small group discussion; necessary handouts-case study. PowerPoint presentation; provided in this

section. A faculty member will assist with the scheduled presentation of a case study on the final day of seminar.

Seminar Dates and Times: To be delivered during spring break over a three-day period as scheduled.

Seminar Evaluation: A summative evaluation will be disseminated to participants on the final day of the seminar (see Appendix F).

Table A 1

Seminar Schedule

Schedule	Topic	Activities/Items
Day 1 Agenda (Morning Session)	*Welcome*	Welcome Remarks, Objectives, Breakfast
	Introductions/Overview	Ice Breaker –Faculty Introductions, Guiding Questions, and Professional Development Goals
	Blended Learning: An Overview	Presentation and discussion- establish the blended learning context of teaching and learning
		Break
	From Teacher Centered to Student Centered	Presentation –discussion on how teaching has evolved from teacher centered to student centered; reflection on faculty current teaching approaches
		Lunch
Day 1 Agenda (Afternoon Session)	*Self-Reflection: What's My Teaching Style?*	Self-reflection on preferred teaching styles; how to aim for teaching styles that are more hybrid and supportive of students
	Small Group Discussion	Group work- participants review diagram showing levels of teacher centeredness and levels of learner activation; generate best practices
	Day 1 Session Review and Adjournment	Discuss what was learned and how ideas may be transferred to the classroom; consider how to develop a community of practice
Day 2 Agenda (Morning Session)	*Review of Day 1 and breakfast*	Recap of Day 1
	Self-Directed Learning (SDL): The Student Experience	Discuss self-directed learning from student's the student's perspective; discuss the goals of self-directed learning

	Differentiated Instruction: An Introduction	Introduction to differentiated discussion as an option to use with students; emphasis on using a variety of methods simultaneously in classroom so as to meet needs or students
		Break
	Small Group Discussion	Group work- participants discuss what differentiated instruction means to them and ways in which they can incorporate differentiated instruction in their teaching
		Lunch
	Small Group Discussion	Group work-Participants review Learning Styles (VARK- Visual, Aural, Read/Write) diagram; emphasis on learning style preferences of students and how teaching should parallel student learning preferences. Report back to larger group after small group discussion.
	Report back to large group	Discussion/exchanging ideas generated from small group discussion
	Day 2 Session Review and Adjournment	Discuss what was learned and how ideas may be transferred to the classroom; consider how to develop a community of practice
Day 3 (Morning Session)	*Review of Day 2 and breakfast*	Recap of Day 2
	Constructivism and Technology	Discussion on the role of constructivism and technology; review the potential of establishing a constructivist classroom; encouraging learners in an active role
	Case Study- Student Challenges with MFL (faculty led)	Group work- per case study, explore strategies for resolving student challenges in using MFL; application of current experience and new knowledge
		Break
	Case Study Review- report back to large group	Discussion/exchanging ideas generated from small group discussion
		Lunch
Day 3 (Afternoon	*Review of Teaching Strategies and Tips*	Discussion on teaching strategies and tips to be taken back to the classroom;

Session)		exploration of variety of methods for reinforcing learning
	Sharing Best Practices-New Beginnings	Discussion of best practices going forward and which ones would yield best results
	Day 3 Session Review and Adjournment	Recap of Day 3-Reflect on major takeaways from seminar; future changes in teaching; future improvement in the classroom; reflect on building community of practice. Participants complete summative evaluation

PowerPoint Slides

Day 1 Agenda

- 8.00am –9.00am: Welcome Remarks, Objectives and Breakfast
- 9.00am –9.30am: Icebreaker – Warm Up Activity
- 9.30am –10.30am: Blended Learning- An Overview
- 10.30am –11.00am: Break
- 11.00am –12.30pm: From Teacher-Centered to Student-Centered
- 12.30pm –1.30pm: Lunch
- 1.30pm –2.30pm: Self- Reflection: What's My Teaching Style?
- 2.30pm – 3.30pm: Small Group Discussion: Teacher-Centered and Learner-Centered Methods
- 3.30pm –4:15pm: Session Review and Adjournment
-

Guiding Questions

- How can you support students through teaching strategies in a blended environment (face-to-face and online)?
- How can you keep students engaged and foster student success?
- How can you implement new strategies of teaching support for your students?

Professional Development Goals

- Augment the existing teaching strategies of faculty so as to meet student learning needs
- Heighten the faculty-student dynamic in a classroom setting
- Enrich the learning experience for students in a blended learning environment
- Improve the overall academic success of students in achieving mathematics curriculum objectives

Icebreaker– Two Truths and a Lie

- Introduce yourself to your colleagues; share with them how long you have been teaching developmental/transitional mathematics and using MFL

- Prepare three statements to share with your colleagues, two of which are true, and one of which is a lie. Your colleagues will attempt to figure out which statement is a lie

Blended Learning (BL): An Overview

- Blended Learning (BL) defined- "…the integration of face-to-face and online instruction (Graham, 2013)
- The scope of blended learning; it "mixes various event based activities, including face-to-face classrooms, live e-learning, and self paced learning" (Valiathan, 2002)
- Blended learning classrooms are naturally student-centered; necessary to place emphasis on maximizing student-centered learning in the blended classroom; developing autonomous and independent learners
- Consider the implications of blended learning on how you teach and engage students; think about pedagogical richness in using the two mediums (online and face-to-face)

From Teacher-Centered to Learner-Centered

- Instruction Paradigm to Learning Paradigm (Barr and Tagg 1995)
- Shift from traditional teacher-centered to student-centered way of learning- How?
- Engage students in thinking and doing; complement online instruction; help students to work across mediums (online and face-to-face); create challenges for students- How?
- Teacher transitions to a facilitator and supporting role; preparation for changes in roles; supporting students
- Use of technology encourages and directs students to be student-centered; connection to blended learning

Self Reflection: What's My Teaching Style?

- Five Main strategies used in the 'classroom': (Gill, 2013)
  - The Authority or Lecture Style- teacher-centered; uses lecture(s); note-taking by students; good for large groups
  - The Demonstrator or Coach Style- teacher-centered; similar to lecture style; added dimension of using multimedia
  - The Facilitator or Activity style- leans towards student-centered; encourages student critical thinking; students develop exploratory skills
  - The Delegator or Group Style- suited to lab work or learning that incorporates immediate feedback; element of student-centered learning; balancing act by instructor; some authority lost by the instructor (?)
  - The Hybrid or Blended Style: adapting teaching style to student needs; an inclusive approach

Self Reflection: What's My Teaching Style? (Cont'd)

- Can you see yourself in any of these teaching styles?
- Which teaching styles do you favor? A Single Style? A Combination of Styles?
- The selection of teaching styles that engage a diverse audience of students is key; teaching style should be flexible and incorporate a 'hybrid' blend of teaching styles
- How can you better support your students in a face-to-face environment?

Small Group Discussion

- Brainstorm and draw up a list of teacher-centered teaching methods and student-centered teaching methods; review diagram below;- Learner-centered teaching can increase the level of learner activation. Teacher-centered teaching can lower learner activation. Adopting the role of facilitator can increase the level of learner activation (Mykra, 2015).

Day 1- Wrap Up

- What did you accomplish today?
- What is your comfort level with the information that we reviewed?
- Where do 'you' fit in within the teaching-learning dynamic?
- What changes can you implement in your teaching/classroom to increase the success of your students?

Day 2 Agenda

- 8.00am – 9.00am: Review of Day 1 and Breakfast
- 9.00am –10.15am: Self-Directed Learning (SDL): The Student Experience
- 10.15am –11.15am: Differentiated Instruction: An Introduction
- 11.15am –11.30am: Break
- 11.30am –12.30pm: Small Group Discussion-Differentiated Instruction
- 12.30pm –1.30pm: Lunch
- 1.30pm – 2.30pm: Small Group Discussion- Learning Styles-VARK
- 2.30pm – 3.30pm: Report Back to Large Group
- 3.30pm – 4:15pm: Session Review and Adjournment

Self-Directed Learning (SDL): The Student Experience

- With the integration of MyFoundationsLab® (MFL), into students' learning experiences, they are expected to become more self directed and student-centered as learners, which is underpinned by the construct of self-directed learning; students must acclimate to become more independent and self-reliant; move from passive to active learning
- Although the use of technology, MFL, requires a level of self-directedness from students, students still also require support
- Merriam (2001) proposed three goals of self-directed learning; (a) the learner's capacity to be self-directed, (b) the development of critical reflection. (c) the promotion of emancipatory learning and social action

Self-Directed Learning (SDL): The Student Experience (Cont'd)

- Merriam's (2001) goals are applicable to students using MFL; however, achieving the emancipatory learning goal and self-directedness may be a challenge for students based on their varied levels of comfort in using MFL
  - **Reflect on how you can assist students to achieve emancipatory learning; what strategies can you employ?**
- Self- directed learning can suggest self-management, self control, and being proactive; students may be hesitant
- Recommendation- blend conventional modes of teaching with SDL approaches to achieve meaningful learning experiences; initiate collaborative learning; faculty pursue self-development

Differentiated Instruction

- Refers to the use of multiple forms of learning taking place at the same time in a classroom (Mintz, 2016); using a variety of instructional strategies to meet the needs of each student based on learning styles; the ultimate aim is effective student learning
- Positive gains realized from differentiated instruction in K-12 education
- Differentiated instruction is based on the idea that "one size does not fit all"
- Five principles of differentiated instruction- (a) mastering through practice and reinforcement, (b) focus on understanding and proficiency, (c) learning by doing (active and collaborative learning), (d) team based learning

Differentiated Instruction (Cont'd)

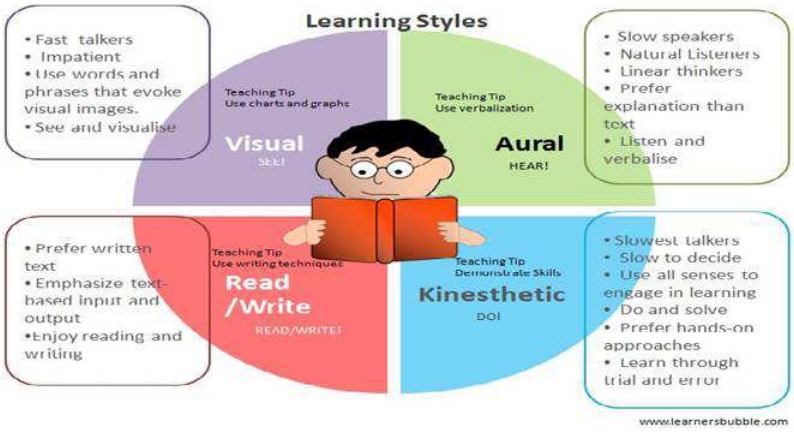
- (e) educator must facilitate educational experiences for students; develop activities that will allow students to achieve learning objectives

Small Group Discussion – Differentiated Instruction

- Reflect on what differentiated instruction means to you; what could you do differently for students by incorporating differentiated instruction methods? Effective strategies that you can use?
- Discuss within your small group; be prepared to report back to the larger group

Small Group Discussion – Learning Styles-VARK

- Students may have a preferred learning style; each student learns differently; therefore their learning should be matched with the appropriate learning strategies



Day 2- Wrap Up

- What did you accomplish today?
- What is your comfort level with the information that we reviewed?
- Where do 'you' fit in within the teaching-learning dynamic?
- What changes can you implement in your teaching/classroom to increase the success of your students?

Day 3 Agenda

- 8.00am – 9.00am: Review of Day 2 and Breakfast
- 9.00am –10.15am: Constructivism and Technology
- 10.15am –11.15am: Case Study-Student Challenges with MFL- Faculty Led.
- 11.15am –11.30am: Break
- 11.30am –12.30pm: Case Study: Review with Larger Group
- 12.30pm –1.30pm: Lunch
- 1.30pm – 2.30pm: Review Teaching Strategies- Tips
- 2.30pm – 3.30pm: Sharing Best Practices – New Beginnings
- 3.30pm – 4:30pm: Session Review and Adjournment

Constructivism and Technology

- Constructivism- theory that focuses on the learner in an active role; learner –centered and interactive. Technology can facilitate the accomplishment of constructivist teaching

Highlights of a Constructivist Classroom

Students collaborate on tasks	Student input is valued in the teacher-learning process
Students are thinkers with the ability to construct new knowledge	Teachers partner with students in the classroom
Teachers seek students' feedback in order to better understand student learning	Assessment of student learning is integral to the teaching learning process
Shift from large group to small group	Teacher facilitation to support students

Constructivism and Technology (Cont'd)

- Technology based teaching and classrooms promote student collaboration; learners build meaning and acquire knowledge through collaborating and engaging in groups.

Case Study- Student Challenges with MFL-

MyFoundationsLab® (MFL) is the main tool that students use for mastering mathematic concepts and achieving the objectives of the mathematics curriculum. Students experience challenges in using MFL. Their challenges include navigating the MFL learning platform, managing their time in using MFL, and coping with the scope and volume of work. Some students, mainly adult learners, who have been absent from education for a long time, not only struggle with MFL, but they also struggle with computers in general. Students are also perturbed about the 'busy work' nature of completing activities in MFL for which they receive no credit. Overall, students' challenges are subject and technology related.

Teaching Strategies -Tips

- Be 'Student-Centered'- be the facilitator; facilitate small group instruction
- Differentiate based on student levels; use student data to group students in pods
- Encourage collaboration; use peer to peer pairings; group students by scores- levels of understanding (mastery and average)
- Practice variation of station rotation model (direct instruction, collaboration, and independent work)- helps with reinforcement of learning

Teaching Strategies –Tips (Cont'd)

- Use differentiated instruction for ensuring that material and knowledge reaches all students
- Use media support; create faculty produced topic specific videos –embed videos within topics in online instruction (MFL)
- Encourage lab workshops for students on a regular basis; can be tutor/peer managed or faculty one-on-one supervised

Day 3- Wrap Up

- What did you accomplish today?
- What is your comfort level with the information that we reviewed?
- Where do 'you' fit in within the teaching-learning dynamic?
- What changes can you implement in your teaching/classroom to increase the success of your students?

Final Thoughts

- What did you learn overall? Major takeaway?
- How will you change your teaching practices?
- What improvements will you make to your classroom?
- What are your thoughts about building a community of practice?
- What did you like most about this seminar?

Resources- References

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Appendix B: Interview Protocol

Welcome:

Thank you for agreeing to participate in this study. The study explores the perceptions and experiences of faculty regarding the use of MFL which supported math instruction in MATH 062 and MATH 103-Beginning Algebra. I want to hear what you have to share with me about your perceptions of students using MFL, particularly as it relates to students who failed their math course. So, during the interview, I will limit my comments so that I may focus on what you can share with me. The interview protocol is a guide and I will follow the questions that I have prepared. During the interview if you need any more information or wish clarification, please do not hesitate to ask or interrupt me. Please note that you are free to take a break, to skip any question, to terminate the interview, and to withdraw from the study, without penalty, at any time.

I will digitally audio record this interview, so please confirm that I still have your permission. I will digitally audio record the interview so that I can listen attentively to what you are sharing with me and accurately capture what you say. Do I still have your permission to digitally audio-record this interview? From time to time during the interview, I may write down notes that I can refer to after the interview and also use for later reflection. The recording of the interview will be confidential. I may need to contact you some time after the interview and during the data analysis of the interview for clarification.

Before we begin, do you have any questions?

Remember that if you have any questions, please do not hesitate to ask me.

1. What is your overall impression of using MFL?
2. What is the student experience of using MFL?

    Probe: What do you think was easy?

    Probe: What do you think was difficult?
3. How much time outside of class time, in your opinion, did students need to work in MFL?
4. Does MFL support students' mathematics learning?

    Probe: Why or why not?
5. What is the interface experience of students using MFL?
6. Does interfacing with MFL become easier over time?

    (Perceived ease of use/Perceived usefulness; in terms of learning math, time management, using technology)
7. Do you think students need prior experience with computers in order to be successful in using MFL?
8. What do you think is the overall student experience with using MFL as a learning tool for mathematics?
9. Are there any other thoughts or experiences about MFL that you would like to share?

Appendix C: Alignment of Conceptual Framework and Interview Questions

Concepts and theories	**A priori codes**	**Interview questions (IQ)**	**Research questions** RQ1: How do faculty describe their perceptions regarding students who failed MATH 062 using MFL? RQ2: How do faculty describe the perceptions and learning experiences of students using MFL as a learning system?
Bandura's (1989) theory of reciprocal determinism. Bandura's (1989) theory addresses how social influences, such as behavior, personal, and environmental can impact the learning process. The interplay of the influences (as individual forces or combined forces) may affect the learning process.	Teaching influences Learning barriers/challenges	IQ 1: What is your overall impression of using MFL? IQ 3: How much time outside of class time, in your opinion did students need to work in MFL? (environment/personal influence) IQ 7: Do you think students need prior experience with computers in order to be successful in using MFL? IQ 6 : Does interfacing with MFL become easier for students over time? (behavior/personal influence) IQ 4: Does MFL support students' mathematics learning? (environment influence)	IQ 1>RQ1 IQ 3> RQ2: Experiences IQ 7>RQ1, RQ2 Experiences IQ 9>RQ1, RQ2: Perceptions and experiences IQ4>RQ , RQ2

Intrinsic and extrinsic motivation theories. Intrinsic motivation- naturally deriving self-fulfilment from a learning activity or task. Extrinsic motivation- attaching instrumental value to completing or engaging in learning activity or task.	Impact of technology on learning experiences	IQ 3: How much time outside of class time, in your opinion, did students need to work in MFL? (extrinsic/intrinsic motivation) IQ 4: Does MFL support students' mathematics learning? (intrinsic motivation)	IQ 3 > RQ1: Experiences IQ 4: >RQ1, RQ2:Perceptions and experiences
Technology acceptance model TAM refers to how users perceive the usefulness (PU) of technology- the degree to which technology helps performance; and whether there is a perceived ease of use (PEOU) of technology)-the extent to which it is thought using technology is effortless.	User convenience re: MFL Satisfaction with technology User challenges re: MFL	IQ 2: What is the student experience of using MFL? (Probe: What do you think was easy? Probe: What do you think was difficult?) IQ 5: What is the interface experience of students using MFL? (perceived ease of use and perceived usefulness)	IQ 2: >RQ1, RQ2:Perceptions and experiences IQ 5> RQ1, RQ2:

ARCS model of motivational design Attention (A)- arousing and sustaining learner curiosity; Relevance (R)- engaging learner needs and interest to accomplish goals ; Confidence (C)- developing positive expectancies for success ; and Satisfaction (S)- engendering positive feelings about learning experiences. Motivation is achieved if combined components of model are experienced.	Positive user engagement Attention Relevance Confidence Satisfaction	IQ 8: What do you think is the overall student experience with using MFL as a learning tool for mathematics? (attention) IQ 4: Does MFL support students' mathematics learning? (relevance/satisfaction) IQ 5: What is the interface experience of students using MFL? (confidence)	IQ 8>RQ1, RQ2: Experiences IQ 4>RQ1 Perceptions and experiences IQ 5>RQ1, RQ2: Perceptions and experiences

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Kathy Clarke-Cook
XXXXXXXXXXXXXXXXXXXXXXX
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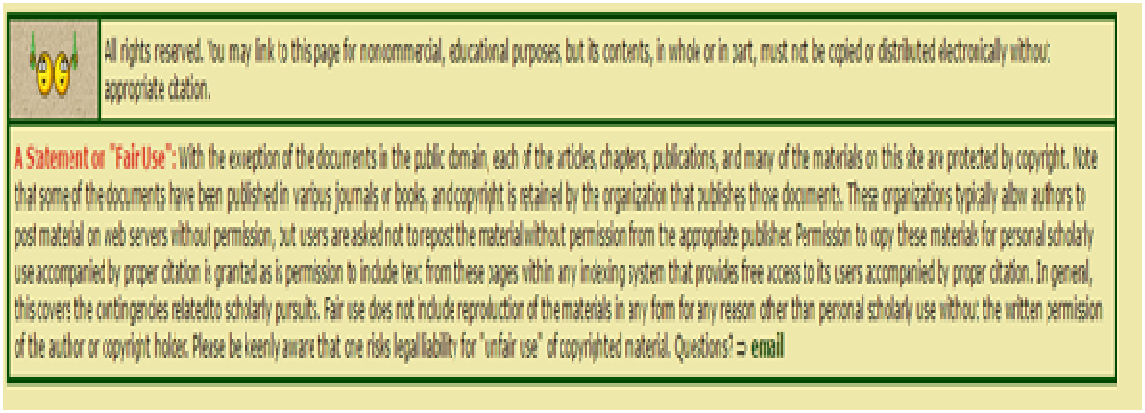
Pajares, F. (2002). An overview of social cognitive theory and of self-efficacy. Retrieved from http://www.uky.edu/~eushe2/Pajares/eff.html



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Appendix F: Evaluation

Participant Summative Evaluation Form

Program Title: Teaching Support Strategies for Faculty Date:

Instructions
Please read the following questions/items very carefully. We value your honest feedback that will be used to structure and improve future faculty development/training.

Please select the rating for each section based on the following criteria:
5=excellent 4=good 3=average 2=fair 1=poor

Please rate the content and structure of the seminar:

1. The usefulness of the information received in seminar.	☐5	☐4	☐3	☐2	☐1
2. The structure of the seminar session(s).	☐5	☐4	☐3	☐2	☐1
3. The pace of the seminar session(s).	☐5	☐4	☐3	☐2	☐1
4. The convenience of the seminar schedule.	☐5	☐4	☐3	☐2	☐1
5. The usefulness of the seminar materials.	☐5	☐4	☐3	☐2	☐1
6. The scope/relevance of the seminar topics.	☐5	☐4	☐3	☐2	☐1
7. The overall content and presentation.	☐5	☐4	☐3	☐2	☐1

8. Was this seminar appropriate for your level of experience? ☐Yes ☐No

If you said "No" to #8, please explain in the space provided below:

Open-ended comments:

9. What did you like about the seminar? (Please give a specific example or specific examples in answering this question)

10. What can be improved with regard to the structure, format, and/or materials for future seminars?

Thank You