The Effects of Online Formative and Summative Assessment on Test Anxiety and Performance: A Study Among First-Year Undergraduate Students at A Higher Education Institution in Abu Dhabi, United Arab Emirates

أثر الاختبارات الالكترونية التمهيدية والنهائية على الطلاب و التأثير المترتب على القلق و الأداء:

دراسة بين طلاب السنة الأولى في معهد التعليم العالي في أبو ظبي ، الإمارات العربية المتحدة

by

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Abstract

The presented study was conducted to provide greater insight into the potential positive, neutral and/or negative effects of online formative and summative assessment on test anxiety and performance. The aim of the study was to determine if online assessment could address the problems associated with test anxiety, which include poor study habits, distraction during testing, mental blocks and other physiological and psychological effects that students might experience as a result of perceived test threats. The theoretical frameworks that the study was based on were constructivism, behaviorism and multiple intelligences, as well as the constructs of Assessment for Learning, blended learning and self-paced learning. Past research on online formative and summative assessment has found that online testing and practice tests can reduce test anxiety because the conditions that facilitate test anxiety are reduced through the integration of online practice tests. In other words, students feel more confident in their knowledge and testing abilities, which in turn removed some of the pre-established, perceived test threats. The current study was carried out using a qualitative, case study approach, in which 24 students and one instructor in a first year, undergraduate social sciences general education class at a large Higher Education Institution in Abu Dhabi, United Arab Emirates. The students were given two online tests, one without access to a prior online practice test, and one with access to a prior online practice test. The test scores were compared and used as supplemental quantitative data to the qualitative data collected from open-ended questionnaires. The questionnaires were modeled after the UTAUT2 technology use and acceptance model, which examines performance expectancy, effort expectancy and social influence as indicators of behavioral intention to use and accept online assessment systems. After conducting the qualitative and quantitative analyses, it was found that the students had more confidence in their test-taking abilities because they had access to the online practice test. This confidence resulted in decreased instances of test anxiety and scores all around improved on the second test. It can be concluded from the results of this study that teachers can help motivate their students to study by using online practice tests, which will in turn help reduce test threats and improve academic outcomes.

ملخص البحث

نظراً للنمو الهائل للتطور التكنولوجي في عصر الانترنت وانسجاما مع المتطلبات الوظيفية لتطوير الكوادر البشرية في مجال التعليم وباعتبار مرحلة التعليم من أهم المراحل التي يتم من خلالها نقل المعرفة و تمكين الطلاب من اكتساب الخبرات والمهارات المختلفة و من هذا المنطلق تم إجراء دراسة بحثية متعلقة بأثر الاختبارات الإلكترونية التمهيدية والنهائية والتأثيرات المترتبه من قلق وضعف الاداء وغيرها من الآثار الفسيولوجية والنفسية التي قد يتعرض لها الطلاب نتيجة لتهديدات الاختبار المتصورة ، وكما تشمل هذه الدراسة على العادات السيئة المصاحبة والأفعال التي بدورها تؤدي الى الانشغال أثناء تأدية الاختبار ، و من خلال هذا البحث تم الاستناد على النظرية البنائية وهي عبارة عن كيفية تعرف المعلم على أسلوب وسلوك الطلاب وطريقة التعلم وماذا يتعلمون وفي ماذا يوظفون هذا التعليم أي (التعلم هو عملية نشطة يبني فيها المتعلمون المعرفة بناءً على التجارب) والسلوك (يحدث التعلم من خلال التحفيز والتعزيز المتكرر) , والذكاء (لا يمكن رؤية الذكاء من عدسة واحدة) لذلك علينا أن نأخذ ذلك في الحسبان عند وضع خطط التقييم وعلينا التمييز بين التعلم السطحي والتعلم العميق ومن هذا المنطلق يمكن القول بأن نظام التقييم من أجل التعلم يمكن استخدامه بشكل متكامل مع عمليات التعليم و التعلم في الوقت الحالي ويجب استبداله بالطرق القديمة والتقليدية حيث ان الطرق التقليدية لا تساعد الطلاب على ان يتعلمون بصورة صحيحة ولا تقدم تعليماً ناجح ولا تحقق النتائج المرجوه من مهارات وما يعرف بـ Higher Order Thinking Skills وعوامل الاستصقاء والتفكر عن طريق هذا الاسلوب (التقيم من أجل التعلم) ، ومن خلال الاطلاع على الأبحاث السابقة التي أجريت على التقييم التكويني والتلخيصي عبر الإنترنت وجدت أن الاختبارات الالكترونية عبر الإنترنت يمكن أن تقلل من قلق الاختبار لأن الطلاب يشعرون بمزيد من الثقة في معرفتهم وقدراتهم على الاختبار ، الأمر الذي أدى بدوره إلى إزالة بعض الاضطرابات النفسية والفيسيولوجية و التهديدات المتصورة. وبناءً على المعطيات أجريت الدراسة الحالية باستخدام النهج النوعي لدراسة الحالة ، حيث قام 24 طالبًا ومتدرباً من طلاب الجامعات في السنة الأولى بفصل التعليم الجامعي العام للعلوم الاجتماعية في معهد للتعليم العالي في أبو ظبي .من خلال إجراء اختبارين عبر الإنترنت ، أحدهما لا يتضمن الاختبار تدريبي ، والآخر يتضمن اختبار تدريبي. تمت مقارنة نتائج الاختبار واستخدامها كبيانات كمية تكميلية للبيانات النوعية التي تم جمعها من الاستبيانات و صياغة الاستبيانات بناءً على استخدام نموذج 2UTAUT والذي يفحص متوسط الأداء المتوقع والجهد والتأثير الاجتماعي كمؤشرات. بعد إجراء التحليلات النوعية والكمية تم التوصل الى أن الطلاب لديهم ثقة أكبر في قدراتهم في الاختبار نظراً للممارسة عبر الإنترنت وبالتالي ينتج عن هذه الثقة انخفاض في حالات القلق وكذلك يمكن أن نستنتج من نتائج هذه الدراسة أن المعلمين يمكنهم المساعدة في تحفيز طلابهم للدراسة عبر الإنترنت والاستعداد المسبق والذي بدوره يساعد في تقليل تهديدات الاختبار وتحسين النتائج الأكاديمية.

Dedications

To my dear husband, for supporting me in my weakest moments

To my mother who has been my guidance to success

To my daughter who has been the light in my dark nights

To my family for encouraging me

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I am articulating an uncountable sense of gratitude to Allah Almighty for giving me the courage and patience to go through this journey.

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List of Acronyms

AfL	Assessment for Learning
SAT	Scholastic Assessment Test
GRE	Graduate Record Examination
GMAT	Graduate Management Admission Test
AR	Augmented Reality
VR	Virtual Reality
E-Learning	Electronic Learning
M-Learning	Mobile Learning
UTAUT2	Unified Theory of Acceptance, and Use of Technology 2
PE	Performance Expectancy
EE	Effort Expectancy
SI	Social Influence
BI	Behavioral Intention
UAE	United Arab Emirates
AD	Abu Dhabi

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Chapter 1: Introduction

1.1 Overview of the Chapter

The first chapter of the dissertation is an introductory chapter to orient the reader in the background, motivation, context, purpose and aims of the study. Specifically, chapter one discusses the researcher's motivation to carry out the study and how this motivation is linked with the current knowledge surrounding the research area. Chapter one also presents the statement of the problem, which is the 'state of the art', which has been formulated on the basis of extant literature and gaps in the extant literature on the topic. The introduction also provides the research questions in which the study seeks to answer, along with the rationale of choosing to study online formative and summative assessment effects on test anxiety and performance.

1.2 Background and Motivation to the Study

As Internet usage has become more ubiquitous across the world more educational institutions have adopted new technologies as a means to deliver classroom instruction, testing, assessment and feedback. Traditional methods of test-taking and assessment have been conducted via written and oral examinations; however, with the use of the internet and other digital technologies such as smartphones, tablets and Wi-Fi, educators and students have greater flexibility in when, how and where testing can occur (Wang, 2012). Students today can access ebooks and other online materials to study and prepare for exams, while educators can develop and integrate online learning into their classroom lessons, activities, testing and assessment.

The research is proposed in the effort to determine the effectiveness of online materials and assessment tools in reducing test anxiety and improving learning outcomes. Therefore, the research is meant to provide an overview of the differences between traditional classroom testing and online testing. Specifically, the research examines and discusses the different traditional educational materials, such as paper syllabi, classroom topic outlines, classroom materials such as textbooks and workbooks, and paper tests in which students are required to be physically present in the

classroom to complete; while at the same time, examines and discusses online study materials and testing methods and the new technologies that provide support for such materials and methods in order to determine students' attitudes and perceptions regarding online assessment as a means to reduce test-taking anxiety and produce positive learning outcomes and academic gains. In light of this, the research will investigate the effectiveness of online formative and summative assessment on test anxiety and performance.

The study of online assessment is important to the researcher because internet-enabled technologies are becoming a ubiquitous component of formal education in nearly all levels of education, especially in higher education. There is also a growing element of importance to address test anxiety and the perceived threats that cause test anxiety among students. Testing and scores have a profound impact on students' educational careers, of which are likely to carry on to the real-world in terms of career opportunities and advancement, especially testing at the higher education levels. Therefore, the researcher desires to place the study within the existing literature on addressing test anxiety and improving test performance with the implementation of online practice and formal testing.

1.3 Statement of the Problem

As the younger generation continues to accept and adopt new technologies, the learning environment must also accept and adopt new technologies. The argument for such changes in the formal learning environment stems from the reality that younger generations are growing up in a society that utilizes the internet, smartphones and other digital technologies for many different aspects of their day-to-day living (Selwyn, 2012; Merchant, 2012; Martin, 2013; Laru, Näykki & Järvelä, 2015). Further, research has stressed "education, years online and youth are significantly associated with using the internet to enhance human capital (visit school-related sites, work, health, finance or science) or social capital (visit government-related sites, or news or politics)" (Allagui, 2009, p. 7). In the Gulf region, and in the United Arab Emirates in particular, internet penetration is at 80 percent (Statista, 2019), indicating that the use of smart devices and other internet-capable technologies is ubiquitous across demographics. However, at the same time, there is a gap in the use of technology and internet-capable devices in higher education in terms of the high levels of

Internet penetration in the country (Allagui, 2009). Indeed, there is also a growing concern for making technological and educational progress in the, and according to the UAE Vision 2021 National Agenda, the country has been launching initiatives that are meant to address new instructional systems that can transform education through technology to address increasing local and global competitiveness and economic requirements.

Teachers and education professionals around the world are also becoming more aware of and knowledgeable of the uses and benefits of using digital technologies in the classroom as a means to motivate their students in the learning content and to improve memory retention, conceptual understanding, and ultimately learning outcomes and academic achievement (Abulibdeh & Hassan, 2011). To add to these benefits or technological usage in the classroom, it has been argued that online summative and formative assessment has the potential for such methods of testing to improve and reduce test anxiety (Cassady & Gridley, 2005; Harandi, 2015). Therefore, this study aims to tackle the problem of test anxiety by examining the effectiveness of online summative and formative assessments that many educational institutions are using as a core tool in the technological era.

1.4 Purpose and Objectives of the Study

The purpose of this study is to examine the effects of online summative and formative assessment in light of the potential positive, negative and neutral impact that online assessments may have on test anxiety and performance. In addition to studying the impact of online assessments on test anxiety and performance, the researcher is also interested in determining how to meet certain objectives in terms of improving certain aspects of test-taking, such as improving study habits, addressing the perceived threats (which increase test-anxiety experienced during examinations), and if certain online assessment techniques/tools are adequate in meeting the needs of the students and the instructor. Therefore, the following objectives have been identified for the purpose of the study:

- The level of stress and anxiety that online assessment can cause for students and educators as compared to the level of stress and anxiety that traditional assessment can cause
- The uses and effectiveness of training, mock exams and lockdown browsers

- The rate of success in online assessment
- The rate of and effects of security in online assessment

As such, by examining these effects, the researcher will add to the current body of knowledge on the uses of technology in education and how new online testing can improve learning outcomes and academic achievement due to the potential to address the often-detrimental impact that test anxiety has on test performance.

1.5 Research Questions

Based on the goals of the study and the current gaps in the research, the researcher has developed a set of research questions to add to discussion in the areas of online assessment, summative and formative assessment, test anxiety and performance outcomes, and perceived threats when introducing new/different methods of assessment.

The following is the main research question under examination in this study:

- **RQ1: What are the effects of online assessments on students' test anxiety and performance outcomes?**

The following are the secondary research questions under examination in this study:

- RQ2: Is there a meaningful difference between paper-based/traditional testing and online testing groups in test perceptions and performance?
- RQ3: What unique contribution(s) to student performance does using online practice tests provide when simultaneously accounting for prior performance and test perceptions?

1.6 Rationale for the Study

The environment for education delivery is evolving, as educators and students no longer need to rely on having a physical classroom space to carry out learning and assessment activities and more educators are opting to employ a 'blended' strategy in which both traditional, in-class instruction and online instruction are carried out (Dziuban et al., 2006; Graham, 2013). Education, like any other societal institution, changes and progresses along with other aspects of society, and ignoring the uses and benefits of technology in the formal learning setting would be defeating to the purpose of improving and advancing society (Graham, 2013). Therefore, this research is conducted within

the argument set forth by Dewey and Dewey (1915): “If we teach today’s students as we taught yesterday’s, we rob them of tomorrow” (p 18). In other words, we cannot expect the current and future generations of students to effectively learn and achieve academic gain if we are attempting to use outdated modes of knowledge content delivery; and further, we cannot expect to gain an honest assessment of their knowledge if we do not carry out testing using a similar/complementary method(s).

Studying the effects of online assessment on test anxiety and performance can help with the understanding of how students perceive threats when taking tests and as such, help identify and remove these threats in order for testing outcomes to more accurately portray actual student knowledge and understanding of the material being tested. According to Behera (2013), the use of technology in education has expanded significantly over the past decade, with the growing ubiquity of Wi-Fi, smartphones, tablets, ebooks, online classrooms and the use of digital blackboards in the physical classroom. These technologies are argued to increase the effectiveness of feedback, as teachers have the ability to provide instant feedback that is more meaningful because it can be personalized to the individual learner (Behera, 2013). Additionally, online assessment, including practice and formally graded exams, provides learners with greater autonomy and flexibility, which in turn improves self-determination and motivation (Mendez & Gonzalez, 2011, Harandi, 2015; Kusurkar, Croiset & Cate, 2011). When learners are more motivated to learn, they are also likely to experience perceived test threats, which reduces test anxiety and improves performance (Kusurkar, Croiset & Cate; Slavin & Davis, 2006; Harandi, 2015).

The importance of this study, therefore, lies in its ability to expand the understanding of how blended learning, flexibility and self-paced learning can increase learning outcomes in regard to addressing test anxiety, and how online formative and summative assessment can be integrated into the formal classroom to facilitate such teaching methods.

1.7 Structure of the Dissertation

The dissertation is divided into five separate chapters:

- Chapter one is the introduction and provides a detailed overview of the background of the study, including the main ideas and the main points of interest of the researcher. Chapter one also includes important elements such as the problem statement, the purpose of the study, the rationale and importance, the research questions, proposed arguments and expected outcomes.
- Chapter Two is the review of literature, including the conceptual analysis which defines and maps out the key concepts presented in the study, the theoretical frameworks in which the study will be examined, a review of existing literature that relates to the study, and a discussion on how the current study is situated in the existing body of knowledge of the topic including the gaps that this study can address and fill.
- Chapter Three outlines the methodology in which the research will be carried out. This chapter includes the higher order approach to the research, details about sampling, data-gathering instruments, instruments of analysis, limitations and delimitations, and will also include a discussion on validity, reliability and ethical considerations. Since this project is a pilot study, a discussion on pilot studies and their purposes will be included.
- Chapter Four presents the results, analysis and discussion of the results. As such, this chapter includes an analysis of the qualitative data with critical analysis, discussion and interpretation of the results. The chapter will conclude with a summary of the results.
- Chapter Five is the concluding chapter of the dissertation; therefore, it includes a summary of the study, key findings, recommendations, implications, limitations and challenges, the scope for further/future study, and a concluding note to present the claim made in the study.

Chapter 2: Review of the Literature

2.1 Overview of the Chapter

Chapter two comprises the comprehensive review of the literature, including the conceptual and theoretical underpinnings of the study and a review of related literature. The conceptual analysis section of the chapter is discussed, which includes concepts of test anxiety, the learning-testing cycle, web-based learning, and assessment for learning (formative and summative assessment, blended learning and self-paced learning The theoretical framework section of the chapter examined constructivism, behaviorism, cognitive theory and multiple intelligences in the context of current uses of online formative and summative assessment. Lastly, the chapter discussed existing, related literature on the topic and places the current study within the existing literature as a means to inform professional practice on how address the pervasive issue of test anxiety with the implementation of online learning systems.

2.2 Conceptual Analysis

According to Taras (2005), all forms of assessment begin with summative assessment and even formative assessment is summative in its conceptualization because formative assessment is summative with provided feedback. The concepts that guide the study of assessment are summative and formative, and it is necessary to define the basic concepts of examination/testing, summative and formative within the framework of assessment for learning (AfL). Further, the study aims to conceptualize new and evolving methods of assessment in the attempt to determine the effects of paper-based testing and online-based testing on test anxiety. Therefore, in addition to assessment for learning (AfL), the study utilizes concepts of blended learning and self-paced learning as a framework to examine online learning and assessment, traditional (paper-based) learning and assessment, and the effects of such methods of learning and assessment on test anxiety and performance. These key concepts guide the research process, and as such, extant literature is included in the review within these conceptual frameworks.

2.2.1 Test Anxiety

In order to understand the implications of using online assessment in replace of traditional assessment methods, it is necessary to examine the phenomenon of test anxiety. Test anxiety—the feelings of anxiousness, fear and dread that one feels before, during and after test-taking—is often argued as a product of modern society and the modern educational institution (Zeidner, 1998). Early studies (Liebert & Morris, 1967; Spielberger, Gonzalez, Taylor, Algase & Anton, 1978) propose that test anxiety can be best defined from the dimensions of emotionality and worry. Test anxiety continues to be a distinct and detrimental concern for test takers and educators, and present research shows that the problem is growing due to higher stakes and increased competition in higher education and in the workforce (Zeidner, 1998; Rana & Mahmood, 2010). Therefore, research on test anxiety measurement and the effects of test anxiety are of great interest in the study and practice of education delivery and assessment methods.

2.2.2 The Learning-Testing Cycle

The learning-testing cycle, according to Cassady (2004), is characterized by three phases: test preparation, test performance and test reflection. Cassady and Gridley (2005) point out that students who exhibit high levels of test anxiety and other negative perceptions of test taking have a difficult time operating the three phases of the learning-testing cycle, which in turn leads to negative learning and performance outcomes. Therefore, all phases of the learning-testing cycle are implicated in test anxiety, as those who have high test anxiety tend to procrastinate, which interferes with the first phase of test preparation. Cassady and Gridley (2005) state that test anxiety occurs during the preparation phase because students "worry over potential failure" and this causes significant setbacks in utilizing effective study materials and strategies, and ultimately, in forming healthy and productive study habits. As a result, students who worry over test-taking are not able to demonstrate effective cognitive processing skills that are needed to navigate the content in ways in which they can gain conceptual understanding of the material under study (Cassady, 2004; Cassady & Gridley, 2005; Culler & Holohan, 1980).

Studies have shown that test anxiety and the inability to effectively prepare for tests is directly associated with the articulatory processing loop, which is linked to speech production and the ability to rehearse and store verbal information (i.e., verbal processing in working memory) (Cassady & Gridley, 2005; Ikeda, Iwanaga & Seiwa, 1996). As such, deficits in test preparation and the development of test anxiety can eb explained by students simply not having "developed the necessary strategies to encode, organize and store the materials at hand" (Cassady & Gridley, 2005). However, students can overcome deficits stemming from ineffective preparation as they can be trained to integrate more effective study strategies, which in turn can significantly alleviate test anxiety (Cassady & Gridley, 2005). It is within this argument that online strategies and using new technologies in the classroom and for studying outside of the classroom can combat test anxiety because students of today are likely to use technology throughout their day and for a variety of academic and non-academic purposes.

Test performance is arguably the most studied and researched phase of the learning-testing cycle, as researchers have considerable data to pull from in terms of testing outcomes and scores. Cassady and Gridley (2005) therefore point out that the "classic view of test anxiety has been focused on the test performance phase, where learners fail to perform well due to task interference" (p. 6). Test performance interference, which reduces the ability for students to locate and use information stored in long-term memory during the testing phase, can occur from a sudden loss of previously learned and mastered information; obsessive self-deprecating ruminations; thoughts of failure that are brought on by feelings that the test is threatening to the self; or physiological reactions such as headaches, shortness of breath, heart palpitation, increased perspiration, that ultimately impair the ability to remain calm and stable in order to think clearly (Cassady & Gridley, 2005; Cassady 2004; Covington & Omelich, 1987; Sarason, 1986; Schwarzer & Jerusalem, 1992).

A commonly accepted and employed method of reducing test performance anxiety include taking practice tests, which "provide ungraded testing experiences that serve as effective test preparation activities; and provide non-threatening practice exams that build student confidence through repeated attempts and presumed success with realistic testing materials" (Cassady & Gridley, 2005). Therefore, utilizing online assessments as a means to engage in practice testing can help remove the threats imposed by test taking and effectively reduce the anxiety-response that learners

go through during assessment. Online assessments whether practice or scored, can be readily available for students so that they can have the flexibility to practice on their own time and under different conditions (timed, specific environments, etc.).

2.2.3 Web-Based Learning and Online Formative Summative Assessment

Web-based learning has been integrated inside and outside of the classroom for several years, and increasingly, the use of the Internet and other digital technologies continue to become integral as a means of formal education (Wang, Wang, Wang & Huang, 2006). Web-based learning, which is a broader classification in which electronic learning (E-Learning) and mobile learning (M-learning) both fall under (Behera, 2013). E-learning has evolved dramatically over the past few decades—Wi-Fi, smartphones, tablets, digital blackboards, e-books, online classrooms, new and faster ways to communicate, online testing and instant feedback (Behera, 2013). M-learning, while similar to E-learning, is distinct in only mobile technologies are utilized in an M-learning model (Behera, 2013). However, education delivery is typically not carried out only via traditional, electronic or mobile platforms, but instead are more of a hybrid model that involves the use of various tools and strategies. For example, even for classes that are online only, students will still likely study using traditional materials such as textbooks or other physical copies of learning materials along with online books, videos and activities. However, when taking online classes, students typically are assessed only using online testing; therefore, the increasing prevalence of online classes provide researchers with unprecedented opportunity to study the effects of online summative and formative assessment on test anxiety and performance.

Essentially, education delivery evolves along with society, and the Internet and digital technologies have become integral to society. Wang et al. (2006) state that "successful learning stems from the conformity between student needs and the learning environment" (p. 207), and students today are highly influenced and impacted by the use of technology. As such, the use of online tools to deliver formative and summative assessments is simply due to the progression to an internet-based society. Therefore, in order to address the negative impact of test anxiety and to inform and improve future instruction, educators must understand the potential effects of online summative and formative assessment.

2.2.4 Assessment for Learning

AfL is based on the concept that educators are qualified and knowledgeable in their ability to make assessments on their students' learning progress (Black, Harrison & Lee, 2003). As such, educators must be given support and resources in order to carry out assessments of their students' progress in various knowledge and content areas. The purpose of AfL is to provide quality feedback to learners so that they can use the feedback to make decisions regarding their own learning process in order to improve learning outcomes (Black, Harrison & Lee, 2003). Essentially, assessment is used to "serve the purpose of promoting students' learning…it is usually informal, embedded in all aspects of teaching and learning, and conducted by different teachers as part of their own diverse and individual teaching styles" (Black, Harrison & Lee, 2003, p. 2).

Recent research has shown that few schools use AfL successfully in regard to teachers developing relevant and adequate assessment for learning strategies in order to meet students' personalized learning needs in light of the high standards that are placed on individual students when it comes to test scores (Black, Harrison & Lee, 2003). Therefore, online assessment tools and methods can be utilized in the effort to develop successful assessment for learning strategies because of the flexibility that they can provide. For example, with online assessment, students can choose their own deadlines and when they want to take online tests and quizzes once they have determined that they have mastered the learning content. Figure 1 below provides a conceptual map of the AfL concept:

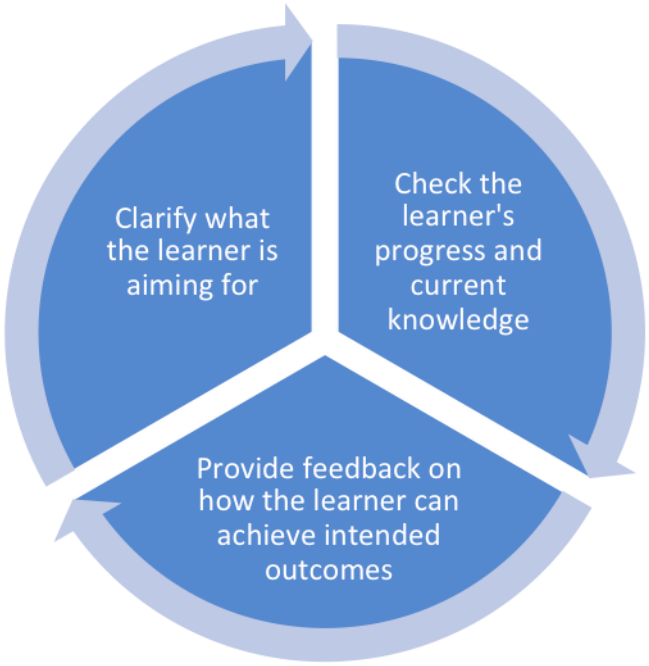

Figure 1. Conceptual map of assessment for learning (AfL) (Cambridge Assessment International Education, 2017).

As Figure 1 above shows, the AfL concept is a cycle in which teachers and learners are constantly working together to determine what level the learner is at in terms of their knowledge and understanding of a particular topic or area of study. First, the teacher is responsible for ensuring that the learner understands what they are meant to achieve in terms of current goals and objectives of the class, the classroom activities/lessons and the wider grade-level/curriculum/school expectations. The teacher then checks the learner's knowledge level which is determined by the learner's marks on classroom assignments, the teacher's expert-subjective observations of the learner's class work and participation, and test/quiz scores. Once the knowledge level is determined, the teacher provides relevant feedback so that the learner can achieve the intended outcomes.

2.2.4.1 Summative Assessment

Summative assessments are evaluative as the purpose of conductive such assessments is to compare the students' outcomes against specific benchmarks, such as other students' scores, average scores, expected scores as determined by the school, the school district or the national average (Taras, 2005). Summative assessments, therefore, are typically based on a point system and are often high stakes, meaning that students are attempting to achieve the highest points possible in order to prove their learning progress (Harlen & James, 1997). Educators and students can use summative assessments formatively in terms of determining where the learner's progress is in comparison with other students or where they are within the average by developing lessons and activities and guiding them in subsequent lessons and courses. Online summative assessments are not too different from paper-based summative assessments, in that they are designed to determine where a student's knowledge is at the time that the assessment is taken (Cassady & Gridley, 2005). According to Cassady and Gridley (2005),

> Summative assessments are designed to have high levels of control and security in the testing process to ensure reliability and validity in scores, attention to technical problems that may arise during the testing session, and assurance that the online nature of the testing process itself has no impact on actual performance (p. 8).

There is concern among educators that online summative assessment may induce higher levels of test anxiety and lower performance outcomes; however, research has found that students are able to concentrate better when taking online tests which reduces panic (Cassady & Gridley, 2005; Bocij, Greasley & Hickie, 2008).

2.2.4.2 Formative Assessment

Formative assessment is closely connected to the AfL concept, as AfL is utilized as a means to provide constructive feedback on students' learning progress. Formative assessment, in its definition, simply refers to the processes and systems in which student outcomes are "appraised qualitatively using multiple criteria" (Sadler, 1989, p. 119). While there are multiple ways in which

formative assessments can be carried out, the one aspect that binds these various assessments is that feedback is provided to the learner in order for the learner to have knowledge of their progress from within the context of the learning material covered in the assessment (Harlen & James, 1997).

Sadler (1989) points out that the primary focus on formative assessments is on making judgments about the quality of student work, and typically those who make the judgments are the students' teachers and the schools that they attend. Further, there are also judgments placed on quality of work by school systems and their locales/governing bodies. While judgments on the quality of student work are meant to help students refine and improve their knowledge and work, the heavy reliance on assessment in many schools across the world has made the testing process highly anxiety-inducing for many students (Cassady, 2001; Cassady, 2004; Cassady & Gridley, 2005). There is also concern for the negative impact that test anxiety has on assessment for those who are more vulnerable to school-related stress, such as students who are socioeconomically disadvantaged (Embse & Hasson, 2012).

Online-based formative assessment, according to Cassady (2001) can help address some of the causes of test anxiety as students can freely access online quizzes and other tests after participating in repeated practice tests. Online formative assessments are only effective if the teachers and students have learned how to use the technology (ies) needed to complete the assessment. A key benefit to online assessments is that students and teachers can implement a more self-paced learning process, which helps provide students of varying needs with personalized learning based on their specific strengths and progress so that they can move closer to the learning goal (Gordon, 2014).

2.2.5 Blended Learning

The most common definitions refer to blended learning as combining instructional modalities; combining instructional methods; and combining online and face-to-face classroom instruction (Rooney, 2003; Orey, 2002; Driscoll, 2002). Blended learning occurs organically because of the process of developing and implementing new tools, strategies and models in education occurs over time as ways of teaching and learning progress and evolve. Blended learning, however, is rooted

in the convergence of online learning with traditional learning, which has resulted in a fundamental shift in how education is delivered (Maxwell, 2016; Watson, 2008). According to Maxwell (2016), online learning has allowed for a heightened focus on the individual student in a way that traditional, face-to-face classroom learning could not facilitate.

New technologies such as Wi-Fi and smartphones, as well as expanded infrastructure to support such technologies, has made it possible for students to have some measure of control over their learning process and outcomes (Mendez & Gonzalez, 2011). Maxwell (2016) says that the aspect of student control is critical in blended learning because "otherwise, blended learning is no different from a teacher beaming online curriculum to a classroom of students through an electronic whiteboard." Therefore, what makes blended learning an effective model of teaching is that students experience some level of autonomy in their education, and with greater autonomy, students are likely to exhibit more motivation to learn (Mendez & Gonzalez, 2011).
The argument behind this is that when students are able to, for example, control the pace of their learning by giving them the ability to pause or go back because they are not quite grasping the content, or skip over because they already have mastered it, then they are acting as free agents (Maxwell, 2016). Further, students can often choose when and where they engage in online learning to ensure they are in an optimal learning situation (Maxwell, 2016; Watson, 2008).

Blended learning, like any other learning model, relies on assessment to ensure that students are learning and progressing. Students can first take online assessments so that their teachers better understand individual student instructional level (Watson, 2008). From this point, teachers can design lessons and activities based on the students' particular instructional level so that they can work with the individual students on creating and meeting their learning goals and progressing from one goal to the next. As such, formative assessment is integral to the blended learning model.

2.2.6 Self-paced Learning

Self-regulation plays an important role in a students' ability to complete tasks on-time and within the intended outcomes (Tullis & Benjamin, 2011). Students already choose what, when and how to study; therefore, integrating self-paced learning into the instructional model can improve student learning outcomes because it allows students to learn which study and learning methods are best suited for their learning styles and the conditions in which they are situated at home and in the classroom (Tullis & Benjamin, 2011). Further, while some students might need more time and practice on a particular subject, other students might need to focus on different content within the same course to prepare for upcoming assessments. For example, research by Son and Metcalfe (2000) shows that students are more likely to devote more study time to material that they have judged as difficult. If students are required to study and work on material they judge as easy as they are required for material they judge as difficult, they will not be able to spend adequate time studying and mastering the difficult material. Self-paced learning gives students more flexibility and control over the conditions in which they learn, and when guided by a teacher to ensure that they allocate their study time effectively, students are more likely to train themselves to become more effective test-takers (Tullis & Benjamin, 2011). Research conducted by Tullis and Benjamin (2011) found that information technology in the learning process plays a promising role in training metacognitive monitoring and control, as being able to take control over their learning resulted in better performance outcomes.

2.3 Theoretical Framework

The theoretical framework discussion provides the underpinnings of the study that are relevant to the purpose, goals, research questions and intended outcomes. The following theoretical frameworks explain the meaning and the nature of the research in terms of what has been uncovered, what is known, and what is still unknown about the topic. As such, this section of the chapter presents different perspectives on learning theory, including constructivist learning theory, behaviorism, cognitive theory and the theory of multiple intelligences.

2.3.1 Constructivism and Learning for Assessment

The practice of assessment to achieve learning and academic outcomes is situated within the constructivist theoretical framework. Constructivism is essentially a theory of knowledge and knowing, stating that people come to know and understand the world through their own experiences (Mascolol & Fischer, 2005). Therefore, as people move through the world and experience new situations and places, they will reconcile new experiences with previous ideas and experiences (Brooks & Brooks, 1993). In other words, people construct their own knowledge by asking about, exploring and assessing information that is learned through experiences. Constructivism is a widely accepted and utilized method of teaching in the classroom, as it relies on students actively seeking knowledge through experiencing real-world events and the experimenting and problem-solving to gain insight into these events (Brooks & Brooks, 1993). The key principle to constructivism in the classroom is that teachers encourage their students their understanding of what they are learning and to discuss and examine their assessment of how a learning activity, lesson or teaching strategy is helping them understand. Therefore, assessment is soundly placed within the constructivist framework of learning.

AfL is most closely associated with socio-constructivist theories (Cambridge Assessment International Education, 2017). In order to successfully implement learning for assessment strategy in the classroom, teachers must understand the experiences that have led their students to their current state of knowledge and understanding of the world. In this regard, teachers can learn about individual students' backgrounds, including their demographics, prior coursework and assessment scores and the subjective judgments from the students' prior teachers. Socio-constructivism as a learning theory is characterized by the following four principles: 1) an emphasis on collaboration and understanding the importance of how collaboration is influenced by culture and social contexts; 2) cognitive functions originate from can be explained through/as a product of social interactions; 3) learning is both the process of assimilating new knowledge with existing knowledge and the process by which learners came to be in a particular knowledge community; and 4) knowledge is derived from social interactions, thus language construction is an integral part of the learning process (Brooks & Brooks, 1993).

There are three key dimensions of constructivism in the context of the learning environment and assessment: 1) learning is an active process; 2) learners have prior knowledge; 3) and the learner takes responsibility for their learning outcomes (Yager, 1991; Magoon, 1977; Hewson & Hewson, 1988). Figure 2 below presents a visual diagram of the learning environment and assessment from the constructivist perspective.

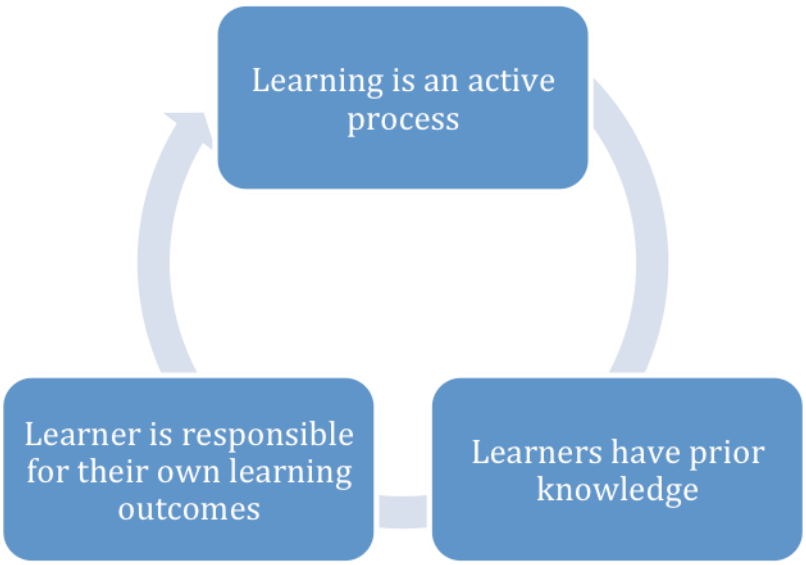

Figure 2. Dimensions of constructivist learning environment and assessment

To further elaborate on the constructivist theoretical model in Figure 2 above, Brooks and Brooks (1993) point out that the learning process continues as assessment takes place, indicating the importance of formative assessment and feedback from peers and teachers. As such, students engage in assessments by using higher order thinking skills, such as application, evaluation, analysis and synthesis, which indicates that learners are constantly applying knowledge and their understanding of the content during assessments (Zahorik, 1995). Further, from the constructivist framework, assessments are inquiries that are focused on the bigger picture and how facts, evidence and information fit into and construct the bigger picture (Zahorik, 1995; Brooks & Brooks, 1993). Students are building upon their body of knowledge with other experiences, and due to their experiences, they are able to solve problems, re-conceptualize what they are

experiencing and learning, and then synthesize their experiences to other knowledge areas. In summation, students learn through a socialization process, and this process is constant as they continue to experience new situations and interact and collaborate with others. Assessment, as such, is the process by which students reflect on what they have learned, and teachers play an important role in providing feedback and making judgements on what their students have learned.

2.3.2 Behaviorism

Behaviorism is a theory based on the proposition that learning is motivated by extrinsic factors of rewards and punishment. Constructivist theory and behaviorist theory in the context of learning are strategically different, as constructivist theorists of learning argue that students learn through engagement and actively seeking out experiences that will enhance their understanding of and ability to synthesize information to other areas of knowledge. Behaviorist theorists of learning argue that students learn through external stimuli (Watson, 1913). Behaviorism, therefore, operates on the belief that all learning is passive and that learning behaviors (i.e., forming good study habits, turning in work on time, etc.) are shaped by positive reinforcement or negative reinforcement (Watson, 1913). Ultimately, learning occurs when there are changes to the "form or frequency of observable performance…[and] is accomplished when a proper response is demonstrated following the presentation of a specific environmental stimuli" (Ertmer & Newby, 2013, p. 9). In a learning context, this is best described as simply presenting the answer to a problem that was posed, and if the learner answered correctly, then they are then being presented with the correct answer. The key elements in this exchange are the stimulus, the response and the association between the stimulus and the response (Ertmer & Newby, 2013). Figure 3 below provides a visual map of the three key elements of the behaviorist model of learning.

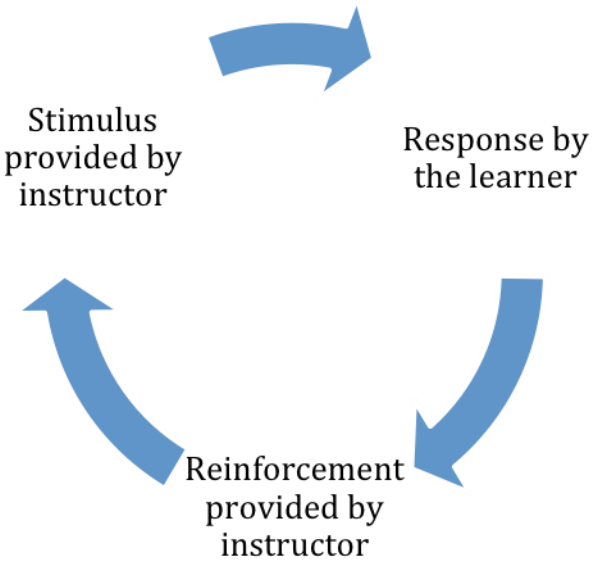

Figure 3. Behaviorist model of learning

The model of learning presented above in Figure 3 shows the relationship between an instructor's use of stimuli in a learning situation, which then provokes a response from the learner. Finally, the instructor provides reinforcement (whether negative or positive) so that the learner will either limit/stop or continue with the response. Therefore, as Ertmer and Newby (2013) point out, "of primary concern is how the association between the stimulus and response in made, strengthened and maintained" (p. 9). Essentially, the theory of behaviorism argues that applying consequences can control behaviors, whether those consequences are negative or positive, and as such, behaviors are learned, and habits are formed (Woollard, 2011). Therefore, behavior is objective, observable and can be measured, while what goes on in the mind cannot be measured because there is no way to know what is actually inside the mind (Woollard, 2011).

Teaching and learning strategies have long been associated with behaviorist strategies, which is often focused on conditioning. The behaviorist approach to education is that all learning situations take place through conditioning (Woollard, 2011). Classical conditioning occurs through paired association, meaning that negative and positive responses are conditioned to occur via a neutral

stimulus, and this stimulus can be anything—it can be a specific place, and event, or an object, that elicits a particular response (Woollard, 2011). Operant conditioning, as developed by B. F. Skinner (1938), is the process by which rewards and punishments are applied to behaviors, and as such, behaviors become associated with those rewards and punishments. Both types of conditioning are used in teaching, such as assigning scores and grades to work, e.g., a low score results in punishment such as detention or failing the class.

Currently, there is a debate over whether constructivist of behaviorist approaches is best suited for teaching strategies (Steele, 2005). One of the key arguments for a constructivist approach in the classroom is that for learning to occur, it must be meaningful and attached to the real-world and real-world experiences (Steele, 2005). Therefore, active learning is a core component of developing a constructivist approach to teaching. The behaviorist approach in the classroom, on the other hand, is most commonly defined as explicit and direct instruction (Steele, 2005). While the constructivist classroom approach has been regarded as more effective in recent years, research has found that explicit and direct instruction has shown promising results, especially for students who have learning disabilities (Mercer, 1997; Grobecker, 1999; Steele, 2005). Perera-Diltz and Moe (2014) point out that behaviorist, or instructivist, education is "based on rote memorization and on-demand, individual articulation of expert-imparted knowledge content," and as such, is unsuitable for online learning and assessment (p. 132). This is because the student is passively involved in learning and can easily become disengaged (Perera-Diltz & Moe, 2014). The purpose of using online methods of learning and assessment (particularly formative assessment) is that "knowledge becomes emergent as individual learners interact and synthesize previous learning with both novel experiences and ways of knowing" (Perera-Diltz & Moe, 2014, p. 132).

2.3.3 Cognitive Theory and Intrinsic Motivators to Learn

Along with constructivism and behaviorism, cognitive theory is used to develop teaching practices and strategies. Cognitive theory of learning is a constructivist approach to learning, as it argues that the learner works to assimilate new knowledge into their existing body of knowledge and to adjust their framework of knowing to accommodate this new information (Slavin & Davis, 2006). This approach to learning was developed out of a dissatisfaction with behaviorist approaches to

learning, and as such, focuses on mental processes that impact learning, particularly concerning how learners are motivated by intrinsic and extrinsic factors (Slavin & Davis, 2006). Extrinsic factors are those that are external, therefore, these factors are often influential because they offer rewards and punishments, which is aligned with the behaviorist approach; however, cognitive theory is more concerned with the intrinsic (internal) motivational factors (Slavin & Davis, 2006).

Intrinsic factors are typically rooted in personal and individual needs, wants, strengths and weaknesses, and are often more aligned with seeking self-satisfaction (Kusurkar, Croiset & Cate, 2011). According to Kusurkar, Croiset and Cate (2011), self-determination is a key factor of motivation in the classroom, as "intrinsic motivation is dependent on fulfillment of three basic psychological needs described by self-determination theory," which are the needs for autonomy, competence and relatedness (p. 299). The need for autonomy is the need that the learner must feel that they have chosen to carry out the task and complete it on their own volition; therefore, the learner is not forced or coerced into completing the task or completing the task well (Kusurkar, Croiset & Cate, 2011). The need for competence in learning, as described by Kusurkar, Croiset and Cate (2011), is the "need to feel capable of learning the study of course material," and the need for relatedness is "to feel a connectedness or a sense of belonging with fellow pupils and the teachers" (pp. 299-300). To meet a student's intrinsic needs, teachers act as guides who encourage students to actively participate, to accept responsibility and challenges as they come their way (Kusurkar, Croiset & Cate, 2011). Further, in order to encourage students, teachers must first learn about their students and what motivates them as individuals, what their needs and wants are, and to then provide constructive feedback and emotional support (Kusurkar, Croiset & Cate, 2011). Online learning and assessment provides teachers and students with greater opportunity to personalize individual learning situations, particularly in regard to providing instant feedback.

2.3.4 Multiple Intelligences

The theory of multiple intelligences emerged in the early 1970s as a cognitive theory of learning and has since been utilized to discuss the relevance of understanding different types of intelligence and how traditional modes of testing, such as standardized tests of intelligence (IQ) and standardized tests for college admissions (SAT, GRE, GMAT), do not always reflect an individual's intelligence, especially admissions tests which can skew positively toward those who have better test-taking skills or examinations that are meant to reflect specific knowledge about certain areas/topics (Gardner, 2011).

Gardner (2011) says that the theory of multiple intelligences takes a "radically different view of the mind, and one that yields a very different view of school…It is a pluralistic view of mind, recognizing many different and discrete facets of cognition, acknowledging that people have different cognitive strengths and contrasting cognitive styles" (p. 5). The theory of multiple intelligences, therefore, emphasizes the importance of individual-centered schools that recognize the view that intelligence is multifaceted, and students cannot learn effectively if they are not recognized as individuals with their own experiences that have influenced their ways of knowing (Gardner, 2011). Further, students cannot be adequately assessed on their intelligence through uniform tests. Gardner (2011) presents the argument by asking readers to picture someone who is intelligent—is that person a world-class violinist, a brilliant chess player, a champion athlete? Each of these individuals have their own set of skills, knowledge and expertise that makes them intelligent, and as such, there are multiple ways in which an individual presents intelligence.

The multiple intelligence approach to assessment is also better in addressing the inconsistencies of intelligence and associated behaviors between individuals and within individuals (Gardner & Moran, 2006). Therefore, the multiple intelligence approach does not "overprivilege the 'average' person," but instead makes room for many different types of intelligences (Gardner & Moran, 2006, p. 228). Online learning and assessment provide educators with a more flexible platform to develop lessons and activities that are designed with the individual learner in mind (McCoog, 2007). According to McCoog (2007), multiple intelligences and modern technologies blend in the evolving education landscape, and students of today need 'twenty first century skills', including greater global awareness and social responsibility. As such, technology can meet the needs of

students in this context as it allows for more accessible ways to differentiate instruction by making adjustments to the curriculum (McCoog, 2007). Ultimately, while the classroom is evolving to include new technologies and to support multiple intelligences, it is necessary to also change assessment methods, including having a better understanding of the level or depth of knowledge of the test-taker.

2.3.5 Current Uses of Technology in Summative and Formative Assessment

There is substantial evidence showing that active learning approaches result in more positive learning outcomes and greater academic achievement than passive approaches (Kerr, Muller, McKinon, & Inerney, 2016). This is partly due to the greater sense of self-efficacy and self-satisfaction that students feel when they are actively involved in their own learning process, which in turn leads to increased motivation and engagement (Kerr et al., 2016; Kusurkar, Croiset & Cate, 2011; Steel, 2005). Therefore, online learning tools, which facilitate the conditions needed for active learning, provide a resource in which students can receive feedback that they can engage with in ways that were not possible with traditional pencil-and-paper assessment (Kerr et al., 2016). Essentially, this allows for additional learning/tutoring opportunities as students receive interactive feedback on their work, which aids in students' improvement in summative test assessments (Kerr et al., 2016). Arguably, as students are given consistent, constructive feedback on their formative assessments, they are able to improve their scores on summative tests, which in turn decreases the likelihood of students experiencing high levels of test anxiety. E-learning and M-learning systems can therefore reduce test anxiety because they are; "largely formative tools employed to assist students in summative assessment tasks" (Kerr et al., 2016, p. 72).

Currently, online assessment is mostly carried out via quizzes and tests in which students can choose what time of the day they can take the quiz, and ideally, this quiz can be repeated any number of times and will provide students with instant feedback so that they can immediately review and understand their mistakes and how to correct their mistakes (Zakrzewski & Bull, 1999). While the student is scored on the quiz, they are still actively engaged in the quiz because they choose the environment in which they would like to take the quiz and they choose how in-depth they would like to review the results and the feedback once they have taken the quiz (Zakrzewski

& Bull, 1999). Methods of online formative assessment that are commonly used in technology-enriched classrooms today include online polls/surveys smartboard applications, using a clicker system, student collaborations with their peers via social media platforms or other online communication platforms. As technologies continue to evolve, the methods of online learning and assessment will also evolve. For example, some medical courses are utilizing augmented reality (AR) and virtual reality (VR) for learning and assessment purposes (Hsieh & Lee, 2018). Hsieh and Lee (2018) point out that VR is compromised of "many features that are ideal for surgical training, pain management, behavioral therapy…allowing users to interact with VR, as if immersive in the actual scene" (p. 2). Indeed, students in anatomy classes are able to use VR as a means to interact with a virtual human body through gesturing dissection (Hsieh & Lee, 2018).

2.4 Review of Related Literature

Past research has indicated that online testing can address issues of test anxiety among students who have in the past-presented higher levels of perceived test threat when taking paper-pencil tests, especially in taking summative assessment tests (Cassady & Gridley, 2005). This is in despite of previous arguments that online testing might cause additional perceived threats because of introducing a new testing format that the test-taker is unfamiliar with. To investigate this, Cassady and Gridley (2005) studied the effects of online formative and summative assessment materials in the undergraduate classroom setting. Specifically, undergraduates' experiences with testing behaviors (e.g., performance and study habits/test preparation strategies) and testing beliefs (e.g., test anxiety, perceived test threat) were studied (Cassady & Gridley, 2005). Cassady and Gridley (2005) were concerned with the additional threat (inducing anxiety or impacting performance levels) that online testing might have on test-takers, and the findings show that there is no support for such claims.

It is more likely, however, that students are more familiar and more comfortable taking online tests, especially in the form of practice tests, because current generations of students consistently use internet-enabled technologies in their regular, day-to-day lives. Therefore, according to Cassady and Gridley's (2005) study students reported lower levels of perceived threat with online tests when compared to paper-pencil summative tests (Cassady & Gridley, 2005). Further, when

taking formative tests online, students overwhelmingly reported that they found online tests to be useful for practice, and repeated practice decreased feelings of perceived threat because they felt better prepared for the summative tests (Cassady & Gridley, 2005). Cassady and Gridley (2005) concluded that the "small but positive impact of practice test use on subsequent course examination performance provides preliminary evidence that online practice tests can serve as an effective test preparation strategy" (p. 23). As such, it can be suggested that online testing can be utilized for practice purposes so as to better prepare students for in-class, paper-pencil exams.

Likewise, Dobson (2008) studied the usefulness of online formative assessment to prepare students for summative exams in an undergraduate Exercise Physiology course. The online quizzes were developed as supportive practice material and students the experiment group of students was required to take the quizzes ahead of the class (Dobson, 2008). Therefore, in order to perform well on the online quizzes, students also needed to read ahead of the material that was to be covered in the upcoming classes (Dobson, 2008). After analyzing course scores from three different groups of students—the first group completed the original version of the course, the second group completed an updated version of the course with more difficult/rigorous exam questions, and the third group completed the updated version of the course along with 10 required online quizzes—it was determined that the formative online quizzes enhanced performance outcomes on the summative exam (Dobson, 2008). Regarding Cassady and Gridley's (2005) and Dobson's (2008) studies, it can be concluded that online quizzes that emphasize repeated practice are able to predict successful exam performance, and inversely, that the absence of online formative quizzes can lead to higher instances of test anxiety and poor performance on summative exams.

It is also relevant to examine what factors are involved in students' acceptance and use of internet-enabled technologies as formal learning and assessment platforms. This is because attitudes and opinions regarding these methods can affect students' perceived threats and levels of threats when studying and going into an examination. Sun, Tsai, Finger, Chen & Yeh (2008) researched the driving force behind student acceptance and use of E-learning, focusing on learner experiences using technology in the classroom and the levels of user satisfaction with E-learning. Sun et al. (2008) studied E-learning satisfaction through six dimensions: learners, instructors, courses, technology, design and environment, as each of these dimensions have an impact on such learning

tools and methods. Results of the study revealed that there are seven specific variables that have critical relationships with E-learner satisfaction: learner computer anxiety, instructor attitude toward E-learning, E-learning course flexibility, E-learning course quality, perceived usefulness, perceived ease of use, and diversity in assessments (Sun et al., 2008, p. 1193).

Similarly, Harandi (2015) studied the role that E-learning has in higher education instruction in regard to the relationship between E-learning and motivation to learn and perform academically. Harandi (2015) points out that many universities use E-learning to carry out classroom tasks and activities, including testing, as a means to increase learner autonomy and active engagement. The findings from Harandi's (2015) research suggest that students' motivation to learn is greater when using E-learning tools and strategies; therefore, because students have greater motivation to learn, they are more likely to be engaged and achieve learning objectives. While Harandi's (2015) study shows that students are more motivated and engaged using E-learning, students' perceptions regarding online assessment and the perceived threats that are present along with test taking were not discussed.

Alenezi, Karim and Veloo (2010) studied E-learning and its effectiveness as an educational tool to increase student's feelings of motivation and self-efficacy. Alenezi et al (2010) found that in some cultures, implementing online learning systems can be more difficult because of a general sense of computer anxiety. Specifically, it was noted that at the time of the study students in Saudi Arabia were reluctant and even unwilling in some cases to use an online system but there is very little known of the cause of these attitudes (Alenezi et al., 2010). However, it is important to point out that when students perceive that their performance in class will improve and that the effort needed to use such systems is minimal, then they are more likely to accept online learning systems. As with Harandi's (2015) research, it is suggested that acceptance and motivation to use E-learning at the university level can be enhanced if students perceive that the system can make learning easier by offering greater flexibility in the time and place in which they can study and take exams.

Theoretical underpinnings also point to greater feelings of motivation and self-efficacy in students help address and lessen the symptoms of test anxiety, and therefore, can improve performance outcomes (Mendez & Gonzalez, 2011, Harandi, 2015; Kusurkar, Croiset & Cate, 2011). Wang,

Shannon and Ross's (2013) research also suggests that E-learning can have a significant positive impact on student self-regulating behaviors in studying and test-taking in terms of reducing anxieties and improving course outcomes. Further, students who have more extensive previous online learning experiences are more likely to have developed more effective studying and test-taking strategies when using online systems (Wang, Shannon & Ross, 2013). Therefore, technology self-efficacy is an important factor in motivation to refine self-regulating learning behaviors (Wang, Shannon & Ross, 2013). As such, these studies have shown that motivation and perceived usefulness is strongly associated with the relevance of the learning system to the student's needs and wants, as well as whether the learning system can be easily understood and accessed.

2.5 Situating the Current Study

This research centers on improving learning outcomes by addressing the pervasive issue of test anxiety. Test anxiety has been a growing concern for education institutions across the world for many years, and there is a great possibility that the issue will worsen if action is not taken in terms of understanding how to improve the situation (Rezazadeh & Tavakoli, 2009). While test anxiety is a pervasive problem of modern society, it is expected in higher-stake testing, and it is especially common among college students (Kruger, Wandle & Struzziero, 2007). However, past research conducted by Hill and Wigfield (1984) shows that test anxiety is related to the most important aspects of negative emotion and "has direct debilitating effects on school performance" (p. 106). Therefore, finding new ways to address test anxiety and to improve the effects thereof is of great concern for the education community. Since the use of technology and internet-enabled devices has become more widely accepted in the formal classroom, assessment methods should be explored in more detail in the context of the effects of online formative and summative assessment on test anxiety and performance.

Cassady and Gridley's (2005) research on online formative and summative assessment on test anxiety and performance was carried out more than a decade ago, and since then, significant advancements in technologies have occurred. Further, the use of technology has greatly expanded, including smartphone ownership and usage and the ability to connect to the Internet wirelessly.

Essentially, using the Internet and supporting devices has become ubiquitous in nearly all aspects of every day life, and therefore, the use of technology has expanded to the formal and informal learning environment. As such, the results of Cassady and Gridley's 2005 study showed great potential for online assessment in terms of improving perceived threats in test taking, including the threat of underperforming and being inadequately prepared to take the test. These findings hold up today, as current research suggests that students are more comfortable using technology to complete learning tasks, and because students use technology to study and to complete classroom activities and lessons, they are also more likely to be comfortable and less anxious taking online summative tests.

Chapter 3: Methodology

3.1 Overview of the Chapter

This chapter is concerned with the methodology of the research. Therefore, the research approach, data collection methods (i.e., the population sample, the site of the study, data collection instruments), methods of data analyses and other considerations such as ethics, the role of the researcher, and establishing trustworthiness has been discussed in this chapter.

3.2 Research Approach

A qualitative method was used in this study. Qualitative research is carried out to study social or human problems (Creswell & Poth, 2017). As such, qualitative studies take place in a natural setting so that the researcher can observe individuals and/or groups who are sensitive to the particular social or human problem that is under study (Creswell & Poth, 2017). The study also used descriptive statistical analysis as a means to introduce and integrate the quantitative data from the exam results into the qualitative data from the student and instructor questionnaires. Using both qualitative and quantitative data collection and analysis methods allowed the researcher to confirm and explore the findings.

The case study method was chosen because it provides the framework needed to answer the 'why' and the 'how' about a specific phenomenon, and for this study, the phenomenon under study is the effect that online summative and formative assessment has on test anxiety. Further, according to Neuman (2014), the purpose of descriptive research is to "provide a detailed, highly accurate picture…[and] report on the background or context of a situation" (p. 38). Because case studies use a variety of data collection methods, which in the present study consisted of exam results and open-ended questionnaires, they provide an element of data triangulation which in turn increases the validity of the data and the results (Shareia, 2016).

It is also important to point out that the purpose of the study is to provide data to support an initial investigation into the area of online summative and formative assessment. Descriptive studies are concerned with the past or current status of an issue or problem and are best suited for pilot studies because they help provide the needed information to move forward with future research (Neuman, 2014). This research observed the variables (patterns and themes) in a natural setting, and because there is no manipulation of the variables, the research does not seek to find causal relationships (Neuman, 2014). Rather, the research sought to describe the patterns that emerged across the data in order to discuss how these patterns inform the research problem. Therefore, after these patterns emerged and were identified, they were assigned themes, and these themes were used to establish the framework to answer the research questions.

3.3 Data Collection

3.3.1 Data collection plan

The data collection methods selected for this study included student and instructor questionnaires and exams. These methods of data collection provided the researcher with different perspectives to ensure that the data was objective and relevant to the study. Recording attitudes, opinions and perceptions is a key part of case studies in terms of collecting data in a natural setting (Neuman, 2014). The questionnaires were open-ended in order to "capture the specificity" of the situation under study. Lastly, using exam review provided quantitative data to determine if the exam results using online testing can be attributed to the attitudes and opinions as indicated in the questionnaires.

3.3.2 Site

The study was carried out at Zayed University in Abu Dhabi, UAE. The study site was chosen due to proximity and cost considerations. Abu Dhabi is the capital city of UAE and has an estimated population of nearly 2 million people. Initiatives have been put in place in Abu Dhabi and UAE in order to enhance education with technology. Sheikh Abdullah bin Zayed Al Nahyan, Minister of Foreign Affairs and International Cooperation says that the "world outside school has changed and

technology has now taken the centre stage…[and] teachers have to embrace technologies to make children learn faster and shape them into thinkers and innovators" (para. 2). The study took place in a classroom setting and data was collected using quantitative data from student exam results and qualitative data from questionnaires administered to the instructor(s). The classroom selected for the study was an introductory-level education technology-enriched instruction strategies and tools; therefore, the setting for the study was appropriate for the purposes of this study. Further, the questionnaires were distributed and collected online.

3.3.3 Population

The population under study includes first-year, undergraduate students in a government-sponsored Higher Education Institution in Abu Dhabi, the United Arab Emirates who are enrolled in general education courses. Therefore, the wider population that the study can apply to include first-year undergraduate students enrolled in general education classes at the University that share similar characteristics, which is estimated to be several hundred students. Further, since the purpose of the study is to describe the effects of online assessment on test anxiety, the population under study can benefit from informing future research in minimizing the effects of test anxiety on performance outcomes.

3.3.4 Sample

The participants were selected using purposive sampling. Purposive sampling is used when the researcher needs to select cases with a specific purpose in mind (Neuman, 2014). Neuman (2014) says that purposive sampling is often used to select members from a specialized population, and in this particular study, it was necessary to select participants who shared common characteristics and were part of a classroom in which online assessment was regularly used. The specific population under study was first year, undergraduate students in general education courses, which is why the researcher conducted the study in a general education class in which first year undergraduate students are required to take.

Purposive sampling was used because it was necessary to find a non-random sample of participants who collectively suited the purposes of the study. Purposive sampling is a type of non-probability sampling technique and relies on the researcher's judgement in selecting participants that are relevant and appropriate for the study (Oppong, 2013). The purpose of the study was to examine the effects of online summative and formative assessment on test anxiety and performance; therefore, purposive sampling allowed for the researcher to use the characteristics of the population under study to find an appropriate sample within this population, which includes first year, undergraduate students at a Higher Education Institution in AD, UAE who are enrolled in a general education course that has access to technology-enriched instruction and assessment capabilities.

The sample consisted of the entire class a particular first year, undergraduate students enrolled in a social science general education course, which included 24 students and one instructor. All 24 students returned the study in which they completed two online exams. The same 24 students completed the tests in November and December, during the 2018 Fall semester. Additionally, the instructor and students completed the online open-ended questionnaire in December after the students took the online exams. The participants were informed of their rights and that their participation was voluntary; therefore, at any time of the study, they were allowed to opt out. The researcher required permission from the institution, the instructor and the students and the continued expressed permission of the students themselves.

3.3.5 UTAUT2 Instrument

The questionnaire was designed based on the second generation of the Unified Theory of Acceptance and Use of Technology (UTAUT2) developed by Venkatesh, Thong & Xu (2012). The UTAUT2 model was designed to determine the rate of acceptance and use of new technologies based on the attitudes, perceptions and beliefs of the participants in regard to technology use (Venkatesh et al., 2012; Huang & Kao, 2015). The model was modified to fit the needs to the present study; therefore, the constructs that were integrated into the questionnaire include: Performance Expectancy; Effort Expectancy; Social Influence; Facilitating Conditions; and Behavioral Intention (Venkatesh et al., 2012; Huang & Kao, 2015). The questionnaire was divided into four different sections that included open-ended questions concerning each of the constructs

included in the adapted UTAUT2 model. The questionnaire was administered to the student-participants and to the instructor using a Power Point file and they were told to answer the questions on the file directly, save them and return them back to the researcher. Participants were encouraged to give more than one-word answers and told to provide details on their attitudes and perceptions regarding the use of online assessment and its effects on test anxiety and performance in regard to their experiences during this class (specifically during the online tests and while taking the practice test).

3.3.6 Validating the Instruments

Before carrying out the research study, the data gathering instruments were tested using a pilot study in October during the Fall 2018 semester. The purpose of testing the instruments in a pilot test is to ensure that the questionnaires and observation strategies will carry over successfully into the "real-world" (McKenney & Reeves, 2012). The pilot instruments were based on information uncovered in the literature review and the questionnaire was developed to determine student perceptions and attitudes toward summative and formative assessments, test anxiety, the use of paper assessments and online assessments, and the general use of technology in the classroom as a tool for learning. Therefore, the questionnaire is based on the second generation of the Unified Theory of Acceptance and Use of Technology (UTAUT2) model (Venkatesh et al., 2012; Huang & Kao, 2015). The UTAUT2 model is used to predict acceptance and use of technology, and for the purposes of this study, the model was adapted and includes the following constructs: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), and Behavioral Intention (BI). The online questionnaire was sent to 10 students and 8 completed the questionnaire. According to the feedback given, the questionnaire developed for the pilot test was successful and was used in the study.

3.4 Data Analysis

Qualitative data analysis of the open-ended questionnaires was conducted using thematic coding. Thematic coding is the process in which key ideas and constructs are pulled from the collected data and arranged in such a way that patterns and relationships emerge (Braun & Clarke, 2006).

According to Given (2008), thematic analysis is a "data reduction" and analysis strategy in which qualitative data are "segmented, categorized, and reconstructed in a way that captures the important concepts within the data set." Braun and Clarke (2006) state that thematic analysis, unlike other qualitative methodologies, provides the researcher with greater flexibility because it does not require the use of a specific epistemological or theoretical perspective. Further, thematic analysis is a descriptive strategy, as it reveals patterns across the questionnaire data that a relevant to the research problem and the research questions (Maguire & Delahunt, 2017).

The study utilized thematic coding because the data collected comes from information-rich sources, and as such, contains various perspectives in which the content contained within the data had to be condensed and organized in such a way that patterns and relationships were identified. Therefore, the first step of data analysis began after collection of the student and instructor questionnaires. During the close-readings of the questionnaire responses, the researcher made notes on the key ideas and themes that emerged and began to develop themes. Once several close-readings were completed, the researcher revisited the data and confirmed and/or made changes to the emergent themes.

Specifically, the questionnaire data was organized within the UTAUT2 model constructs, which include 1) performance expectancy; 2) effort expectancy; 3) social influence; 4) facilitating conditions; and 5) behavioral intention. These constructs are the independent variables and behavioral intention is the dependent variable. As such, thematic coding revealed the patterns across the data and these patterns were then assigned to a higher-level themes/constructs as listed above. The purpose of using this method to organize the data was to find the relationships between the patterns, themes and constructs.

To analyze the quantitative data, descriptive statistics were utilized. Descriptive statistics are used so that the basic details of the data are presented and simplified so that the data is more manageable (Hinton, 2014). The descriptive statistics presented were meant to summarize the exam data scores, and in the present study, these statistics included distribution, central tendency (the mean), and standard deviation. These data points are presented in the findings section in visual table and graphic format.

3.4 Other Key Research Considerations

Trustworthiness in research is most often determined through validity and reliability, but it is also important to include ethical considerations and the role that the researcher plays in the research process. Validity refers to the ability of the study instruments to measure what the study intends to measure, Generalizability is also often included in the discussion of validity; therefore, it is important to point out that since this is a descriptive case study, it is not likely that the results can be generalized to a wider population (Creswell & Poth, 2017). Reliability refers to the ability of the study to produce consistent results if the study was carried out repeatedly under the same conditions (Creswell & Poth, 2017). For qualitative methods, ensuring trustworthiness is achieved by establishing credibility, transferability, confirmability and dependability (Bowen, 2005).

The current research study used triangulation to enhance credibility by capturing different dimensions and perspectives with the use of exams and questionnaires. Transferability was established by using a population sample of students who were enrolled in a general education course, of which the findings can be applied to similar classes with students who share similar characteristics (first year, undergraduate, large university in UAE). Confirmability was established by only including participant and instructor questionnaire responses and participant exam results for the data, which helps eliminate the potential for researcher bias or the inclusion of researcher's personal motivations (Trochim, 2006). Further, a co-rater was used during thematic analysis, which helps increase objectivity in the findings (Creswell & Poth, 2017). Lastly, dependability was established by ensuring that the methods and instruments used in the data collection and analysis were easily accessible and repeatable for future researchers to model their own studies after, e.g., using the UTAUT2 model which has been verified via past research as a valid and dependable instrument in collection data on attitudes and perceptions on the use and adoption of technology (Raman & Don, 2013; Yang, 2013).

3.4.1 Triangulation

Triangulation is the process in which the researcher employs different methods of data collection and analysis, specifically using different instruments, sources and methods. Triangulation is used to establish trustworthiness by increasing validity (Denzin, 2007). The researcher employed various methods, sources and instruments to ensure trustworthiness and to achieve cross-validation of the data (Denzin, 2007). Figure 4 below provides a visual map of how the data collection tools and analysis methods resulted in triangulation and increased test validity.

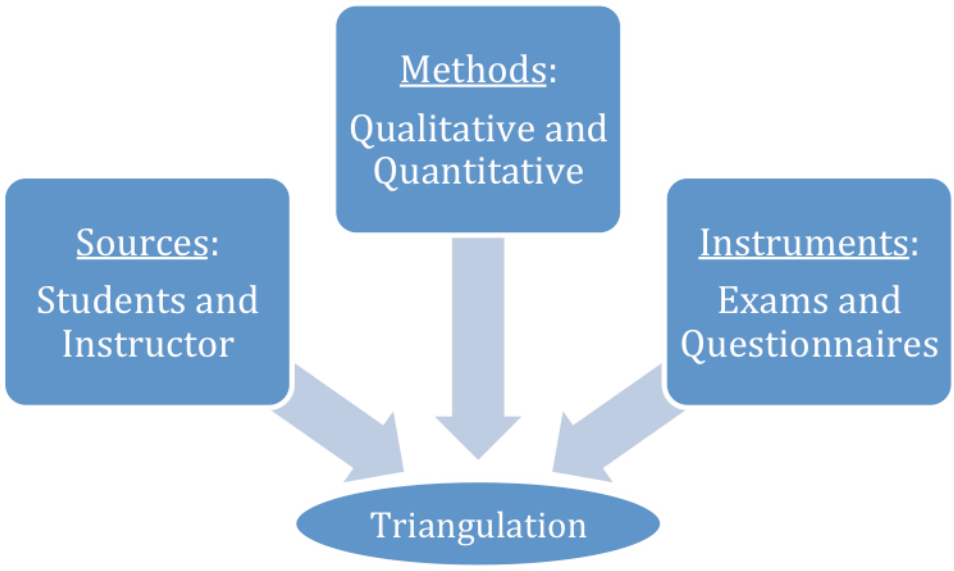

Figure 4. Triangulation of methods, instruments and sources used to increase test validity

3.4.2 Validity

There are three measures of test validity— criterion, validity, and content validity and construct validity. Criterion validity assesses the relationship between the instruments, the methodology and the results of the study; content validity is the measure of which the instruments represent its construct; and construct validity determines how well the instruments and the sample chosen is able to measure its claims (Neuman, 2014). This research was based on construct validity, as the UTAUT2 model was chosen to develop the questionnaire in the effort to ensure that the questionnaire measured the correct constructs to gather data concerning participant attitude and

opinions on the topic. The data collection instruments also included a quantitative element in which exam data was collected and then analyzed using descriptive statistics. Therefore, triangulation of data occurred because multiple data sources were collected, which effectively increases validity (Neuman, 2014).

While test validity can be confirmed because of the use of triangulation, external and internal validity are not present since the study is descriptive and non-experimental (Neuman, 2014). This is because external validity refers to the ability of the findings of the study to be applied to a wider population, and internal validity refers to the ability of the researcher to establish a cause and effect relationship without the possibility of alternative explanations (Neuman, 2014). Therefore, test validity can be established, while internal and external validity do not specifically apply.

3.4.3 Reliability

The study utilized a co-rater during the coding process. Using a co-rater reduces the possibility of errors in the reading and coding stages of data analysis, which in turn increases the study's reliability. According to Cohen, Manion and Morrison (2007), inter-raters increase external consistency because in observational research studies, using multiple coders can establish agreements about the identified patterns and themes found in the subjective data. While inter-rater reliability is most often used to establish generalizability in quantitative studies, it can also be used to increase the trustworthiness of qualitative studies because it allows for multiple perspectives to approach the data analysis.

3.4.4 Ethical Considerations

When conducting research with questionnaires and observation, there are specific ethical considerations to take into account. According to Cohen, Manion and Morrison (2007), questionnaires will "always be an intrusion into the life of the respondent" due to the time needed to answer the questions, the possible sensitivity of the questions, and the potential to invade their privacy (p. 317). It was necessary for the researcher to remember that the act of completing a questionnaire is not a passive act, and that there are real people behind the responses (Cohen,

Manion & Morrison, 2007). Therefore, the researcher took measures needed to ensure that the participants' identity, privacy and security was protected at all points of carrying out the research. Specifically, the researcher kept all survey data, exam results and background/identifying information about the participants anonymous while reporting on and analyzing the results. All survey data was collected and stored on a password-protected laptop that can only be accessed by the researcher. In addition, no data has been stored in emails, phone conversations and other non-secure methods of communication. The exam results were submitted to the researcher using the alternative IDs instead of their names so as to enhance privacy and security. Further, the data gathered for the study has been and only will be used for the purposes of this study unless provided expressed permission from the participant. The study proposal, including its details concerning data collection, was also approved before beginning the research.

To minimize ethical threats while administering open-ended questionnaires and collecting exam result data, the researcher received informed consent from each individual participant; the participants were permitted to withdraw at any stage in the research; the participants could choose to not answer any question on the questionnaire if they did not feel comfortable to do so; the participants were informed that if they chose to not answer the questionnaire or some of the questions that their grades for the course would not be penalized; and the researcher ensured that the participants were aware of the study's purpose, which was to determine how to improve their overall situation in terms of test taking and reducing test anxiety.

3.4.5 Role of the Researcher

In qualitative research studies, the researcher plays an integral role in collecting, identifying and interpreting the data. Unlike quantitative studies, qualitative research consists of various levels of 'rich' and 'thick' data, which can include open-ended responses from questionnaires, long interview sessions, collecting data from observations like recordings, notes, photographs and reflective journals (Cohen, Manion & Morrison, 2007). As such, the researcher is responsible for gathering and organizing the data, and even the very acts of gathering and organizing data requires some level of interpretation and subjectivity (Cohen, Manion & Morrison, 2007). In this sense, the qualitative researcher is also considered an instrument of data collection (Neuman, 2014). The

researcher has both education and professional experience in technology-rich classrooms and learning environments and has sufficient background and knowledge in methods and tools used in online and traditional testing.

The researcher took measures to limit interference and influence over the participants in any way and had no prior connection/relationship with the participants other than knowledge of the details of the course that they were enrolled in and coursework that they were being taught. The questionnaire was designed to reflect the purpose of the study and only included questions that pertained to the participants' background as needed, such as age, language and nationality. Additionally, the researcher integrated a modified version of the UTAUT2 model that has been tested and evaluated by various peer-reviewed articles and researchers. The researcher was solely responsible for developing the survey instrument and administered the pilot before the study in order to minimize the potential of errors and missing important data. Lastly, the researcher has a background in qualitative and quantitative research, and therefore has the experience and knowledge needed to make decisions regarding the methods of data collection and analysis that is relevant and appropriate for this research.

Chapter 4: Results, Analysis and Discussion

4.1 Overview of the chapter

This chapter presents the findings from the quantitative and qualitative data analysis. This section also includes a discussion and interpretation of the results. While this is a qualitative study, it was necessary to perform quantitative analysis on online exam scores (Test 1 and Test 2) and to discuss how the scores between the two exams compare in light of the findings from the findings from the qualitative data analysis. As such, these findings are then discussed and interpreted within the constructs detailed in the Chapter 2 discussion on the theoretical frameworks in which this study has been designed. These constructs include constructivism, behaviorism and multiple intelligences. Questionnaires were used in the qualitative data analysis section, of which there were 24 individual open-ended questionnaires which were completed by the 24 student-participants. Thematic analysis was conducted on the questionnaire data in order to find emerging patterns and relationships across the data. The findings from the thematic analysis directly relate to and answer to the research questions. The results from the quantitative data analysis are first presented and examined, with the analysis and discussion of the qualitative data results to follow.

4.2 Analysis of Quantitative Data

4.2.1 Online Tests for Performance Indicators

The performance indicators used in this study were two online summative tests, Test 1 and Test 2 that were administered during November and December of the Fall 2018 semester. All students completed both online tests (n = 24). Both tests consisted of a total of 40 questions— 25 multiple-choice questions, 10 short answer/fill in the blank questions and 5 short essay questions. The highest score possible was 100 points, with each multiple-choice question worth two-points each (50 points), short fill in the blank questions worth 3 points each (30 points), and short essay questions worth 4 points each (20 points). Test 1 was administered without a prior online practice test available to the students. Students still had regular lectures and study materials available to

them prior to Test 1, which was similar to the standard method of instruction and testing. Test 2 was administered after Test 1, and before they were required to take Test 2, students had access to an online formative test in which the instructors provided personalized feedback regarding the correct answers and other relevant information. This was to determine whether the added online practice test helped decrease students' perceived test threats, and as such, reduced test anxiety and improved their performance on Test 2 as compared to results on Test 1. Both tests were completed prior to the self-report UTAUT2 questionnaires on attitudes and opinions on online formative assessment, which were administered to the participants in order to gather self-report data on their perceptions on how the practice tests and ability to have more flexibility and autonomy on their tests improved their study habits and stress/anxiety levels. Table 1 below presents the descriptive statistics from the data analysis conducted for Test 1, while Table 2 presents the results from the analysis of Test 2. These results were SAS 9.2 for Windows 10.

	Descriptive Statistics, Test 1					
	N	**Mean**	**Standard deviation**	**Standard error**	**High score**	**Low score**
Test 1, Formative Test	24	77.04	12.89	2.63	92	48

Table 1. Descriptive statistics for Test 1

Table 1 above shows that the mean score on Test 1 was 77.04 and there was a standard deviation of 12.89. This indicates that there was relatively significant difference between the average score, lower scores and higher scores.

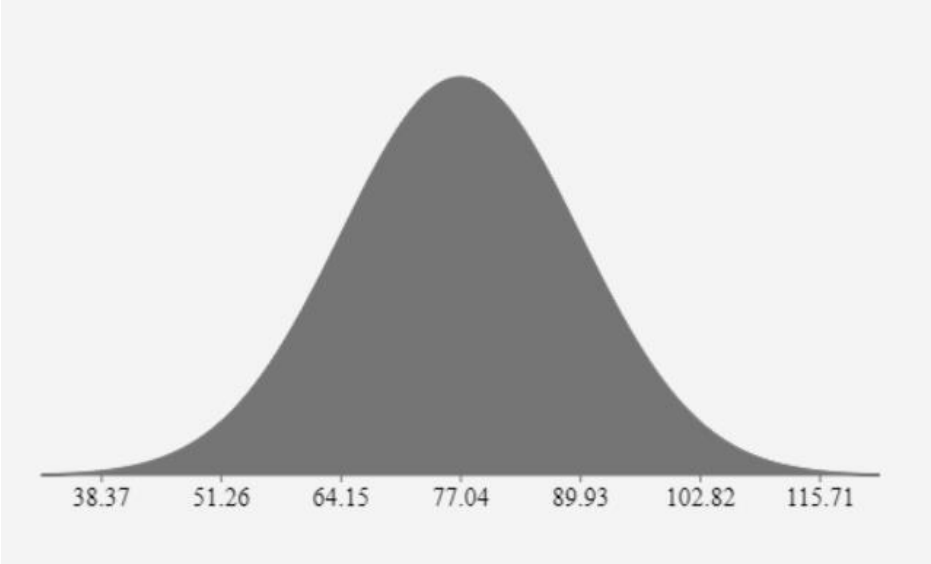

Figure 5. Distribution of scores for Test 1

In Table 2 below, the highest (92) and lowest (48) scores were removed from the data set. The mean increased from 77.04 to 77.68, which is a slight difference, and the standard deviation decreased from 12.89 to 11.42. As such, with the highest and lowest scores removed, the lowest and highest score deviations from the mean were not as widely distributed.

	Descriptive Statistics, Test 1, highest and lowest scores removed			
	N	**Mean**	**Standard deviation**	**Standard error**
Test 1, Formative Test	22	77.68	11.42	2.44

Table 2. Descriptive statistics for Test 1, highest and lowest scores removed

Table 3 presents the statistical data from Test 2. Test 2 was taken after the students were given access to an online practice test in which they would take as many times as they preferred. After

the students took the practice test, they were provided immediate feedback with correct answers. The instructor also provided the students with some individualized feedback regarding their performance on the practice test. Table 3 shows that the students scores increased, especially in improving the lowest scores. The mean score was 80.21 with a standard deviation of 9.03. The lowest score was 67 and the highest score was 94. Thus, the deviation from the mean was lower than on Test 2, while the lowest score was 67 compared to a lowest score of 48 on Test 1, indicating that a larger percentage of the students performed better on Test 2 than on Test 1.

		Descriptive Statistics, Test 2				
	N	**Mean**	**Standard deviation**	**Standard error**	**High score**	**Low score**
Test 2, Summative Test	24	80.21	9.03	1.84	94	67

Table 3. Descriptive statistics for Test 2

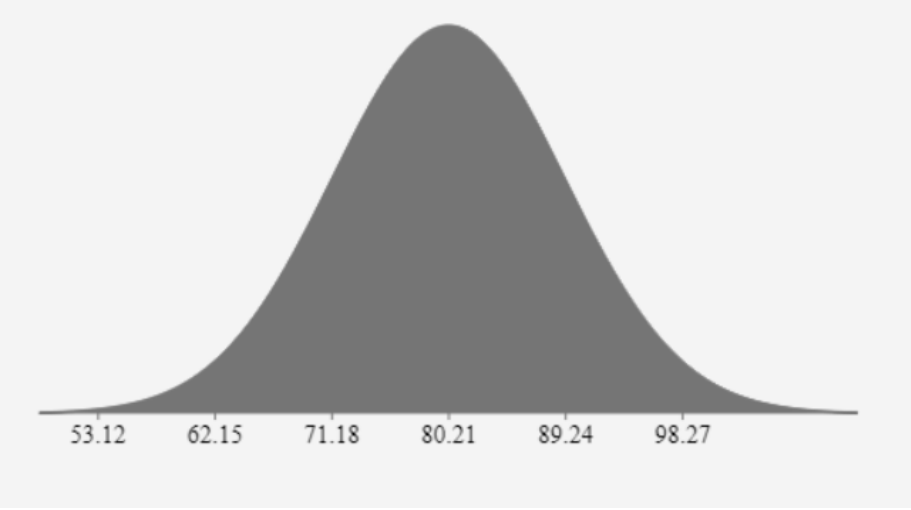

Figure 6. Distribution, scores for Test 2

Figure 6 above provides a visual representation of Test 1 and Test 2 scores compared on a scatter plot. As shown, Test 1 scores take up a wider range on the plot, while Test 2 scores are more

contained to a specific range. Therefore, the scores on Test 2 were more consistent across the student's individual performance outcomes.

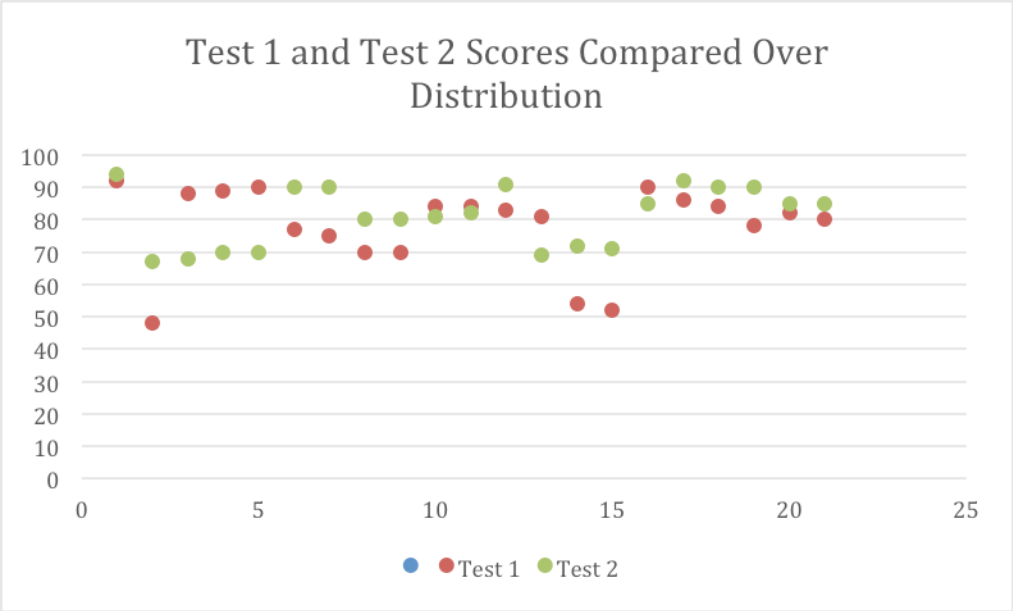

Figure 7. Test 1 and Test 2, compared

4.3 Summary of Quantitative Results

The overall results of the quantitative analysis showed that students improved their test scores from Test 1 to Test 2.

- On Test 1, students had an average mean score of 77.04 with a 12.89 standard deviation, showing that half the students fell below the already relatively low score of 77.04. The lowest score for Test 1 was 48.
- On Test 2, students had an average mean score of 80.21 with a 9.03 standard deviation, showing a slight overall average improvement, but a relatively significant improvement in terms of deviations from the mean. The lowest score for Test 2 was 67.

Based on the above results, it can be suggested from these results that the instructor providing the online practice test in addition to the other traditional study materials helped improve students scores and made them more confident going into Test 2 which reduced their test anxiety.

4.4 Analysis of Qualitative Data

4.4.1 UTUAT2 Model for Self-Report Questionnaires

The questionnaire was based off the UTUAT2 model of technology use and acceptance by Venkatesh et al. (2012). This model was chosen for qualitative data gathering because it has been proven to explain user (students and teachers) intentions to use a system (online assessment) and their behaviors toward using that system. Figure 8 below is a map of the modified UTAUT2 model that was used in the development of the questionnaire. Each construct represents an important factor in how both students and teachers are influenced to accept or reject online assessment.

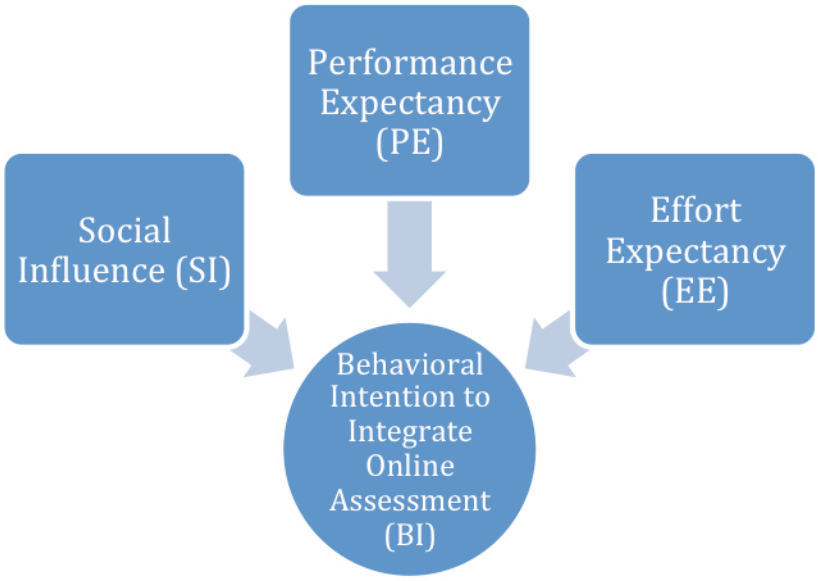

Figure 8. Modified UTAUT2 model used to develop and analyze questionnaire

According the questionnaire responses and subsequent analysis of the data across the data, performance expectancy was found to be the strongest indicator of student and instructor intention to use and adopt online assessment as a form of practice and formal testing. Social influence, however, was found to be the weakest indicator for students and instructor intention to continue using online assessment. Past research by Raman and Don (2013), had similar results, noting that students and instructors' intentions to adopt *Moodle*—an online learning management system that

allows instructors to facilitate online tests, quizzes, lessons, etc.—was driven primarily by the performance expectancy and effort expectancy constructs, while social influence was not a major indicator of use and acceptance. The questionnaires revealed that the instructor believed that providing access to an online practice test prior to Test 2, which in turn influenced the instructor's perception that online formative assessment was worth the effort needed to develop and integrate the online practice test into their classroom strategy. The instructor also noted that since there are several online learning management systems available, the effort to integrate the online assessment was minimal compared to its potential positive effects in terms of reducing students' test anxiety and improve their learning outcomes.

Students reported that they felt more confident after taking the practice test because they had direct feedback that pertained to their performance before having to take the summative test. Students were able to practice the material and the online test-taking format so that many of their concerns were addressed. Students had multiple study aid options and were pleased that they could have greater autonomy during their study time and during the test. Therefore, they felt more motivated to take the online practice test because they believed that they would see more positive results on the outcomes of Test 2. While the majority of the students felt less pressure and decreases in threats during the test, there were some that did not see any real improvements from Test 1 to Test 2. This was likely due to the perception that adding another study material to their already busy schedules was too much effort and would take up too much of their time that was already allocated for other study options. It should be noted, therefore, that when adding a new study aid (the online practice test) to the class materials, instructors should make the effort to explain and show the benefits of using such study aids.

4.4.1 Research Questions and Data Findings

RQ1: What are the effects of online assessments on students' test anxiety and performance outcomes?

Students improved their scores on Test 2 when compared to Test 1. This shows that providing online study aids in the form of practice tests can help address students' test anxiety and therefore help improve their performance outcomes. The questionnaire responses indicated the same, as nearly all participants reported that they felt more confident and more comfortable taking Test 2 after having access to the practice test.

RQ2: Is there a meaningful difference between paper-based/traditional testing and online testing groups in test perceptions and performance?

While the research did not compare paper-based test results with online test results, it did compare the difference between using only traditional study materials and adding online practice tests with the traditional study materials. As such, the findings from both the exam results and the questionnaire responses show that there was a meaningful difference in the test scores after students were given the online practice test in addition to the paper-based/traditional test study materials.

RQ3: What unique contribution(s) to student performance does using online practice tests provide when simultaneously accounting for prior performance and test perceptions?

Students performed better overall after given the online practice test. The exam scores improved by over three points on average and had there was a smaller gap between the highest and lowest scores on Test 2. Students also noted that they had more confidence going into Test 2, which made them feel that they would perform better using online assessment and that the effort required to use online practice tests was minimal compared to the potential to reduce perceived test threats.

4.5 Summary of Qualitative Results

Overall, the questionnaire responses showed that adding online testing (both practice and formal tests) impacted perceptions and expectations.

- The primary drivers of students' perceptions regarding online assessment were performance expectancy and effort expectancy
- Students' perceptions were driven by how they believed online assessments would benefit their scores on the formal exams
- Students' perceptions were influenced by having access to the online practice exam
- Students believed that there was/is minimal effort required to take online tests at home or in the classroom
- Students did not feel any real social pressure/influence in their perceptions toward online assessment
- Students indicated that they had lower test anxiety levels after taking the online practice test
- Comparing the questionnaire results with the exam (Test 1 and Test 2) results show that students were likely to have addressed some of their perceived threats that made them more anxious while taking the tests. Test 1 mean score was 77.04 with a standard deviation of 12.87, while Test 2 mean scores was 80. 21 with a standard deviation of 9.03.
- Students also overwhelmingly agreed in their questionnaire responses that they felt less anxious going into Test 2.
- Instructor believed that students would perform better on Test 2 because they were able to take the online practice test and receive instant feedback on correct answers and receive personalized feedback from the instructor
- Instructor did not feel that there was much added effort in integrating the online assessment tools into their classroom
- Lastly, the instructor indicated that they are highly likely to use and adopt online assessment in the future, while students indicated that they would like to take more classes that allowed them to regularly access more online practice exams before high-stakes summative tests

As such, the results from the questionnaire analysis suggest that online tests can have a positive effect on addressing test anxiety and improving performance.

Chapter 5: Conclusion

5.1 Summary of the Study

The purpose of this study was to determine the effects of online summative and formative assessment has on test anxiety and performance. Since university students are often faced with high-stakes testing that can cause high rates of test anxiety, the chosen population of study was first year, undergraduate students taking a general education social sciences course. All 24 of the student-participants were enrolled in the same class at a large Higher Education Institution in Abu Dhabi, United Arab Emirates. The study also utilized questionnaire responses from the class instructor. It was argued that integrating online practice assessments into the course would help address test anxiety and in turn improve performance outcomes. It was also argued that there might be some level of test anxiety experienced by the students due to the added stress of taking the exams online instead of the traditional method of paper-pencil.

The research used both quantitative (exam scores) and qualitative (open-ended questionnaires) to study the effects of online assessment. The research was designed to give greater insight into different methods of teaching that fit with various learning styles, and as such, integrating online assessment can have a positive influence on student learning because of its flexibility. The questionnaire was designed to include the UTAUT2 model constructs of performance expectancy, effort expectancy and social influence in the effort to determine how these constructs influence behavior to use and adopt online assessment. Venkatesh et al.'s (2012) UTAUT2 model was developed to study the factors that influence technology use and acceptance. The students took two tests (Test 1 and Test 2), and Test 1 was administered without a prior online practice test and Test 2 was administered after students were able to study using an online practice test. The questionnaires were administered to the students and the instructor after both of the tests and after the students received their scores on the tests so that their responses would indicate their satisfaction with their performance outcomes.

The findings show that students' scores improved from Test 1 to Test 2 and the questionnaire responses indicated that the students felt more confident taking an online test after they were able to take an online practice test. Further, students liked that they could take the online practice test as many times and whenever they wanted. Students were also motivated by the direct feedback from the instructor to follow-up with their studying as they were corrected on questions that they answered incorrectly.

5.2 Key Findings

The goals and objectives of the research were to provide meaningful insight into the effects of online assessment on test anxiety and performance. The primary goal was to develop methods to address test anxiety so that college students could feel more confident in their test-taking abilities and in turn improve their learning and academic outcomes. In light of this goal, the key findings from the study include:

- Online practice tests have a positive effect on test anxiety
- Online practice tests have a positive effect on performance outcomes
- Greater autonomy and flexibility in studying and test-taking makes students more comfortable
- Instructors are more likely to use online assessment if they believe it will improve scores and reduce stress
- Instructors will be more likely to integrate online practice tests into the study material if they believe the effort is minimal when compared to the possible outcomes
- Students are more motivated to study if they are provided immediate and personalized feedback
- Students who indicate high levels of test anxiety can experience reduced perceived test threats if they are given more flexibility with how they can take a test

5.3 Recommendations

- Based on the findings from the study, the following recommendations can be suggested in regard to using online assessment to address test anxiety and improve performance:
- Develop a blending learning curriculum that integrates traditional study materials, tools and methods with E-learning and M-learning
- Train instructors to properly use E-learning and M-learning tools so that the new methods are relevant and appropriate and not just an added stress to the instructor and confusing to the students
- Use online assessment to provide meaningful and personalized feedback so that students can understand their mistakes and learn how to improve/correct their mistakes

5.4 Implications of the current study

The use of technology in education is becoming increasingly imperative. Society has grown to rely on technology for many aspects of day-to-day living, including in our personal, school and work lives (Trilling & Fadel, 2009). New systems and practices must also be developed in order for societies to progress and flourish, and new technologies have proven to help address some of the common issues of modern society. As such, the use of technology in education has been shown to provide new and better opportunities for students of various backgrounds (Bennett & Maton, 2010). One such factor that has shown to negatively impact learning and performance outcomes are test anxiety and the effects that test anxiety can have on widening the opportunity gaps between individual students (Zeidner, 2007). Many students experience test anxiety, which can be caused by a variety of internal and external factors (Zeidner, 2007). Test anxiety is characterized by physiological and psychological negative reactions to perceived threats while studying for and taking tests (Zeidner, 2007). Test anxiety can cause many students to perform poorly on high-stakes tests, which can have a profound negative impact on their future education and careers (Zeidner, 1998; Zeidner, 2007; Rana & Mahmood, 2010). In order to improve the conditions of society, education outcomes must improve, which is why it is important to investigate and develop new testing tools and strategies that can help address test anxiety and improve performance outcomes. There must also be greater focus on improving students' confidence and motivation to

learn. The aim of better education is to improve societal conditions and having a better understanding of reducing test anxiety can lead to better education and a better society.

5.5 Limitations of the current study

One of the major limitations of the study was that it was labor intensive and time consuming due to the process of reading the data and data organization and categorization. The process of gathering the different sources of data and organizing the data into specific categories required multiple readings and the help from a second reader to ensure that the emergent data was objective and free of errors. Further, another drawback of using a descriptive case study design is that it does not identify any direct causal relationships from the data (Cohen, Manion & Morrison, 2007). As such, determining causal relationships can provide an explanation of what are the possible causes of the effects of online assessment on test anxiety and performance. However, when comparing the exam scores with the qualitative data, the researcher was able to make important inferences on the benefit of using online practice tests.

5.6 Scope for Further Study

Further study can be improved by carrying out a longitudinal research design that follows student progress over an entire semester, a full academic year, or from one academic year to the next. According to Plano-Clarke et al. (2014), "longitudinal approaches are well-suited for investigating phenomena that change over time such as developmental processes, responses to interventions and societal trends" (p. 1). Further studies can also include classroom observation and interviews so that the researcher can have more nuanced data on the topic that can be applied to the graded materials that are produced by the students. Interviews can be conducted before and after high-stakes tests so that the researcher would better understand the students' perceived test threats and their levels of test anxiety. Questionnaires on students' suggestions on using online assessment, including practice tests, can be included to help inform future practice in the effort to improve the situation.

5.7 Concluding Note

The present study was designed to improve teaching practice by focusing on the problems that stem from test anxiety. The conditions that facilitate test anxiety can cause some students to have significant issues in their performance during tests (Cassady & Gridley, 2005; Harandi, 2015; Zeidner, 2007). Chapell et al. (2005) state that "it is clear that test anxiety is associated with reduced student grade point average" (p. 268). In order to help students improve their performance during tests, and subsequently their grades, teachers need to develop interventions that are designed to reduce test anxiety. As such, this study was carried out so that the education community can have a better understanding of how online formative and summative assessment effects test anxiety and performance. The researcher discovered that students' grades improved with the addition of an online practice test before a high-stakes summative test. Further, the majority of the student-participants self-reported that they had more confidence before, during and after taking the test after using the online practice test. Therefore, their increased confidence levels helped reduce the perceived threats and anxiety levels while studying and taking the test.

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Appendices

Appendix 1: UAUT2 Questionnaire

Demographic/Background:

1. What is your age?
2. What is your nationality?
3. Do you use a smartphone, laptop or any other smart device on daily basis? Please list all that you use and how often (example: 4 hours on my smartphone, 3 hours on my laptop, etc.).
4. Do you use these devices for your coursework?

Factor: Performance Expectancy

1. Did you find the online practice test useful for Test 2?
2. Did you feel confident that you would perform well on Test 1?
3. Did you feel confident that you would perform well on Test 2?
4. Did the online tests help you feel more confident while taking the tests when compared to taking pencil/paper tests?
5. Describe how you felt before, during and after taking Test 1 (anxious, confident, hard to concentrate, calm, etc.):
6. Describe how you felt before, during and after taking Test 2:

Factor: Effort Expectancy

1. Was it easy to access and use the online tests?
2. Was the practice test easy to access and use?
3. Did you feel that the practice test added too much work for you when combined with other study materials?
4. The instructions for both tests and the practice test were clear and easy to understand?
5. It was easy for me to learn new information and study the course content with the online practice test?

Factor: Social Influence

1. Were there any specific influences for you to use the online practice test?
2. Would the people who are important to me would think that using online practice tests and using an online learning and assessment system would help me improve my test scores?
3. Did you feel pressure from outside influences (family, friends) that online learning systems are ineffective/detrimental to learning and performance outcomes?
4. Did you feel supported by classmates, instructor and the school in my use of the online assessment system?

Appendix 2: Sample of Completed UAUT2 Questionnaire

Demographic/Background:

1. What is your age? **18**
2. What is your nationality? **Emirati**
3. Do you use a smartphone, laptop or any other smart device on daily basis? Please list all that you use and how often (example: 4 hours on my smartphone, 3 hours on my laptop, etc.). **I use a smart phone and a laptop every day for personal and school. About 3 hours for my smart phone and the same for my laptop.**
4. Do you use these devices for your coursework? **Yes**

Factor: Performance Expectancy

1. Did you find the online practice test useful for Test 2? **Yes**
2. Did you feel confident that you would perform well on Test 1? **Yes**
3. Did you feel confident that you would perform well on Test 2? **Yes**
4. Did the online tests help you feel more confident while taking the tests when compared to taking pencil/paper tests? **Yes I was able to study more with the practice test**
5. Describe how you felt before, during and after taking Test 1 (anxious, confident, hard to concentrate, calm, etc.): **I was anxious but still calm enough not to make mistakes and to concentrate on the questions.**
6. Describe how you felt before, during and after taking Test 2: **I was not as anxious as during the first test. Before the test I felt calm and like I would do well.**

Factor: Effort Expectancy

1. Was it easy to access and use the online tests? **Yes**
2. Was the practice test easy to access and use? **Yes**
3. Did you feel that the practice test added too much work for you when combined with other study materials? **No it helped**
4. The instructions for both tests and the practice test were clear and easy to understand? **Yes it was easy to follow the instructions**
5. It was easy for me to learn new information and study the course content with the online practice test? **The practice test was easy to use and it helped me understand the material for the test better. It helped me remember answers and concepts**

2

Factor: Social Influence

1. Were there any specific influences for you to use the online practice test? **Yes. I used the practice test because it seemed like it would help me make a better grade.**
2. Would the people who are important to me would think that using online practice tests and using an online learning and assessment system would help me improve my test scores? I think so. **My friends and family like to use technology for fun and entertainment and for learning, so they would think it would help me study my coursework.**
3. Did you feel pressure from outside influences (family, friends) that online learning systems are ineffective/detrimental to learning and performance outcomes? **No**
4. Did you feel supported by classmates, instructor and the school is my use of the online assessment system? **Yes**

Appendix 3. Questionnaire Analysis, Assigning Data to Key Themes