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Comparing Students' Academic Achievement and attitudes in Undergraduate Flipped and Non-Flipped Classrooms: A Mixed-Methods Study

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ABSTRACT

COMPARING STUDENTS' ACADEMIC ACHIEVEMENT AND ATTITUDES IN UNDERGRADUATE FLIPPED AND NON-FLIPPED CLASSROOMS: A MIXED-METHODS STUDY

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Today's classrooms are filled with a diversity of students of different cultural backgrounds, languages, and socioeconomic statuses, and these differences can impact the students' learning styles and outcomes. To meet their individual needs, the focus of educational institutions has been on transforming the role of teachers from lecturers to "guides on the side" by developing student-centered active learning strategies and employing effective instruction. A flipped classroom model of instruction is student centered and grounded in the constructivist theory of learning and serves as a potential instructional model to achieve these goals. Recently, a movement has emerged in higher educational institutions in Saudi Arabia toward developing student-centered active learning strategies and employing technology for effective instruction. It is a relatively new phenomenon in Saudi Arabia, and empirical research that examines its effectiveness in higher education is sparse.

The purpose of this sequential explanatory mixed-methods study was to compare undergraduate female students' achievement in flipped and non-flipped classrooms and to explore their attitudes toward this model with a convenience sample (n=28) of two groups. One was a treatment group (n= 14, flipped classrooms were employed), the other, a control group (n= 14, traditional classrooms were employed). Quantitative data were collected using a non-

equivalent comparison group pre/post-test design. Qualitative data were collected via semi-structured interviews (n=9).

The quantitative data were analyzed using repeated measures ANOVA, ANCOVA, and η^2 to identify statistically significant differences in the female students' academic achievement regarding students in flipped classrooms. The qualitative data explored students' attitudes toward flipped classrooms and were analyzed using open coding strategy. The findings showed that students in flipped classrooms had a higher achievement level than students in traditional classrooms. Moreover, depending on the nature of the class, students had positive attitudes toward flipped classrooms as well as provided information regarding their learning styles and the benefits and challenges of this model.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

In the 21st century, young people are introduced to technology at a very early age and have different needs, abilities, personalities and learning styles that require instructors to learn how to communicate in their students' language and styles of learning (Levy, 2008). Prensky (2001) identified that today's students prefer technology to be integrated into the learning process. Lecture-style classes are boring and unacceptable to students (Roehl, Reddy & Shannon, 2013). Goodwin and Miller (2013) found pacing was a problem associated with traditional classes, where some students might be familiar with the information while others have trouble comprehending. Aljaser (2017) claimed that in the Saudi context there is a need to transform traditional classes and curricula to modern instructional models and use different technological tools to help improve students' critical thinking as well as a responsibility for their learning and academic achievement, since traditional classes are not sufficient to improve these skills, especially with this tech-savvy generation. However, Aljaser (2017) also contended that Saudi students in higher educational institutions do not take responsibility for getting information, applying it, or even discussing its sources, since they depend on the lecturer to deliver the content.

Moreover, today's classrooms are filled with a diversity of students from different cultures, languages, and socio-economic statuses, and these differences can have an impact on

their learning styles and outcomes. To meet their individual needs, the focus of educational institutions has been on transforming the role of teachers from lecturers to "guides on the side" as King (1993) suggested, developing student-centered active learning strategies and employing effective instruction. Moreover, Vygotsky (1978) suggests that instructors work as guides and facilitators by providing different levels of scaffolding to help students achieve a task and acquire and retain information. Gullen and Zimmerman (2013) discussed that as times change and new instructional concepts evolve, there is a need to employ new models of delivery to better suit the learners' needs. Gullen and Zimmerman describe technology as a means of helping leverage time, redesigning learning activities, and offering more opportunities for better instruction. Johnson and Renner (2012) claimed that since technology has become a part of the society, it is the time for educational institutions to employ online learning and provide opportunities to enhance the daily classroom experiences. The flipped classroom model of instruction serves as a potential instructional model to achieve those goals (Bergmann & Sams, 2012). According to Sharma and Chowdhry (2018), it provides methods for delivering content that appeal to learners, like the Millennial Generation, who constantly use technology, which might lead to better motivation and obtain deeper learning skills.

Bergmann and Sams (2012) define flipped classrooms as "an environment where students obtain lecture-worthy information via technology at home (either provided by the school or the student), and come to class prepared to apply the information in a hands-on way with teacher and student collaboration" (p. 25). It generally "provides pre-recorded lectures (video or audio) followed by in-class activities" (Wolff & Chan, 2016, p.9). Jarvenoja (2010) found that collaborative work has more cognitive and motivational benefits than individual activities, but one common barrier for implementing such activities is instructors' lack of time in class. Ash

(2012) noted that, in reality, the flipped classroom is a model that helps free up class time, where students will have time for hands-on activities, collaborative work, and applying knowledge instead of spending time listening to lectures.

This model of instruction is student centered and grounded in the constructivist theory of learning, which emphasizes the important role of student collaboration for constructing meaning from their backgrounds and newly acquired information (Strayer, 2012; Vygotsky, 1978). As Vygotsky (1978) highlighted the importance of students' collaboration to construct their knowledge, the flipped classroom offers a highly collaborative learning environment in which students engage with classmates and instructors (Strayer, 2012). These kind of learning environments in flipped classrooms might increase students' attitudes and satisfaction (Lee, 2013).

Although flipped classrooms have different terms for the same concept, which include inverted classrooms, reversed classrooms, upside-down classrooms, flipped learning, and flipped education (Siegle, 2014), the concept of moving basic instruction through reading out of class or at home and providing the class with more collaborative activities has existed since the 1950s (Shell, 2002). In 1993, King focused on the effectiveness of allocating class time for building meaning over lecturing information. Even though the researcher did not used flipped classrooms, she is considered the stimulator of active learning (King, 1993). In 1996, Mazur developed the peer instruction strategy. In 2011, Mazur succeeded in coaching his students in class instead of lecturing them. Therefore, he influenced the concept of flipped classrooms (Hamdan, McKnight, McKnight & Arfstrom, 2013).

The concept of flipped classrooms itself is not new. It has existed for more than a decade (Baker, 2000; Strayer, 2007). Strayer (2007) reported that in 1995 Baker introduced the idea at

Cedarville University in Ohio, and in 2000, Baker introduced a paper about flipped classrooms at an educational conference. Also, Lage, Platt, and Treglia (2000) wrote a paper that showed how implementing flipped classrooms in higher education can provide a better learning environment that meets students' different learning styles.

In 2007, Bergmann and Sams, who are considered the founders and pioneers of flipped learning in classrooms, implemented this method into their classes as a solution for providing learning content or lectures to students who were absent (Bergmann, 2011). They began using screen capture software to record their lectures and posted them online for their students. At that time, YouTube and online videos were in their infancy (Bergmann, 2011). Since that time, this methodology has revolutionized the flipped classroom movement in education. According to Ahmed (2016), Pink first used the term "flipped classroom" in 2010. Pink reported on this model of instruction, and educators have since used this name until now (Ahmed, 2016).

Zainuddin and Halili's (2016) review of the literature illustrates that improving students' academic outcomes and attitudes in higher education is a crucial focus of educational institutions around the world. Shams-Abadi, Ahmadi and Mehrdad (2015) suggested that introducing the flipped classroom model to education might provide opportunities for students to be more motivated, creative, and have better self-efficacy and academic achievement. Abeysekera and Dawson (2014) also identified that scholars (e.g., Love, Hodge, Grandgenett, & Swift, 2014; Mason, Shuman & Cook, 2013; McLaughlin et al., 2013; Wilson, 2013) have encouraged implementation of the flipped classroom in education since it has had positive effects on students' learning outcomes or attitudes. Others have disagreed about its integration into most learning contexts and recommended more studies to decide about using it (Moran, 2014; Strayer, 2007), since some students have negative attitudes toward flipped classrooms. Love et al. (2014)

suggested the conflicting research findings of flipped classrooms requires replicating or repeating studies to be able to make a decision regarding flipped classroom effectiveness.

According to Zainuddin and Halili (2016), the flipped classroom has been more widely used in secondary schools than in higher education. This model of instruction has been employed in STEM (Sowa & Thorsen, 2015; Zengin, 2017), statistics (Cilli-Turner, 2015; Strayer, 2007) and English (Al-Harbi and Alshumaimeri, 2016; Alsowat, 2016; Moran, 2014) courses. At the same time, very few studies have been conducted about using flipped classrooms in educational technology courses in higher education (Alzahrani, 2015). McNally et al. (2017) reported that despite the widespread use of flipped classrooms, there is a lack of empirical evidence about whether they are effective for student engagement or learning outcomes. Blair, Maharaj, and Primus (2016) found that most previous studies had looked at the effectiveness of flipped classrooms on students' experiences rather than its impact on course grades and perceptions. Sowa and Thorsen (2015) and Love et al. (2014) believed that even though flipped classrooms attract the attention of the academic world in schools and higher education, few studies exist regarding student outcomes. Further studies regarding the length of class activities during the implementation of the flipped classroom are needed (Blair et al., 2016). This recommendation comes because very little research has been conducted to investigate the potential impact of class time during flipped classrooms on students' achievement (Love et al., 2014; McNally et al., 2017). In addition, most of the relevant studies have not provided a foundational theory for the flipped classroom, since it is a new trend that needs more empirical studies to provide a theoretical framework for employing it at different academic levels.

One of the issues associated with some of the previously conducted studies, such as Al-Harbi and Alshumaimeri (2016) and Olakanmi (2017), is the limited time for applying the

flipped classroom model. To obtain accurate results for the application, the technology might require a longer period. In this way, students will be excited about it in the beginning, and after a while, any change in their attitudes can be noticed accurately, whether negative or positive. Consequently, providing a longer period might help understand some of the conflicting research findings regarding attitude and achievement.

A drop in attendance of face-to-face sessions in flipped classrooms could be another deficiency. Students believe that reviewing a provided video is enough to pass the course (Blair et al., 2016). Another important deficiency of research on flipped classrooms is that students come to class unprepared because they do not review the provided materials, which makes the in-class phase of flipped classrooms unsuccessful (Cilli-Turner, 2015). One possible reason for this lack of preparedness is the length of the provided videos, which bore students if they watch until the end (Yılmaz, Yel, & Griffiths, 2018). In some studies, such as Love et al.'s (2014), the videos were about 30 minutes.

Also, in studies pertinent to higher education, the researchers did not consider the students' academic levels or individual differences (Hao, 2016a). Considering these issues can provide a logical interpretation for the outcomes and attitudes regarding the use of a model like Bishop and Verleger (2013) discussed. Braun, Ritter, and Vasko (2014) stated that since every student has different prior knowledge, examining the effect of flipped classrooms on different student groups is required.

Based on a systematic review of the literature, there have been international studies of flipped instruction, but the one context in which flipped classrooms have not been investigated very often is the Saudi context (Al Rowais, 2014). Al-Harbi and Alshumaimeri (2016) reported that flipped classrooms have not been widely utilized in the Saudi educational system and

recommend conducting studies investigating the flipped classroom model in diverse contexts in Saudi Arabia. To date, there has only been a single study conducted in educational technology courses in higher education on male students' critical thinking and attitudes in Saudi Arabia (Alzahrani, 2015), and its findings are limited to males. However, females and males have different experiences with using technology due to cultural factors in Saudi Arabia (Amoundi & Sulaymani, 2014). Challenges occur when trying to implement technology in Saudi girls' learning environments as they have not been introduced to technology at a young age.

The goal of this mixed-methods research was identified from gaps in the literature and the call for more studies to investigate the effectiveness of flipped classrooms in Saudi Arabia. This study compared students' academic achievement in flipped and non-flipped undergraduate classrooms as well as their attitudes toward the use of this model. Female students enrolled in the Computer in Education course in Fall 2019 at one of the western district's universities in Saudi Arabia were the sample for this study. I applied a non-equivalent comparison group pre/post-test design for the quantitative part and conducted follow-up interviews with some students. The pre- and post-achievement tests were administered to collect quantitative data to measure the difference between students' academic achievement in treatment (flipped classrooms) and control (traditional classrooms) groups.

I used interviews, not surveys, to explore the attitudes for many reasons. Interviews provide more in-depth information than a survey, especially with a small sample size as used for this research, which helped me to understand why flipped classrooms worked or did not work for these Saudi Arabian students. Additionally, from a systematic review of the literature, as will be discussed in the next chapter, only one study, conducted by Olakanmi (2017), measured attitude via interviews. Interviews are more flexible in the number of questions that can be asked and,

unlike surveys, allows a deeper understanding of their attitudes. Regarding the Saudi context, few studies have been done regarding students' attitudes toward flipped classrooms, so researchers have limited knowledge about their attitudes to be able to design a scale to measure it. Therefore, interviews were a better choice for conducting such a study.

The intervention studied in this context is based on the constructivist theory (Strayer, 2012) employing an innovative element, a mandatory quiz, after reviewing outside class materials to verify the success of the first phase (pre-learning) of the flipped classroom.

Purpose of the Study

The intent of this sequential explanatory mixed-methods study was to compare use of the flipped classroom model for instruction in relation to the constructivist theory (Strayer, 2012) and the traditional model of instruction as they related to the achievement and attitudes of female undergraduate students in the Computer in Education course at one of the western district's universities in Saudi Arabia. In this mixed-methods design, the quantitative and follow-up qualitative data were collected to understand the data in more depth (Creswell, 2014). First, the quantitative data were collected through pre/post-achievement tests from undergraduate students enrolled in the Computer in Education course to compare students' academic achievement in flipped and non-flipped undergraduate classrooms. Second, to explain the quantitative results more in depth and explore the students' attitudes toward flipped classrooms and whether they relate to their achievement levels, follow-up qualitative data (semi-structured interviews) were collected. A volunteer sample from the treatment group participated in these follow-up interviews.

Theoretical Perspective

The flipped classroom model of instruction generally "provides pre-recorded lectures (video or audio) followed by in-class activities" (Wolff & Chan, 2016, p. 9). This model of instruction is student centered and grounded in the constructivist theory, which emphasizes the important role of student collaboration to construct meaning from their backgrounds and newly acquired information (Felder, 2012; Strayer, 2012).

The constructivist theory, specifically Vygotsky's (1978) social development theory (SDT), was employed as the theoretical foundation of this mixed-methods research study. SDT is essential for discovering the relationship between the flipped classroom model of instruction and students' academic achievement and attitudes in an educational technology course for undergraduate students. The theory holds the expectation that flipped classrooms influence or explain the increase or decrease of students' academic achievement and their attitudes toward it. Al Rowais (2014) discussed how flipped classrooms with utilization of media to deliver the content are rooted in socio-constructivist theories of education. She used this theory, and Vygotsky's zone of proximal development (ZPD) as well, as a guide for her study on the effectiveness of flipped classrooms on students' achievements and attitudes. Constructivism leverages the students' abilities to develop learning foundations and knowledge by themselves based on their own personal experiences through engaging in cooperative activities along with a sufficient amount of instructor assistance.

According to Vygotsky's (1978) theory, building knowledge in the human mind happens when humans link their prior knowledge to new information, which helps to foster further knowledge construction in their minds. Knowledge cannot be directly transferred from

instructors' heads to students' heads. Moreover, to learn most effectively, students must engage in selected collaborative activities to solve problems with the supervision of the educators (Vygotsky, 1978). Vygotsky's work shows that students need to build on prior knowledge and work collaboratively. Thus, the flipped classroom model of instruction meshes with the constructivism theory.

Teachers are encouraged to utilize the principles and assumptions of constructivism theory by allocating class time for inquiry-based learning. The flipped classroom model of instruction pushes students to engage in communication and collaborative activities to build new knowledge, which is a main objective of constructivist theory (Felder, 2012; Kim, Chun, & Choi, 2014; Strayer, 2012). Michael (2006) and Prince (2004) encouraged the implementation of student-centered and active learning strategies to increase students' learning and achievement. Flipped classrooms provide these strategies for learners.

Vygotsky's Learning Theory

Vygotsky's (1978) learning theory is a student-centered theory that illustrates how knowledge acquisition happens through social interactions and culture to experience meaningful learning. Social interaction is one construct of this theory and plays an essential role in cognitive development. Vygotsky (1978) stated that

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals. (p. 57)

The theory also suggests that when scaffolding is provided by a skillful instructor, learning happens and students can be successful in their ZPD (Blake & Pope, 2008).

The main constructs of Vygotsky's (1978) zone of proximal development and facilitation and scaffolding are evident in both phases of a flipped classroom model of instruction: the first phase – pre-learning and the second phase – in-lecture engagement (Green, 2015). Teachers must make sure students have completed phase one and viewed the learning materials. Otherwise, phase two, which includes collaborative activities, discussion with peers, debate, teamwork, and other content, will not be successful (Green, 2015).

Vygotsky (1978) found that through the ZPD, students are able to complete activities with a proper amount of interaction and scaffolding provided by more knowledgeable persons such as teachers and peers (Lewis, Perry, Friedkin, & Roth, 2011). ZPD can be defined as the difference between the learner's actual developmental level and the level of potential development (Vygotsky, 1978). In other words, ZPD is the space for learning. Within it, learners are getting new information that is not hard to understand rather than materials that are so difficult the learner gives up (Vygotsky, 1978). An important construct to mention regarding ZPD is that it focuses on having the students understand the topic on their own, which can happen in the first phase of a flipped classroom. The instructors are facilitators who provide students with scaffolding to arrive at a complete understanding of the topic or to complete a given task specifically through teacher and classmate modeling, scaffolding, and feedback (Vygotsky, 1978), which can happen in the second phase of flipped classrooms. Through this, the students are able to bridge the learning gap that the ZPD reflects (Snowball, 2014)

In flipped classrooms, instructors should provide students with videos that explain, model, and guide students to content before class, so students can study at their own pace, since each student has a different background. By doing that, students will be better able to understand

the content, as they will have time to think and try out ways to relate this new knowledge to prior experiences (Blake & Pope, 2008).

ZPD suggests that instructors work as guides and facilitators by providing different levels of scaffolding to students to achieve a task and acquire and retain information (Vygotsky, 1978). During class time, instructors should guide students' collaboration, interaction, and group problem-solving activities through questioning techniques and scaffolding (Blake & Pope, 2008). Instructors should actively assist students with a sufficient amount of scaffolding, which is another construct of Vygotsky's learning theory, to reach full participation in activities and eventually reach full understanding of the concept.

Scaffolding refers to a kind of assistance provided by adults or more skillful persons that enables a novice or learner to achieve a specific goal, such as solving a problem or completing a task (Daniels, 2001). Vygotsky asserts that when students are provided with enough scaffolding in the ZPD, they will be able to succeed in a task (Vygotsky, 1978). Green (2015) suggested that in flipped classrooms, the integration of instructors' scaffolding can assist them understand the ZPD of their students, which could happen in the second phase.

When students master knowledge, the instructor can withdraw the scaffolding and let students complete the work by themselves. Cooperation with peers is also a beneficial way of scaffolding for mastering a task by letting students with different levels of proficiency work together (Vygotsky, 1978). This goes well with the flipped classroom model in that the instructor can assign collaborative work and individualized scaffolding of tasks to create an effective learning environment. Instead of being a "sage on the stage", the instructor should be a "guide on the side", as King (1993) suggested. The instructor's role is to provide feedback, explain the content, and be a designer and observer of learning activities. Instructors become more like

coordinators and administrators of the learning process, whereas students are encouraged to explore their learning capacities and abilities to acquire new skills in the most suitable manner, such as sharing their experiences and exchanging ideas with others to be able to learn more (Jonassen & Roher-Murphy, 1999). Al Rowais (2014) discussed scaffolding in relation to flipped classrooms. She reported that without the facilitation of teachers, students may not be able to construct a deeper meaning.

Moreover, during class in this model, as constructivist social learning requires, students are highly interactive through hands-on task-based activities that make them active rather than passive agents, with the teachers as facilitators. Collaborative learning and peer instruction in class help students understand ideas and add to their prior knowledge about a topic. Students learn new concepts through connecting them to past learning experiences via communication with peers, which encourages students to reconstruct their views of the world and gain a deeper meaning. Eventually, when students actively participate in their learning, their attitudes toward the course will be more positive.

Consequently, this model of instruction provides students with the instructor's scaffolding and support for their learning and meta-cognitive needs and helps students be self-regulated and independent (Johnson & Renner, 2012). Integrating Vygotsky's learning theory into today's learning environments, where instructors plan their lessons to create meaningful learning for students, can affect learners' achievements (Fogarty, 1999).

In short, a flipped classroom model of instruction is grounded in constructivist theory through challenging students to exit their comfort zones with encouragement and support from peers and the instructor, who ensures the validity of the learning. Moreover, it depends on active learning strategies that help students construct meaningful learning through social collaboration

and interaction. Therefore, the aim of this study was to compare the use of a flipped classroom model of instruction to the traditional model of instruction on students' achievement and attitudes.

Research Questions

Quantitative

1. What are the differences between undergraduate female students' academic achievement in a flipped classroom and students in a traditional classroom in the Computer in Education course in Saudi Arabia?

Qualitative

1. What are female students' attitudes toward the flipped classrooms in the Computer in Education course?

Mixed-Methods

1. How does the qualitative data help in explaining the quantitative results?

Definition of Terms

Flipped classrooms (FC): This study employed Bergmann and Sams's (2012) definition of flipped classrooms: "an environment where students obtain the lecture-worthy information via technology at home (either provided by the school or the student) and come to class prepared to apply the information in a hands-on way with teacher and student collaboration" (p. 25).

Student achievement: For this study, student achievement is defined as students' grades based on the correct answers on a specific assessment, which is a comprehensive achievement test.

Student attitude: For this research, student attitude can be defined as a tendency, either positively or negatively, toward a situation (in this case, the use of flipped classrooms in their education).

Delimitations

Delimitations of the study include:

1. This study was limited to only females, since the educational system in Saudi Arabia separates males and females at all academic levels. This separation might have affected the generalizability of the research results for male students in Saudi Arabia or any other groups in higher education in other countries.
2. Participants in this research study were from different academic levels (seniors, juniors, etc.) enrolled in the Computer in Education course. This might affect the generalizability of the research results as well, since the participants are from different academic levels.
3. This study was limited only to students enrolled in the Computer in Education course.
4. The data may not contain enough historical information about using flipped classrooms because the college had not used this kind of teaching strategy prior to this study.
5. The interviewees' responses were based on their own experiences, which the researcher cannot do anything about.

Significance of the Study

A mixed-methods study quantitatively comparing female students' academic achievement in flipped and non-flipped undergraduate educational technology classes at one of the western district's universities in Saudi Arabia, while exploring their attitudes qualitatively, contributes to the literature of flipped classrooms and the field of educational technology. It addressed some gaps through 1) utilizing a flipped classroom model for educational technology courses in higher education in the context of other countries and 2) extending the time frame for at least one semester, since some of the studies, especially in Saudi Arabia, last for a short period of time.

Additionally, it is hoped this study will inspire educational administrators, especially in higher educational institutions, to respond to the need to implement different teaching models promoting additional technologies in the learning environment to increase students' satisfaction, content comprehension, and learning outcomes. Hopefully, faculty members in Saudi Arabia will be motivated to utilize this model in their teaching to increase collaboration between themselves and the students as well as among students. This implementation could then serve as a model for other universities and educational institutions in Saudi Arabia. Finally, although this research is in the educational technology field, its results might also be applied to other areas such as medicine, engineering, the arts, and others.

CHAPTER 2

REVIEW OF THE LITERATURE

This literature review discusses the following elements: the flipped classrooms model of instruction and the advantages and disadvantages of this model. Finally, relevant studies on flipped classroom are discussed regarding students' attitudes, academic achievement, and individual differences.

Flipped Classroom Model

The flipped classroom is an instructional model in which students receive and watch lectures outside school. Bergmann and Sams (2012) defined flipped classrooms as "an environment where students obtain the lecture-worthy information via technology at home (either provided by the school or the student) and come to class prepared to apply the information in a hands-on way with teacher and student collaboration" (p. 25). According to the Flipped Learning Network, George Mason University, and Pearson's Center for Educator Effectiveness, there are four pillars that serve as a guide for instructors and administrators to support effective flipped learning: a) flexible environments, b) shifts in learning culture, c) intentional content, and d) professional educators (Hamdan, McKnight, McKnight & Arfstrom, 2013).

Instructors provide students with flexible environments in which students can learn at a steady pace by integrating different technological resources and tools. These tools, which are

selected and evaluated by instructors, may be used outside or inside the classroom and are available for everyone. Moreover, they offer different learning modes that involve "group work, independent study, research, performance, and evaluation" (Hamdan et al., 2013, p. 5). Moreover, in this environment, teachers should expect class time to be somewhat "chaotic and noisy" and should be flexible in their timelines and learning assessments (Hamdan et al., 2013).

In flipped learning a shift in learning culture is required. The learning shifts from teacher-centered to student-centered modes, which means students actively work as agents in knowledge formation through participation and evaluation of their learning during class time. This model helps learners to acquire in-depth knowledge through Vygotsky's zone of proximal development (Hamdan et al., 2013).

In addition, educators should evaluate the content they need to teach, and students should review the pre-class materials they will study at their own pace. Also, instructors should consider how they help students gain conceptual understanding. They use intentional content to increase class time and the mastery level of content through implementing different teaching models like "active learning strategies, peer instruction, and problem-based learning" (Hamdan et al., 2013, p. 6). In the flipped classroom, employing professional educators is required, and they are needed more than ever. Instructional videos cannot replace instructors. For this reason, instructors should decide what the best technological tools are and the best time to shift from group instruction to the individual learning process while also considering ways of maximizing face-to-face time between teachers and students. They must also monitor the learning process, provide feedback, assess student work, design learning experiences, control classroom chaos and evaluate the quality of performances (Hamdan et al., 2013).

Advantages and Disadvantages of Flipped Classrooms

Advantages of Flipped Classrooms

The flipped classroom model of instruction has many advantages. It has revolutionized differentiated instruction, which provides students with different avenues to learning. Students can skip some lessons when they feel they already know concepts without being bored waiting for peers to understand them (Sams & Bergmann, 2013). One of the most important advantages is that students are not passive. They work as active agents where they spend class time working with peers and instructors. This collaboration improves their problem-solving skills and helps in professionally completing tasks (Defour, 2013). Students get a valuable opportunity to discuss concepts with other students and help each other understand the material through different points of view. In this case, instructors are able to provide students with a greater amount of feedback and interaction (Hamden et al., 2013). Students also have the opportunity to directly discuss concepts with the teacher and ask about things they do not understand from the lecture they have watched.

In addition, students have an opportunity to learn the material while watching video lectures at their own place, time, and speed. Thus, they will not become frustrated with fast lecture speeds and not being able to take complete notes before the teacher erases them from the board, which consequently makes them lose some information (Goodwin & Miller, 2013). Davies, Dean and Ball (2013) stated that flipping learning for college courses provides students with more time for enrichment activities. They reported that pacing is a major benefit of flipped classrooms, since each student has a different background.

Moreover, the flipped classroom offers a means for absent students to keep up with the

class and not miss the lesson, as was the case with Sams and Bergmann's students (2013). According to Sams and Bergmann, flipped learning offers many advantages through customized and student-centered content, increases interaction among students and peers and students and teachers, and gives students responsibility for their learning (Sams & Bergmann, 2013).

The flipped classroom model is beneficial for teachers as well, in that it saves time in class. They can deliver content on video faster, without having to stop to answer questions and repeat the same information. Teachers can answer those questions in class time (Springen, 2013). Goodwin and Miller (2013) reported that research findings showed students lose interest and focus after just ten minutes of watching or listening to content. Because of this, the flipped classroom minimizes students getting bored. Advocates of flipped classrooms believe that using videos to deliver content will maximize class time to focus on deeper, inquiry-based learning ("Flipping the Classroom", 2011). The instructor's role is to provide feedback, explain content, and design and observe learning activities. Thus, they become coordinators and administrators of the learning process, and students are encouraged to explore their learning capacities and abilities to acquire new skills in the most suitable manner, such as sharing their experiences and exchanging ideas with others to be able to learn more (Jonassen & Roher-Murphy, 1999).

One important thing to mention here is that flipped classrooms do not negatively affect face-to-face class time in the traditional model of teaching, as both have the same amount of class time. Video supplements are provided outside of class to get the content, and class time is used to develop inquiry-based learning (Sams & Bergmann, 2013).

Disadvantages of Flipped Classrooms

According to Tétreault (2013), there are challenges to accessing technology as well as a

preference for traditional instruction over flipped classrooms and teachers' technological skills. In every society students have different levels of income, which might affect their access to technology. Some of them cannot afford personal computers to access the internet, which is required for a flipped classroom model to be successful (Bergmann & Sams, 2012). However, it is the educational system's responsibility to make sure all students have access to the internet so they can study at their own pace (November & Mull, 2012).

Tétreault's (2013) survey showed that students prefer the traditional way of learning, since they are used to it and do not want to do a lot of group work. Hutchings and Quinney's (2015) results showed that while there was evidence of higher academic achievement, the change in the model of instruction challenged students to engage in inquiry-based learning through an educational platform. But some students were not satisfied with this change. Green (2015) reports that the flipped classroom might be challenging for less motivated students to become engaged. Also, it could be challenging for junior students at the university, who are encountering a new environment, to have a new learning methodology as well (Snowball, 2014).

Many scholars discuss a main concern regarding the flipped classrooms model, which is the amount of time spent preparing to use it compared to the traditional method (Bishop & Verleger, 2013; Hamdan et al., 2013). Instructors need extra time for planning and designing flipped classrooms. They need to know that such a model of instruction requires time and skill to be prepared. They should create pre-class materials to help them plan and design face-to-face class time (Hamdan et al., 2013). It might be challenging for some teachers to flip their classes since they must be able to use educational technologies such as videos, LMS, online quizzes and other tools (Bergmann & Sams, 2012). However, educators are encouraged to think a lot about their schedules before using such a model.

There are two phases to the flipped classroom (phase 1: pre-learning and phase 2: in-lecture engagement) that can cause challenges (Green, 2015). Teachers must make sure students have completed phase 1 and watched the learning materials; otherwise, phase 2, which includes collaborative activities, discussion with peers, debate, and teamwork, will not be successful (Green, 2015).

General Focuses of Flipped Classroom Research

In recent years, the flipped classroom has become one of the emerging technologies in educational research. Recent research efforts have focused on the following areas: students' attitude, satisfaction, perceptions, engagement, learning outcomes, and critical thinking as well as students' individual differences. This review will examine the effects of flipped classrooms on attitude, academic achievement and individual differences.

Flipped Classrooms and Effects on Attitude

The flipped classroom model of instruction has become a trend for improving students' attitudes toward learning, which might play an essential role in improving their academic achievement. Multiple studies have investigated the effect on students' attitudes for the flipped classroom. In some studies, students had positive attitudes toward this model of instruction while others showed students were less satisfied.

Love, Hodge, Grandgenett and Swift (2014) examined the effectiveness of flipped classrooms on student perception in a linear algebra course at the University of Nebraska at Omaha. This quantitative study lasted for one semester, having two sections with 55 students in all. One section of students (n=27) studied using the flipped classroom with multiple online

resources, and the other (*n*= 28) used the traditional method without online resources. The experimental group was provided with parts of textbooks, notes and screencasts (about 30 minutes long) developed by their teacher in preparation for the class. The class time was specified for interactive, hands-on activities and problem solving. To avoid previous research limitations of students' lack of preparation for flipped classrooms, a daily readiness assessment was administered, which students gained points for answering. Both sections were taught by the same instructor. Post-surveys (at the end of the semester) of students using the flipped classroom showed that students' perceptions of their experience toward the flipped classroom were positive. Students greatly appreciated the collaborative work and instructional video materials. Love et al. (2014) emphasized the importance of conducting research in specific areas to make informed decisions about implementation of flipped classrooms.

Similarly, Mason, Shuman, and Cook (2013) compared the effectiveness of the flipped model to a traditional method by studying teachers' content coverage and students' observations and perceptions in an engineering course at Seattle University. This study lasted for two successive years. During the first year, the traditional class (*n*=20) was used, and the inverted class (*n*=20) was used in the second year. The researchers used a control-treatment experiment in this study. The findings of an anonymously written survey with a five-point Likert scale administered at the end of both courses showed the teacher could cover more learning materials in the flipped classroom, and even though students struggled with the flipped classroom format, they found it satisfactory and effective.

Along the same line, Gilboy et al. (2015) conducted a quantitative study to illustrate how to implement flipped classrooms and evaluate students' perceptions toward it in two undergraduate nutrition courses at West Chester University of Pennsylvania. The data showed

that most of the students (*n*=142) preferred studying in flipped classrooms as compared to the traditional model, which was consistent with previous research (Love et al., 2014; Mason et al., 2013). Furthermore, Nouri (2016) also used a quantitative design to examine the effect of the flipped classroom model on students' perceptions of research methods. The sample consisted of 240 students in their last year at a university. Nouri used a questionnaire instead of a survey to measure students' perceptions, but the results were consistent with previously mentioned studies, which revealed students had a positive attitude toward the use of video as a learning tool in the flipped classroom.

Using a mixed-method research design, some studies have evaluated the effect of flipped classrooms for different subjects. Wilson (2013) did research in an undergraduate statistics course in Columbus, Ohio, to explore student engagement of 20–25 students who had little or no experience with statistics. Even though students showed negative comments at the beginning regarding viewing lectures at home, findings from the middle-and end-of-semester evaluations showed students had positive attitudes toward flipped classrooms and their grades in comprehensive exams improved.

With similar results, McLaughlin et al.'s (2013) mixed-methods study examined if flipped classrooms in a pharmaceutics course would improve students' engagement and perception. The sample consisted of 22 students in 2012 (the experimental group) and 13 in 2011 (the traditional group) at two different campuses of UNC – Chapel Hill. A pre/post survey and a course evaluation survey were administered and information about students' activities was collected. The findings showed that students had a positive perception toward flipped classrooms and that students' empowerment, development, and engagement could be promoted using this model. Furthermore, Zengin (2017) conducted a mixed-methods study to evaluate the impact of

flipped classrooms on student perceptions, consistent with McLaughlin et al.'s (2013) results. The sample for the study was 28 students in a mathematics department at a state university in Turkey. The students responded that the flipped classroom enhanced their understanding, promoted retention, and increased motivation.

Olakanmi's (2017) empirical mixed-methods study that evaluated attitudes for secondary school students about chemistry within flipped classrooms in Minna, Niger State, Nigeria, was consistent with previous research. His sample included 66 students divided randomly into an experimental group (using the flipped classroom) and control group (using the traditional lecture model). The following instruments were used to measure impact on students' performance and attitudes: 1) Rates of Reactions Knowledge Test (RRKT), 2) Chemistry Attitude Scale (CAS), and 3) observations and interviews. Quantitative and qualitative data revealed that students involved in a flipped classroom showed a positive attitude toward chemistry.

Regarding the Saudi context, Al Rowais (2014) investigated the effectiveness of flipped classrooms in regard to students' attitudes toward studying teaching methods and communication skills at Salman bin Abdul-Aziz University in Saudi Arabia. The researcher utilized socio-constructivist theories of education, active learning theory, and the zone of proximal development (ZPD). The purpose of using this flipped classroom was to help students gain more knowledge through receiving lecture content outside of the classroom while using class time for application of the learned materials through instructor feedback. The study sample consisted of 64 female students in the sixth level of college during the second term of 2013/2014. Two classes were selected and divided into experimental and traditional groups, with both sections taught by the same instructor. The researcher employed a quantitative design with a quasi-experimental treatment. Al Rowais (2014) used a pre/post attitudinal scale to measure students'

attitudes toward learning within the flipped classroom model. The attitudinal scale data analysis showed that attitude increased positively toward studying in flipped classroom courses.

Another quasi-experimental study in Saudi Arabia was conducted by Alzahrani (2015) to investigate the impact of the flipped classroom on the promotion of students' attitudes in an e-learning course for higher education at King Abdulaziz University, Saudi Arabia. Two classes were divided into two groups. The first group used the lecture-based strategy (n = 28), and the second group implemented a flipped classroom (n = 27). The findings of the questionnaire revealed that students in the flipped classroom showed a more positive attitude than the other group.

With similar results but a different research design, Sajid et al. (2016) conducted a descriptive analytical study to examine the effect of blended learning and flipped classrooms on students' perceptions toward this model of instruction in comparison with the traditional model. The sample of this study was a non-randomized purposive sample from third-year medical students (n=154) from Alfaisal University in Saudi Arabia. Out of 127 responses, 64 were from females and 63 from males. Data were obtained from students' feedback toward blended learning and flipped classroom experiences via a researcher-developed questionnaire. Results showed that students were more satisfied with blended learning and flipped classrooms since both helped them prepare for exams.

Using a mixed-methods research design, Alsowat (2016) investigated the effectiveness of the flipped classroom model on students' English higher order thinking skills (HOTS), engagement, and satisfaction for an English course at Taif University in Saudi Arabia. The sample consisted of 67 female graduate students. The experimental group, consisting of 33 students, was taught using the flipped classroom model. The control group, consisting of 34

students, was taught using the traditional method. The mixed-methods study used a pre/post HOTS test, two 5-point Likert scale questionnaires, and engagement and satisfaction scales. Results showed a difference between the two groups favoring the experimental group in the HOTS. Moreover, students in the experimental group showed a high level of satisfaction and engagement.

Consistent with the previous results, but this time with a different academic level, Al-Harbi and Alshumaimeri (2016) examined the impact of flipped classrooms on the perceptions and attitudes of secondary school students in Riyadh, Saudi Arabia. The sample consisted of 43 female students studying English as a foreign language; 20 were assigned to the experimental group and 23 to the traditional group for a period of six weeks. The experimental group watched videos before class and spent class time collaboratively practicing what they had learned. The control group studied in the traditional model without any videos. A mixed-methods research design was employed, with quantitative and qualitative questionnaire data analyses revealing students' attitudes toward the flipped classroom were positive and they felt it improved their communication skills while encouraging autonomy. Moreover, data analysis of the semi-structured interviews, which consisted of three questions, showed students felt positively toward the use of flipped classrooms in their learning.

However, the previously mentioned studies are inconsistent with other studies conducted in the flipped classrooms literature. Strayer (2007) conducted a mixed-methods study that used the flipped classroom and traditional models in two different university-level classes for introductory statistics. Strayer's study was dependent on active learning theory, which emphasizes the importance of activity and physical engagement for students to learn. The results of a questionnaire and researcher observation showed the experimental sample was less satisfied

with how the structure of the flipped classroom was introduced into the course. The students did not perform very well in the given task because they had less interaction with the instructor and the class time seemed boring and repetitious to them. Moreover, students were split on their feelings toward taking control of their own learning, which may reflect that self-perception and confidence in such a model need time to evolve. This confirms the results of Moran's (2014) research study, which was conducted to evaluate student engagement and teacher practice in flipped classrooms in a seventh-grade English language arts course (n=183) in the United States. The study also conflicts with the positive results of previous studies. The mixed-methods data shows that students' engagement was lower and students had different reactions toward this model compared with the traditional model. Students had challenges motivating themselves to learn until the end. Moreover, students with high motivation to excel in English language arts revealed they easily navigated in the flipped unit, whereas less motivated students found the flipped classroom model to be a frustrating strategy.

The participant teachers revealed their support for students fell during the middle of the unit due to frustration with large classes and many assessment issues. This finding is congruent with previous research by Sowa and Thorsen (2015) that examined using flipped classrooms pedagogy among university underclassmen in STEM courses in the United States. Student preferences, perceptions, and social capital development were the dependent variables. Both courses were taught by the same teacher. The mixed-methods data analysis revealed students did not show a preference for flipped classrooms and pre-recorded video lectures over the traditional method. The researchers suggested that instructors should use a type of graded assignment to encourage students to watch the video before class. Finally, the survey results show that flipped classrooms have a potential for supporting social capital development. Students in flipped

classrooms reported that they have a better chance to work with other students on problem solving in class, as they know classmates in this class structure better than in other classes and are comfortable asking peers and teachers for help.

Cilli-Turner (2015) conducted a study in line with the results of Strayer (2007), Moran (2014) and Sowa and Thorsen (2015). Cilli-Turner measured students' attitudes in an introductory undergraduate statistics course that utilized flipped and non-flipped classroom environments at Salve Regina University in Newport, Rhode Island. This study lasted two consecutive semesters. In the first, the traditional lecture was employed for two sections (n=56); 27 were male and 29 were female. In the second, three sections comprised of 78 students, 58 females and 20 males, were taught using the flipped classroom. The researcher was the instructor for both sections in both semesters. Students in the flipped classroom sections were provided with videos that ranged from 10 to 20 minutes each week. To ensure student readiness, an open-note quiz on the video was given during each class. Quantitative data for both groups were then collected. A survey with a 5-point Likert scale for several questions was given to students in the flipped classrooms to rate their agreement on the usage of the flipped classroom model. Students showed negative attitudes toward the flipped classroom, with most reporting a preference for the traditional method over the flipped classroom. They also noted they liked to read from the textbook instead of watching the videos, since both contained the same content. The researcher suggested this negative attitude might have been caused by students being challenged by a new model of instruction.

The above-mentioned studies considered the effect of the flipped classroom on attitudes. Nonetheless, the inconsistent results of those studies highlight the need for additional studies regarding this model of teaching, especially in Saudi Arabia. Moreover, most studies applied

surveys and questionnaires to measure students' attitudes. Only one study, conducted by Olakanmi (2017), measured the attitude via observation and interview. It was for secondary school students taking a chemistry class in the United States. Thus, the rationale for the current study to be conducted in Saudi Arabia was to explore undergraduate female students' attitudes through semi-structured interviews. Interviews gave the students the chance to talk in the area of interest more deeply (Bogdan & Biklen, 2007). Moreover, qualitative interviews offered the researcher an opportunity to have a range of details regarding the targeted topic (Bogdan & Biklen, 2007).

Flipped Classrooms and Students' Academic Achievement

Recently, the flipped classroom model of instruction has been implemented at different educational levels to investigate its effect on students' academic achievement. Some of the studies proved its effectiveness, but others proved the opposite.

Bergmann and Sams (2012) found the flipped classrooms model beneficial for improving learning outcomes. They claimed that providing students with feedback and assessment in class provides the students with a better understanding of the course materials. Giving students more responsibility to learn and collaborate in class increases their self-efficacy, which promotes the learning outcomes as well (Kim, Chun, & Choi, 2014).

Recently, the flipped classroom model has become widely used in higher educational institutions in the United States. Jackson (2013) reported that a nationwide survey by the Center for Digital Education was conducted to determine the reason behind this evolution. The findings showed that 80% of students improved their mastery of information, 81% developed more retention of information, and 86% agreed that students have positive attitudes toward the flipped

classroom model of instruction. This is in line with another survey conducted by Goodwin and Miller in 2013 of 453 teachers who used flipped classrooms. The study revealed that 67% claimed their students' academic performance was higher, with 80% reporting an improvement in students' attitude (p. 78). This is consistent with Mason et al. (2013), not only on the positive attitude but also in the performance. The findings of comparable quiz and exam questions and open-ended design problems showed students had a higher level of performance.

These confirm Missildine, Fountain, Summers and Gosselin's (2013) findings of similar results in other subject areas for 589 nursing students at Texas A&M Health Science Center. The study measured students' performance utilizing a quasi-experimental design via three approaches to learning: traditional lecture only (LO), lecture and lecture capture back-up (LLC), and the flipped classroom approach of lecture capture with innovative classroom activities (LCI). The examination scores were higher for the flipped classroom group than for both the lecture and lecture capture back-up and the traditional lecture-only groups.

Furthermore, Love et al. (2014) had similar findings. The results of three midterm exams and a final exam for content understanding showed the students' performance in course exams significantly increased in the flipped classroom model compared to the traditional method. Comparing the performance on the first and second exams, the average change between the experimental and traditional group sections significantly favored the first section ($p < 0.034$). Equivalently, comparing the third understanding content exam to the first one, the average change was also higher in favor of the same group section ($p < 0.012$). The researchers utilized the non-parametric Mann–Whitney U test for the data analysis. In the final exam, both sections obtained similar average scores, with an average raw score of 89.5 for the experimental section and 87.4 for the traditional section, which reveals no significant difference between the two

groups. The most important thing was even though both sections had similar scores for performance, students in the flipped classroom enjoyed it while learning the necessary skills.

Cilli-Turner (2015) also examined students' learning achievement via three achievement exams given throughout the semester for each section, with an additional final comprehensive exam. Overall course grades for each exam showed a positive effect of flipped classrooms on students' outcomes, t (132) = 4.96, $p < 0.001$, $d = 0.87$. Moreover, grades on the final exam were significantly higher in favor of the experimental group, t (132) = 6.57, $p < 0.001$, $d = 1.15$, even though the attitude was negative. The researcher concluded that students' attitudes were not necessarily correlated to their performance. She also related that she preferred the flipped classroom for many reasons: 1) the increase in student engagement; 2) as an instructor, she could observe students more closely and concentrate on concepts they struggled with; and 3) the flipped classroom for her was a more enjoyable way to teach a statistics course.

Albert and Beatty (2014) conducted a quasi-experimental design study to compare the effect of flipped classroom versus lecture classes on students' grades in a management course at a U.S. university. Albert and Beatty used non-equivalent groups: treatment and control group LC (n=650) and flipped classroom (n=325). The control group was taught in 2012 and the experimental group in 2013. Both groups were taught by the same teacher using the same learning content materials and tests. The findings revealed that students in the experimental group had significantly higher grades on three exams than the control group. Sowa and Thorsen (2015) also identified the difference between earlier exam scores for a course taught traditionally and current exam scores for a course taught using the flipped classroom model were significantly in favor of the flipped classrooms.

Leo and Puzio (2016) conducted an empirical study that examined the effectiveness of flipped instruction in a ninth-grade biology classroom for academic achievement. The results suggested that flipped instruction had a positive effect on students' achievement. Adding more, some students revealed they favored watching video lectures outside of class and appreciated more active approaches to learning. Using the same research design and having the same results, but for chemistry, Olakanmi's (2017) empirical study with a pre-test and post-test revealed that students involved in a flipped classroom showed a positive shift in their conceptual understanding of the content as compared to the control group; their performance was higher on average.

Using a different research design, Zengin (2017) conducted a mixed-method study in a higher educational institution in Turkey to evaluate the impact of flipped classrooms on students' academic achievement as well. In a double-integral achievement test, the same finding was reached: students' achievement was significantly increased. Another study confirming the above-mentioned study's results regarding academic achievement was Aljaser's (2017), an experimental study in Saudi Arabia at a higher educational level. The researcher examined the effectiveness of using the flipped classroom model on academic achievement and self-efficacy for female students for one semester of the Classroom Management course. The sample was randomly selected and divided into two groups. One used the flipped classroom while the other studied via the traditional method. The results of the achievement test and the self-efficacy scale showed academic achievement for the experimental group was significantly higher, which caused a positive attitude on the self-efficacy scale. This is consistent with the results of Al Rowais (2014) regarding academic achievement. He also conducted his study in Saudi Arabia to evaluate the use of flipped classrooms on students' achievement via a pre-post achievement test

in teaching methods and communication skills courses. The results showed that student achievement in both courses utilizing the flipped classroom was significantly higher than that of the traditional group.

In contrast, some results showed that implementing a flipped classroom model did not affect students' understanding of the content (Johnson & Renner, 2012). For instance, Johnson and Renner conducted a study to examine the efficacy of traditional and flipped classrooms in a secondary school computer application course. They used a mixed-methods switching replications design on students' perceptions and academic achievement. A high school in Kentucky was chosen as a sample for this research, which included two classes having a similar grade level composition. The results showed that using flipped classrooms in the computer applications class did not have an impact on students' scores. The pre- and post-test showed no significant difference on their scores compared to the traditional group. Moreover, there was no significant difference between the means of pre- and post-survey results of students who participated in the treatment.

Using a mixed-method study as well, Marlowe (2012) obtained similar research findings. The sample was 19 students in the second semester of their senior year in the Environmental Systems and Societies (ESS) course. The course was divided into two parts. The first was taught using the traditional method and the second using the flipped classroom model. The findings showed the students demonstrated lower levels of stress and higher levels of enjoyment using the flipped classroom model over the traditional method. However, the exam grades did not show significant improvement, as they only increased by three points. McLaughlin et al. (2013) used the same research methods and collected data from the two course projects, eight quizzes, and three midterm and comprehensive final examinations. Their analysis showed no significant

difference between the traditional and the experimental groups even though the qualitative findings suggested that students' empowerment, development, and engagement could be promoted using the flipped classroom because students have positive attitudes toward this model of instruction.

To test the academic achievement of undergraduate students, Findlay-Thompson and Mombourquette (2014) compared two different teaching approaches in business courses: traditional and the flipped classroom. The quantitative results of the grades were identical, which revealed no significant differences in academic outcomes. This parallels Blair, Maharaj, and Primus's (2016) research findings. Their study was conducted consecutively for two years at the University of the West Indies in Jamaica for the Material Technology course for undergraduate students in the Department of Mechanical and Manufacturing Engineering. The study investigated whether the flipped classroom had a positive effect on students' learning experiences in correlation with their performance and perceptions. The traditional method (n=71) was used in the first year – 2012/2013. The year after, 2013/2014, the flipped classroom model (n=42) was used, during which students received screencasts before the class and spent most class time on group activities. The researchers used a mixed-methods research design. For triangulation, they used three types of data (questionnaire, instructor's comments, and exam), with notes from their literature review to increase the reliability of the research data. The student questionnaire and instructor's comments (before and after the study) revealed an improvement in perception of class materials, and students showed positive attitudes in terms of completion. Students preferred to continue using a flipped classroom model since it gave instructors more time to work with each student individually. However, the exam results showed no significant differences. The course grades showed the pass rate for the flipped classroom in 2013/2014 was

less than 1% different than the pass rate for the traditional classrooms recorded in 2012/2013. A limitation to this study was a noticeable drop in attendance in the flipped classroom, which related to student performance. This may be due to students thinking that simply viewing screencasts was enough to enable them to pass the course.

Bossaer, Panus, Stewart, Hagemeier and George (2016) conducted an experimental design study to determine if flipped classrooms had a positive effect on students' performance in comparison to an interactive lecture model. The sample was from third-year pharmacy students at East Tennessee State University. This study was conducted for two consecutive years in 2012/2013. In the first year, the students experienced interactive lectures. In the second year, students experienced the same content in a flipped classroom model. The exam grades were then compared. The results showed that students' performance in flipped classrooms was lower than the students' performance in the interactive lectures. Bossaer et al. concluded that the flipped classroom model of instruction did not essentially increase students' performance, and for this reason, they recommended conducting further studies utilizing different flipping techniques.

In Saudi Arabia, Sajid et al. (2016) conducted a descriptive analytical study to examine the effect of blended learning and flipped classrooms on higher education male students' academic performance as well as in comparison to the traditional model. The results of the assessment for academic performance were compared with those from the previous year, which showed the grade comparisons between the two models were not statistically significant, even though students were more satisfied with the blended and flipped classroom models and wanted to have all their courses taught using the flipped classroom model of instruction. This agrees with Al-Harbi and Alshumaimeri's (2016) results, which also examined the impact of flipped classrooms on performance. Their results showed that the mean scores of the two groups post-

testing did not show a significant difference, even though their attitudes toward this model were positive. These results conflicted with those of Cilli-Turner (2015).

Critical thinking is also a part of learning outcomes. For this reason, researchers study this aspect as well. Some studies showed that critical thinking was promoted through the flipped classroom model, such as Alzahrani (2015) and Kong (2014). Moreover, Alsowat (2016) also examined students' higher order thinking skills (HOTS) in flipped classrooms. His findings showed a significant difference between the HOTS test scores of the two groups, with the experimental group scores being higher. In contrast, some other studies detailed findings that flipped classrooms have no effect on critical thinking (Cheong & Cheung, 2008).

All the above-mentioned studies explored the effect of flipped classrooms on academic achievement. It is noticeable that the results conflict. Some studies found that there is a positive effect of the flipped classroom on academic achievement, but others found no significant effect. Blair et al. (2016) recommended that since the results show no significant change in performance, more attention should be paid to learners' outcomes while obtaining relevant data in the future to verify or contradict their results. Moreover, Bossaer et al. (2016) concluded that the flipped classroom model of instruction did not essentially increase students' performance. For this reason, they recommended conducting further studies utilizing different flipping techniques. Additionally, since researchers like Cilli-Turner (2015) concluded that negative attitudes are not mainly correlated to performance, further research in this area is needed, especially in Saudi Arabia, where limited studies exist regarding use of the flipped classroom.

Flipped Classrooms and Students' Individual Differences

Students enter schools with different abilities, learning styles, and personalities. Levy

(2008) suggested that one of the most important tasks of teachers is to meet the different needs of every student. McTighe and Brown (2005) emphasize that educators should recognize these differences and needs so every student may gain a holistic development. Therefore, the flipped classroom model can be used, as it focuses on student centered teaching while including other forms of teaching as well. Flipped classrooms can provide more individualized approaches for each student if teachers are experienced enough to utilize such a model (Bergmann & Sams, 2012).

Bishop and Verleger (2013) noted that educational outcomes can be improved by taking learning theories into consideration as they help explore students' unique learning styles, experiences, and needs. By utilizing flipped classrooms, students can be successful as they employ a variety of approaches, and students will be more motivated to learn, thus retention will be higher.

Braun, Ritter and Vasko (2014) studied flipped classrooms in a mathematics course for undergraduate engineering students over three semesters to examine whether they helped to better address the needs of those who had large differences in terms of prior knowledge in mathematics. Only 20% of the course was taught using the flipped classroom model. The sample of the study contained 55 students in the summer semester of 2012, 62 in the winter semester of 2012/13, and 73 in the summer semester of 2013. The results showed that even though the performance remained constant compared to previous semesters, students benefited from the flipped classroom. Students reported positive feedback about this model. They appreciated the development of the amount of practice inside the class and the availability of learning at their own pace.

Afrilyasanti, Cahyono and Astuti (2016) also conducted a mixed-methods study to

examine the impact of the inverted classroom model on the writing skills of Indonesian EFL students, despite individual differences in learning. The sample was 62 high school students divided into experimental and control groups. The quantitative data were collected through pre- and post-tests, and qualitative data were collected by observing the students' writing. The results illustrated that after the integration of the flipped classroom, the students' ability to write was higher and there was a significant difference in students' writing ability. Moreover, their research concluded that students with different styles of learning might obtain different effects of the integration of this model from each other, and students with diverging, assimilating, converging, and accommodating learning styles had a higher achievement level in writing ability within flipped classrooms than students in traditional classrooms. Their research implied that similar studies with different groups of students in different contexts are needed.

Hao (2016a) also conducted mixed-methods research to examine the perspectives of undergraduate students with different personal characteristics (self-directed learning, preference for group work, gender, academic status and course grades) to discover their readiness for the flipped classroom model. Hao contended that the students' ability to direct and regulate their own learning is fundamental for this model to be successful, as they have multiple learning resources in it. Therefore, Hao hypothesized that there is a correlation between students' flipped classroom readiness and self-directed learning. His second hypothesis was that students' preference for group learning participation is associated with their readiness for flipped classrooms. Hao suggested that other personal characteristics such as gender, academic level (junior or senior) and course grades may affect students' readiness for flipped classrooms. Hao conducted this study for two different courses: Information Technology and Education and Classroom Observation, which were taught by the same teacher for one semester. The sample

was 84 students with different genders and academic statuses. The qualitative and quantitative data analyses showed even though some students disliked this model of instruction because they were asked to preview the lecture before class, most students still demonstrated a positive perspective of flipped classrooms. Junior students preferred teacher-centered instruction and did not like regulating their own learning like the freshmen, whereas senior students enjoyed the model of instruction and regulating their learning time. There was no significant variation among those groups regarding the other features of the flipped classrooms like peer evaluation, group discussion, online resources and not having a lecture inside the class. The results also showed that self-directed learning, group-based work and gender were associated with the overall readiness level. In general, male students displayed a higher readiness than females toward flipped classrooms, and senior students showed higher readiness levels for self-directed learning compared to junior students. Finally, the readiness level negatively predicted course grades. Correlation coefficients were calculated, and there was no significant relationship, which indicates no correlation between the readiness level and course grades.

Along the same line, Chen, Yang and Hsiao (2016) conducted a study to fill the gap in previous literature regarding student learning perceptions, outcomes and gender differences within flipped classrooms. The random sample was 632 students. The findings show that feelings of female and male students with relation to final grades varied; however, both genders performed equally, even though they had different topic interests. Moreover, they showed a positive attitude toward this flipped classroom model.

Another study was conducted by Hao (2016b) to investigate the effect of flipped classrooms on 387 Taiwanese EFL students' personal characteristics (gender, the availability of outside-school support and resources, foreign language beliefs, perceptions of their English

teachers, and how they use the internet) on their readiness for flipped learning. The findings showed the characteristics can affect students' level of flipped classroom readiness.

Balaban, Gilleskie and Tran (2016) investigated the application of flipped classrooms in a large lecture course, Principles of Economics, with further quantitative evaluation. The results found flipped classrooms increased students' performance compared to the traditional model of instruction while developing the students' motivation during the semester. The positive effect of this model was measured through observable student characteristics (i.e., gender, age, race, ethnicity, educational experience, background or supportive characteristics, out of state or need for financial aid). The researchers explored whether students' performance was affected by individual characteristics and to find evidence for this difference. They concluded that students eligible for financial aid and non-state residents benefitted more from a flipped classroom model of instruction, although Hispanic students did not benefit. For this reason, Balaban et al. suggested it is important to examine why flipped classrooms are less beneficial for these students.

Lyons, Limniou, Schermbrucker, Hands and Downes (2017) emphasized that individual differences influencing students' preference for diverse learning styles might have affected the previous results. The researchers studied 200 undergraduate psychology students and found flexibility and self-based learning goals were significant predictors positively affecting students' preferences for flipped classrooms. Students whose goal was to master the content in a short period of time enjoyed this model more than the lecture model.

In the findings of the Blair et al. (2016) research, instructor reflection was positive and confirmed they would like to continue using the flipped classroom model since it allowed them more time to work with students of different individual characteristics.

Summary of Research and Further Implications

Recently, the focus of educational institutions has been calling for transforming the role of teacher from lecturer into the "guide on the side", as King (1993) suggested to develop student-centered active learning strategies. Consequently, the flipped classroom serves as a potential model to achieve this goal (Sams & Bergmann, 2013). Some educators are enthusiastic about the integration of new computer-based technologies to improve the learning process and collaborative learning beyond the classroom (Hyland & Hyland, 2006). Other scholars are enthusiastic about using flipped classrooms, but stress more examination of the effectiveness of this model in educational pedagogical settings is needed (Lyons et al., 2017).

Some research showed promising results for the flipped classroom model, as it utilized problem-solving techniques that help students improve their proficiency (Mason et al., 2013). However, Nouri (2016) reported that despite being a new trend in higher education, the flipped classroom model of instruction has not been thoroughly examined for its effectiveness. Although Abeysekera and Dawson (2014) and Bishop and Verleger (2013) stated some scholars encourage the implementation of the flipped classroom in education – such as Love et al. (2014), Mason et al. (2013), McLaughlin et al. (2013), and Wilson (2013) – others disagree about its integration into the curriculum – such as Moran (2014) and Strayer (2007).

In general, the review of the literature on flipped classrooms suggests that one of the most important goals of implementing the flipped classroom in education is to enhance students' achievement (Zainuddin & Halili, 2016). Further studies are needed regarding the length of class activities during the implementation of flipped classrooms. This recommendation comes because very little research has been conducted to investigate potential impacts of class time of the

flipped classroom on students' academic achievement (Love et al., 2014).

According to Zainuddin and Halili (2016), the flipped classroom has been more widely used in secondary schools than higher education. Very few studies were conducted concerning the implementation of flipped classrooms in e-learning courses. Blair et al. (2016), McNally et al. (2017) and Sowa and Thorsen (2015) reported that despite widespread use of flipped classrooms, there is a lack of empirical evidence of its effectiveness on students' engagement and learning outcomes. They suggest that further research is needed to examine whether flipped classrooms are effective for students from different academic levels, such as freshmen. Moreover, Braun, Ritter and Vasko (2014) stated that examining the effect of flipped classrooms on different student groups is required, which includes students with different prior knowledge and whether they are juniors or seniors.

In the Saudi context, empirical studies on the implementation of flipped classrooms are limited at different academic levels. According to Alzahrani (2015), Al-Harbi and Alshumaimeri (2016), and Al Rowais (2014), that little research examining the impact of this model on students' learning and attitudes has been conducted in Saudi universities. They all suggest that conducting research on the use of flipped classrooms in different learning contexts will start a new trend in Saudi Arabia.

CHAPTER 3

METHODOLOGY AND PROCEDURE

Research Design

The purposes of this sequential explanatory mixed-methods study were to compare students' academic achievement in flipped and non-flipped undergraduate classrooms and to explore their attitudes toward the use of this model in Saudi Arabia. Female students enrolled in the Computer in Education course at one of the western district's universities were the convenience sample for this study. The independent variable for this study is the implementation of the flipped classroom model of instruction and dependent variables are students' achievement and attitudes toward flipped classrooms.

Mixed-methods design was employed for this study. Mixed-methods research designs include using both quantitative and qualitative data to answer research questions in more depth (Creswell, 2014). This method was chosen because one research method, either qualitative or quantitative, was not sufficient to address the research questions regarding students' academic achievement and attitudes toward flipped classrooms. Mixed-methods provided access to different levels of data while obtaining more comprehensive results than if using only one type of method (Morse, 2003). I believed qualitative data might make participants' attitudes toward flipped classrooms clearer, which could enhance the quantitative results. Moreover, all methods have bias and weaknesses and using mixed-methods overcomes weaknesses in both forms of data (Creswell, 2014).

The sequential explanatory approach of mixed-methods design was employed in this study. The notation for this design is QUAN → qual. I started the first phase of this study through flipped model implementation for a one-semester period. A non-equivalent comparison group pre/post-test design was utilized.

For the first phase of this study, the two groups were administered a pre-achievement test, which is a copy of the post-test, before treatment to statistically match the groups to decrease the threat of internal validity and mitigate selection bias. After treatment, the two groups were administered a post-achievement test to collect the quantitative data. I calculated growth scores and then compared the growth score means in the two groups to measure any differences in students' academic achievement for treatment (flipped classrooms) and control (traditional classrooms) groups.

For the second phase of this study, student volunteers from the treatment group were interviewed (n=9). I collected and analyzed qualitative data resulting from interviews to explore their attitudes toward flipped classrooms. These data were used to provide a more in-depth explanation for the quantitative data. The reason for using qualitative data was to help me understand why flipped classrooms worked or did not work for students in Saudi Arabia and their attitudes toward them. Priority was given to the quantitative data. Figure 1 is a visual model of the phases that were followed in this study.

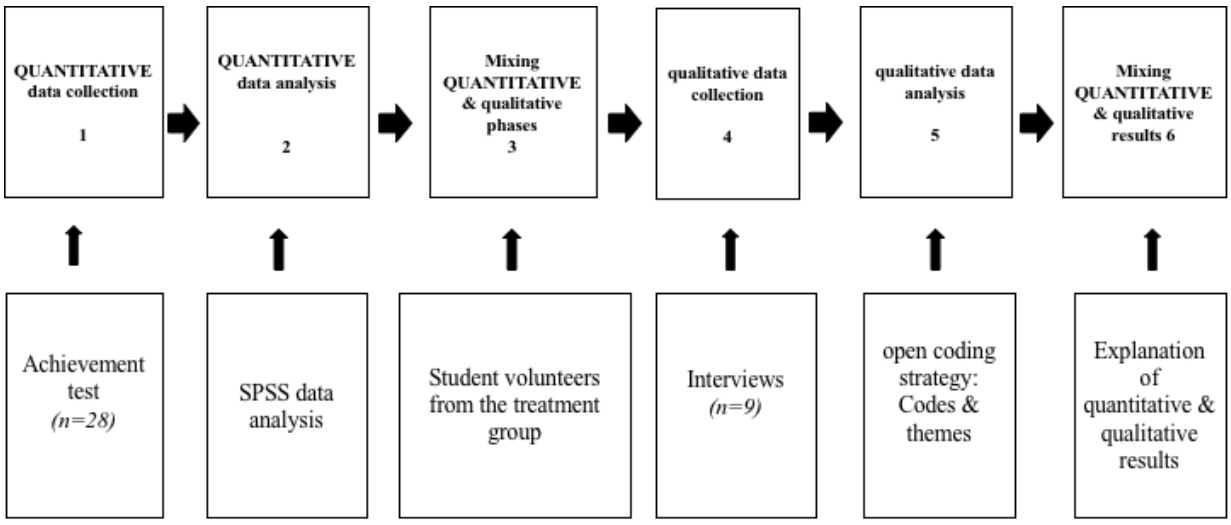

Figure 1. Visual model of sequential explanatory approach of mixed-methods design phases.

Ethical Considerations

I obtained necessary permissions prior to starting each phase of this study. First, permission was obtained from Northern Illinois University's Institutional Review Board (IRB), since human subjects were involved. Information required in the IRB application was filed with additional information about the dissertation committee chair and members and the researcher. Moreover, it included the title and description of the research with the expected number of participants. Moreover, permission from the target university for the research was obtained.

Anonymity, confidentiality, and protection of participants were prioritized. In the quantitative phase (Phase 1), permission from student participants was given through a consent form (see Appendix A), giving them the option of participating or withdrawing. Also, they were assured their information would remain confidential. In the second phase (the qualitative phase), students were also informed that participation was strictly voluntary, with the right to withdraw without penalty. Moreover, a consent form was obtained from each interviewee (see Appendix

B) for the qualitative phase (Phase 2). It guaranteed students' confidentiality while explaining how they were chosen for interviews and granted approval for recording their interviews as well as how their data would be used, transcribed, and published. All data from each research phase will be kept in an electronic file on the researcher's computer as well as a hard disk until they are discarded; the data are accessible only by the researcher.

Data Collection

Quantitative

Data collection for the study's first quantitative phase was conducted in the Fall 2019 semester. A non-equivalent comparison group pre/post-test design was employed as well as a convenience sample. Two classes of students enrolled in the Computer in Education course were randomly chosen. One was a treatment group (n= 14, flipped classroom employed); the other was the control group (n= 14, traditional method employed).

Students had the choice of whether to participate in this phase. Student recruitment scripts (Appendix C) were given to the student. During the first lecture, informed consents for participating in the first phase were signed, with the two groups being given a pre-test, which is a copy of the post-test, before the treatment to statistically match the groups and decrease the threat of internal validity and mitigate selection bias (Appendix D).

For the treatment group, the instructor met with students weekly on Mondays for 50 minutes throughout the semester. The instructor introduced the treatment group to the flipped classroom model and the Edmodo website as an educational platform tool. The instructor used screen capture software to record lectures. Then the treatment group was introduced using

Edmodo as the educational platform. Each week students were encouraged to review instructor-recorded videos explaining presentation slides and informing students about requirements for reviewing learning content before class. Also highlighted was how students should review recorded lectures outside the classroom to prepare them for activities related to these recordings inside the classroom. These videos ranged in length from 10-15 minutes.

Before entering class, students were required to answer a readiness quiz for each lesson, consisting of two or three questions posted on Edmodo. Some points were earned by answering questions correctly or even somewhat correctly, which improved their class readiness. To answer correctly, students needed to watch the videos, and submit their answers two days before class. The instructor designed the face-to-face discussion time based on the answers. When students entered class, the teacher led the discussion, answered questions, addressed any misconceptions, and moved forward to engaging in activities. Discussions, hands-on activities, and collaboration with peers to solve problems were conducted throughout class time. The treatment and control groups had the same homework after class. To create more accurate results and to avoid a drop in student attendance, grading scales for student attendance were administered.

At the same time, the control group was exposed to a traditional lecturing approach. Just like the treatment group, the students met the instructor weekly every Thursday for 50 minutes. To standardize the conditions, the topics were the same, but instead of having a recorded video at home, the instructor lectured and gave them the same materials in class. The instructor had notes, lesson plans, the course outline and PowerPoint presentations to make sure the same content was covered as in the flipped classroom. Class time was divided into three parts: lectures, some activities, and a review of the lecture content. Students had the same homework assigned to the treatment group. A final test to measure student academic achievement was administered to both

groups at the end of the semester to be able to compare results. The achievement test is in Appendix D.

Qualitative

To explore the quantitative results in-depth, semi-structured interviews were administered (Creswell, 2014). Since the treatment group contained just 14 students, all were asked to volunteer for interviews, and nine did so. These students were then interviewed to develop the second phase of this study. As previously mentioned, the participants signed a consent form before the interviews were conducted; they were informed about the interview being recorded. The interviews ranged from 35 to 45 minutes and were conducted at the research site in a place convenient to both the interviewees and interviewer. Interview questions were designed to answer the research questions (see Appendix F). These questions were not shared with participants prior to the interview.

Description of Research Site

The research site was in the College of Education at one of the western district's universities in Saudi Arabia. The site is one of its newest public universities, established in 2014. In 2018, there were 49,218 students enrolled in its programs, with 27,211 males and 22,007 females. The university has 10 scientific, educational, and societal colleges: the Business School, College of Education, College of Science, College of Engineering, College of Medicine, College of Computing and Information Technology, English Language Institute, and Community College. The research study's exact location was in the College of Education for female students.

In 2018, about 956 students were enrolled, served by 137 faculty members. Students enrolled in the Computer in Education course during the Fall 2019 semester were the subjects of this study.

Researcher's Role

Since qualitative research is interpretive research, the researcher is usually involved with participants in a sustained or intensive experience (Creswell, 2014). For this study, I was considered an insider since I had worked at the research site as a full-time instructor for four years and now have a scholarship from the same institution to complete my studies. I worked in the Educational Technology Department, teaching many courses: Computers in Education as well as e-learning and educational technology courses.

I am also of the same religion, gender, background and nationality as the participants. These elements may create a potential bias and shape interpretations of the qualitative results. I may lean toward specific themes to find evidence supporting my position and to draw favorable conclusions about the participants (Creswell, 2014). Moreover, as Creswell (2014) discussed, when the researcher collects data from the workplace, the information might not be accurate and may jeopardize the researcher's and participants' roles.

As far as biases toward this study, there are not any since this model is a new trend and I wish to explore students' attitudes toward flipped classrooms to decide whether to implement them in my future teaching career. To reduce researcher bias and influences of the above-mentioned aspects, I had an external auditor review this phase of the study while providing feedback. Moreover, I made considerable effort to deal with the information objectively. Also, I was careful to keep my relationship with study participants strictly academic, that is between instructor and participants.

Sampling

The targeted population of this study was undergraduate female students at one of the western district's universities in Saudi Arabia. For the first quantitative phase of this study, the convenience sample consisted of 28 undergraduate female students from different academic levels (senior, junior, freshman, etc.) and different specializations; all students were taking the Computer in Education course. Their ages ranged from 19-22. Participants were recruited from existing classrooms (Appendix C). This sample was then divided into two groups: the treatment group (n=14), who studied using the flipped classroom model of instruction, and the control group (n=14), who studied using the traditional lecturing model. I taught both groups.

For the second qualitative phase, only students from the treatment group who volunteered (n=9) were interviewed. To entice these students to participate in the interview, a monetary incentive was given after the interview. This incentive was utilized in this phase only and not offered during the first quantitative phase of this study. The interviews provided data about the students' attitudes toward flipped classrooms and helped in deriving a better explanation for the quantitative results.

Instrumentation

Quantitative

To measure students' academic achievement levels, two instruments were employed during this phase. First, a pre-test for achievement was administered to participants before the treatment. Second, a post-achievement test, the same as the pre-test, was administered after the treatment (Appendix D). I developed this test myself using assessments included in the required

textbook, *The Use of Computer in Education*, by Al Mosa (2009) along with additional questions. The test covered multiple units of the required textbook. The purpose of this test was to measure students' acquisition of concepts and knowledge about the computer itself, its components, computer applications in education, strategies of computer-assisted instruction, building and evaluating educational software, and stages of building educational software. Test construction for this study included two steps: 1) developing test items and 2) evaluating them (Franzen, 2011).

Developing Test Items

This step included specifying the construct of interest, which assesses content knowledge for the Computer in Education course: analyzing the learning content and learning objectives. Moreover, it included developing a test blueprint, a table of specification (TOS), which is

> A tool used to ensure that a test or assessment measures the content and thinking skills that the test intends to measure. Thus, when used appropriately, it can provide response content and construct (i.e., response process) validity evidence. A TOS may be used for large-scale test construction, classroom-level assessments by teachers, and psychometric scale development. (Frey, 2018, p.1654-1655)

As Frey (2018) suggests, a TOS can be used as validity evidence for the test constructors and is developed as a table consisting of key elements helping instructors align the learning objectives, instruction, and assessment "that represent the content and cognitive levels intended for students to achieve with class time spent and the number of test items" (p.1655). The TOS helps to make sure the two sources of validity evidence essential for classroom assessment exist: evidence based on test content and evidence based on response process evidence (Fives & DiDonato-Barnes, 2013). According to Fives and DiDonato-Barnes, "Evidence based on test content underscores the degree to which a test (or any assessment task) measures what it is

designed (or supposed) to measure, and response process evidence is concerned with the alignment of the kinds of thinking required of students during instruction and during assessment (testing) activities" (p. 2).

After deciding the learning content to be included in the assessment, analyzing it, and determining learning objectives related to this content, I developed a modified TOS for the achievement test following the strategies of Franzen (2011), Frey (2018), and Fives and DiDonato-Barnes (2013). The table of specification for this test (Appendix E, Table E.1) is based on Bloom's (1956) Taxonomy. It consists of topics to be included on the test, the level of thinking for learning objectives, the total number of objectives, percentages of topics in the test, and the time to be spent on each topic, also the percentage for gathering validity evidence for test content, number of items and points per topic to be included on the test (depending on the number of the learning objectives), and classes allocated for each topic as well as the importance of the topic and assessment as Fives and DiDonato-Barnes (2013) recommended. Evaluating this information, I decided to include 30 items: 15 multiple-choice with, four possible answers in which the student must select one correct answer, and 15 true-false items. Upon constructing this, I sent this TOS to an expert in the field to evaluate the importance of each topic as well as the elements of the TOS. The expert's feedback was then taken into consideration, and the TOS was modified.

After that, I began preparing a preliminary draft of the test, consisting of 30 items and taking 60 minutes to complete. There were 15 multiple-choice questions, with four different answer choices, and 15 true-false items, all considering the level of thinking for each item in conjunction with the learning experience involved, learning objectives, and students' characteristics. These items were written clearly and specifically in the Arabic language. The

maximum score for this achievement test was 30 points, with one point given for each correct answer (Appendix D).

Evaluating Test Items

After developing the achievement test, I did a pilot study, using it while evaluating its validity and reliability, as will be discussed in the following sections, while the achievement test was developed, depending on the results of the validity and reliability measurements. Moreover, difficulty and discrimination indexes were measured to evaluate the quality of the test, where these distributions helped to identify items that can be improved or discarded if not performing well (Mahjabeen et al., 2018). As will be discussed in the following sections related to difficulty and discrimination indexed, there was no item that needed to be removed.

Qualitative

To explore students' attitudes toward the flipped classroom model of instruction, semi-structured interviews were conducted with questions developed by the researcher. These consisted of demographic questions and open questions concerning students' attitudes toward and views about having the flipped classroom model of instruction in their courses, any benefits gained from using this model, and techniques that might improve integration of flipped classrooms into the learning environment (see Appendix F).

Data Analysis

Quantitative

To answer the quantitative research question: (What are the differences in higher education students' academic achievement between students in the flipped classrooms and students in traditional classrooms?), The pre- and post-achievement tests (the quantitative data) were analyzed using the Statistical Package for Social Sciences (SPSS) program, and descriptive statistics, repeated measures ANOVA, and analysis of covariance are presented in this section. A repeated measures ANOVA to determine whether the mean growth in scores differ for the two groups and an ANCOVA to determine whether there are mean differences in the post-test scores, controlling for the pre-test scores, were utilized. Those tests helped to determine if there were statistically significant differences between students' academic achievement levels in the treatment and control groups. I used eta-squared (η^2) to determine the difference in size. Some histograms, box plots, and figures are provided as a graphical method to visually show differences between students' achievement levels.

Qualitative

To answer the qualitative research question: (What are female students' attitudes toward the flipped classrooms in the Computer in Education course?), data from the semi-structured interviews were analyzed through reviewing transcripts, writing memos, coding data, developing and integrating themes from the codes, and finally building narratives to answer the research questions (Creswell, 2014).

A systematic coding procedure (open coding strategy) was utilized, in which I read the

transcripts line-by-line "to identify and formulate all ideas and themes" (Emerson, Fretz & Shaw, 1995, p.143). This coding and development of themes was done by hand (Table 1). Each transcript was analyzed separately and all transcripts were cross-analyzed to consider common as well as more influential themes. Three themes emerged from the qualitative data analysis: 1) mixed attitudes toward the use of the flipped classrooms model, depending on the nature of the classes and students' learning styles; 2) a variety of strategies were proposed by students to improve their |engagement in flipped classrooms; and 3) students showed positive attitudes toward flipped classrooms by pointing out the benefits of flipped classrooms and the shift in instructors' and learners' roles. This analysis added more explanations for the quantitative data and helped in exploring students' attitudes toward flipped classrooms.

Table 1

Interviews' Codes and Examples

Code	Example
Like Flipped Classrooms (FC)	I enjoy this method. I believe it helped me learn a lot more and my learning style become better. I wish I was in charge, to make all theoretical courses taught using this model. I believe this will be the future of teaching in our university. /Nada's interview
Like Traditional Classrooms (TC)	I like both models of teaching, but feel more comfortable with the traditional one, since I am used to it and don't like changes. /Sumaih's interview
FC Learning Experience	It is a positive experience which helped me progress in the course, with ah, without making, uh, the effort in focusing for at least one to three hours like the traditional lecture. /Asma's interview
Reasons for Value FC	I like when I'm studying alone at home. There are no distractions, or wasting of my time with silly questions from some students. /Fatima's interview
Advantages of FC	It saves time because as I understand a point, I skip it, and finish the lecture in a shorter time. Moreover, it gives me space and time to think about the lecture and form my questions for the teacher before attending the class. /Nada's interview

Table continued on next page

Table1 cont. from previous page

Code	Example
Value Responsibility in FC	We used to have the teacher doing everything to us. A change in taking the responsibility to teach myself, served as a catalyst for me to work harder in this course. /Sara's interview
Challenges of FC	I get frustrated at home when I don't understand something and need to wait until next class time to ask the instructor. Sometimes I forget to ask questions and get answers to questions that appear in the exam, and I don't answer them correctly. /Hajer's interview
Challenges of TC	Usually with the traditional method, I am distracted, and bored. I don't listen to the lectures, and don't buy the required text 'til the night before the final exam. /Sara's interview
Like Shift in Roles	We are listeners no more; we are responsible for our learning; Ah, I feel that I am the one who is teaching myself, not the teacher. I feel I am positive in my learning. /Nada's interview
FC Helps Achieve Better	I appreciate having the lecture available all the time. I just play it again and find what I am looking for. This helped me to remember better and get higher scores. /Alla's interview
Needs for Better FC	Students need to be more motivated to attend the class and watch the videos regularly. /Sara's interview

Data Integration, or Mixing

To answer the mixed-methods research question: (How does the qualitative data help in explaining the quantitative results?), data resulting from the study's two phases were mixed to provide a more-in-depth explanation for quantitative results and also make inferences. This form of mixed-methods data analysis was chosen because it is related to the sequential explanatory approach and to illustrate how the qualitative data results provided a deeper understanding of the quantitative data (Creswell & Clark, 2018).

Validation Procedures

Quantitative

A very important consideration in a quantitative study is reliability and validity (Bolarinwa, 2015). After developing the test, as discussed in a previous section, I used strategies to justify the study's validity and reliability. For validity, I built a TOS that can provide validity evidence for test constructors (Frey, 2018), as discussed in previous sections. This TOS helped ensure the two sources of validity evidence essential for classroom assessment existed: evidence based on test content and evidence based on response process evidence (Fives & DiDonato-Barnes, 2013).

Also, I examined the content validity. Three experts on the research subject and an Arabic language expert reviewed the test items and evaluated whether the test was a valid measure of the concepts being measured. The experts examined the questions one by one while concentrating on three main areas:1) whether the achievement test is directly related to the learning objectives and measures concepts and constructs meant to be measured, 2) the accuracy of the formulated questions, and 3) the clarity of phrasing for the students. I adjusted the test depending on these reviews.

The feedback was constructive for improving the students' understanding. Rephrasing of some items was requested and minor changes were noted and completed. Some examples for editing and rephrasing are presented in the following items: 1) "Educational software consists of one screen through which the educational software can present lessons in the form of a tutorial, drill and practice, simulation or problem solving," which was edited after feedback to "Educational software consists of one screen through which lessons can be presented in the form of a tutorial, drill and practice, simulation or problem solving"; 2) "The problem solving

strategy depends on using different codes," which was edited after feedback to "The problem solving strategy improves students' logical thinking"; and 3) "Financial aid resources are a challenge for implementing the computer in education," which was edited to "Limited financial resources are considered as main challenges for implementing the computer in education."

For reliability, a pilot test was carried out with 64 students via Google Forms, distributed to students at one university in Saudi Arabia's western district. The Kuder-Richardson Formula 20 (KR-20) was estimated for test items to determine the internal consistency reliability. The KR-20 test checks the internal consistency of tests with dichotomous choices and is used to measure reliability from a single administration of any test (Zimmerman, 1972). It is applicable when each question is either correct or incorrect (Zimmerman, 1972). A higher value of KR-20 indicates a strong relationship between test items, while a lower value indicates a weaker relationship, where values range from 0 to 1. A binary grading system was used to score this test. A correct question scores 1, and an incorrect question scores 0. Using Microsoft Excel, KR-20 reaches a good reliability of $\alpha = 0.87$.

After that, difficulty and discrimination indexes were measured to evaluate the quality of the test. "Difficulty index (DIF), also called ease index, describes the percentage of students who correctly answered the item" (Hingorjo & Jaleel, 2012, p. 143). A higher value of DIF shows an increased number of students gave the correct answer, meaning the questions are easy to attempt. The range is from 0-100%. "Discrimination index (DI), also called point biserial correlation (PBC), describes the ability of an item to distinguish between high and low scores" (p. 143). Its range is 0-1. These distributions helped in identifying items that can be improved or discarded if not preforming well (Mahjabeen et al., 2018). The items are listed according to the

degree of difficulty index (too easy, average, good, difficult, too difficult) and discrimination (excellent, good, acceptable, poor); (Appendix E.b).

According to DIF, of the 30 items, 2 were in the average category, 26 were in the good category, and 2 were in the moderately difficult category. Regarding the ID, 11 items showed a good discrimination tendency and 19 showed an excellent discrimination tendency to distinguish low-and high-performing students.

Qualitative

To check the accuracy and credibility of the qualitative findings, I employed certain procedures and strategies as proposed by Creswell (2014).

1. Member checking through reviewing the final report with interviewees and taking their feedback about the accuracy of the themes.
2. Spending prolonged time in the field, covering more details about the site and people, providing more accuracy for, and strengthening the findings.
3. Using an external auditor to review and provide feedback for this phase of the study.

Limitations

The sequential explanatory mixed-methods design has its challenges. Creswell (2014) explained the length of time required to collect data from two distinct phases is the main challenge for this type of research design. He also discussed how the qualitative phase of the study cannot be developed until the researcher has finished the first quantitative phase. Another challenge is focusing on appropriate findings to be used in the qualitative data. Limitations of the study included:

1. Internet accessibility was a limitation since high-speed internet is not available in every home in Saudi Arabia and accessibility for girls might be restricted, as Amoundi and Sulaymani (2014) discussed.
2. Availability of IT support to provide technical support for students in flipped classrooms was another limitation (Missildine, Fountain, Summers & Gosselin, 2013).
3. I designed the flipped classroom videos and was the instructor for both groups. This made the researcher an insider in this study, which might have affected the qualitative part, which does not follow Creswell's (2014) recommendation not to be an insider when conducting this type of research.
4. Because the duration of lectures for the Computer in Education course was only 50 minutes, the brief period allowed for activity application was considered as a limitation as well (Kim, Kim, Khera & Getman, 2014).
5. Another limitation was the small class size, with only 14 students in each class (Kim, Kim, Khera & Getman, 2014). This might lead to selection bias, which is a threat to internal validity.
6. The sample of the quantitative part of this study was a convenience sample, which was not 100% representative of the population, as Creswell (2014) discussed. This is considered a threat to the external validity.
7. The population of this study was higher education students in Saudi Arabia. The sample consisted of only female students in Saudi Arabia, which limits generalizability to students in other countries and to male students (Bracht & Glass, 1968).

8. Since this research employed a non-equivalent comparison group pre/post-test design for the quantitative part and an important weakness of nonrandomized research design is selection bias (different initially), this may yield misleading results (Shavelson & Towne, 2002). Students could be systematically different from the beginning, factors I had not considered before conducting the intervention. Even if students are the same in terms of the pre-measure, they could be different in other unmeasured ways, as with motivation. So the statistical difference might not be related to the implementation of the flipped classroom model of instruction and instead be related to students' individual differences. In addition, history and maturation are other common weaknesses, since they interact with participant selection. For the history threat to internal validity, events occurring between the first and second measurements in addition to the treatment variable might affect the results (Campbell & Stanley, 1963). Regarding maturation, one group might be more mature than the other, which might affect the results as well (Campbell & Stanley, 1963). To decrease the threat of internal validity and mitigate selection bias, I employed a pre-test that was a copy of the post-test before the treatment to statistically match the groups.

Additionally, participants were only female students 19 to 22 years of age. These fixed variables might play a positive role in minimizing internal validity threats for the research. While I used the pre-measure to check initial group equivalency and account for that pre-measure, it is possible there were unmeasured variables distributed differently in the two groups that could explain why the results were found. Some variables associated

with academic achievement, like motivation or socioeconomic variables, could also affect the results.

9. The qualitative part of this study obtained by interviews might be limited by inherent researcher bias toward the flipped classroom model, since the researcher designed and introduced the flipped classroom model to the students (Bergmann & Sams, 2012; Creswell & Miller, 2010). This is a serious external validity threat, and to mitigate it, I had an external auditor review this phase of the study and provide feedback (Creswell, 2014).
10. For the qualitative section, different readers might have different interpretations and judgments of the data. To check the accuracy and credibility of the qualitative findings, I employed certain procedures like member checking and used an external auditor to review this phase of the study and provide feedback.

CHAPTER 4

RESULTS

The purpose of this sequential explanatory mixed-methods study was to compare students' academic achievement in flipped and traditional undergraduate classrooms and explore their attitudes toward the use of this model in Saudi Arabia. Both qualitative and quantitative data were collected over one semester in the Computer in Education course taught by the instructor/researcher, as discussed in the previous chapter. This chapter reports the results of those phases to answer the three research questions:

1. What are the differences in higher education female students' academic achievement between students in the flipped classrooms and students in traditional classrooms in the Computer in Education course?
2. What are female students' attitudes toward the flipped classrooms in the Computer in Education course?
3. How do the qualitative data help in explaining the quantitative results?

Quantitative Findings

To answer the first research question: (What are the differences in higher education female students' academic achievement between students in the flipped classrooms and students in traditional classrooms in the Computer in Education course?), the results from the statistical analyses, more specifically from the descriptive statistics, repeated measures ANOVA and

analysis of covariance are presented in this section. A repeated measures ANOVA for assessing the mean growth in scores for the two groups is presented as well as an analysis for covariance ANCOVA for assessing whether there were mean differences in the post-test scores, controlling for the pre-test scores.

Descriptive Statistics

The study sample included 28 students. Each group included 14 students. Table 2 shows the mean pre-test score is $M = 14.32$ ($SD = 4.13$) and the mean post-test score is $M = 18.36$ ($SD = 3.33$). Appendix G also provides the descriptive statistics by group (Table G.1). For the traditional group, the mean pre-test score is $M = 14.71$ ($SD = 4.12$), and the mean post-test score is $M = 17.14$ ($SD = 2.25$), while for the flipped group, the mean pre-test score is $M = 13.93$ ($SD = 4.25$) and the mean post-test score is $M = 19.57$ ($SD = 3.84$). Appendix G provides a more complete set of descriptive statistics for the sample (Tables G.2 and G.3).

Table 2

Descriptive Statistics (*n, M, SD*) for Both Groups and the Total Sample

	Tradition			*Flipped*			*Total*		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Pretest	14	14.71	4.122	14	13.93	4.251	28	14.32	4.128
Posttest	14	17.14	2.248	14	19.57	3.837	28	18.36	3.325

The box plots in Figures 2 and 3 correspond to pre/post-test scores for the entire sample and show some outliers for the pre-test scores. Figures 4 and 5 provide the box plots by group.

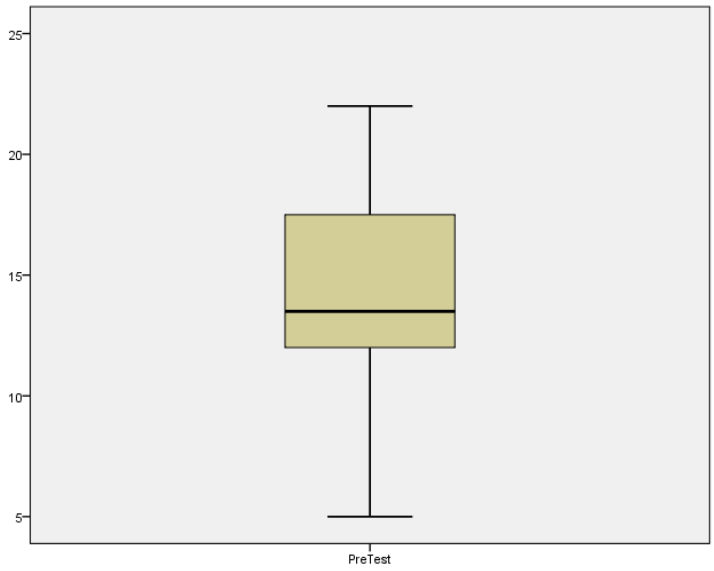

Figure 2: Box plot of pre-test scores.

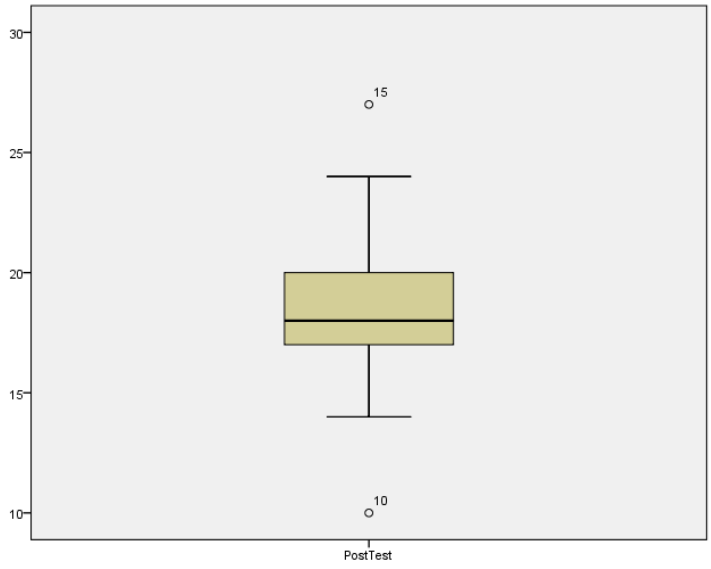

Figure 3: Box plot of post-test scores.

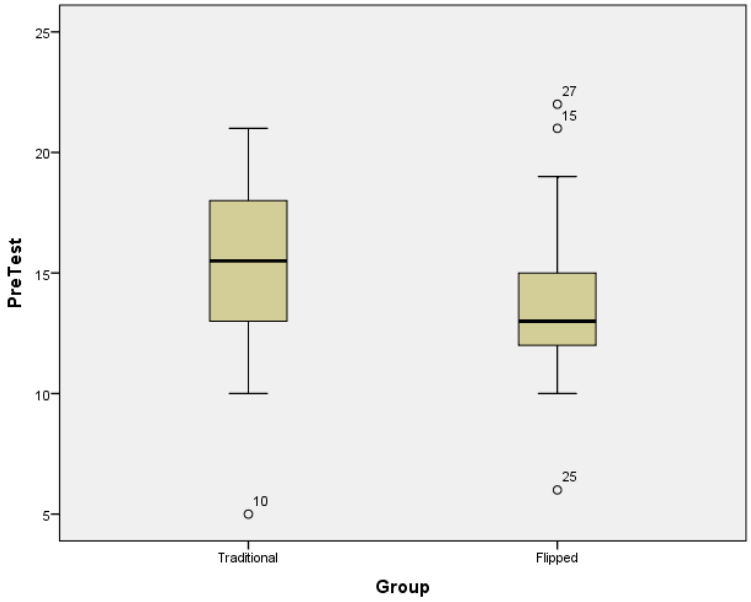

Figure 4: Box plot of pre-test scores by group.

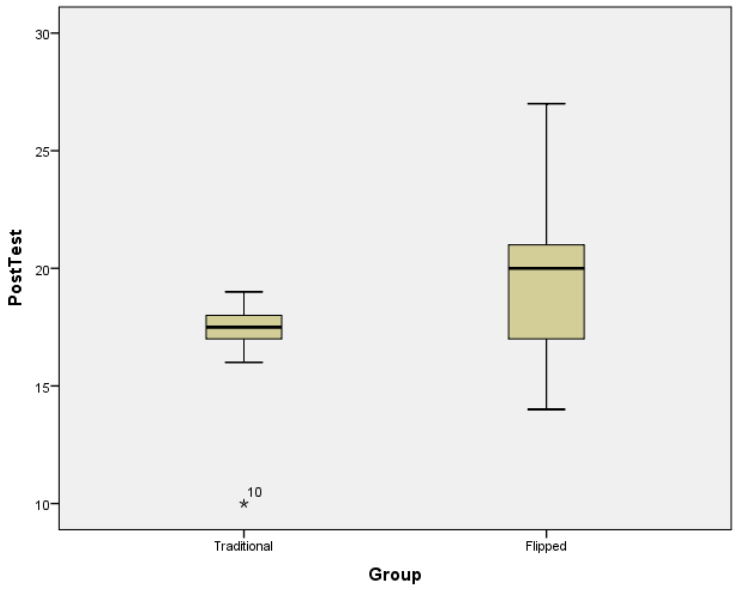

Figure 5: Box plot of post-test scores by group.

It is clear that the variability of the post-test is much larger for the flipped group than for the traditional group.

The plot in Figure 6 shows the marginal means by time for both the traditional and flipped groups.

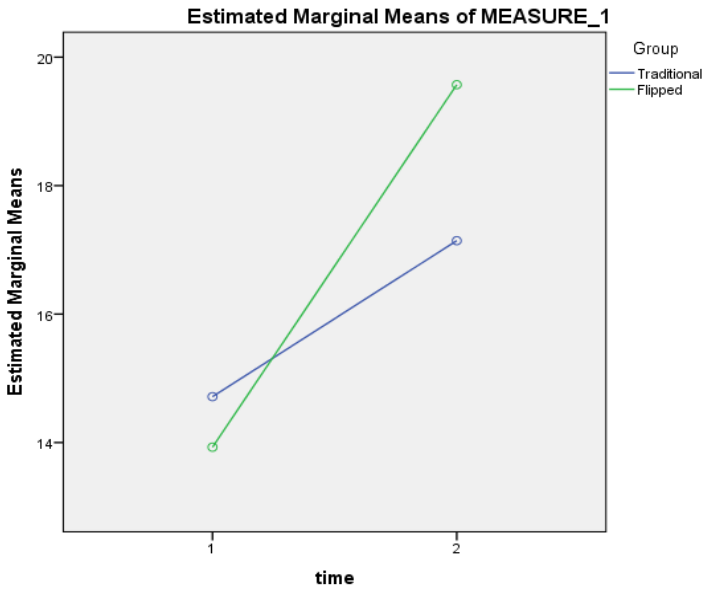

Figure 6: Marginal means by group.

At the sample level, the marginal mean plots intersect, which suggests the mean growth in scores may differ for the two groups. Appendix G (Table G.4) shows the assumption of homogeneity of covariance is met, $F(3, 121680) = 2.540$, $p = .055$.

Also, the histogram of the residuals for the difference scores (Figure 7) do not seem to depart significantly from normality, which is confirmed by the results found in normality test results shown in Appendix G, with $KW = .09$, $p = .200$ (Table G.5). Appendix G also shows the results of Levene's test for the score differences (Table G.6), with $F(1, 26) = 0.50$, $p = .488$, and

together with the fact that the ratio of variances, at 1.54, is less than 2.0 and it is therefore concluded the homogeneity of variances is met.

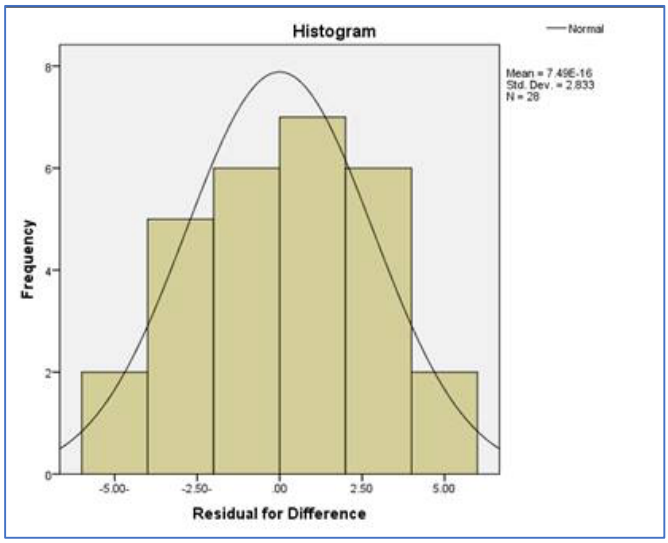

Figure 7: Residuals of difference scores.

The results of the repeated measures ANOVA are shown in Appendix G (Table G.7). The effect of time is statistically significant, $F(1, 26) = 54.73$, $p < .001$, and there is an overall increase from pre to post scores. Additionally, the change in scores depended significantly on the group, as the interaction Time × Group is significant, $F(1, 26) = 8.68$, $p = .007$, with an effect size of $\eta^2 = 0.06$, which indicates a moderate effect size (Cohen, 1988). See Appendix G, Table G.8. The p-value= .007 indicates a probability of 0.007 of seeing a sample difference in growth as extreme or more extreme than one observed, under the assumption that the difference in growth between groups is not present in the population.

Analysis of Covariance

The assumptions for ANCOVA are normality, homogeneity of variances, and homogeneity of regression slopes.

Figure 8 shows that the distribution of residuals is left skewed, which suggests that normality is violated, but the results of the Kolmogorov-Smirnov test shown in Appendix G (Table G.9) indicates that this departure from normality was not statistically significant, KW = 0.15, p = .112, although the results of the Shapiro-Wilk test suggest that significant non-normality is indeed evident (SW = 0.92, p = .036).

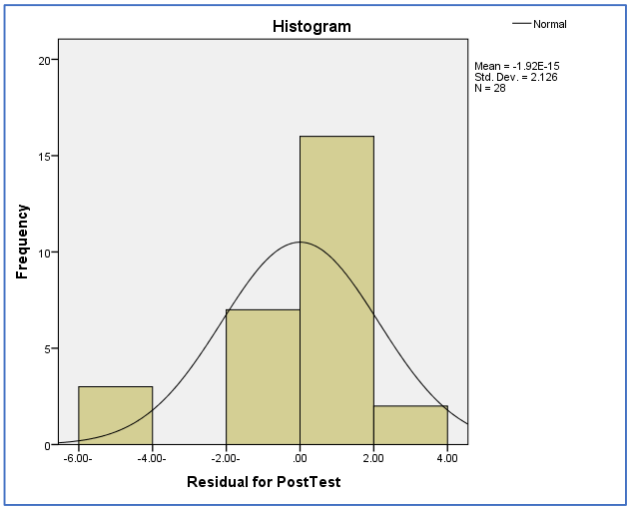

Figure 8: Residuals for the ANCOVA analysis.

Appendix G shows that the homogeneity of regression slopes assumption is met, $t(24)$ = .83, p = .415 (Table G.10), but the homogeneity of variances assumption is not met, $F(1, 26)$ =

6.14, p = .020 (Table G.11). Additionally, the pre-test was not a significant predictor of post-test, $t(24)$ = .85, p = .404.

The results from the ANCOVA in Appendix G show a statistically significant group effect on the post-test scores after controlling for the pre-test scores, $F(1, 25)$ =11.59, p = .002 (Table G.11), with an effect size of η^2 = 0.19, which indicates a large effect size (Cohen, 1988). The adjusted marginal mean post-test score for the traditional group is 16.93, and the adjusted marginal mean post-test score for the flipped group is 19.79 (see Figure 9).

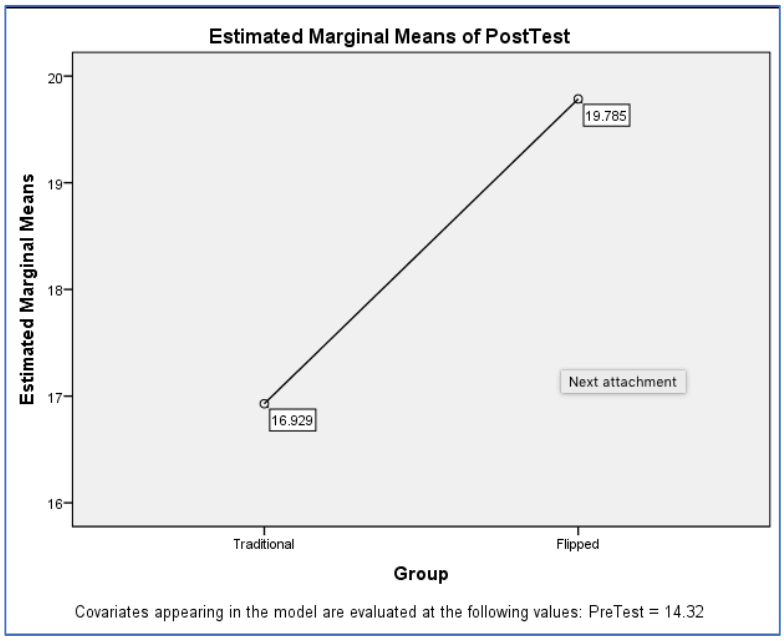

Figure 9: Adjusted marginal means.

Summary of Quantitative Findings

From the descriptive analysis, the variability of the post-test was much larger for the flipped group than for the traditional group. Moreover, from the repeated measures analysis, it

can be concluded the interaction between time and group was significant, which was reflected in the change in mean from Time 1 to Time 2 that was significantly larger for the flipped group than for the traditional group. On the other hand, the ANCOVA found the effect on the group was significant on the post-test scores, even after controlling for the pre-test scores. This leads to the conclusion that there were statistically significant differences in higher education female students' academic achievement between students in the flipped classrooms and students in traditional classrooms in the Computer in Education course that favored students in the flipped classrooms.

Qualitative Findings

To provide an answer for the second research question: (What are female students' attitudes toward the flipped classrooms in the Computer in Education course?), semi-structured interviews were analyzed. Three themes emerged from the data analysis: 1) mixed attitudes toward the use of the flipped classrooms model, depending on the nature of the classes and students' learning styles, 2) a variety of strategies were proposed by students to improve their engagement within flipped classrooms, and 3) students showed positive attitudes toward flipped classrooms by pointing out the benefits of flipped classrooms and the shift in instructors' and learners' roles.

Mixed Attitudes Toward the Use of the Flipped Classroom Model

This study emphasizes students' attitudes and experiences in flipped classrooms. Looking at students' responses concerning their attitudes toward integrating flipped classrooms into their

learning, which were defined by their experiences in the Computer in Education course, the responses were different, fluctuating between advocating for and opposing flipped classrooms. There was a range of answers from students participating in flipped classrooms for the first time. Experiencing this new model of learning and moving from one students are used to (the traditional classroom model) lead to different views. According to Tahani, a student specializing in learning disabilities:

> I believe every learner has a special characteristic or way of learning, which affects the reaction toward this new model or anything new in life, whether positively or negatively. I am an auditory learner, preferring to study by listening to a lecture repeatedly, and not from lecture notes.

This comment shows that human characteristics could be considered a main factor leading to an immediate negative reaction due to frustration or a positive reaction toward new teaching models. Tahani expressed her positive attitudes toward flipped classrooms because she is an auditory student. Another type of reaction from having a different way of learning was also expressed by Fatima, a student specializing in emotional behavioral disorders:

> To be honest, I have a dependent personality, and like to see the teacher standing in front of me lecturing. Having to attend the class to understand the content makes me more committed. However, when I have to study by myself, I always delay everything to the last moment. Moreover, I like to work under pressure, which I found in the traditional method of teaching.

The students had different attitudes depending on their own characteristics.

There are other factors influencing attitudes, which are learning styles students are used to in their schools. This was echoed by Sumaih, a student specializing in educational technology:

> I like both models of teaching, but feel more comfortable with the traditional one, since I am used to it and don't like changes.

This assertion reveals anything new to students' learning is challenging and, thus, may lead to

immediate negative reactions. Some students were happy, having positive attitudes toward flipped classrooms and hoping for more use of this model with their other courses.

Sara, a student specializing in operation and information management, expressed:

> I am an expert in computers, and computer courses are easy and even boring for me. Within the flipped classrooms I am more excited by the learning content, and feel the course is lighter. Usually with the traditional method, I am distracted, don't listen to the lectures, and don't buy the required text 'til the night before the final exam. Now, with the flipped classroom, I am more committed and watch the weekly lectures to be prepared for class discussions. I wish this model was used in all computer courses.

The above comments convey positive attitudes toward the flipped classrooms. They confirm how the students might be more committed and exhibit better follow-up with lectures. Repeating this sentiment is Nada, a student specializing in hearing impairment. She was very positive about this new teaching method and eager to use it with her other courses since it helped improve her learning:

> I need to say that this is uh, a new strategy we had never used before and it was exciting! It saves time because as I understand a point, I skip it, and finish the lecture in a shorter time. Moreover, it gives me space and time to think about the lecture and form my questions for the teacher before attending the class. I enjoy this method. I believe it helped me learn a lot more and my learning style become better. I wish I was in charge, to make all theoretical courses taught using this model. I believe this will be the future of teaching in our university. Yes, this really benefits students.

This shows students' positive attitudes toward flipped classrooms and their beliefs that they represent the future of teaching and will be a welcome substitute for traditional instructional methods, specifically for theoretical courses.

Like the two previous students, others reflected a positive feeling about how helpful learning content with instructor commentary being available all the time is for students. Alla, a student specializing in learning disabilities, said:

> For me flipped classrooms are better than traditional methods. Sometimes, I forget what

> the instructor says or I do not jot it down, and feel lost. Having the lecture available all the time, I just play it again and find what I am looking for. This helps me get higher scores, especially in the final exam, when I must absorb a lot of material. Moreover, it lowers my anxiety, hearing it at home in my spare time, and not having to listen at a specific time, even if I am ill, as the traditional way warrants.

The above comment confirms the full-time availability of lectures enhancing positive attitudes toward flipped classrooms, as this helps students get the required information while reducing anxiety levels and creating higher scores.

Asma, a student specializing in hearing impairment, concurs:

> It is a positive experience which helped me progress in the course, with ah, without making, uh, the effort in focusing for at least one to three hours like the traditional lecture. Now, it is a much shorter lecture which I can hear when I like. And even if I get distracted, I can easily replay what I wish to understand better without being forced to ask the teacher to repeat it or bothering any of my friends. Moreover, I couldn't attend one of the classes and feel I didn't lose anything. I got the same information as my friend, but just lost out on participating in the discussion. For these reasons, I prefer it over traditional lecturing.

As illustrated by the previous comment, some features of flipped classrooms create a positive reaction. Short lectures help students focus, and being absent is not a big deal compared to participating in the traditional model of teaching. Moreover, it provides the opportunity to replay lectures multiple times without bothering other students, so students can learn on their own pace.

In contrast, Hajer, a student specializing in behavioral disorders and autism, had a negative feeling toward flipped classrooms:

> I get frustrated at home when I don't understand something and need to wait until next class to ask the instructor. Sometimes I forget to ask questions and get answers to questions that appear in the exam, and I don't answer them correctly. Also, I feel negative toward myself when I come to class and others understand the lecture, but I don't. Am I stupid? I don't like the flipped classroom, or watching lectures at home, or whatever you call it.

Thus, flipped classrooms might cause a loss of self-confidence and frustration if students misunderstand some points in the recorded lecture, which might lead to a loss of interest in learning content and then to a negative attitude toward flipped classrooms, eventually affecting their achievement.

In line with Hajer, Fatima has a negative attitude toward flipped classrooms:

> I don't like it. I feel panic since I don't watch the video when released, and leave it to the end of the week., forgetting about it. At the same time, when I watch it early, I come to class forgetting all the information and can't participate in the required activities correctly. This pushes me to lose my self-confidence. I feel more responsible and this is a burden. I should do everything by myself which I am not used to and don't like.

The above comments convey how flipped classrooms may cause not only a loss of self-confidence but also negative feelings, like being panicked all the time about taking responsibility for their learning. This might lead to negative attitudes toward flipped classrooms. Moreover, Fatima illustrated how it is boring to attend flipped classes:

> So far, there is no need to attend class after watching the video at home. I don't need to do these activities and discussions. It is a waste of my time. I believe it is better to, ah, I don't know what to say… maybe it is better to be fully online or traditional, with no need to mix this and waste our time. Instructors can send us the activities, which we will do at home using Blackboard.

As illustrated, Fatima felt it was a waste of time to come to class since she already knew the learning content. Another type of reaction regarding the implementation of flipped classrooms is defined by the type of course. Sara said:

> I think I like this model with courses such as the Computer in Education. I could say it would be wonderful if teachers use such a model with theoretical and boring courses. But not with specialized or practical courses that need to be under teachers' supervision. In those courses, I need the teacher to direct me all the time.

As shown, flipped classrooms are not suitable for all subjects. Sara prefers them for theoretical,

long, boring courses. Fatima has the same opinion:

> Yes, it, ah, I wouldn't take any flipped classrooms with difficult courses or ones that demand practical work. However, I prefer them with easy courses such as the Computer in Education.

Fatima believed flipped classrooms work with easy and theoretical courses, but not with difficult or practical courses. Consistent with this view, Tahani expressed:

> Honestly, there are courses that need the presence of the teacher so in case you did not understand anything you will have an immediate facilitation. Such as the support courses and practical courses like math, chemistry or physics. Those courses should be taught in the traditional way. Courses such as the Computer in Education, electronic education, religion or theoretical courses, I like to have flipped, as there is no need for immediate facilitation.

Based on the above comments, the student clearly prefers flippng the theoretical and easy courses but not the difficult, practical and specialized courses. However, Mashael had the opposite opinion:

> I can't say there is a better model over the other. It depends on how I see the course and how I feel about it. If the course is difficult I prefer flipped classrooms since I can study at my own pace and if I don't understand everything I have a full class time to ask about any points and discuss them until I grasp the content. Do you understand me? I have a longer time to ask my questions. If the course is easy, I don't have to concentrate all the time so the traditional would be better as there is no need to work at home. The Computer in Education is not easy for me, so I am happy to have it the flipped way.

Mashael expressed that flipped classrooms would work with difficult courses in which you need to understand every single point, so she can study at her own pace, repeating the lecture as often as necessary. She prefers the option to ask and discuss material rather than be lectured to during class time.

Another type of reaction from experiencing a new teaching model was also expressed by Sara, who showed a positive attitude and enthusiasm about taking responsibility for her learning

in the flipped classroom:

> We used to have the teacher doing everything to us. A change in taking the responsibility to teach myself, served as a catalyst for me to work harder in this course. I enjoyed everything, since I used to be bored with traditional lectures, and just sitting there being passive.

Such a positive perspective leads one to think about flipped classrooms as a potential beneficial teaching model that may prove dominant for future education in Saudi Arabia, as Nada mentioned.

Strategies for Improving Engagement in Flipped Classrooms

Through the interviews, students provided some suggestions and strategies based on their individual needs to make the integration of flipped classrooms better and to improve their engagement in this model. Students pointed out some of those strategies and needs. Sara said:

> I like to be asked to find answers and search for new ideas related to the lecture, more than just watching the video and come to class to discuss those ideas. I prefer to pay more effort than just telling us about stuff already existing in the video, otherwise, it would be a waste of time for me to attend class. This what you need to do with the idea that the class will be more attractive. Students need to be more motivated to attend the class.

It is obvious from the above comments that students prefer to participate in their learning. They want to have some terms or homework regarding new points not explained in the video to be discussed during class time, instead of discussing points already explained within the recorded video. Otherwise they felt flipped classrooms classes were not beneficial. Consistent with Sara's view, Sumaih suggested a strategy to make the lecture more attractive by involving students in finding some of the learning content:

> I would prefer something to do on my own. For example, if you give us some questions and ask us to find their answers and give us a kind of quiz in the beginning of each lecture, we will pay more attention to the class and it will be more interesting.

This comment affirmed the others' need to have a part in their learning. They said they would like to actively participate in the learning process by searching for new learning content. Another strategy was discussed by Asma:

> I believe as a student with a traditional schooling experience for all of my life, I would have liked to be trained at a younger age to experience new teaching methods like the one we are using right now. I need to have more practice in having greater responsibility for my own learning.

Asma expressed the need for some training that might help learners be more prepared for such an instructional model that requires students to take responsibility for their learning. As discussed in the previous theme, students are not used to flipped classrooms, which are considered challenging and lead to negative perceptions. Fatima provided some recommendations for flipped-classroom instructors regarding the commitment for watching the pre-recorded lectures:

> In fact, as Saudi students, we are dependent and procrastinate. If we have the information in our computers for the whole semester, why should I would watch it regularly each week? The readiness quizzes are not enough, since I can complete them without watching the video. We are a nation of lazy people. We will not study until we have an exam. If we have an exam to be done in class in front of the instructor, instead of the readiness quiz, we will watch the video regularly.

As illustrated by the above comments, some students procrastinate in general. So, in flipped classrooms they are not committed to watching the recorded videos regularly before attending class even though they have a readiness quiz to be completed before the class. Fatima suggested that a type of quiz at the time of the class would push them to watch the videos regularly and also attend the class. She added another suggestion:

> If there is a specific time, let's say four hours to watch the video, and after that you close off access, we will be more cautious and committed. For example, having the lecture available each Monday from 5 to 9, I believe. would work because there is nothing

motivating me to see the video regularly.

Fatima further explained that adding rules like putting a timeline to watch the pre-recorded lectures at home would help the students be more committed to watching them regularly. Nada provided more recommendations for flipped-classroom instructors to provide more assistance to their students:

> Oh yeah, it is necessary the teacher provide some external links for a chat with the teacher if we need any help, since we are studying by ourselves, not even as groups. Of course there will be some ambiguous information. Ah, also, some extra links or um, like visiting a website or YouTube for additional information related to the lectures.

As illustrated by the above comment, students in flipped classrooms need more assistance, since they have a responsibility to teach themselves without the existence of the instructor, which makes it difficult to move forward if they do not understand some of the concepts. So providing a link or way to get assistance immediately from their own instructors is necessary. Additionally, links and supplementary materials should be available for students. When they encounter a difficult concept, they could then find immediate help by reviewing links to extra learning materials or videos that provide added explanation about a specific topic created by instructors. Alaa gave another recommendation that would increase the rate of attendance in flipped classrooms:

> If you gave some points for attending class, adding to practical activities that should be done in class, otherwise students won't be able to gain those and explain only half of the lecture in the recorded video, and the other half in the class, I would attend more.

Alaa suggested that the instructor should allocate scores for activities done inside the class and divide the lecture into two parts, half recorded and half to be explained during class time, which would serve as a catalyst for class attendance.

Hajer suffered from not understanding each point in the video and gave a suggestion:

> The teacher attends class asking if we have any questions regarding the previous lecture, reviews it quickly, and then starts the discussion and activities. The teacher assumes that we understand everything. This is not enough for me. I would say ah, I would like to check in with your students and walk them step-by-step through the whole lecture to make sure that we grasp all the information. Otherwise the activities have no meaning for me.

Hajer explained how the teacher assumed all the students were at the same level of understanding and that they understood learning concepts before coming to class. Thus, the instructor reviewed the concepts rapidly with no additional explanations. She wanted her instructor to slowly go over each concept and to explain more so she would have a better understanding. Consistent with this view, Mashael said: "I need more explanation than what the videos have provided. That's the reason I'm here on campus." This comment affirmed the others' needs for more explanation that would provide a better understanding of concepts learned from videos in the pre-class phase and help students overcome their difficulties. Training might help learners be more prepared for an instructional model that requires student responsibility for their learning. Adding in-class quizzes, specifying a limited time for watching videos, assisting with further explanation, and facilitating of more discussions would help in improving the integration of flipped classrooms in learning environments.

Benefits of Flipped Classrooms and Shift in Instructors' and Learners' Roles

Another important finding of this study began with Nada's comments concerning the benefits of flipped classrooms and the shift in instructors' and students' roles within flipped classrooms as a main benefit:

> At least for me, I can watch the video and research any ambiguous information until I get it. Sometimes, I search for a point and find other related ideas and read about them, which helped me master the content and become familiar with beyond the content. Ah, I

> feel that I am the one who is teaching myself, not the teacher. I feel I am positive in my learning. Yes, I come to class to discuss each point with full confidence that I might add some points not explained in the video. I feel we are listeners no more; we have a role here, being responsible for our learning.

From the above comment, Nada confirms that the flipped classroom model of instruction offers different approaches for learning through watching lectures at home and searching for additional information. She addressed the change in the student's role from passive to active, which increases her level of self-esteem and confidence when attending the class. Sumaiah agreed with Nada regarding the active role of the student:

> I also feel that I am responsible for my learning and I am playing the biggest role in teaching myself. I should study and follow the timeline and make sure that I grasped everything, unlike the traditional way, where I depend fully on the teacher to understand the lecture. It encourages us to, to be well… hard working because I have to be well organized also because I need to set a time for everything. I come to class ready to answer all the questions and take a role in the discussion with no hesitation.

These comments supported what previous students said about the advantage of taking responsibility for the learning and how their confidence increases in the class and builds their ability to effectively organize time. Hajer added some advantages and described the change in the role of the instructor:

> Within this class, there is a kind of development for the teaching. It is better than having the teacher lecturing all the time. Now the time is limited to no more than 15 minutes with concentration on the most important points. Yes, just the thing the teacher wants us to understand without interruption. It has a kind of suspense, since if we come to class we must discuss and the time passes with discussion, laughing and competition than just listening. The teacher here is more of a guide who provides good feedback and helps us face or tackle some problems or situations. I prefer the discussion, since those situations usually stick in my mind and I don't forget them during the exam. So, I think this part improves your learning experience.

As illustrated, the instructor's role changed. Instead of being the sage on the stage, the teacher

became a guide, as King (1993) suggested. Instructors provided feedback, explained learning content design, and observed learning activities. They became more like coordinators and administrators of the learning process, whereas students were encouraged to take responsibility for their learning. Moreover, the short time of the video helped students concentrate and not be distracted.

Peer interaction and discussions also made richer the learning experience. Fatima explained more benefits:

> In fact, the time is more flexible for me. I have a private business which takes all my time. Sometimes, I can't pay any attention to the teacher in the class since my mind is focused on my business. Having the lecture at home helped me to choose the time that works for me. Sometimes, I watch it in the car while traveling to a meeting etc. Moreover, I can skip some points I am familiar with. I don't have to wait for anybody to understand nor listen to their questions. I like when I'm studying alone at home. There are no distractions, or wasting my time with silly questions from some students.

Fatima liked the idea of studying by herself at home instead of sitting in class listening to the teacher's explanation. She said she can study at her own pace at a time suitable for her to be able to focus on her learning. She appreciated how quiet and fast it was studying by herself, which saved time and allowed students to learn the material and watch video lectures at their own pace and at a convenient time. Nada affirmed Fatima's statements:

> I make less effort in this flipped class. The videos are short and focused. The best thing is that I can watch them at any place and time. I am a mother of three, which makes my life busy. Now, I can watch the videos when I am doing chores, teaching my kids, or even cooking.

In agreement with the previous student, the participants noted that flipped classrooms are suitable for different situations the students may encounter. Studying is not an easy thing to deal with when working or parenting. Having the advantage of studying at one's own pace might help in achieving higher scores. Sumaih appreciated customizing class time for discussion and

activities:

> I do prefer leaving class time for discussion. Sometimes, I am embarrassed to ask questions within a traditional lecture. Some students don't have time or become annoyed when I ask questions, since I usually ask many. Now, there is no reason to be embarrassed. All the time is yours. I first tried to ask my classmates during activities so I can know what my mistakes were. Then, if I did not understand I asked the teacher. This helped me to reduce my number of questions.

Allocating class time for discussion encourages them to ask questions and discuss things comfortably while focusing on mistakes. Moreover, Asma benefited from studying alone by watching the videos multiple times: "I think the idea of replaying video lectures is a good thing, that I am free to repeat the recording without being embarrassed to ask the instructor to repeat it more than one time." Accordingly, it is a good model for shy students who get frustrated asking questions in class.

Also, flipped classrooms help to increase students' confidence in class as Asma claimed: "I am coming to class very excited because I can confidently discuss with my peers what I have learned." This shows how students were not passive anymore. They worked as active agents and spent class time working with peers and their teacher, which provided more interaction. This collaboration improved their problem-solving skills and aided in professionally completing a task (Defour, 2013). Students had a valuable opportunity to discuss concepts with other students and help each other understand the material from different points of view. According to these comments, the first phase of flipped classrooms helped students be more confident in their knowledge. Nada discussed another important advantage:

> Sometimes, I have to be absent when my kids get sick or another issue arises, which causes me to affect my achievement level. I can't go to the teacher and ask her to repeat the whole lecture. Now, the absence does not affect my understanding of the course, since the biggest part of the lecture I have in my computer. I will miss only the discussion.

With this comment Nada discussed how flipped classrooms help absent students follow up with other students. This confirms what Alaa claimed: “I believe it is a good means for absent students to keep up and not miss any important points.” Tahani agreed with them:

> I was absent for two lectures and since I am an auditory student, I felt I did not miss any lectures, while if I was studying within the traditional way, I would be lost, since my friends will not be able to explain everything to me just like the teacher.

These comments illustrate the difference between being absent in traditional vs. flipped classrooms. In the first one, students may encounter a challenge in understanding the missed lecture, while in the latter, they have the lecture recorded without missing any points.

A final advantage for this model of instruction is the availability of learning content for the whole semester, which gives students the opportunity to repeat the lecture as often as they want without bothering anyone. Tahani said:

> Sometimes, it helps me when I need to repeat the lecture without being embarrassed to ask the teacher to repeat it. In fact, I get anxious and nervous when I feel my friends understand what is being said but not me. I feel stupid, and I am not like them, but now I can repeat it over and over without letting anybody know about it or bothering them.

These comments show one of the great advantages of flipped classrooms. Repeating the recorded lecture many times helped them to grasp the learning content without causing feelings of being less than others. It reduced their levels of anxiety as well. Asma also appreciated this feature: “Before the exam, I watched the video again as a revision to stabilize the information.” This explains another benefit of the ability to replay the videos as a revision. Consistent with the others, Alaa added:

> For me flipped classrooms are better than the traditional classes regarding the availability of the learning content. Usually in traditional classes, I can’t make notes for every point. I am not fast. I always forget some of my teachers’ explanations and when I study, I get lost. I like how the videos are at hand whenever I need them.

In the previous comments, Alaa appreciated the availability of the recorded lecture, which helped her to jot down all the important notes.

All of the findings confirm Sams and Bergmann's (2013) explanation that flipped learning offers many advantages for students and instructors since it is student-centered teaching that increases interaction among students and peers as well as students and teachers and promotes students' responsibility for their own learning.

Summary for the Qualitative Findings

This qualitative phase explored students' attitudes toward flipped classrooms at one western university in Saudi Arabia. Semi-structured interviews were used. The findings showed that students had different attitudes toward flipped classrooms, depending on the nature of the classes and students' learning styles. Most were excited and eager to use them, but a few had negative attitudes and were frustrated. All the participants discussed how it was their first time studying with such a model, and shifting from what they were used to led to different views. Students discussed how their own ways of learning might influence their attitudes toward flipped classrooms as well. Some of the positive attitudes had reasons for this positivity; they believed they are more committed in flipped classrooms and hoped this methodology will be the future of education. Also, as they reported, short lectures helped them to focus, they felt being absent would not be a big deal compared to the traditional model of teaching, and they noted taking responsibility for their own learning motivates them to learn more.

In contrast, students with negative attitudes provided some reasons for this negativity: flipped classrooms might cause a loss of self-confidence and frustration if students misunderstand some points in the recorded lecture and may cause negative feelings like panic.

One student discussed how taking responsibility for her learning is burdensome; another felt it was a waste of time to come to class, since she already knew the content. Additionally, some students showed flipped classrooms are not suitable with all subjects. Most believed this model of instruction works well with theoretical and easy courses, but not difficult or practical ones.

Some strategies that could improve the integration of flipped classrooms and increase students' engagement emerged. Students suggested more instructor assistance and additional information and explanation during class time instead of depending completely on video lectures was required. Also, creating more opportunities for student discussion and contributions to learning would enhance integration of this model into the learning environment. Additionally, a training workshop before integration of a new teaching model would help students assimilate. Some strategies discussed to push students to be more committed included more quizzes, scores for attending classes, and allocating a timeline for watching pre-recorded videos.

Finally, students discussed the benefits of flipped classrooms in relation to their responsibility for their learning and the shift in instructors' and students' roles in the learning process. They believed flipped classrooms offer different approaches for learning. Some students believed it helps in changing students' roles from passive to active, which increases their level of self-esteem and confidence when attending class and helps them effectively organize their time. The change in the teacher's role is another benefit in that they could provide feedback, explain learning content design, and observe learning activities. Teachers became more like coordinators and administrators of the learning process. Moreover, within this model students were more focused since the recorded lecture was not long. Some participants appreciated having the opportunity to learn the material and watch video lectures at their own pace and chosen time to be able to focus on their learning. Allocating class time for discussion encouraged them to ask

questions and comfortably discuss and focus on their mistakes. It was also a good model for shy students who are frustrated asking questions in class because they can replay the video multiple times, which reduces anxiety. Peer interaction and discussion during class time were the most favorite part of flipped classrooms, as students could discuss what they did not understand and comprehend their mistakes.

Mixed-Methods Findings

To answer the mixed-methods research question: (How does the qualitative data help in explaining the quantitative results?), data resulting from the study's two phases were mixed to provide a more in-depth explanation for the quantitative results. Some relationships were observed in the data collected from the two phases. Most interviewees from the treatment group expressed a positive attitude and preference for implementing flipped classrooms into their learning. Students reported multiple perceived benefits of flipped classrooms for the positive shift in students' roles in the learning process from passive to active, providing different approaches for learning that increased their level of self-esteem and confidence. This helped them focus, since the recorded lectures were short, giving them the opportunity to learn the material and watch video lectures at their own pace, time, and speed. This in turn provided students with different avenues for learning, as having more time in class for discussion and peer interaction encouraged them to ask questions and comfortably discuss and focus on their mistakes, while helping students not physically present to follow up with classmates, as compared with traditional classes.

This positive attitude toward flipped classrooms, revealed in interviews, makes clear the significant effect of flipped classrooms on students' achievement levels in getting higher scores

than the control group. As previously mentioned, the perceived benefits of flipped classrooms on the students' learning process influenced the feelings they have toward this methodology and, at the same time, affected their achievement level in the class, as measured by the achievement test.

Thus, the qualitative data showed students appreciated the benefits of flipped classrooms and had positive attitudes toward using them, which translated into better achievement levels in the Computer in Education course. This illustrates a relationship between students' attitudes and achievement through the variables examined in this study.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

The purpose of this sequential explanatory mixed-methods study was to compare students' academic achievement in flipped and non-flipped undergraduate classrooms and explore their attitudes toward use of this model in Saudi Arabia. Both qualitative and quantitative data were collected over one semester for the Computer in Education course taught by the instructor/researcher. This chapter includes a discussion of results for each research question in relation to the previous literature in the field. Moreover, it includes implications and recommendations for future research as well as the conclusion.

Research Question #1

The first research question asked, "What are the differences in higher education female students' academic achievement between students in the flipped classrooms and students in traditional classrooms in the Computer in Education course?" Quantitative data were collected and analyzed using repeated measures analysis. ANOVA and ANCOVA identified statistically significant differences in academic achievement between undergraduate female students in flipped classrooms and students in traditional classrooms, favoring students in the flipped classrooms. These findings are consistent with some studies showing students in flipped classrooms have a higher level of performance, and with small sample sizes as well. For

example, Zengin's (2017) study had 28 participants, and Mason et al. (2013) had 40 participants.

The findings of this present study are also consistent with some conducted at higher educational institutions as well. Cilli-Turner (2015) found a positive effect of flipped classrooms on students' outcomes in that the grades were higher, even though their attitudes were negative. Albert and Beatty (2014) revealed that students in the flipped group had significantly higher grades than the control group. Sowa and Thorsen (2015) illustrated that data analysis for using flipped classroom pedagogy among university underclassmen found the difference between earlier exam scores for a course taught traditionally and current exam scores for a course taught using the flipped classroom model significantly favored flipped classrooms.

The current findings are also congruent with previous research conducted for the same period (one semester) at higher educational institutions. Missildine et al. (2013) concluded examination scores were higher for the flipped classroom group than for both the lecture and lecture capture back-up and the traditional lecture-only groups.

Consistent with this study's results, and using the same approach of administering readiness assessments to avoid previous research limitations of students' lack of preparation for flipped classrooms, Love et al.'s (2014) findings showed students' performance in sequential exams significantly increased in the flipped classroom model, compared to the traditional method. Furthermore, findings in the current study regarding academic achievement parallel previous studies conducted in the same research context in Saudi Arabia. Al Rowais's (2014) results showed student achievement in both courses utilizing the flipped classroom were significantly higher than the traditional group's. The results also parallel Aljaser's (2017) study, which not only had the same context in Saudi Arabia but also the same gender, only female

participants. Both results showed academic achievement for the experimental group was significantly higher and caused positive attitudes on the self-efficacy scale.

The current study and the above-mentioned studies provide an explanation for why students in flipped classrooms (the treatment group) performed better than students in traditional classrooms (the control group). Zengin (2017) and Mason et al. (2013) found that flipped classrooms enhanced students' understanding of the concepts and improved retention when they come to class prepared for the opportunity to study and discuss. Mason et al. (2013) added that a flipped-classroom instructor can cover more material and expand the explanation more than the traditional-class instructor, which was revealed in students' performance. Cilli-Turner (2015) justified the increase in achievement due to the structure of flipped classrooms that encouraged students to be adequately prepared for quizzes, more engaged with the learning materials and each other, and where the instructor was able to observe concepts the students were struggling with and make efforts to clarify misconceptions. Albert and Beatty (2014) suggested the positive impact of flipped classrooms on students' performance was due to the consideration that instructors should redesign and work more on the curriculum and video creations integrated into each class. Sowa and Thorsen (2015) contended that flipped classrooms support social capital development. Missildine et al. (2013) claimed that implementing new teaching technologies in interactive classrooms with increasing activities can result in improved learning. Love et al. (2014) argued that flipped classrooms contribute to sparking and retaining students' interest in the content and to administering readiness assessments to assure students' preparation contributes to their increased performance. Al Rowais (2014) explained that flipped classrooms make the learning student centered, which helps them to achieve more. Aljaser (2017) illustrated

that the improvement in performance may be due to the positive effect of implementing flipped classrooms that increased learners' excitement, positivity and responsibility toward learning.

Nonetheless, contrary to this study's results, previous studies have also showed that implementing a flipped classroom model negatively affected students' understanding of the content or their achievement level. Marlowe's study (2012) with a small sample size as well (n=19) concluded the exam grades did not show significant improvement, as they only increased by three points. McLaughlin et al.'s (2013) data showed no significant difference between the traditional and experimental groups, even though the qualitative findings suggested that students' empowerment, development, and engagement could be promoted using the flipped classroom since students have positive attitudes toward this model of instruction. Findlay-Thompson and Mombourquette's (2014) results showed that grades were identical, which revealed no significant differences in academic outcomes. This confirms Blair, Maharaj, and Primus's (2016) research findings that also showed no significant differences. Bossaer et al. (2016) found that student performance in flipped classrooms was lower than student performance in the interactive lectures.

A conflicting result for this present study is shown also within studies conducted in the same context, Saudi Arabia. Sajid et al. (2016) found the difference in grades was not statistically significant, even though students were more satisfied with the blended and flipped classroom models and wanted to have all their courses taught using the flipped classroom model of instruction. This agrees with Al-Harbi and Alshumaimeri's (2016) study results, conducted in Saudi Arabia, showing mean scores for the two groups did not show a significant difference, even though their attitudes toward this model were positive.

The previous studies provided an explanation for why students in flipped classrooms did

not perform better than those in traditional classrooms in their studies. Marlowe (2012) provided several possible reasons that might cause no change in students' grades, such as researchers not considering differences in teachers because there were different teachers for each group. Moreover, Marlowe did not apply a readiness or mandatory quiz for students to make sure they watched the video and came prepared for class. Bossaer et al. (2016) confirmed this reason for students doing poorly in flipped classrooms: faculty members failed to ensure students' preparation before attending the class as they did not collect data on whether students had watched the podcasts prior to class. Along with Marlowe (2012) and Bossaer et al. (2016), Al-Harbi and Alshumaimeri (2016) claimed that the short period of the treatment and not employing strategies for assuring students were prepared and had watched the assigned video before class were the causes of obtaining non-statistically significant results. McLaughlin et al. (2013) stated that the poor activities and class discussions they offered should be changed to be more engaging, the burden on students that flipped classrooms could create should be decreased, and the length of out-of-class time work should be minimized for students to achieve more. Findlay-Thompson and Mombourquette (2014) said students reported they felt they did better within flipped classrooms, but the quantitative data did not show that. Findlay-Thompson and Mombourquette suspected the reason might be that students had more responsibility for their learning and did not understand the purpose of the model, did not communicate properly, and perhaps the teacher was not fully trained in flipped classroom practices. Blair, Maharaj, and Primus (2016) explained the decrease in students' scores was due to a noticeable drop in attendance in the flipped classroom, which related to student performance. This may be due to students thinking that simply viewing screencasts was enough to enable them to pass the course or because students were not encouraged by getting some points for attending the class. Sajid et

al. (2016) identified limited interaction with the instructor as a barrier to students' learning. Moreover, their study was applied to only one module, which limited the impact of flipped classrooms on students' achievement levels.

Research Question #2

The second research question asked, "What are female students' attitudes toward the flipped classrooms in the Computer in Education course?" The qualitative data exploring students' attitudes toward flipped classrooms were collected via semi-structured interviews and analyzed using a systematic coding procedure. The findings showed students had different attitudes toward flipped classrooms depending on the nature of the classes the students' learning styles, and the benefits and challenges of this model. Most were excited and eager to use them, while very few had negative attitudes and were frustrated when studying in them. This is consistent with several previous studies in the literature that support the current findings.

The participants reported that peer interaction, collaboration and discussion during class time were their favorite part of flipped classrooms, as students were not passive anymore and could discuss what they did not understand and comprehend their mistakes. They believed the hands-on activities and discussions in flipped classrooms helped them clarify misconceptions and remember the content better, which helped them achieve more. This is consistent with Zengin's (2017) study, which showed students had positive attitudes toward flipped classrooms since they believed they enhanced their understanding, moved away from memorization, promoted retention, and increased their motivation. Another study, conducted by Jackson (2013), reported that a nationwide survey by the Center for Digital Education to determine the reason behind flipped classrooms evolution among educators showed that 80% of students improved

their mastery of information, 81% developed more retention of information, and 86% agreed that students have positive attitudes toward the flipped classroom model of instruction. In the current study, the students reported the flipped classroom offers a means for absent students to keep up with the class and not miss the lessons, as was the case with Bergmann and Sams's (2012) students. These findings are also in line with Al Rowais's (2014) findings that revealed a positive attitude toward flipped classrooms since they promote peer interaction, collaboration skills, and engagement. Love et al. (2014) found that students had positive perceptions toward flipped classrooms, not only because they could remember course materials better but they greatly appreciated the collaborative work and instructional video materials. Students claimed the discussions in class helped them develop a deeper understanding and the videos offered them the option of watching them multiple times without disrupting the flow of the class.

Furthermore, the students in the current study expressed that this model of instruction reduced anxiety because it was suitable for students who get frustrated asking questions in class, since they could get the instructor's explanation (available all the time) and replay the video multiple times without being embarrassed, which is congruent with previous research conducted by Olakanmi (2017). The findings confirm Wilson's (2013) and Marlowe's (2012) studies as well. Their studies revealed that students had positive attitudes toward flipped classrooms since they not only improved their learning level but also decreased their anxiety and stress because they had learning resources and explanation available when needed.

Interestingly, the students in the current study expressed positive attitudes toward flipped classrooms by discussing their benefits in relation to their responsibility for their learning and the shift in instructors' and students' roles in the learning process. They believed flipped classrooms offer different approaches for learning and reported this model features customized and student-

centered content, as Sams and Bergmann (2013) claimed, which changed students' role from passive to active, increased their responsibility for learning, and eventually prompted their motivation to learn, encouraging them to be more committed and focused as well as increasing their levels of self-esteem, efficacy, and confidence when attending class. These findings support McLaughlin et al.'s (2013) findings, which identified that flipped classrooms improved student empowerment, development, and engagement. Positive student perceptions are associated with being active learners. They asserted that in-home materials enabled them to engage actively in their learning with more focus, confidence, and enthusiasm. This is consistent with Olakanmi's (2017) findings, which revealed students involved in a flipped classroom showed a positive attitude, highlighted how students' preparation before class provided more opportunities to interact with peers and the teacher, and encouraged higher levels of self-efficacy during lectures. In line with the previous studies and consistent with this study's findings, Sajid et al. (2016), Al Rowais (2014), and Alsowat (2016) affirmed that students were more satisfied with flipped classrooms since they shifted the passive lecture to active student-centered learning, which enhanced their critical thinking, application, and retention while eventually helping them prepare for exams. In line with these findings, Al-Harbi and Alshumaimeri's (2016) findings revealed students' attitudes toward the flipped classroom were positive, and they reported flipped classrooms promoted communication skills and responsibility for their learning that moved them to active learning and encouraged their autonomy.

The change in the teachers' role is another benefit discussed by participants of this study. Students reported that in flipped classrooms, the instructor provided more feedback, provided detailed explanations for the learning content, and observed learning activities closely. They became more like coordinators and administrators of the learning process than previously. Cilli-

Turner (2015) expressed her preference for flipped classrooms as an instructor, as she contended instructors can observe students more closely, providing feedback and concentrating on concepts they struggle with. The current study's findings fall in line with Blair et al.'s (2016) research, which revealed an improvement in perception of class materials, positive attitudes in terms of completion, and preference to continue using a flipped classroom model, since it gave instructors more time to work with each student individually. In their study, Mason et al. (2013) identified similar results in that students found flipped classrooms satisfactory and effective since teachers could cover more learning materials. Consistent with this, Wilson (2013) found that flipped classrooms allowed more time for students in that they could have immediate feedback from their instructors on their learning progress.

Moreover, most participants in the current study appreciated having the opportunity to learn the material and watch video lectures at their own pace and chosen time, thus being able to focus on their learning. Gilboy et al. (2015) also found this in their quantitative study, which showed that most students preferred flipped classrooms compared to the traditional due to the ability to study at their own pace and time. Nouri's (2016) study recognized this result as well in that students appreciated the flexibility and mobility of the accessible video lectures, which gave them the opportunity to study at their own pace.

Even though most students in the current study had positive attitudes toward flipped classrooms, some expressed concerns regarding the flipped classroom model, and a few of them had negative feelings toward flipped classrooms. Most participants discussed how it was their first time studying with such a model and shifting from what they were used to led them to different views toward it. Cilli-Turner's (2015) study has contrasting findings in which the students showed a negative attitude, which was justified by students being challenged by a new

model of instruction that is different from what they are used to. This finding is also present in the current study.

Furthermore, a few participants in the current explained that flipped classrooms might cause a loss of self-confidence and frustration if students misunderstand some points in the recorded lecture and may even cause negative feelings like panic. One student discussed how taking responsibility for her learning was burdensome, and another felt it was a waste of time to come to class since she already knew the learning content. Those findings are congruent with what Strayer (2007) found as causes for students' dissatisfaction with flipped classrooms. His study was dependent on active learning theory, which emphasizes the importance of activity and physical engagement for students to learn. The students did not perform very well in the given task because, as they expressed, they had less interaction with the instructor and the class time seemed boring and repetitious to what they had watched at home. Moreover, students were split on their feelings toward taking control of their own learning, which may justify some students having had a low level of self-confidence in such a model. Moran (2014) also found that students had challenges in motivating themselves to learn until the end. Moreover, students with high motivation to excel in English language arts revealed they easily navigated in the flipped unit, whereas less motivated students found the flipped classroom model was a frustrating strategy. This frustration issue was also indicated in Sowa and Thorsen's (2015) study, which showed that students did not indicate a preference for flipped classrooms over traditional lectures due to frustration.

Additionally, some students' responses highlighted further concerns that flipped classrooms are not suitable with all subjects. Most believed this model works well with theoretical and easy courses such as the Computer in Education course, religion, and educational

courses in which there is no need for immediate facilitation or with long and boring courses such as history. However, it does not work well with more complicated courses or ones that demand practical work and the presence of the teacher because students need immediate support and facilitation, like math, specialized courses, chemistry, or physics.

The findings of this study also highlight several strategies that could improve the integration of flipped classrooms and increase students' engagement. These strategies were noted from the students' response to the interview question, "What activities do you think would help to improve the integration of flipped classrooms for different academic levels, or specifically at your academic level?" Students suggested that more instructor assistance and additional information and explanation during class time, instead of depending completely on video lectures, were required. Also, creating more opportunities for student discussion and contribution to learning would enhance integration of this model into the learning environment. Additionally, a training workshop before integration of a new teaching model would help students better assimilate. Some strategies to push students to be more committed were discussed, such as including additional quizzes, scores for attending classes, and allocating a timeline for watching pre-recorded videos.

Research Question #3

The third research question asked, "How does the qualitative data help in explaining the quantitative results?" Data resulting from the study's two phases were mixed to offer more in-depth explanation for the quantitative results. A relationship was observed in the data collected from both phases. Most interviewees from the treatment group expressed a positive attitude and preference for implementing flipped classrooms into their learning. They reported flipped

classrooms provided students with different avenues for learning, influenced feelings they have toward this methodology, and affected their achievement levels in the class, as measured by the achievement test. Thus, the qualitative data showed students appreciated the benefits of flipped classrooms and had positive attitudes toward using them, which translated into better achievement levels in the Computer in Education course.

The results of this mixed-methods study are consistent with several previous mixed-methods studies regarding the improvement of the students' achievement and their positive attitudes toward the use of flipped classrooms, such as Wilson (2013), Zengin (2017), Olakanmi (2017), Alsowat (2016), Al Rowais (2014), Love et al. (2014) and Mason et al. (2013).

Some studies had similar findings regarding the improvement of students' achievement levels but contrasted in the attitude findings. Sowa and Thorsen's (2015) and Cilli-Turner's (2015) studies showed a positive effect of flipped classrooms on students' outcomes, where the grades were higher even though the attitude was negative. The researchers concluded that students' attitudes were not necessarily correlated to their performance.

In contrast, some previous studies had similar results regarding the positive attitudes toward flipped classrooms, but different results regarding achievement levels, such as Sajid et al. (2016), Al-Harbi and Alshumaimeri (2016), and McLaughlin et al. (2013), who showed the grade comparisons were not statistically significant even though students were more satisfied with the flipped classroom model. Marlowe (2012) also found students demonstrated lower levels of stress and higher levels of enjoyment using the flipped classroom model over the traditional method, while exam grades did not show significant improvement. Finding the same results as the previous studies, Blair et al. (2016) concluded there was no correlation between performance and perceptions.

The current study is in direct contrast to Johnson and Renner's (2012) study that showed using flipped classrooms in a computer applications class did not impact students' scores or attitudes toward learning content. Furthermore, Strayer's (2007) mixed-methods study showed students did not perform well at the given task because they were less satisfied with the flipped classroom model.

Implications

This study provided insight into the effect of flipped classrooms on undergraduate female students' achievement levels and attitudes toward the use of flipped classrooms in their learning process. A major contribution of this study is its existence since there have been few studies published regarding the usage of flipped classrooms at different academic levels in Saudi Arabia (Alzahrani, 2015). Al-Harbi and Alshumaimeri (2016) reported that flipped classrooms have not been utilized widely in the Saudi educational system, and no study has been published about using the flipped classroom in the Computer in Education course. Moreover, this study contributed to the literature about using technology with Saudi female students, who have different technological backgrounds and experiences than male students due to cultural factors in Saudi Arabia (Amoundi & Sulaymani, 2014). This study used a sequential explanatory mixed-methods design to examine data resulting from the achievement test and semi-structured interviews and used qualitative data to explain the quantitative data in greater depth.

The results are directed at researchers, faculty, and administrators. The positive quantitative and qualitative results of this study indicate researchers should conduct more studies regarding the implementation of flipped classrooms in Saudi Arabia and faculty should consider implementing flipped classrooms in their teaching as an alternative to traditional teaching to

increase their students' academic achievement levels. Also, educational administrators, especially at higher education institutions, should respond to the need for implementing such a model to increase student satisfaction, motivation, content comprehension, and learning outcomes.

Based on the results of this study, modifications and improvement plans were developed to support students' needs to make the integration of flipped classrooms better. Instructors should 1) be highly trained to effectively implement flipped classrooms in their teaching; 2) include pre-flipped classroom training for students, which might help learners to be more prepared for such an instructional model requiring student responsibility toward learning and students should be informed about the importance of watching the pre-recorded video before coming to class so as to increase the in-class activities rate; 3) make the lecture more attractive by involving students in finding some parts of the learning content while not explaining each point in the recorded video; 4) send regular reminders to students to watch the pre-recorded videos, since they are not used to such a model and to increase their commitment to watch the video specifically during the beginning of the implementation period; 5) include a timeline to watch the pre-recorded lectures at home to help students become more committed to watch them regularly as well; 6) make sure of students' preparation (watching pre-recorded lectures) by implementing a readiness quiz before attending the class; 7) give a type of quiz during class time that will encourage them to watch the videos regularly and also attend the class; 8) allocate a time at the beginning of the class to review the learning content and make sure all of the students have an average understanding for the learning content, rather than assuming all students are at the same level of understanding; 9) provide more explanation in class than what the videos have provided and allocate some scores for activities done in class to motivate students to attend the class; 10)

include different learning resources and supplementary materials for assessing student learning in addition to the pre-recorded lecture; and 11) give careful consideration to student workloads to avoid the burden that flipped classrooms could potentially create for students with their new responsibilities.

Recommendations for Future Research

This mixed-methods study was conducted to understand more about the effect on implementing flipped classrooms on students' achievement and attitudes. Recommendations for future research are:

1- Since the sample size of this study was small, conducting other studies with larger sample sizes to collect more accurate quantitative data is recommended.

2- As a result of the qualitative analysis, students liked flipped classrooms to be implemented in theoretical and easy courses but not in difficult or practical ones, so additional research for other courses is recommended.

3- Since the population of this study was undergraduate female students in Saudi Arabia, it makes this research limited in its generalizability to students in other countries and male students. Thus, more studies are recommended for other genders and in other countries to be able to generalize the results.

4- Because this study was applied over a one-semester period, conducting studies for longer periods is recommended to obtain more accurate results and to make more comprehensive evaluations of flipped classrooms' benefits or drawbacks for students.

5- Since the participants in this study were from different academic levels (seniors, juniors, etc.) enrolled in the Computer in Education course, this might affect the generalizability of the research results as well.
6- Since the study did not contain any historical data about using flipped classrooms because the college has not used this kind of teaching strategy prior to this study, more studies are recommended that will extend this study.
7- Due to the lack of qualitative, quantitative, and mixed-methods research regarding the use of flipped classrooms in Saudi Arabia (Al-Harbi & Alshumaimeri, 2016; Al Rowais, 2014; Alzahrani, 2015), more studies are recommended that will contribute to the literature on the flipped classroom model of instruction and assist in making informed decisions about implementing it in the learning environment.

Conclusion

Recently, there has been a movement in higher education institutions in Saudi Arabia toward developing student-centered active learning strategies and employing technology for effective instruction. The flipped classroom model of instruction is student centered and grounded in the constructivist theory of learning, which emphasizes the important role of student collaboration to construct meaning from their backgrounds and newly acquired information (Strayer, 2012; Vygotsky, 1978). It is a relatively new phenomenon in Saudi Arabia that shows promise for positively impacting student learning. It has not been widely utilized in the Saudi education system (Al-Harbi & Alshumaimeri, 2016) and empirical research that examines its effectiveness in higher education is sparse (Alzahrani, 2015).

The purpose of this sequential explanatory mixed-methods study was to compare female students' achievement in flipped and non-flipped undergraduate classrooms and explore their attitudes toward this model in Saudi Arabia. The results of the current study support the findings of the previous literature that the flipped classroom model significantly increased students' achievement and positively improved their attitudes toward their learning. The results have also provided practical implications for instructors/faculty to consider when implementing flipped classrooms in their teaching as an alternative to traditional teaching to improve their students' attitudes, satisfaction, motivation, content comprehension, and learning outcomes. Moreover, the results have shown that this model of instruction, by assigning students to review the pre-recorded lectures before class, has the potential to decrease students' anxiety and replace it with confidence.

More studies investigating the potential effect of the flipped classroom model of instruction on students' learning in Saudi Arabia are recommended. Faculty and instructors should improve their instructional practices and implement flipped classrooms into their teaching to be able to build a foundation of systematic research regarding the use of flipped classrooms in Saudi Arabia.

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APPENDIX A

INFORMED CONSENT: FLIPPED CLASSROOMS AND ACHIEVEMENT TEST

I agree to participate in the research project titled "Comparing Students' Academic Achievement and Attitudes in Flipped and Non-Flipped Undergraduate Classrooms: A Mixed-Methods Study" being conducted by Rabab Alareifi, a doctoral candidate at Northern Illinois University. I have been informed that the purpose of this mixed-methods study is to examine students' academic achievement and attitudes toward flipped classrooms via a final achievement test and individual interviews.

By agreeing to participate in the interview phase of this mixed-methods study, I confirm that I have indicated my willingness to share my experience and my scores for this course.

I am aware that my participation is voluntary and may be withdrawn at any time without penalty or prejudice, and that if I have any additional questions concerning this study, I may contact Dr. Pi Sui Hsu, Northern Illinois University, [redacted]. I understand that if I wish further information regarding my rights as a research subject, I may contact the Office of Research Compliance at Northern Illinois University at (815) 753-8588.

I expect to participate in this study for one semester. If the researcher requires further information from me after the conclusion of the study, she will request it via email/phone. I can choose to decline to give additional information.

I understand there is no direct benefit to myself individually from taking part in this study. I also acknowledge that I am not receiving compensation of any kind in exchange for my participation in this research.

I understand that if results of this study are published or presented, individual names and other personally identifiable information will not be used. In order to protect my anonymity, I will be identified only by my major and academic level.

I understand that the researcher will store the scores of my achievement test and the final total for this course for up to five years in a secure location and that the information I provide may be used in future studies with the same protections of my identity.

CONSENT

You will be given a copy of this consent form to keep for your own records.

If you wish to participate in this study, please sign and date below.

_____	_____
Participant's Name *(please print)*	Participant's Signature Date
_____	_____
Researcher's Name *(please print)*	Researcher's Signature Date

APPENDIX B

INFORMED CONSENT: INTERVIEWS

I agree to participate in the research project titled "Comparing Students' Academic Achievement and Attitudes in Flipped and Non-Flipped Undergraduate Classrooms: A Mixed-Methods Study" being conducted by Rabab Alareifi, a doctoral candidate at Northern Illinois University. I have been informed that the purpose of this mixed-methods study is to examine students' academic achievement and attitudes toward flipped classrooms via a final achievement test and individual interviews.

By agreeing to participate in the interview phase of this mixed-methods study, I confirm that I have completed the final achievement test and have indicated my willingness to be interviewed by the researcher. I understand that the interview will involve questions about my opinion of and experience with flipped classrooms.

I am aware that my participation is voluntary and may be withdrawn at any time without penalty or prejudice, and that if I have any additional questions concerning this study, I may contact Dr. Pi Sui Hsu, Northern Illinois University, [redacted]. I understand that if I wish further information regarding my rights as a research subject, I may contact the Office of Research Compliance at Northern Illinois University at (815) 753-8588.

I am aware that my interview will be recorded to accurately record the information I provide and that the recording will be used for transcription purposes only. I also understand that I can elect to not be audiotaped and I may request that the audio recorder be turned off at any point during the interview. If I decline to be audiotaped, the researcher will record the interview via handwritten notes. I also know that I can stop the interview at any time.

I expect to participate in one interview that will consist of approximately X questions. If the researcher requires further information from me after the conclusion of the interview, she will request it via email/phone. I can choose to decline to give additional information.

I understand there is no direct benefit to myself individually from taking part in this study. I also acknowledge that I am not receiving compensation of any kind in exchange for my participation in this research.

I understand that if results of this study are published or presented, individual names and other personally identifiable information will not be used. In order to protect my anonymity, I will be identified only by my major and academic level.

I understand that the researcher will store the audio recording and transcription of my interview for up to five years in a secure location and that the information I provide may be used in future studies with the same protections of my identity.

CONSENT

You will be given a copy of this consent form to keep for your own records.

If you wish to participate in this study, please sign and date below.

_____
Participant's Name *(please print)*

_____ _____
Participant's Signature Date

_____
Researcher's Name *(please print)*

_____ _____
Researcher's Signature Date

APPENDIX C

INFORMED CONSENT: STUDENT RECRUITMENT SCRIPTS

Rabab Alareifi.
Ph.D. candidate
Department of Educational Technology, Research and Assessment
Northern Illinois University

Dear Students:

I am currently a Ph.D. candidate in the Department of Educational Technology, Research and Assessment at Northern Illinois University. I am inviting you to participate in my study. The study is entitled, "
Comparing Students' Academic Achievement and Attitudes in Flipped and Non-Flipped Undergraduate Classrooms: A Mixed-Methods Study"

I will teach you using the flipped classroom model of instruction, administer a pre-and a post achievement tests, collect students' achievement measures and interview some of you. This study will take about one semester. All students will be asked to watch a video prior coming to class and participate in class activities. All students will be asked to have the pre and the post achievement tests to measure their achievement level. Some of students will be ask to participate in interviews to measure their attitudes toward flipped classrooms.

Your identity will remain confidential. Should this study be published, only results will be documented and your name will be replaced by a pseudonym.

I would be happy to answer any questions or concerns that you may have at that time. You may contact me at my email address: [redacted]

Thank you!

APPENDIX D

FINAL ACHIEVEMENT TEST (ENGLISH AND ARABIC VERSIONS)

English Version)

University of ……..
Educational College
Educational Technology Department

The final exam for the Computer in Education for the Fall semester 2019

Name……. University ID No…….

Put "True" or "false" in front of the following sentences.

1- The uses of computers in education would make the role of the teacher unnecessary (False)

1- Computer software is any physical device used in or with your machine, whereas hardware is a collection of codes installed onto your computer's hard drive (False).

2- Using the computer to record employee files is an example of computer assisted instruction (False)

3- The computer is an electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program (True).

4- Limited financial resources are considered as main challenges for implementing the computer in education (True)

5- Final evaluation (summative) is done during the process of building the program continuously (False)

6- The process of developing educational software goes through only one stage (False)

7- Educational software consists of one screen through which lessons can be presented in the form of a tutorial, drill and practice, simulation or problem solving (False).

8- During the Scenario Writing Stage of building educational software, the developer writes the learning objectives (False)

9- During the Execution Stage, the project team develops the product and presents the final software for usage (False)

10- Using examples related to the learner's environment is better than using fictional examples in educational software (True)

11- A lot of sound effects, graphics and colors should be implemented within the software to attract students' attention (False)

12- The educational software should be presented to experts at the Implementation and Enhancement Stage of building (True)

13- Computers were invented for creating social networks (False)

14- Virtual Reality (VR) is the use of computer technology to create a simulated environment of a three-dimensional image using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors (True).

Choose the correct answer

15- For a student's performance to reach the mastery level, the following strategy should be used

A- Drill and Practice

B- Tutorial

C- Simulation

D- Instructional Games

16- …… Indicates the speed of the computer

A- Cached Memory

B- ROM

C- CPU

D- Storage Units

17- …… is the stage at which design requirements are compiled and objectives are formulated

A- preparation

B- Development

C- Implementation

D- Evaluation

18- One of these is not an output tool?

A- Headphones

B- Screen

C- Scanner

D- Printer

19- One of the computer software components

A- Operation systems

B- CPU

C- ROM

D- RAM

20- The ……. memory retains basic start-up data and does not lose its contents when the device is turned off.

A- ROM

B- Cache

C- Hard disks

D- RAM

21- ……is a term used for the learning environment that provides direct interactions between the learner and the computer:

A- CMA

B- CMS

C- CAI

D- IAC

22- …… is a strategy that presents new information that has never been learned

A- Drill and Practice

B- Tutorial

C- Simulation

D- Instructional Games

23- All screens provide a single sequence for all learners in the …… style

A- Branching

B- Linear

C- Diverging

D- Conditional

24- ……. is a strategy that provides information through interactive and entertainment methods

A- Drill and Practice

B- Tutorial

C- Simulation

D- Instructional Games

25- ……. is a strategy that allows the learner to make mistakes that do not have serious consequences

A- Drill and Practice

B- Tutorial

C- Simulation

D- Instructional Games

26- In the ……. stage, the designer presents a complete picture about the software project

A- preparation

B- Design

C- Development

D- Implementation

27- the .....manages all the software and hardware on the computer.

A- RAM

B- Storage Units

C- PowerPoint presentations

D- operation systems

28- Which of the following statements is true about using computers in education?

A- It decreases the number of workers

B- It develops cognitive skills

C- It helps the instructor present information clearly

D- All of the above

29- The ……. strategy improves students' logical thinking

A- Drill and Practice B- Simulation C- Problem Solving D- Instructional Games

Arabic Version

جامعة.....
كـــلية التـــربيـــــة
قســـم تقنيـــات تعليـم

الاختبار النهائي لمادة الحاسب في التعليم للفصل الدراسي الأول لعام ١٤٤٠ هـ-١٤٤١هـ
الاسم : ..... **الرقم الجامعي: .....** **الرقم التسلسلي**:.....
عزيزتي الطالبة: الرجاء التأكد من كتابة معلوماتك + الرقم التسلسلي في نموذج الإجابة والتركيز عند نقل الإجابة الصحيحة.

السؤال الأول:

ضعي علامة " √ " أو" × " أمام رقم السؤال في نموذج الإجابة للفقرات التالية:

١-استخدام الحاسب الآلي في التعليم يغني عن وجود المعلم (×)

٢-المكونات البرمجية هي أجهزه تستخدم مع أو داخل جهاز الكمبيوتر بينما المكونات المادية مجموعة من الرموز يتم تثبيتها داخل نظام الحاسب (×)

٣-استخدام الحاسب لحفظ ملفات الموظفين والمعلمين هو مثال لاستخدام الحاسب كوسيلة مساعده في التعليم (×)

٤-الحاسب الآلي هو آلة إلكترونية يمكن برمجتها لتقوم بـمعالجة البيانات وتخزينها واسترجاعها وإجراء العمليات الحسابية والمنطقية عليها (√)

٥-تعتبر المصادر المالية المحدودة احدى العوائق التي تعيق استخدام الحاسب في التعليم (√)

٦-التقويم النهائي لبناء البرمجية التعليمية يتم أثناء عملية بناء البرنامج بشكل مستمر (×)

٧-تمر عملية إعداد البرمجيات التعليمية بمرحلة واحدة فقط (×)

٨-تتكون البرمجية التعليمية من شاشة واحدة تعرض من خلالها الموضوعات في صورة تدريس خصوصي أو تدريب ومران أو محاكاة أو حل مشكلات (×)

٩-في مرحلة كتابة السيناريو من بناء البرمجيات التعليمية، يتم صياغة الأهداف التعليمية (×)

١٠-في مرحلة التنفيذ من بناء البرمجيات التعليمية، يتم بناء البرمجية بصورتها النهائية (×)

١١-استخدام أمثلة متعلقة ببيئة المتعلم أفضل من استخدام الأمثلة الخيالية في البرمجيات التعليمية (√)

١٢-يجب استخدام الكثير من المؤثرات الصوتية والرسوم والألوان في البرمجية التعليمية لجذب انتباه المستخدم (×)

١٣- يتم عرض البرمجية التعليمية على المحكمين في مرحلة التطوير والتحسين (√)

١٤-كانت نواة فكرة صنع الحاسب الآلي هي إنشاء الشبكات الاجتماعية (×)

١٥-الواقع الافتراضي هي تكنولوجيا تتيح إنشاء بيئة مشابهة للحقيقة بواسطة الحاسوب (√)

السؤال الثاني:

ضعي حرف الإجابة الصحيحة في نموذج الإجابة:

١٦- لإيصال أداء الطالب لمرحلة الإتقان يُستخدم نمط .....

أ- التدريب والمران ب- التدريس الخصوصي ج- المحاكاة د- الألعاب التعليمية

١٧-..... يدل على سرعة جهاز الحاسب

أ- الذاكرة المخبأة ب- الذاكرة ROM ج- المعالج د- وحدات التخزين

١٨-..... هي المرحلة التي يتم فيها تجميع متطلبات التصميم وصياغة الأهداف

أ- التجهيز والإعداد ب- التصميم ج- كتابة السيناريو د- التجريب والتطوير

١٩-أحد هذه الأدوات ليس من أدوات الإخراج:

أ- السماعات ب- شاشة العرض ج- الماسح الضوئي د- الطابعة

٢٠-من المكونات البرمجية للحاسب الآلي:

أ- نظام التشغيل ب-وحدة المعالجة المركزية CPU ج-الذاكرة ROM د-الذاكرة RAM

٢١-تحتفظ ..... بالبيانات الأساسية لبدء التشغيل ولا تفقد محتوياتها عند إيقاف تشغيل الجهاز:

أ- الذاكرة ROM ب- Cache ج- الأقراص الصلبة د-الذاكرة RAM

٢٢-..... هو مصطلح يطلق على بيئة التعلم التي توفر التفاعل المباشر بين المتعلم والكمبيوتر:

أ- CMA ب- CMS ج- CAI د- IAC

٢٣-.....نمط من انماط التعليم التفاعلي الحاسوبي يقدم معلومات جديدة لم يسبق تعلمها

أ- التدريب والمران ب- التدريس الخصوصي ج- المحاكاة د- الألعاب التعليمية

٢٤-تقدم كل الشاشات بتتابع واحد لجميع المتعلمين في النمط.....

أ- المتشعب ب- الخطي ج- المتفرع د- المشروط

٢٥ -نمط ..... يقدم معلومات بطريقة تشويقية ومسلية وتفاعلية وتعتمد على اسلوب التعلم بالترفيه

أ- التدريب والمران ب- التدريس الخصوصي ج- المحاكاة د- الألعاب التعليمية.

٢٦-نمط ..... يتيح للمتعلم فرصة تعلم مهارات قد يكون تعلمها في الواقع ذا أضرار جسيمة

أ- التدريب والمران. ب- التدريس الخصوصي ج- المحاكاة د- الألعاب التعليمية

٢٧-مرحلة ..... يضع فيها المصمم تصوراً كاملاً عن مشروع البرمجية

أ- التجهيز والإعداد ب- التصميم ج- كتابة السيناريو د- التجريب والتطوير

٢٨-..... يتحكم بإدارة جميع المكونات المادية والمكونات البرمجية للحاسب الآلي:

7 - الذاكرة RAM ب- وحدات التخزين ج- العروض التقديمية د- نظام التشغيل

٢٩-من مبررات استخدام الحاسب في التعليم:

أ- توفير الأيدي العاملة ب- تنمية المهارات المعرفية ج- مساعدة المعلم د- جميع ماسبق

٣٠- تهدف برامج..... إلى تنمية التفكير المنطقي

أ- التدريب والمران ب- المحاكاة ج- حل المشكلات د- التدريس الخصوصي

انتهت الأسئلة تمنياتي لكن بالتوفيق

أ .رباب العريفي

APPENDIX E

CONSTRUCTING TEST TABLES

Table E.1 Table of Specification for the Achievement Test

Unit	Level of objective			Total of objectives	% of the topic	Time spent on topic	% of time spent on topic	Items/points per topic
	Remember	Understand	Application					
Unit 1 The computer in education and its components	2	6	0	8	26.7%	2 class sessions	25%	8
Unit 2 The usage of computers in education	2	2	0	4	13.3%	1 class session	12.5%	4
Unit 3 The computer-assisted instruction CIA and its strategies	1	6	0	7	23.3%	2 class sessions	25%	7
Unit 4 Educational software and its development	1	7	0	8	26.7%	2 class sessions	25%	8
Unit 5 Evaluating the educational software	0	1	2	3	10%	1 class session	12.5%	3
Total	6	22	2	30	100%	8	100%	30
% of each level of thinking	20%	73.3%	6.7%	100%				

Table E.2 Degree of Difficulty and Discrimination Indexes

Criteria of Categorization in Difficulty Index (DIF)	**Criteria of Categorization in Discrimination Index (DI)**
DIF>70%=Too easy	DI≤0.2= Poor,
DIF b/w 30-70%=Average	DI b/w 0.21-0.24= Acceptable
DIF b/w 50-60%= Good,	DI b/w 0.25-0.35= Good
DIF b/w 21-30%= Moderately difficult	DI≥0.36=Excellent
DIF<20%=Too difficult	

APPENDIX F

INFORMED CONSENT: INTERVIEW QUESTIONS

1. What can you tell me about your academic life (background)?

    i) Which degree are you pursuing now?

    ii) Tell me about the model of instruction in your country that you are used to?

2. Tell me about your learning experiences within flipped classrooms model of instruction?

    i) How many courses are you enrolled in using the flipped classroom model?

    ii) How long have you been studying within the flipped classroom?

3. What are your favorite class activities in flipped classrooms?

    i) Would you describe one of them in detail?

    ii) Why it is your favorite activity?

4. What are your less favorite class activities in flipped classrooms?

        i. Would you describe one of them in detail?

        ii. Why it is a less favorite activity?

5. Regarding mastering the learning content, explain how you do that within the flipped classroom?

i)Which instructional model (flipped classrooms vs. traditional lectures) would work better for you regarding this point?

ii) Which instructional models (flipped classrooms vs. traditional lectures) would work better for you to do your assignments in less time?

6. Do you believe you are putting in more or less effort within flipped classrooms than before traditional classrooms? Why or why not?

7. What are the benefits of studying in courses utilizing flipped classrooms?

8. What are the challenges of studying in courses utilizing flipped classrooms?

9. Do flipped classrooms help you to prepare for class? How you prepare yourself for discussion and working with peers in the class?
10. What activities do you think would help to improve the integration of flipped classrooms for different academic levels, or specifically at your academic level?
11. Explain how you prepare for the final project/exam within flipped classrooms?
12. Explain how you prepare for the final project/exam within traditional classrooms?
13. What is your attitude toward studying using the flipped classroom? Do you prefer it or do you prefer the traditional lecturing model?

i)Why it is positive or why it is negative?

14. Explain how traditional classrooms do/do not help in improving your learning experiences?
15. Explain how flipped classrooms do/ do not help in improving your learning experiences?
16. How do flipped classrooms help you in getting high or low scores in your final exam?
17. What advice would you give to students enrolled in courses utilizing flipped classrooms?
18. Is there anything else you would like to add?

APPENDIX G

QUANTITAIVE RESULTS

Table G.1 Descriptive Statistics

			Statistic	Std. Error
PreTest	Mean		14.32	.780
	95% Confidence Interval for Mean	Lower Bound	12.72	
		Upper Bound	15.92	
	5% Trimmed Mean		14.41	
	Median		13.50	
	Variance		17.041	
	Std. Deviation		4.128	
	Minimum		5	
	Maximum		22	
	Range		17	
	Interquartile Range		6	
	Skewness		-.165	.441
	Kurtosis		.119	.858
PostTest	Mean		18.36	.628
	95% Confidence Interval for Mean	Lower Bound	17.07	
		Upper Bound	19.65	
	5% Trimmed Mean		18.33	
	Median		18.00	
	Variance		11.053	
	Std. Deviation		3.325	
	Minimum		10	
	Maximum		27	
	Range		17	
	Interquartile Range		3	
	Skewness		.262	.441
	Kurtosis		1.750	.858

Table G.2 Descriptive Statistics of Pre-Test score by Group

	Group			Statistic	Std. Error
PreTest	Traditional	Mean		14.71	1.102
		95% Confidence Interval for Mean	Lower Bound	12.33	
			Upper Bound	17.09	
		5% Trimmed Mean		14.90	
		Median		15.50	
		Variance		16.989	
		Std. Deviation		4.122	
		Minimum		5	
		Maximum		21	
		Range		16	
		Interquartile Range		6	
		Skewness		-.900	.597
		Kurtosis		1.067	1.154
	Flipped	Mean		13.93	1.136
		95% Confidence Interval for Mean	Lower Bound	11.47	
			Upper Bound	16.38	
		5% Trimmed Mean		13.92	
		Median		13.00	
		Variance		18.071	
		Std. Deviation		4.251	
		Minimum		6	
		Maximum		22	
		Range		16	
		Interquartile Range		4	
		Skewness		.499	.597
		Kurtosis		.522	1.154

Table G.3 Descriptive Statistics Post-Test score by Group

	Group			Statistic	Std. Error
PostTest	Traditional	Mean		17.14	.601
		95% Confidence Interval for Mean	Lower Bound	15.84	
			Upper Bound	18.44	
		5% Trimmed Mean		17.44	
		Median		17.50	
		Variance		5.055	
		Std. Deviation		2.248	
		Minimum		10	
		Maximum		19	
		Range		9	
		Interquartile Range		1	
		Skewness		-2.718	.597
		Kurtosis		8.815	1.154
	Flipped	Mean		19.57	1.026
		95% Confidence Interval for Mean	Lower Bound	17.36	
			Upper Bound	21.79	
		5% Trimmed Mean		19.47	
		Median		20.00	
		Variance		14.725	
		Std. Deviation		3.837	
		Minimum		14	
		Maximum		27	
		Range		13	
		Interquartile Range		5	
		Skewness		.202	.597
		Kurtosis		-.321	1.154

Table G.4 Box's Test of Equality of Covariance Matrices[a]

Box's M	8.313
F	2.540
df1	3
df2	121680.000
Sig.	.055

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Group
Within Subjects Design: time

Table G.5 Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Difference	.086	28	.200*	.980	28	.858

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table G.6 Levene's Test of Equality of Error Variances[a]

Dependent Variable: Difference

F	df1	df2	Sig.
.495	1	26	.488

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Group

Table G.7 Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
time	Sphericity Assumed	228.018	1	228.018	54.730	.000	.678
	Greenhouse-Geisser	228.018	1.000	228.018	54.730	.000	.678
	Huynh-Feldt	228.018	1.000	228.018	54.730	.000	.678
	Lower-bound	228.018	1.000	228.018	54.730	.000	.678
time * Group	Sphericity Assumed	36.161	1	36.161	8.680	.007	.250
	Greenhouse-Geisser	36.161	1.000	36.161	8.680	.007	.250
	Huynh-Feldt	36.161	1.000	36.161	8.680	.007	.250
	Lower-bound	36.161	1.000	36.161	8.680	.007	.250
Error(time)	Sphericity Assumed	108.321	26	4.166			
	Greenhouse-Geisser	108.321	26.000	4.166			
	Huynh-Feldt	108.321	26.000	4.166			
	Lower-bound	108.321	26.000	4.166			

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	228.018	1	228.018	54.730	.000
Time* Group	Linear	36.161	1.000	36.161	8.680	.007
Error (time)	Linear	108.321	26.000	4.166		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	14950.4	1	14950.4	642.916	.000
Group	9.446	1	9.446	.406	.529
Error	604.607	26	23.254		

Table G.8 Tests of Normality for ANCOVA

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for PostTest	.149	28	.112	.921	28	.036

a. Lilliefors Significance Correction

Table G.9 Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.063	5.023		2.003	.057
	Group	.380	3.104	.058	.122	.904
	PreTest	.283	.333	.351	.850	.404
	PreTest_x_Group	.173	.208	.487	.829	.415

a. Dependent Variable: PostTest

Table G.10 Levene's Test of Equality of Error Variances[a]

Dependent Variable: PostTest

F	df1	df2	Sig.
6.143	1	26	.020

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + PreTest + Group

Table G.11 Tests of Between-Subjects Effects

Dependent Variable: PostTest

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	176.382[a]	2	88.191	18.065	.000	.591
Intercept	229.593	1	229.593	47.030	.000	.653
PreTest	135.096	1	135.096	27.673	.000	.525
Group	56.574	1	56.574	11.589	.002	.317
Error	122.047	25	4.882			
Total	9734.000	28				
Corrected Total	298.429	27				

a. R Squared = .591 (Adjusted R Squared = .558)