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Influence of culture on teachers' attitudes towards technology

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INFLUENCE OF CULTURE ON TEACHERS' ATTITUDES TOWARDS TECHNOLOGY

By

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Dedication

I want to dedicate this to my family –

My children Aidhan, Dhain and Wife Shizna

who fill my life with immeasurable joy
and inspire me to be a better person

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In the name of Allah, the most Beneficent, most Graceful, most Merciful, I wish to acknowledge His Grace and Guidance, without which my journey this far in my academic career would have been fruitless.

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ABSTRACT

Many consider the adoption and use of technology in schools an integral part of modernization (Kozma & Vota, 2014; Pelgrum, 2001). Prior research indicated that teachers' attitudes towards technology plays a vital role in the integration. An emergent body of research mainly from the developing countries indicated that cultural perceptions towards technology impacts teachers' attitudes and thus their integration of technology.

This study explores the influence of culture on teachers' attitudes towards technology beyond the established factors. The research model is mainly based on Fishbein and Ajzen (1975) framework for attitudes and Rogers (1995) Diffusion of Innovations theory. Based on existing literature on teachers' attitudes and cultural theories, this study incorporated cultural perceptions towards technology and teacher autonomy to explore the critical aspects of teachers' culture: the national culture measured as a macro-level predictor or the teacher autonomy measured as the micro-level predictor.

The study used survey methodology to collect data from teachers at 9 schools in three countries—Jordan, Maldives and the United States. Hierarchical/blockwise linear regressions and a factorial ANOVA was used to identify if cultural perceptions or autonomy predicted teacher attitudes towards technology over and above the established factors. Despite vast differences in culture, educational systems and schools, the teachers in this study indicated that cultural perceptions towards technology and autonomy are important factors influencing their attitudes towards technology. The findings also showed that there were significant differences in attitudes toward technology between the teachers in the nine schools. Implications for teacher professional development are provided, along with recommendations for further research.

Keywords: technology attitudes, technology access, technology attributes, cultural perceptions, teacher autonomy, developing countries, Jordan, Maldives, USA

CHAPTER ONE: INTRODUCTION

Technology Use in Education

A consistent theme in modern education is that teachers must effectively integrate technology (Cuban, 2001). As new tools emerge, teachers and instructional technologists consider how to use these tools in the classroom and how these tools may add value to existing teaching practices. For example, many teachers, especially in Western countries, have been using Internet-based tools to teach students to solve real world problems (e.g., Web-based Inquiry Science Environment [WISE] Curriculum library; Linn, Clark, & Slotta, 2003). Other researchers have argued that the availability and implementation of technology tools favors a shift towards student-centered instruction, which can result in better learning outcomes (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012).

While the use of technology does not offer answers to all of the problems and challenges schools face, educational researchers believe that effective technology integration will improve students' learning as well as prepare students for the future workforce and society (Inan & Lowther, 2009; Kozma, 2003; Pelgrum, 2001). In this view, integration of technology involves the use of educational technology for teachers' instructional preparation and delivery as well as a learning tool for students (Inan & Lowther, 2009). Educators and researchers consider educational technology to be any electronic or mechanical tool, equipment, or device that teachers can use to help students accomplish specific learning goals (Davis & West, 2014).

Policymakers in developing countries consider the adoption and use of technology in schools an integral part of modernization (Kozma & Vota, 2014; Pelgrum, 2001). Other countries that have championed technology integration report positive outcomes in terms of innovative teacher practices and enhanced student learning (Kozma, 2003); accordingly, parts of

the developing world seek to replicate these results. One example is in the Maldives, where governmental leaders view technology as a necessity for economic, social, and educational advancement (Ministry of Planning and National Development, 2006). The Ministry of Education is investing in technology infrastructure for schools (Ministry of Education, n.d.). For example, throughout the Maldives in 2007, the Ministry of Education established more than 20 Teacher Resource Centers equipped with broadband Internet connections and technology tools such as SmartBoards (Li, 2007). In 2008, the Ministry provided an additional 100 remote schools with broadband Internet services (Miadhu News, 2008). Furthermore, according to the Commonwealth of Learning (2010), the Ministry of Education launched a "mini-laptops for learning" program in 2010 with a vision to provide laptops for all students in third grade by 2011. More recently, local newspapers reported several instances of schools throughout the country acquiring new equipment through donations, loans, and direct funding from the government (Haveeru Daily, 2014; Minivan News, 2014). Despite the lack of official data, these reports demonstrate the Ministry of Education's attention to technology access in schools throughout the nation.

A second example of a developing nation with a small population and only limited natural resources is Jordan. Similar to the Maldives, Jordan is making headway in introducing technology in schools. According to a recent UNESCO-sponsored report, Jordan launched a systematic education reform initiative, the Education Reform for the Knowledge Economy (ERfKE), funded by the World Bank and other donors to support technology use in schools (Kozma, 2011). Along with the $380 million ERfKE program, the Jordan Education Initiative also launched a program to support 100 schools and develop electronic content through a public-private partnership model. According to Kozma and Vota (2014), the Jordan Education Initiative

saw an investment of $6 million from the Jordanian government and $25 million in cash and in-kind services from the private sector.

This trajectory in the Maldives and Jordan is similar to that taken by developed countries in previous decades. In the United States, for example, researchers highlighted that the focus in the early stages of technology adoption was mainly on hardware acquisition and not on training (Cuban, 2001). Some education researchers called for attention to teacher training as well as acquisition (Ertmer, 1999); however, researchers found that, even with training, teachers used computers less frequently than anticipated and in limited ways that did not support student learning (Cuban, 2001; Ertmer, 1999). According to Cuban (2001), increase in access to technology at schools "has not led to frequent or extensive teacher use of technologies for tradition-altering classroom instruction" (p. 171).

Several researchers agreed with Cuban's conclusion (Albirini, 2006a; Becker, 2001; Marshall & Cox, 2008; Woodrow, 1992). A common theme across multiple studies was a connection between teacher attitudes and the adoption (or non-adoption) of technology in the classroom. In a number of studies based on Rogers' (1962) diffusion of innovations literature, researchers established a direct connection between teachers' technology integration and their attitudes, which serve as predictors of their use of technology in teaching (Albirini, 2006a; Becker, 2001; Marshall & Cox, 2008; Woodrow, 1992). During a meta-analysis of research regarding the adoption of technology among teachers from 1995 to 2006, Hew and Brush (2007) confirmed the importance of teachers' technology-related attitudes and skills. In several studies, researchers identified teacher attitude as one of the key factors in the final success or failure of an initiative to introduce computers into the classroom (Albirini, 2006a; Becker, 2001; Woodrow, 1992).

In addition to teacher attitudes, other researchers have noted contextual factors that influence rates of technology adoption. One such factor is access to functional technology and support at schools (Bauer & Kenton, 2005; Clark, 2006). Others suggested teachers' perceptions of characteristics of technology (Zhao & Frank, 2003) and knowledge of basic technology skills and pedagogy needed to design and conduct meaningful learning opportunities involving technology (Bauer & Kenton, 2005; Hughes, 2004; Koehler & Mishra, 2005). Miranda and Russell (2011) highlighted relationships between several factors, such as (a) teachers' experience with technology, (b) positive technology attitudes, (c) technology obstacles, (d) pressure in technology use, (e) the principal's technology use and discretion, and (f) the technology standards. At the classroom level, as Huang and Liaw (2005) stated, no matter how sophisticated and powerful the technology, teachers' attitudes are the primary variable determining whether teachers use instructional technology or not. Given that teachers' attitudes are the necessary, but not sufficient, factor, researchers need to explore the effects of these attitudes.

Factors Affecting Teachers' Attitudes Toward Technology

Factors affecting teachers' attitudes toward technology have received considerable attention in current research (Albirini, 2006a; Ertmer, 2005; Liu & Szabo, 2009; Loyd & Gressard, 1986; Pelgrum, Janssen, & Plomp, 1993; Selwyn, 1997). One crucial factor researchers have identified through studies conducted in developed countries is teachers' perception of the attributes of technologies. In one of the most prominent books on diffusion of innovations theory, Rogers (1962) identified five characteristics of technology that facilitated or hindered the adoption: (a) trialability, (b) relative advantage, (c) observability of results, (d) complexity/simplicity, and (e) compatibility with the existing practices. Researchers have applied and consistently upheld Rogers' work in multiple fields, including instructional

technology (Albirini, 2006a; Greenhalgh et al., 2005; Jacobsen, 2000; Rogers, 2004). Some researchers have also reported a significant association between technology access and attitudes toward technology (Christensen & Knezek, 2001; Drent & Meelissen, 2008; Gardner, Dukes, & Discenza, 1993; Na, 1993; Pelgrum, 2001). Having technology accessible at school is an important step towards technology integration (Becker, 2006); however, many researchers found that access to technology, especially at home, contributed to formation of positive attitudes in teachers (Christensen & Knezek, 2001; Sadik, 2006; Tsitouridou & Vryzas, 2003).

A third major factor researchers identified in a number of studies is teacher attributes—the unique characteristics of an individual teacher or group of teachers such as age, gender, or years of teaching experience. However, teacher attributes (or demographic characteristics) have less influence on their attitudes toward technology than the characteristics of technology. The literature shows conflicting results regarding the significance of teachers' age (Handler, 1993; Massoud, 1991; Migliorino & Maiden, 2004; Woodrow, 1992), gender (Busch, 1995; Chou, 2003; Sadik, 2006; Shapka & Ferrari, 2003; Yuen & Ma, 2002), and years of previous service (Asan, 2003; Becker, 1999; Dusick & Yildirim, 2000). In some cases, technology attitudes positively correlated with gender; in other studies, however, this same variable showed no significant relationship with teachers' attitudes. Within teacher attributes, one demographic variable that has shown a consistently significant relationship with attitudes toward technology is training, particularly as a pre-service teacher (Albirini, 2006a; Tsitouridou & Vryzas, 2003). For example, in a national study of U.S. teachers, Becker (1999) found that technology training contributed to the positive attitudes toward technology.

Researchers in Western contexts have documented three major factors related to teachers' attitudes towards technology—technology attributes, access to technology, and teacher

characteristics. In contrast, few researchers have explored teachers' technology attitudes in developing countries (Asan, 2003; Sadik, 2006; Yuen & Ma, 2002). In addition to finding that the three factors from Western or developed contexts apply in the less-developed countries' contexts, researchers in developing countries highlight an additional issue: the context or cultural beliefs. For example, Albirini's (2006a) research in Syria as well as Hammond and Shameem's (2012) findings in the Maldives Islands showed that those teachers with positive cultural perceptions toward technology also had positive attitudes toward technology. These findings are in accordance with several other researchers (Albirini, 2006a; Ebrahimi, Singh, & Tabrizi, 2010; Ertmer, 2005; Straub, Loch, Aristo, Karahanna, & Srite, 2002), who suggest that the context surrounding technology integration plays a significant role in the acceptance or rejection of technology among teachers.

In summary, past researchers suggested that several factors contribute to teachers' attitudes toward technology. Such factors include (a) the perceptions of technology attributes, (b) access to technology, (c) teacher characteristics such as technology training, and (d) emergent factors such as cultural perceptions toward technology.

Problem Statement

While researchers have directed considerable study toward understanding teachers' attitudes in specific countries, only a handful of researchers examined the cultural effects on teachers' attitudes. Despite the lack of direct research linking attitudes and culture, especially among teachers, Rose and Straub (1998) conducted a major study regarding technology acceptance among the general population of several Arab countries (Jordan, Saudi Arabia, Lebanon, Egypt, and Sudan) and found consistent results compared to major findings in the United States. However, the researchers and many other earlier researchers did not measure

cultural perceptions nor make direct comparisons between countries. Thus, as shown through an emerging body of literature, there has been a growing recognition of the importance of cultural perceptions toward technology among teachers (Albirini, 2006a, 2006b; Al-Otteawi, 2002, Hammond & Shameem, 2012).

This attention to culture is a reworking of Rogers' (1962) compatibility factor: to be adopted, the technology must match with existing beliefs or practices. In schools, teachers' actions and attitudes are the result of interactions with the interlocking cultural, social, and organizational contexts (Somekh, 2008). Moreover, as Clark and Peterson (1986) stated, environmental constraints and opportunities play a significant role in any model of teachers' thoughts and actions; thus, an understanding of the culture is an essential prerequisite to understand teachers' attitudes and actions. Consequently, several researchers believed that culture is the missing element that needs to be understood in order to facilitate the adoption of technology in education (Albirini, 2006b; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Stanley, 2003). Nevertheless, researchers have not clearly shown how these factors related to teachers' attitudes toward technology are influenced by cultural contexts. The researcher of this study intends to address this gap in the literature and shed light on the influence of cultural context on technology attitudes, thus extending technology adoption and research findings to cross-cultural settings.

Cultural Influences

In order to explore the influence of culture on teachers' attitudes toward technology, the researcher will explore the concept of culture at several levels, both macro (the nation) and micro (school and subject-area specialization). The researcher based this on the premise of the cross-cultural researcher Hofstede (1980), who studied cultural influence at the macro level by

identifying the factors that can compare different nations based on their culture. According to Hofstede(1980), culture is "the collective programming of the mind which distinguishes the members of one human group from another" (p. 260). Hofstede suggested several dimensions such as *individualism/collectivism*, *power distance*, and *uncertainty avoidance* to characterize the concept of culture, which have been used as a lens to study the differences in information technology adoption in different countries. For example, Hofstede reported that Jordan has a relatively low score of 30 on individualism dimension whereas the United States has a high value of 91. This shows that Jordan is a collectivistic society which is very different from one of the most individualistic cultures in the world—the USA (Hofstede, Hofstede, & Minkov, 2010).

At the micro level, Wagner et al. (2006) defined school culture as "the shared values, beliefs, assumptions, expectations, and behaviors related to students and learning, teachers and teaching, instructional leadership, and the quality of the relationships within and beyond the school" (p. 102). The shared values and beliefs within a school over time often become the underlying assumptions that permeate the way teachers do things at schools. According to Schein (2004), the culture of a school helps to determine "what to pay attention to, what things mean, how to react emotionally to what is going on, and what actions to take in various kinds of situations" (p. 32). For example, Peterson and Deal (1998) highlighted that culture influences how teachers dress, while Hargreaves (1997) asserted that culture influences how teachers decorate their classrooms, their emphasis on certain aspects of the curriculum, and their willingness to change. The rituals and procedures commonly practiced in schools play a part in defining a school's culture (Goodlad, 1984; Deal, 1988). However, even with schools, a number of differences exist among different groups of teachers. For example, in my personal experience in the Maldives, teachers instructing exam year classes teach and work differently from teachers

in a non-exam year. Similarly, researchers reported differences among various subject-area specializations (Howard, Chan, & Caputi, 2015; Inan & Lowther, 2010), just as with the differences one may notice among different school buildings.

The complex and dynamic nature of teaching and technology integration makes it difficult to understand cultural differences in teachers' attitudes towards technology. However, it is theorized that differences in individuals' need for autonomy may vary according to cultural differences in identity of self (Iyengar & DeVoe, 2003). In this study, the researcher will explore cultural differences based on teacher decision-making or autonomy, defined as the "capacity to choose behaviors based on inner desires and personal perceptions" (Deci, 1980, p. 5). Different social contexts encourage different levels of autonomy based on individual versus collectivist goals that lead to different ways of seeing the world (Douglas, 1992; Harris, 1995; Hofstede, 1980). For example, in individualistic cultures, the goals of the individual receive more emphasis than the goals of the collective (Iyengar & DeVoe, 2003). In most Western cultures, such as in the United States, personal freedom of choice and individual responsibility are stressed (Iyengar & DeVoe, 2003), in contrast to the focus on social duties and harmony among members of collectivist cultures.

Most of the non-Western countries, such as the Maldives, are associated with collectivism. In these countries, low autonomy can prevent teachers from controlling the basic aspects of their daily work. Dwyer (1994) highlighted the effect of teacher autonomy in technology adoption in one of the seminal studies of technology integration in the 1980s, *Apple Classrooms of Tomorrow*. In this regard, teacher autonomy is a significant factor in technology integration. According to Dwyer (1994), how teachers perceive their autonomy related to their instructional practices can affect their use of technology and, subsequently, the learning

opportunities available to students. Thus, teacher autonomy should be included in the study of teachers' attitudes toward technology in context.

Proposed Model

Based on Hammond and Shameem's (2012) study of factors influencing teachers' attitudes and the review of literature on teachers' technology adoption and culture, the researcher of this study proposed the following model to study the effects of culture on teachers' attitudes toward technology. The model's key elements are (a) technology training, (b) technology attributes, (c) access to technology, (d) teacher autonomy, and (e) cultural perceptions related to technology integration, as shown in Figure 1. The researcher added teacher autonomy to the model based on the finding from the literature regarding culture and technology adoption that highlighted the role of autonomy on attitudes. The dashed line indicates emergent factors based on the literature and the researcher's prior work.

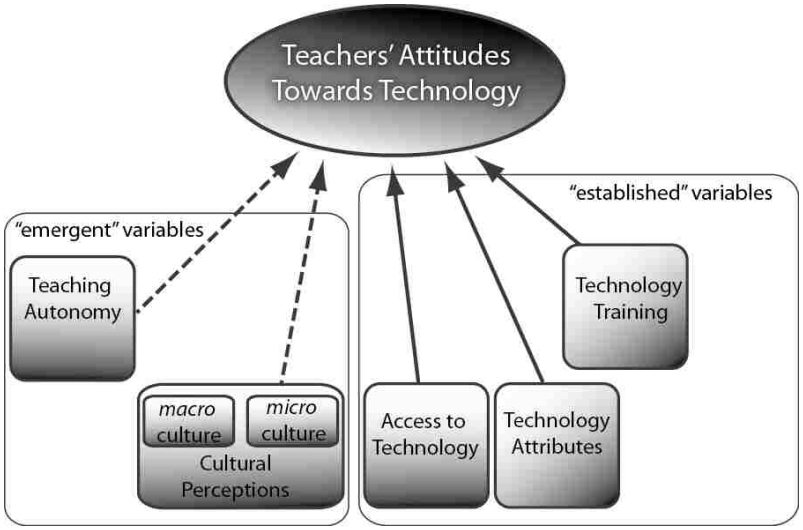

Figure 1. Proposed model for the study. Established variables are based on findings from several previous studies and emergent variables are based on fewer research studies and thus not widely included in the literature on teacher attitudes toward technology. The *macro* culture concept

covers national-level cultural perceptions of technology. The *micro*-level cultural concepts address smaller units, such as building-level school culture or curricular-instructional culture.

Purpose of the Study

Using the model in Figure 1, the researcher explored teachers' attitudes in context by delving into the socio-cultural context to understand the contextual differences in teachers' attitudes toward technology leading to adoption. This will help developing countries where teachers' attitudes toward technology and technology adoption remain unexplained. The overarching questions for the study are: (a) To what extent do cultural perceptions predict teachers' attitudes toward technology and (b) Which level best describes the critical aspects of teachers' culture: the national/macro level or the local autonomy/micro level? The researcher will use self-report survey data to answer the following research questions:

1. To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?
2. What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and school)?
3. To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

Significance of the Study

Through this dissertation, the researcher will attempt to examine the applicability of the research findings from one cultural context to others. Such a comparative study is important for a number of reasons. First, the results of this study will be beneficial for many developing countries with similar cultural factors as these countries undertake education policies that emphasize technology integration. Through this implementation, the results of this study will show whether the findings generated in Western, post-industrial societies apply to the school systems from widely differing cultural contexts around the world. The results of this comparative study will also help to better understand and "validate research findings across different populations" (Gall et al., 2003, p. 42). Furthermore, by including two Eastern countries—the Maldives and Jordan—the researcher will balance the view that all Eastern cultures are the same (Nisbett, 2003). Last, the results will help policymakers and administrators in developing countries avoid "replica trap" (Wiske & Perkins, 2005). According to Dede, Honan, and Peters (2005), "scaling up" or adapting an innovation that is successful in a particular setting to effective usage in a wide range of contexts is extremely difficult in education. As Straub, Keil, and Brenner (1997) highlighted, the solution and best practice is affected by many different factors such as characteristics of the innovation and various psychological, social, economic, and organizational factors.

Research Design

This is an explanatory study that used an online survey to collect the data from a sample of teachers in three countries. According to Gall, Gall, and Borg (2003), surveys provide a cost-effective, efficient, and concise way to collect information such as opinions and characteristics from a large, geographically dispersed population. The study also fits partially into the cross-

cultural research paradigm that focus on systematic comparisons of cultures on a construct to "answer questions about the incidence, distributions, and causes of cultural variation and complex problems across a wide domain" (Ilesanmi, 2009, p. 82).

Population and sample of study. The population for this study was all teachers at the selected nine schools in three countries: two developing countries (i.e., the Maldives and Jordan) with relatively similar national culture and emphasis on technology use in education (Al-Zaidiyeen, Mei, & Fook, 2008), plus a developed country (the United States). In each country, three secondary schools were selected based on Patton's (2002) purposeful-sampling strategy. The goal was to select schools with access to technology and leadership support towards technology integration.

Procedure. Upon approval from the heads of schools, the researcher contacted all of the teachers in each of the nine schools via email with a request to participate in the online survey on a voluntary basis. Participants received the link to the online questionnaire on Qualtrics.com. The participants were asked to provide informed consent before proceeding with the survey. No personal identification information was collected and the entire survey took less than 25 minutes to complete.

Instrumentation. The researcher used an online questionnaire with three sections to collect data for this study. The final section was used to collect data for demographical characteristics such as age, gender, ownership of a computer, teaching specialization, grade-level teaching, school type, country, technology training, and years of teaching. Section 1 included inform consent and Section 2 included different scales with items that will provide the measures of dependent variables in the study, teachers' attitudes toward technology, and the predictor variables: (a) perceptions of technology attributes, (b) access to technology, (c) cultural

perceptions toward technology, and (d) teacher autonomy. The researcher adapted the scales from validated instruments in the literature—Teachers' Attitudes Towards Technology Survey by Albirini (2006) and Teacher Autonomy Scale by Pearson and Hall (1993).

Data analysis. SPSS statistical program version 22.0 was used to analyze the data obtained from the survey. Research variables and sample demographics will be analyzed using descriptive and inferential statistics. Descriptive statistics including frequency was used help summarize and describe demographic data and distribution of scores on the different scales. In order to measure the reliability of the scales, the researcher calculated Cronbach's alpha for each of the scales. A hierarchical linear regression was used to determine whether teachers' cultural perceptions of technology are significant predictors of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as (a) access to technology, (b) technology training, (c) perceptions of technology attributes, and (d) demographic characteristics. The hierarchical linear regression is an appropriate statistical analysis to conduct when the goal of the researcher is to assess if a statistically significant relationship exists between a series of predictor variables and a continuous outcome while controlling for the effect of additional variables (Tabachnick & Fidell, 2012). The researcher entered the predictors to the regression model based on Cohen and Cohen's (1983) guideline on causal priority. As such, this analysis included teacher characteristics such as age, gender, and teaching experience in the first step to control for these confounding variables (McMillan, 2008).

To address Research Question 2, a factorial analysis of variance (ANOVA) was used to determine whether significant differences exist between teachers' attitudes toward technology and curricular-instructional context (i.e., subject-area and school). The factorial ANOVA is an appropriate statistical analysis when the goal of the researcher is to examine whether

simultaneous mean differences exist on a continuous dependent variable by two or more grouping variables. In order to address Research Question 3, a hierarchical linear regression was used to determine whether teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology within each nation while controlling for (a) cultural perceptions, (b) perceptions of technology attributes, (c) access to technology training, and (d) demographic characteristics.

Definitions of Terms

The following definitions support the purposes of this study. Chapter II provides further description regarding how the researcher derived these definitions.

Perception is the process of using one's senses to develop thoughts or beliefs about an object (Hamlyn, 1957). In this study, the researcher will address teachers' perceptions on multiple topics, including technology attributes, national culture, and professional autonomy.

Technology is any innovation including computer equipment, software, and other electronic devices in action that involves the production of knowledge and processes, which create systems to solve problems and expand human capabilities. For the purposes of this study, the researcher is primarily interested in digital technologies (e.g., computers, mobile devices, and interactive whiteboards) that would be used in a classroom setting by a teacher or student.

Educational Technology includes both instructional technologies, which focus on technologies teachers employ to provide instruction, and learning technologies, which focus on technologies learners use to accomplish specific learning objectives.

Technology Integration is the practice of using new and emerging technology effectively to accomplish the intended meaningful learning experiences for students (Davies & West, 2014).

Attitudes Toward Technology refers to a learned predisposition to respond to technology in a consistently favorable or unfavorable way. According to Fishbein and Ajzen (1975), an individual's attitude towards an object, person, or event comes from three domains: (a) cognitive (factual knowledge about a person or object), (b) affective (liking or emotional response to a person or object), and (c) behavioral (actual responses directed toward a person or object). In this study, attitude toward technology is operationally defined as teachers' in different cultures degree of favorable or unfavorable responses to technology.

Technology Attributes refers to the characteristics of technology that facilitate or hinder the adoption: trialability, relative advantage, observability of results, complexity/simplicity, and compatibility with the existing practices (Rogers, 1962). In this study, technology attributes is operationally defined as the level of relative advantage, compatibility, complexity, and observability of technology as perceived by teachers.

Access to Technology refers to everything that encompasses the availability of computers for teaching and access to digital resources on the Internet. In this study, access to technology is operationally defined as the extent of access to technology in different places including school, home, and elsewhere.

Technology Training refers to instructions on how to use educational technology. These may include pre-service courses, in-service training such as one-time training workshops, or

continuous professional development for technology use available online or through technology coaches at school. In this study, technology training will include all such technology training activities including the technology-related courses taken during pre-service teacher education programs as well as the in-service technology training offered as professional development.

Cultural Perceptions toward Technology are based on Roger's (1962) idea of compatibility, specifically the role of "social system norms." The largest body of research in this area is Hofstede's (1980) work on dimensions of national culture. Albirini (2006a) applied this concept on teachers' use of technology. In this study, cultural perceptions are operationally defined as the perceptions of the value, relevance, and influence of technology as it relates to the cultural norms of the society and schools in which teachers teach and live.

Teaching Autonomy is defined as teachers' feelings of whether they control themselves and their work environments (Pearson & Hall, 1993). In this study, teacher autonomy is operationally defined as teachers' perceptions of their curricular autonomy (control of what they teach and how they teach it) and their general teaching autonomy (control of classroom standards of conduct and personal on-the-job decision making).

Secondary school. Due to differences in school organization and grade levels across the countries of interest, secondary schools are defined as those schools with grades 8-12. In the United States, these schools are typically referred to as high schools.

Assumptions

The researcher based this study on several assumptions. The first was the assumption that the study participants answered the questions honestly. Even though the researcher addressed

privacy concerns, some teachers may have feared that their results would fall into the administration's hands; therefore, the participants may not have answered all questions truthfully. The second assumption was that the same online survey administration procedure could be used at all schools. The third assumption was that the schools and teachers selected in each country were representative of the teachers in similar schools within the country. If the teachers are similar to other teachers in similar schools, the results of the study are presumed to be relevant in other locations. Last, it was assumed that the theoretical constructs used in the study—teachers' attitudes toward technology, perceptions of technology, access to technology, and teacher autonomy—were similarly defined in all three nations.

Limitations of the Study

Since this study is based on a self-report survey instrument in a purposeful sample of schools in each of the three countries, a number of limitations need to be noted. The most applicable limitations include the survey instrument, survey administration, and participant selection. According to Van de Vijver and Leung (1997), cross-cultural studies are limited because of equivalency of constructs, methods, and measures. The variables in the study may not be defined similarly in all cultural groups and if the instrument is standardized for each culture, it may be difficult to make comparisons between groups. In order to use the same instrument across cultural groups, a number of adaptations will be made to the existing instruments. The goal is to make it valid across cultures by removing confusing language to use the survey in the English language (without having to translate it into other languages) in different contexts including in non-native English speaking countries. Furthermore, the researcher conducted a pilot study to gain insight into the wordings and to minimize bias in the possible perceptions of the survey items among teachers in the three different countries. In order to increase response

rate, the survey was kept as short as possible while still making sure that the scales were valid and reliable.

Since the online questionnaire was self-administered, some teachers who began the survey did not take the time to complete it. In addition, teachers with limited or no access to the Internet as well as those who are technophobic may have decided against starting or completing the survey. Some teachers may not have answered the questions honestly based on the belief that their administrators may be able to trace their responses. A number of teachers in each school ignored the solicitation email, or postponed answering it, thus failing to participate in the study. Another limitation is based on the distribution of the online survey. In order to overcome this limitation, school administration's support was requested to provide a verbal reminder for the teachers in addition to the email reminders. The researcher also requested the administration to assign a specific time to complete the survey—possibly during a professional development day or after a faculty meeting. Finally, the researcher provided assurance at the beginning of the survey and in the solicitation email that the responses from individual teachers would remain confidential.

Participants in the proposed study were from a purposeful sample of schools in the three countries, thus making it difficult to randomize participation. The purposeful sampling procedure reduces the generalizability of findings; they cannot be accurately implied to the entire nation or to other countries. Not all schools in these countries may share the same characteristics as the schools that were selected for this study. The three schools in each of the three countries were secondary schools with a much high level of technology access for students and teachers than many schools in the country or in the region. The schools selected in Jordan and the Maldives were not representative of the public schools as the sample of schools were English medium

schools so as to administer the survey instrument in English language. It is also important to note that the sample of secondary school teachers may differ from a random sample of K-12 schools in the same region or the country in many ways. For example, secondary school teachers may have higher autonomy if they are not following a prescribed curriculum or curricular maps as in the primary school. Furthermore, the secondary school teachers in the selected sample may be more experienced than the teachers working in schools in inner-city or rural parts of the country. They may also have more technology training than teachers at schools where technology is not readily available. Although this sampling methodology may come with selection bias and may not be fully representative of the nations or the schools in specific regions, it helped in the selection of information rich sample (Patton, 2002) with knowledge of technology integration. The researcher addressed this limitation by using a sample size based on the literature and through exhaustive data collection, surveying all teachers in the selected schools.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this study is to examine the extent of the influence of culture on teachers' attitudes toward technology beyond the established factors. The researcher also aims to identify which level best describes the critical aspects of teachers' culture: the national culture measured as a macro-level predictor or the teacher autonomy measured as the micro-level predictor. This chapter provides an overview of relevant concepts, ideas, theories, and research pertinent to understanding the context of this study. The researcher begins by exploring the meaning of technology integration and different approaches to technology integration. The chapter includes an analysis of theories and research studies that focus on teachers' attitudes toward technology and the influence of culture on their attitudes.

Technology initiatives in education have been part of the policy and vision in many countries including those in the developing world (Kozma & Vota, 2014; Pelgrum, 2001). According to the U.S. Department of Education (2010), such policy and vision is based on fundamental beliefs that learning can be enhanced through the use of technology and that students need to develop technology skills in order to be successful in a competitive global economy. In the context of developing countries, technology policy and investment in education is aimed to improve teacher quality, increase access to educational services for students, and better prepare students for the global economy (Kozma & Vota, 2014). However, no agreement exists regarding the appropriate and effective use of technology. As Davis and West (2014) explained, "not everyone shares a common understanding of what technology is and what technology integration means" (p. 842). According to Cuban (2001), the focus of technology initiatives in the early 1980s was predominantly on providing access to technology in the schools. As a result, the widespread expectation that technology would be integrated into the

curriculum was not realized. Thus, Cuban and many other researchers (Bauer & Kenton, 2005; Ertmer & Ottenbreit-Leftwich, 2010) believed that technology is not being used to its full advantage. Technology integration remains problematic and many teachers seem unwilling and unable to effectively integrate technology into the teaching and learning process (Leonard & Leonard, 2006).

The goal of this study is to examine teachers' attitudes toward technology by exploring cultural perceptions related to their attitudes. The researcher seeks to identify which level best describes the critical aspects of teachers' culture: the national culture measured as a macro-level predictor or the teacher autonomy measured as the micro-level predictor by answering the following research questions:

1. To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?
2. What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)?
3. To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

Technology Integration

To fully understand the problem of technology use in education, one must understand the

meaning of technology and technology integration. For many, technology may refer to computer equipment, software, or other electronic devices (U.S. Department of Education, 2010); however, as Davis, Sprague, and New (2008) highlighted, researchers should avoid this narrow definition of technology. A complete definition of technology should go beyond digital technologies to include any innovation including computer equipment, software, and other electronic devices in action that involve the production of knowledge and processes that create systems to solve problems and expand human capabilities.

Based on these different views on technology, and how technology should be used effectively in education, a number of different definitions of the term technology integration exist in literature (Bebell, Russell, & O'Dwyer 2004; Hew & Brush, 2007). Some scholars define technology integration in terms of the types of technology use in the classrooms, while others include how teachers used technology to carry out familiar activities more reliably and productively as well as how such use may be reshaping these activities (Bebell et al., 2004). Moreover, other researchers define technology integration in terms of teachers using technology to develop students' thinking skills (Hew & Brush, 2007). Some argue that technology integration must focus on the curriculum and learning, not just the extent or type of technology used. They should also look at how and why teachers use technology. For example, Jonassen(2000) and Robyler (2006) suggested that students should learn with computers by using tool that will allow students to create new understanding by accessing and manipulating information with computers. Thus, Jonassen (2000) highlighted the importance of curriculum and instruction models that support technology integration.

For the purposes of this study, however, the researcher is only interested in digital technologies (e.g., computers, mobile devices, and interactive whiteboards) that would be used in

a classroom setting by a teacher or student. Thus, for this study, the researcher will use Davies and West's (2014) definition of technology integration, which refers to the effective implementation of educational technology to accomplish the intended meaningful learning experiences for students.

Despite the lack of a unified definition of technology integration, progress towards providing access to technology in schools exists. Examples of such progress include: (a) Apple Classrooms of Tomorrow in the United States (Dwyer, 1994), (b) One Laptop Per Child Program (OLPC) in the developing world (Kozma & Vota, 2014), (c) One-to-One Computing Initiatives in schools (Center for Digital Education, 2008), and (d) Open Educational Resource (OER) movement (Atkins, Seely Brown, & Hammond, 2007). According to an early report by the Office of Technology Assessment (1988) describing how teachers were using technology in the classroom, technology uses varied from using computers in labs to having individual computers, from teaching from existing curricula to creating new curricula. The report detailed the movement away from teaching *about* computers to teaching *with* computers (Office of Technology Assessment, 1988). Through this publication, the researchers also highlighted limited access and poor equipment as one of the major barriers that teachers face when using technology. Although an appreciable number of teachers had access to a computer for school-related activities, most classrooms had few computers for student use. The majority of school computers were located in centralized computer labs, which made it more difficult for core subject-area teachers to use the devices on a frequent basis. However, by 1999, more than 99% of surveyed public teachers reported having access to a school computer, whereas 53% of those teachers reported using computers for instructional activities (National Center for Education Statistics, 2000).

Once high levels of access to technology at schools occurred, teachers reported barriers such as lack of training and anxiety regarding the new technology. Although the past two decades have seen an increase in professional development for both pre-service and in-service teachers, a lack of training, along with the other barriers mentioned in the report, continue to interfere with technology integration in the classroom (Office of Technology Assessment, 1988). Thus, some researchers (Adcock, 2008) advocated for technology training during content courses for pre-service teachers, as researchers believed that this type of training tended to cause an increase in the effectiveness of technology integration. However, a decade after the initial report on educational technology, the Office of Technology Assessment (1995) reported that teachers' use of technology ranged from simple administrative tasks, such as composing e-mail, using an electronic grade book, and creating classroom documents, to more complex tasks such as having the students complete projects or presenting multimedia lessons. According to the report, the main uses for computers were for drill and practice activities, word processing, and learning keyboarding skills. The data suggested that in traditional academic courses, teachers used computers much less than did teachers of technology courses where students learned about computers (Office of Technology Assessment, 1995).

In 2001, Cuban, Kirkpatrick, and Peck (2001) published a report based on a research study that attempted to explain the apparent paradox of classrooms and schools with plenty of computers having a low technology integration rate. The researchers addressed typical barriers: (a) lack of time, (b) lack of professional development, and (c) irrelevant training. In addition, researchers Cuban et al. did not find any relationship between gender, experience level, or age, and teacher technology use (Cuban, Kirkpatrick, & Peck, 2001*).* One explanation for the lack of integration was the idea that school culture is slow to change. A second explanation was because

of school scheduling. Cuban et al. posited that inflexible scheduling and traditional teaching methods made it difficult for the teachers to integrate technology into the classroom. However, according to Cuban (2001),

> abundant availability of a 'hard' infrastructure (wiring, machines, software) and a growing 'soft' infrastructure (technical support and professional development) in schools in the late 1990's has not led, as expected, to frequent or extensive teacher use of technologies for tradition-altering classroom instruction (p. 171).

Other researchers have reported similar findings and highlighted that even with sufficient access to educational technology, adequate training in technology use, and confidence in their abilities to apply it, not all teachers actually integrate technology; furthermore, those who do may not always do so effectively (Bauer & Kenton, 2005; Hew & Brush, 2007; Woolf, 2010; Zhao, 2007). Some of the common themes found by researchers to be the root causes for this conundrum included (a) incompatible beliefs of teachers toward technology integration, (b) lack of support for the teachers to integrate technology, and (c) lack of sufficient professional development for teachers (Becker, 2001; Cuban, 2001).

In a meta-study of teachers' adoption of technology from 1995 to 2006, Hew and Brush (2007) found at least five common barriers that might explain why teachers may not integrate technology into the classroom. These barriers include: (a) resources which include lack of access to available technology, time, and technical support; (b) the lack of specific technological and pedagogical knowledge and skills; (c) institutional barriers such as leadership, daily schedule, and school planning; (d) teachers' attitudes and beliefs about learning and teaching by technology; and (e) subject culture identified as the "general set of institutionalized practices and expectations which have grown up around a particular school subject, and shapes the definition

of that subject as a distinct area of study" (Goodson & Mangan, 1995, p. 614). In summary, the researchers of this analysis highlighted the importance of teachers' technology-related beliefs, attitudes, and skills when integrating technology into instruction (Hew & Brush, 2007). Thus, several researchers conducted studies to explore the attitudinal and motivational factors toward technology use in education (Marshall & Cox, 2008). Researchers often identified teacher attitude as one of the key factors in the final success or failure of an initiative to introduce computers into the classroom (Albirini, 2006a; Becker, 2001; Woodrow, 1992). According to Huang and Liaw (2005), no matter how sophisticated and powerful the technology, adoption (or non-adoption) depends on users' attitudes.

Teachers' Attitudes Toward Technology

In examining teachers' predisposition to respond favorably or unfavorably to technology, researchers need to understand where these predispositions or attitudes come from. According to psychologists Fishbein and Ajzen (1975), an individual's attitude towards an object, person, or event comes from three domains: (a) cognitive (knowledge about a person or object), (b) affective (liking or emotional response to a person or object), and (c) behavioral (actual responses directed toward a person or object). In terms of teachers' attitudes toward technology, the cognitive aspects include the perceived relevance of technology, the affective aspect refers to the liking of technology or enjoyment in technology use, and the behavioral aspect refers to individuals' anxiety or self-confidence in using technology.

Three components of attitudes. The research community studying teacher attitudes has adopted and validated Fishbein and Ajzen's (1975) three-part framework (see Figure 2) across a range of findings. Addressing teachers' cognitive aspects, Lillard (1985) found that teachers' attitudes toward technology are influenced by their knowledge of technology. For example, those

teachers with low levels of computer competence are likely to develop negative attitudes toward technology. In the affective domain, Davis (1989) identified perceived usefulness and perceived ease of use as antecedents of attitudes—the higher the perceived usefulness and ease of use, the more positive the attitudes (Clark, 2000; Gressard & Loyd, 1985; Rovai & Childress, 2003). Turning to behaviors, Loyd and Gressard (1986) showed that positive attitudes toward technology positively correlated with their experiences with technology—as teachers gain more experience in technology, their anxiety with technology decreases leading to more positive attitudes (Gardner, Dukes, & Discenza, 1993; Pelgrum, 2001).

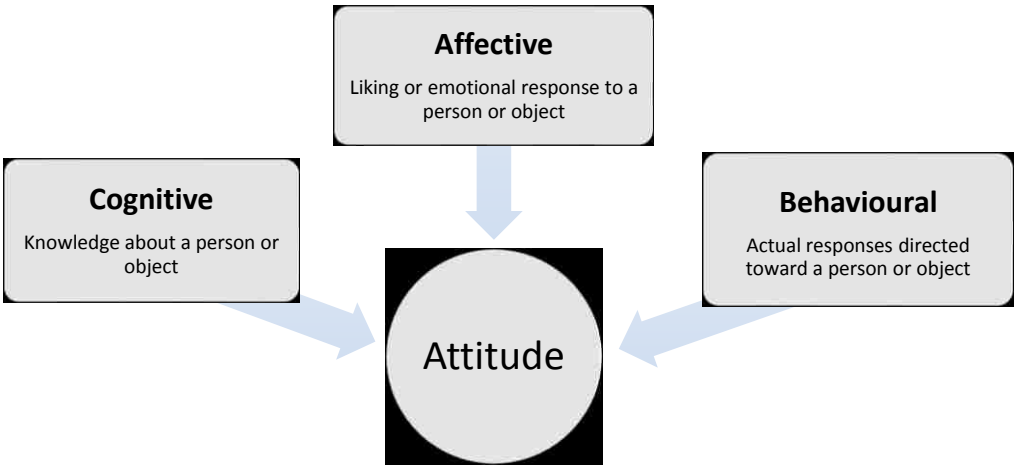

Figure 2. Schematic conception of three-part framework of attitudes.

Factors Affecting Teachers' Attitudes Toward Technology

Since the mid-1980s, a large number of studies exist regarding teachers' attitudes toward technology in the developed world (Marshall, & Cox, 2008). These researchers have shed light on the way teachers form their attitudes toward technology (Ertmer, 2005; Liu & Szabo, 2009; Loyd & Gressard, 1986; Pelgrum, Janssen, & Plomp, 1993; Selwyn, 1997). For example, Marshall and Bannon (1986) used a sample of 2,302 students from Grade 7 through University level, 537 teachers, 81 administrators, and 95 library and media specialists in the United States to

investigate their computer knowledge and attitudes. Marshall and Bannon (1986) showed that older people had more positive attitudes toward the computers, and that no difference existed between males and females in their attitudes toward computers.

In another study, Shegog (1997) also investigated the attitudes of 255 teachers from different racial or ethnic backgrounds in three secondary public schools in Chicago to determine their attitudes toward computer technology use in classrooms. Approximately half of the sample was White, while the rest were Black, Hispanic, Asian, or another minority group (Shegog, 1997). Shegog concluded that the best predicator of teachers' attitudes was computer experience followed by ethnicity as the second best predictor. African American teachers had the highest positive attitudes toward computers, while white teachers had the least positive attitude. The study also found that age and teaching experience were not good predictors of teachers' attitudes toward computer and technology use in classrooms.

In a similar study of 380 teachers in 31 schools in a school district in Western Newfoundland, Canada, King (1999) examined teachers' levels of computer and information technology competencies and their attitudes toward technology, and connected the teachers' competencies and attitudes toward computers to their gender, age, school type, and geographic location. The in-service teachers' ages ranged from 20 to more than 50, their teaching experience ranged from 2–25 years, they taught at different school types, and were almost evenly represented by gender and urban and rural location (King, 1999). The results indicated that teachers' attitudes toward technology were generally positive, with little differences between teachers' gender, age, and urban and rural teachers. In addition, this study indicated a strong positive correlation between positive attitudes toward technology and teacher competency level.

Christensen and Knezek (2001) conducted a study of teachers' attitudes, skills, and

access to computer tools in Laredo, Texas. Christensen and Knezek utilized a combination of research instruments, including (a) the Teachers' Attitude Towards Computer (TAC), (b) Teachers' Attitudes Towards Information Technology (TAT), (c) Teacher Perceptions Self Assessment (TPSA), (d) Stages of Adoption (Rogers, 1995), and (e) Concern-Based Analysis Measure (CBAM) among a sample of 517 teachers representing 21 public schools in the district. The researchers found that the teachers' competence and confidence in their computer use correlated with their home access (Christensen & Knezek, 2001). The researchers also suggested that frequent use of a computer at home would increase a teacher's level of confidence when using technology in school. In general, teachers with the highest scores on perceived significance of computers for teaching and those who believed that computers made instruction easier were found to be at a higher level of adoption (Christensen & Knezek, 2001).

In addition to the teacher characteristics and technology-related factors studied in the earlier studies, researchers have highlighted some other contextual factors influencing teachers' attitudes. For example, in a sample of elementary and secondary school teachers in central Pennsylvania, Piper and Austin (2004) examined the relationship between leadership, experience, and attitudes toward teachers' self-efficacy of using computers in the classrooms. These authors found that despite extensive professional development opportunities, if the teachers ultimately have a negative attitude regarding the use of computers in the classroom or feel the building leadership is not supportive, then it is likely that the teacher's self-efficacy in using the computer in the classroom will be negatively influenced (Piper & Austin, 2004).

A number of similar studies have emerged in the context of developing or less developed countries. For example, Sa'ari, Luan, and Roslan (2005), studied teachers' attitudes and perceived competency towards information technology with a sample of 160 secondary teachers

(64 males; 96 females) from three selected schools in Malaysia. The findings highlighted that teachers who had teaching experience ranging between 9–14 years had positive attitudes toward technology. In a similar study, Teo (2008) conducted a survey of 139 pre-service teachers in Singapore using questionnaire with four factors: (a) affect (liking), (b) perceived usefulness, (c) perceived control, and (d) behavioral intention to use the computer. Teo found that teachers were more positive about their attitudes toward computers and intention to use computers than their perceptions of the usefulness of the computer and their control of the computer.

In a study conducted in Egypt, Sadik (2006) examined factors influencing teachers' attitudes toward personal use and school use of computers. The sample consisted of 443 public school teachers in Egypt. The teachers' attitudes toward computer school use and personal use were connected to teachers' gender, age and teaching experience. The findings showed a significant relationship between attitudes toward personal use and school use of computers based on teachers' gender, age, and teaching experience. In sum, the findings indicated that teachers who have positive attitudes toward their personal use also have positive attitudes toward its usage in schools.

In the same year, Albirini (2006a) examined the attitudes of high school English as Foreign Language (EFL) teachers in Syria. Albirini investigated the relationship between computer attitudes and computer attributes, cultural perceptions, computer competence, computer access, and personal characteristics. Findings showed that teachers have positive attitudes toward ICT in education (Albirini, 2006a). Computer attributes, cultural perceptions, and computer competence were the best predictors of attitudes toward ICT.

In Jordan, Samak (2006) replicated Albirini's study using a random sample of 363 EFL teachers in the First and Second districts of the capital city of Jordan, Amman, findings showed

that Jordanian EFL teachers have positive attitudes towards ICT and have moderate positive cultural perceptions of ICT. These teachers also reported a moderate level of computer competence and a high access to ICT. Also, Jordanian EFL teachers' access to ICT was higher than Syrian EFL teachers. The positive attitudes and perceptions of Jordanian teachers in regard to ICT suggests that Jordanian EFL teachers in the First and Second Amman districts have adopted ICT as an innovation to a great degree. The study also revealed that Jordanian society is notably more receptive and accepting of ICT than Syrian society.

Wang (2007) examined the attitudes of faculty members toward technology and their perceptions of the competencies needed for effective integration of technology in Taiwan. The sample included 336 faculty members in 62 college education programs. The results showed significant differences between faculty members based on age (Wang, 2007). The results also revealed that faculty members had positive attitudes toward technology and see themselves as competent to integrate technology.

Abu Qudais, Al-Adhaileh, and Al-Omari (2010) conducted a study to examine the main factors affecting faculty members' attitudes toward using technology in their teaching, with a sample of 251 faculty members who were selected randomly among 22 universities (10 public and 12 private) in Jordan. Results indicated no significant differences in faculty members' attitudes toward ICT based on their gender, college, experience, university attended, and country of the PhD awarding institution (Abu Qudais, Al-Adhaileh, & Al-Omari, 2010). Moreover, Abu Qudais et al. revealed that the faculty members had the basic knowledge and skills of using technology and had positive attitudes toward using technology. In a more recent study based on Albirini's (2006a) model in the context of Maldives, Hammond and Shameem (2012), found that three predictor variables—technology attributes, cultural perceptions, and access to

technology—explained a significant amount of variance (39.3%) in Maldives' teachers' attitudes toward technology.

In a comparative study, Kusano et al. (2013) investigated the effects of the ICT environment regarding teachers' attitudes and technology integration in Japanese and United States elementary schools. The purpose of their research was to find what factors affected teachers' attitudes toward the use of technology and how those attitudes varied between the two countries. The study sample contained 99 elementary teachers in the United States (Kusano et al., 2013). Teachers' attitudes were connected to their age and teaching experience of 11 male teachers and 88 female teachers in the United States, and 67 elementary teachers in Japan with 32 male and 35 female teachers (Kusano et al., 2013). The results showed that the Japanese teachers' gender significantly predicted teachers' perceived ease of use and usability, perceived usefulness, and attitudes toward using technology, while the American teachers' gender did not (Kusano et al., 2013). The researchers predicted male teachers to have higher perceived ease of use and usability, perceived usefulness, and attitudes toward using technology in both countries. In addition, the results showed that the U.S. teachers' age significantly predicted perceived ease of use and usability (Kusano et al., 2013). Younger teachers were predicted to have more positive perceived ease of use and usability.

In summary, research regarding teachers' attitudes toward technology shows that several factors, such as technology attributes, teachers characteristics, training, competency in technology, and access to technology contribute to their attitudes toward technology. Researchers also highlighted that teachers' attitudes toward technology also may differ based on demographic variables such as gender, age, and number of years of teaching experience. The following section summarizes some of the major predictors on teachers' attitudes toward

technology, as identified from the studies summarized above and many others.

Technology attributes. One crucial factor explored by researchers studying teachers' attitudes toward technology is the attributes of technology itself. Rogers (1995) identified five characteristics of an innovation such as technology that facilitated or hindered the adoption: (a) trialability, (b) relative advantage, (c) observability of results, (d) complexity/simplicity, and (e) compatibility with the existing practices. Rogers defined these characteristics as follows:

Relative advantage describes the degree to which an innovation is perceived as better than that which it supersedes (Rogers, 1995). Teachers must be convinced that the technological innovation will serve their needs better than what is currently in use. The more teachers are convinced of this potential in the technology, the greater their dispositions to accept it or even adopt it.

Compatibility is the degree to which a technological innovation is consistent with the existing values, past experiences, and needs of the teachers (Rogers, 1995). Familiarity with the technology, based on what teachers are used to, enhances the acceptance and consequent adoption of the technological innovation.

Complexity is the degree to which a technological innovation is perceived as difficult to understand and use (Rogers, 1995). A natural inclination as humans is always to avoid pain or difficulties, whether psychological or physical. People tend to embrace changes that bring comfort and make work or solutions process easier. Thus, the rate of adoption is higher when teachers perceive the technology to be easy to work with or use. In other words, the more user friendly the technology is, the higher its acceptance and possible adoption.

Trialability is whether a technology can be experimented with on a limited basis (Rogers, 1995). Teachers need to receive the opportunity to test the technology before they can start using it.

Observability is the extent to which the technological innovations are visible to others (Rogers, 1995). Teachers tend to embrace technological tools when the effects of integration are meaningful and measurable.

These characteristics of technology have helped explain adoption and non-adoption decisions across a wide range of contexts, from farming to educational technology. Rogers (1995) posited that a new technology will be adopted if potential users perceive that the innovation: (a) has an advantage over previous techniques, (b) is compatible with existing practices, (c) is not complex to understand and use, (d) shows observable results, and (e) can be experimented with on a limited basis before adoption.

Demographic characteristics. Another predictor of the attitudes toward technology is not the technology but the people—the unique characteristics of an individual teacher or group of teachers. In contrast, teacher attributes (or demographic characteristics) have less influence on their attitudes toward technology. The literature shows conflicting results regarding the significance of teachers' age (Handler, 1993; Massoud, 1991; Woodrow, 1992), gender (Busch, 1995; Sadik, 2006; Shapka & Ferrari, 2003), and years of previous service (Asan, 2003; Becker, 1999; Dusick, & Yildirim, 2000). Researchers often use age as a predictor of attitudes toward technology; however, the relationship is unclear. In a study conducted in two suburban school districts in the United States, Migliorino and Maiden (2004) showed that age of educators was not significantly related to the teachers' attitudes for either of the two school districts. However, some researchers (Ocak, 2005) showed that age is a significant predictor of attitudes.

Similar to age, effect of gender on attitudes is inconsistent in the literature. For example, in a study of 136 teachers from rural and urban areas in Taiwan, Chou (2003) found that female teachers had significantly higher anxiety than male teachers did. Similarly, Massoud (1991) revealed that males had more positive attitudes toward computer use and showed that gender is a predictor of teachers' attitudes toward the use of technology. However, Shapka and Ferrari (2003) and Yuen and Ma (2002) showed that no significant differences occur in attitudes toward technology based on gender. The number of years of teaching shows similar patterns as age and gender. For example, Asan (2003) showed a significant relationship between the number of years of teaching and teacher's attitudes toward the use of computers while others researchers contested this relationship (Becker, 1999; Dusick & Yildirim, 2000).

Technology training is one demographic variable that has shown a consistently significant relationship with teachers' attitudes toward technology. This is particularly true for pre-service teacher training (Albirini, 2006a; Tsitouridou & Vryzas, 2003); however, some researchers have highlighted positive relationship between in-service technology professional development and teacher attitudes. For example, in a national study of United States teachers, Becker (1999) found that technology training contributed to the positive attitudes toward technology. In another study, Kumar and Kumar (2003) examined the effectiveness of a training course in improving teachers' attitudes toward computers and their technology skills. Results revealed that a significant improvement occurred in the teachers' attitudes toward computers and their technology skills after completing the training (Kumar & Kumar, 2003). Furthermore, findings from Yildirim (2000) showed that the more experience and training teachers have with computers, the more positive attitudes teachers will possess.

Technology access. Some researchers have also reported a significant association between technology access and attitudes toward technology (Christensen & Knezek, 2001; Drent & Meelissen, 2008; Gardner, Dukes, & Discenza, 1993; Pelgrum, 2001; Na, 1993). Having technology accessible at school is an important step towards technology integration (Becker, 2006); however, many researchers found that access to technology, especially at home, contributed to formation of positive attitudes in teachers (Christensen & Knezek, 2001; Sadik, 2006; Tsitouridou & Vryzas, 2003). Consequently, Knezek and Christensen (2008) included technology access in their will, skill, and tool (WST) model of technology adoption.

Culture. Researchers have defined culture in different ways. However, the most common theme from the myriad of definitions is that culture is a set of common characteristics shared by a group of people. The culture factor in this study refers to the common characteristics present in the environment that influence teachers' attitudes toward technology. This is based on the emerging body of literature suggesting that teachers' attitudes are significantly influenced by their cultural perceptions toward technology (Albirini, 2006a, 2006b; Al-Otteawi, 2002, Shameem, & Hammond, 2012). According to Morgan and Morgan (2003), the cultural background of a user not only influences the effectiveness of their use of computer systems, but a culturally sensitive design helps in user satisfaction of the system. Thus, Morgan (2013) emphasized that cultural considerations are an important research consideration for technology integration in multicultural settings. Similarly, Schepers and Wetzels' (2007) conducted a meta-analysis of the technology acceptance model across different countries and cross-cultural differences in attitudes toward technology use in the general population and found significant differences in acceptance of technology based on cultural characteristics of nations. This recent attention to culture is a reworking of Rogers' (1995) compatibility factor: to be adopted, the

technology must mesh with existing beliefs or practices. In schools, teachers' actions and attitudes are the result of interactions with the inter-locking cultural, social, and organizational contexts (Somekh, 2008). Furthermore, different social contexts encourage different levels of autonomy and ways of seeing the world (Douglas, 1992; Harris, 1995). Consequently, several researchers believe that culturally-grounded perceptions toward technology among teachers is the missing element that needs to be understood in order to facilitate the adoption of technology in education (Albirini, 2006b; Ottenbreit-Leftwich et al., 2010; Stanley, 2003). For example, Albirini's (2006a) study in Syria as well as Hammond and Shameem's (2012) study in the Maldives showed that those teachers with positive cultural perceptions toward technology also had positive attitudes toward technology. These findings are in accordance with other researchers (Albirini, 2006a; Ebrahimi, Singh, & Tabrizi, 2010; Ertmer, 2005; Straub, Loch, Aristo, Karahanna, & Srite, 2002) who suggested that the context surrounding technology integration plays a significant role in the acceptance or rejection of technology among teachers.

Cultural perceptions refer to factors associated with the macro-culture or national culture as well as the micro-culture or the school culture that exert an influence on teachers' attitudes as shown in figure 3. For example, Hofstede (1980) highlighted the importance of national culture on technology adoption by identifying factors that can compare different nations based on their culture. According to Hofstede, culture is the "collective programming of the mind which distinguishes the members of one human group from another" (p. 260) and includes several dimensions such as individualism/collectivism, power distance, and uncertainty avoidance. At the micro level, Wagner et al. (2006) defined *school culture* as "the shared values, beliefs, assumptions, expectations, and behaviors related to students and learning, teachers and teaching, instructional leadership, and the quality of the relationships within and beyond the school" (p.

102). The shared values and beliefs within a school over time often become the underlying assumptions that permeate the way teachers do things at schools. According to Schein (2004), the culture of a school helps to determine "what to pay attention to, what things mean, how to react emotionally to what is going on, and what actions to take in various kinds of situations" (p. 32). For example, Peterson and Deal (1998) highlighted that culture influences how teachers dress while Hargreaves (1997) asserted that it influences how teachers decorate their classrooms, their emphasis on certain aspects of the curriculum, and their willingness to change. The rituals and procedures commonly practiced in schools play a part in defining a school's culture (Deal, 1988; Goodlad, 1984). However, even with schools, a number of differences exist among different groups of teachers. For example, in my personal experience in the Maldives, teachers teaching exam year classes teach and work differently from teachers in a non-exam year. Those teaching in exam year classes tend to have less time to integrate technology since they are on a tight schedule to prepare the students for examinations. Similarly, researchers reported differences among various subject-area specializations (Howard, Chan, & Caputi, 2015; Inan & Lowther, 2010), just as with the differences one may notice among different school buildings.

School culture is described as a complex "system of shared orientations (norms, core values, and tacit assumptions) held by members, which holds the unit together and gives it a distinct identity" (Hoy, Tarter & Kottkamp, 1991 p. 5). For example, Summerhill School –an independent democratic, self-governing boarding school founded in 1921 in Britain—has a very unique school culture. According to a report by Ofsted (2011), at Summerhill, students are free to choose whether or not they attend classes. When not in lessons, they can be involved in whatever activity that captures their interest. Students and teachers meet each week during school meetings to share and discuss information and make decisions as a community of equals.

However, most schools have more formal daily routines and structures. According to Hopkins, Ainscow, and West (1994), school culture is identified by: (a) the observed patterns of behavior, (b) the norms that evolve in working groups of teachers (c) the dominant values espoused by the school (d) the philosophy that guides the approach to teaching (e) the unwritten policies and procedures that new teachers have to learn. Peterson and Deal (2002) argued that the culture of school influences how people think and feel while Boyd (1992) suggested that it can have a powerful influence on teachers' attitudes.

It is possible to explore the differences in school culture is through the micro-level lens of teacher decision-making or autonomy, which is defined as the "capacity to choose behaviors based on inner desires and personal perceptions" (Deci, 1980, p. 5). Different social contexts encourage different levels of autonomy based on individual versus collectivist goals that lead to different ways of seeing the world (Douglas, 1992; Harris, 1995; Hofstede, 1980). For example, in individualistic cultures, the goals of the individual receive more emphasis than the goals of the collective (Iyengar & DeVoe, 2003). In most Western cultures such as in the United States, personal freedom of choice and individual responsibility (Iyengar & DeVoe, 2003) are stressed in contrast to the focus on social duties and harmony among members of collectivist cultures. However, most non-Western countries, such as the Maldives, are associated with collectivism. In these countries, low autonomy can prevent teachers from controlling the basic aspects of their daily work. Dwyer (1994) highlighted the effect of teacher autonomy in technology adoption in one of the seminal studies of technology integration in the 1980s, *Apple Classrooms of Tomorrow*. In this regard, teacher autonomy is a significant factor in technology integration because how teachers perceive their autonomy related to their instructional practices can affect their use of technology and, subsequently, the learning opportunities available to students

(Dwyer, 1994). Thus, teacher autonomy should be included in the study of teachers' attitudes toward technology in context.

Another important aspect of school-culture is the curricular instructional context. The role of curricular-instructional context such as pedagogy is clear from early proponents of technology such as Kozma (1994) as well as in recent literature on technology integration (Koehler & Mishra, 2005). According to authors Hew and Brush (2007), as well as Inan and Lowther (2010), researchers need to investigate subject area as an influencing factor in teachers' adoption of technology in teaching. Goodson and Mangan (1995) stated, "each subject in the secondary school is a separate microcosm, a micro-world with varying values and traditions" (p. 615). Tamim, Bernard, Borokhovski, Abrami, and Schmid (2011) confirmed these findings through a second order meta-analysis of educational technology research during the last 40 years. Based on a systematic analysis of 25 meta-analyses, totaling 1,055 individual studies and including a wide range of technologies and involving all school grade levels and postsecondary, as well as most subject areas, these authors concluded that elements of teaching specific to subject area practices were significant factors likely to influence technology integration (Tamim, et al., 2011). Moreover, in a recent study of teachers' integration of laptops in New South Wales Australia, Howard, Chan, and Caputi (2015) confirmed that a significant difference exists in technology integration between teachers in English language, mathematics, and science department. The researchers study also showed that subject areas contribute to teachers' beliefs about technology integration (Howard, Chan, & Caputi, 2015). Thus, a need exists to understand differences in teachers' attitudes toward technology based on the culture of the subject area.

In addition to subject area, another key component of a school culture is the assessment regimen. Although there may be many other constraints related to contextual conditions in the

teaching environment, teaching an exam year class may require different instructional practices than a non-exam year or foundation year class. Exam year classes in secondary school include more content to cover and thus less flexibility in teaching methodology, require more intensive coaching for exams that are traditional (i.e., paper and pencil) and/or have stringent assessment formats, thus presenting less time for technology integration. Teachers in an exam year are also bounded by more constrained, external curriculum requirements than those in the non-exam year. Such constraints occur because of instructional requirement classes that prepare students for terminal examinations, which are in line with the established barriers to technology integration in the existing literature (Ertmer, 2005; Hew & Brush, 2007).

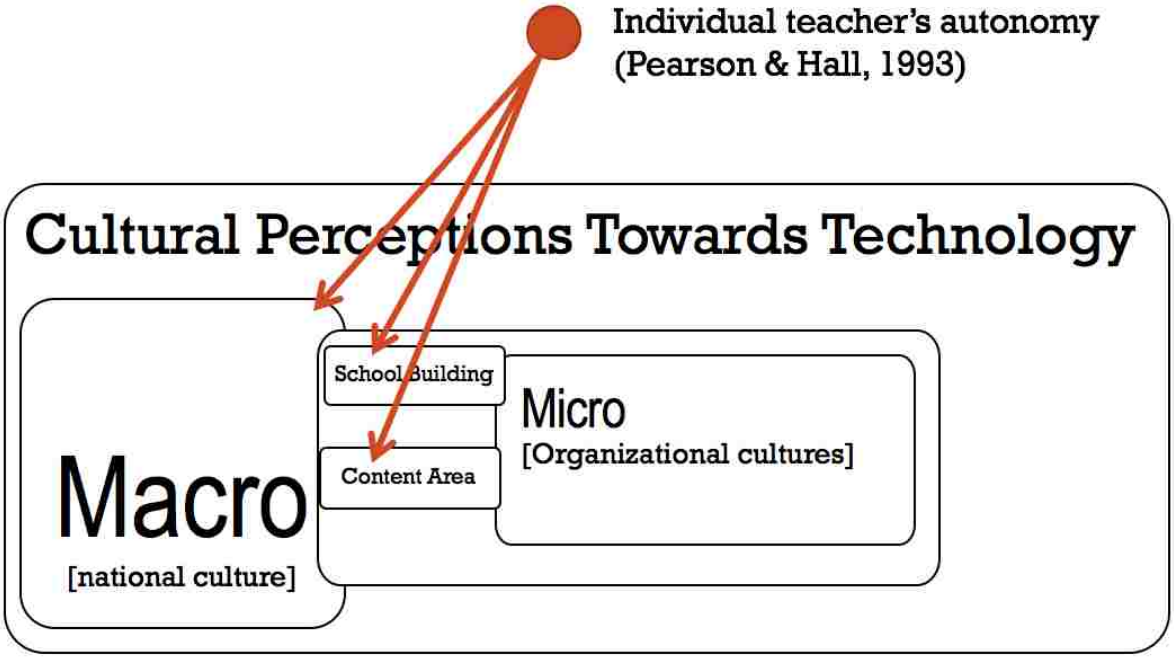

Figure 3. Model of cultural perceptions towards technology

Proposed Model

Based upon Hammond and Shameem's (2012) study of factors influencing teachers' attitudes and the review of literature on teachers' technology adoption and culture, the researcher

proposes the following theoretical model to describe teachers' attitudes toward technology, including attention to culture. The model's key elements are (a) technology training, (b) technology attributes, (c) access to technology, (d) teacher autonomy, and (e) cultural perceptions related to technology integration (see Figure 4).

The researcher added teacher autonomy to the model based on the literature regarding culture and technology adoption, which highlights the role of autonomy on attitudes. The dashed lines indicate emergent factors based on the literature. The model will be tested separately in three different countries using self-report survey data from teachers at schools. Unlike many other previous studies, the model directly addresses cultural perceptions of the teachers rather than merely comparing teachers' attitudes in different countries.

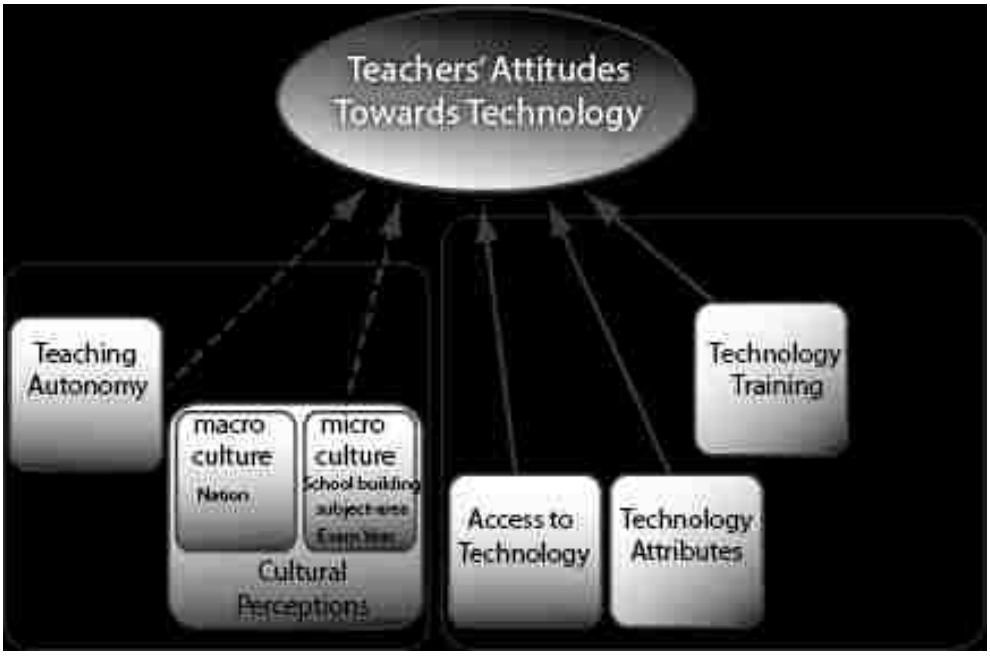

Figure 4. More detailed visual of the proposed research model for the study. The *macro* culture concept covers national-level cultural perceptions of technology. The *micro*-level cultural concepts address building-level school culture, within-subject curricular culture, and exam year vs. non-exam year teaching.

CHAPTER THREE: METHODOLOGY

The researcher of the proposed study seeks to explore the association between teachers' attitudes toward technology and cultural perceptions. This purpose is supported by research regarding teachers' attitudes toward technology that moved the focus from teacher-related factors to the understanding of contextual and cultural factors affecting teachers' attitudes. The premise of this study is based on the belief that teachers are important decision makers and that their attitudes, and eventually their decisions, to integrate technology are influenced by the social and cultural context of schools and nations. This chapter presents the research design, procedures, and techniques that were used in this study to accomplish its objectives. First, the chapter outlines the definition of the research methodology in this study. Second, the population and sample of the study are described. Third, the researcher explains the instrument to be used to collect the data, followed by a description of the proposed data analysis techniques for the study.

Research Design

The purpose of this study was to test a conceptual model based on theory that highlights the importance of the cultural perceptions of teachers' attitudes toward technology. The researcher conducted this study by examining the influence of several predictor variables in sequential steps to help identify the relative importance of culture-related predictors based on how much it adds to the prediction of teachers' attitudes toward technology, more than that which can be accounted for by other established predictors as shown in Figure 3. The cultural perceptions of technology scale was used to measure the macro culture or the national culture while teacher autonomy scale was used to measure individual or micro level cultural perceptions that are based on general and curricular autonomy at school. Additionally, the researcher explored the micro culture by analyzing if a significant difference exists in teachers' attitudes

toward technology between different curricular-instructional contexts (i.e., subject-area, and schools). The three research questions are:

1. To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?
2. What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)?
3. To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

This research design is an explanatory study of teachers' attitudes toward technology and the relationship with cultural perceptions. Few researchers have conducted studies on teachers' attitudes toward technology using a cultural lens. The study is based on quantitative approach (Creswell & Clark, 2011), whereby the data was collected from teachers in a selected sample of schools in three different countries using an online questionnaire. According to Gall, Gall, and Borg (2003), surveys provide a cost-effective, efficient, and concise way to collect information such as opinions and characteristics from a large, geographically dispersed population. Fink (2006) posited that surveys "are information collection methods used to describe, compare, or explain individual and societal knowledge, feelings, values, preferences, and behavior" (p. 1) and the use of the survey in a one-time fashion indicates a cross-sectional design.

The proposed study fits partially into the cross-cultural research paradigm that focuses on exploring cultures to "answer questions about the incidence, distributions, and causes of cultural variation and complex problems across a wide domain" (Ilesanmi, 2009 p. 82). According to Kohn (1987), cross-cultural studies can be used to establish that similar associations between variables exist across a range of different societies, thus confirming or explaining a theoretical model. Although many cross-cultural researchers focus on comparing countries (e.g., The Trends in International Mathematics and Science Study), such studies may not include direct measures of contextual factors. However, through this study the researcher will measure contextual factors related to teachers' attitudes toward technology as variables (i.e., cultural perceptions toward technology and teacher autonomy) to understand the influence of culture on the macro and micro level.

Target Population and Sampling Method

A cross-cultural study requires a sample of participants from different cultural contexts—subject-area, school, and nation—used as levels of analysis in the study. Based on Van de Vijver and Leung's (1997) recommendations of systematic sampling procedures for cross-cultural research where the theoretical framework is not fully developed and study is exploratory is nature, the researcher selected three countries for this study. The three-country sample was selected to ensure a mix of similar as well as dissimilar cultures to detect cultural differences in the attitudes toward technology, if such attitudes exist.

The researcher chose the two developing countries, the Maldives and Jordan, because of their similar emphasis on advancing technology integration (Al-Zaidiveen, Mei, & Fook, 2008; Hammond & Shameem, 2012), their shared Islamic roots and identity, and their internally homogeneous national culture and ethnicity (U.S. Department of State, 2014). Against the

backdrop of these commonalities, the Maldivian and Jordanian contexts present useful differences that may influence teacher attitudes. For example, the education system in the Maldives is a replica of the British educational system whereby the curriculum and textbooks, especially in the secondary grades throughout the nation, are based on the General Certificate Examination from British Universities (i.e., University of London and University of Cambridge). In the Maldives, few international schools offer non-British curricula. Conversely, Jordan has its own system, al Tawjehy, which includes terminal examinations at the end of 10th grade similar to the British system. The medium of instruction at public schools in Jordan is Arabic, and most of the textbooks are in Arabic; in the Maldives, instruction is in English, and the schools use British textbooks. In terms of their ties with traditional culture, both countries are similar because Islam is the official religion and both countries depend on tourism (U.S. Department of State, 2014). In addition to these two countries, the researcher will use the United States as a multiethnic comparison group because some of the research instruments are validated in this context and a plethora of useful literature exists based on studies in the United States. Table 1 shows the comparison between the three countries on the different factors related to attitudes toward technology.

In each of the three countries, the researcher selected three secondary schools based on a purposeful-sampling strategy (Patton, 2002). The aim was to select three schools in each country where English is the medium of instruction, and technology is prevailing along with leadership support for technology integration. In Jordan, where the medium of instruction at public schools is not English, the three schools selected were private, international schools where English is the medium of instruction, where as in the Maldives and the United States, the schools were a mix of public and private schools. This sampling strategy was necessary to be able to use a single

version of the questionnaire in English to provide consistency in the survey administration and measurement.

Table 1

Comparison Between Three Countries Based on Teacher Attitudes Toward Technology and Other Factors

	Attitudes Toward Technology	Access to Technology	Cultural Perceptions of Technology	Teacher Autonomy
United States	Positive	High/Medium	Positive	High
Jordan	Positive*	Medium	Mixed	Low
Maldives	Positive**	Medium	Mixed	Mixed

*Al-Zaidiyeen, Mei, & Fook, 2008 ** Hammond, & Shameem, 2012

The targeted population for this surveyed was all teachers in the selected three secondary schools in each country. Secondary school teachers refer to the teachers who instruct students in any grade eight through twelve. Although this sampling methodology may come with selection bias and may not be fully representative of the nations or the schools in specific regions, it helped in the selection of information rich sample (Patton, 2002) with knowledge of technology integration. It is also important to note that the sample of secondary school teachers may differ from a random sample of K-12 schools in the same region or the country in many ways. For example, secondary school teachers may have higher autonomy if they are not following a prescribed curriculum or curricular maps as in the primary school. Furthermore, the secondary school teachers in the selected sample may be more experienced than the teachers working in schools in inner-city or rural parts of the country. They may also have more technology training than teachers at schools where technology is not readily available. However, even if the

purposeful sample is not representative of the population as a probability random sample, by using the purposeful sample of secondary schools in three countries, I am able to identify if the cultural perceptions towards technology influences teachers' attitudes towards technology in these countries and schools.

Power analysis and sample size.

When sampling a population, researchers need to involve a large enough pool of participants and ensure that complete data are collected from enough participants to accomplish adequate power for the proposed analyses. In the current study, the researcher utilized both a factorial ANOVA and hierarchical linear regression. The factorial ANOVA analysis requires a larger number of participants and was thus used to determine the overall sample size requirement. The researcher expected to discover a generally accepted medium effect size (Cohen, 1988). With a general accepted power of .70, the researcher analyzed 12 groups, and there were 16 numerator degrees of freedom. An alpha level of .05 ensured that the researcher could be 95% certain that significant findings were not because of random chance alone. Informed by the above delineated parameters, G*Power 3.1.7 (Faul, Erdfelder, Buchner, & Lang, 2013) was used to calculate an appropriate sample to assure statistical significance if found in the model. Based on these calculations, a sample of at least 270 participants was deemed sufficient for the study.

Instrumentation

To answer the research questions, the researcher collected data using a self-reporting online questionnaire based on validated instruments in the literature—Teachers Attitudes Towards Technology Survey by Albirini (2006) and Teacher Autonomy Scale by Pearson and Hall (1993). The researcher sought permission to use the original instruments; however, contact

could not be established with the author of Teachers Attitudes Towards Technology Survey, and the author of Teaching Autonomy Scale granted permission via email (Appendix A).

Instrument Selection & Refinement. For the past 25 years, many researchers (e.g: Gressard & Loyd, 1985; Pelgrum, Janssen Reinen, & Plomp, 1993; Christensen and Knezek, 1996; Albirini, 2006) were interested in developing reliable and comprehensive instruments to measure teachers' attitudes towards the use of computers and these scales differ in many ways. One of the well-known instruments in this field is "Computer Attitude Scale (CAS)" and this scale was developed by Loyd & Gressard in 1986. According to Shapka and Ferrari (2003), CAS is used by many researchers and provide an appropriate metric for assessing attitudes toward computer. Another widely used instrument in this field is Teachers' Attitudes toward Computers Questionnaire (TAC) developed by Christensen and Knezek in 1996. The major aim of this scale is to measure teachers' attitudes. Despite the availability of survey instruments, only a few of them focus specifically on measuring teachers' attitudes toward the use of technology and their cultural perceptions (Albirini, 2006). One such instrument is Albirini's(2006) survey of teachers attitudes towards technology which is based on literature such as Ajzen and Fishbein's three domains of attitudes as well as Roger's (1995) diffusion of innovation model. This instrument is also among the few that explicitly measured teachers' cultural perceptions towards technology, thus is appropriate for use in the proposed study.

Based on the recommendations from Van de Vijver and Leung (1997), adaptations were made to the original scales to ensure that they mean the same in all these different contexts. The aim of the adaptations and scale reduction was to increase the response rate by reducing the time it takes to respond to the survey while keeping the validity and reliability. Changes to the original scales were done with caution to retain the intent and dimensionality of the original

instrument. For example, in Albirini's (2006) survey of teachers' attitudes toward technology, references to Syrian context and English as a foreign language teaching (which was the context of Albirini's participant population) were changed to reflect any country or any subject-area specialization. Furthermore, the author used data collected from a pilot study in the Maldives to identify items to be removed. In teachers' attitudes towards technology scale, items 1, 2, 8, 15, and16 were dropped because the exploratory factor analysis showed that these items were cross-loading and did not load on any of the subscales. In teachers' perceptions of technology attributes scale, items 1, 5, 7, 10, and 18 were removed because these items were either confusing or referring to English language teaching and they showed cross-loading and non-significant correlations. Similar methods were used for cultural perceptions scale. For teacher autonomy instrument, the researcher piloted with a sample of 30 teachers from Jordan and the Maldives to reduce the length and to verify that the questions on the instrument were neutral in different contexts.

The final survey consists of 49 items in three sections as shown in Appendix A. The first section is the informed consent form, followed by the section with scales, and the last section includes questions regarding demographic characteristics. The section with scales includes items specific to the six scales used to gauge the dependent variables: (a) teacher autonomy, (b) teachers' attitudes toward technology, (c) access to technology, (d) technology training, (e) cultural perceptions related to technology, and (f) perceptions of technology attributes as detailed below. The researcher field-tested the final survey instrument with a sample of three teachers from the selected countries to make sure that items translated relatively equally in each of the three selected countries. These participants were asked to review the items for appropriateness of phrasing. Face-to-face cognitive interviews (Desimone & Le Floch, 2004) with the three teachers

helped to ensure the reliability and validity of the survey by understanding the potential respondents' thought processes when responding to particular items. The researcher used the data from these interviews to verify that the questions on the survey reveal the information desired. Furthermore, the field-testing helped to improve the formatting, phrasing, and the instructions to the participants. According to Dillman (2008), feedback from such field-testing can also be used to order the survey questions starting with the most interesting items first.

Informed consent. The informed consent is the first section of the survey (see full survey with the inform consent in Appendix B). The format of this section closely mirrored the recommendation formulated by Fink (2006). This section included the following information: (a) purpose of the survey, (b) voluntary nature of survey instrument, (c) procedures to be followed, (d) statement of confidentiality, and (e) identification of researcher. Informed consent was translated to the native language of the Maldives (Dhivehi) and Jordan (Arabic) to ensure that the teachers in the Maldives and Jordan who are second language English speakers understood the possible risks and benefits of the study before participating (see Appendix C for translations of inform consent). Participants clicked "next" to indicate their consent.

Section A: Teachers' attitudes toward technology scale. Teachers' attitudes toward technology was measured using a 5-point Likert-type scale (see Table 2). The 15 items for this scale were based on psychologists Fishbein and Ajzen's (1975) three domains of attitudes: (a) cognitive (knowledge about a person or object), (b) affective (liking or emotional response to a person or object), and (c) behavioral (actual responses directed toward a person or object). These were adapted from Albirini's (2006a) study of teachers' attitudes in Syria. For the negatively worded items (e.g., I do not like talking with others about technology), the responses were reverse coded prior to analysis. Albirini (2006a) used 20 items to measure teachers' attitudes and

reported Cronbach's alpha coefficient of .90 with high coefficients for the sub-scales subscales: affective = .71, cognitive = .81, and behavioral = .79, indicating a high degree of internal consistency. Hammond and Shameem (2012) replicated the study in the Maldives and reported a similar high alpha of .86 for the overall scale and .67, .77, .78 respectively for the affective, cognitive, and behavioral sub-scales. The composite score for the teachers' attitudes towards technology scale was generated by adding the scores of the 15 items which ranged from 15 – 75.

Table 2

Items for Teachers' Attitudes Toward Technology Scale

Sub-Scale	Item
Affective	I do not like talking with others about technology.*
Affective	I enjoy using computers.
Affective	I enjoy working with technology.
Affective	I dislike using computers in teaching. *
Cognitive	Computers save time and effort.
Cognitive	Students must use technology in all subjects.
Cognitive	Learning about technology is a waste of time.*
Cognitive	Technology would motivate students to do more study.
Cognitive	Computers are a fast and efficient means of getting information.
Cognitive	I do not think I would ever need technology in my classroom.*
Cognitive	Technology can enhance students' learning.
Behavioral	If I had the money, I would buy a computer.
Behavioral	I would avoid technology as much as possible.*
Behavioral	I would like to learn more about technology.
Behavioral	I have no intention to use computers in the near future.*

* Negatively worded items: These were reverse-coded before analysis.

Section B: Cultural perceptions toward technology scale. The cultural perception toward technology scale consists of 6 items, as shown in Table 3 and was used to measure the macro culture or the national culture. The researcher adopted and modified these items from

Albirini's (2006) study in Syria and Hammond and Shameem's (2012) study in the Maldives. The scale used a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Albirini (2006) used 16 items and reported an alpha of .76, whereas Hammond and Shameem (2012) reported a low reliability of α =.57. The six items in this scale were selected using a scale reduction technique that focused on keeping items with strong correlation with one another and removing items that increased alpha value once they were dropped. The selected items were also refined by revising some wording and rephrasing negatively phrased items. The composite score for the cultural perceptions scale was generated by adding the scores of the six items which ranged from 6 – 30.

Table 3

Items for Cultural Perceptions Toward Technology Scale

Students need to know how to use technology for their future jobs.
Knowing about technology earns one the respect of others.
Technology will improve our standard of living.
The increasing use of technology will make our lives easier.
Working with technology does not diminish people' relationships with others.
Technology use should be a priority in education.

Section C: Perceptions of technology attributes scale. The perception of technology attributes scale is based on the technology adoption theory proposed by Rogers (1995). The scale includes the characteristics of technology, such as trialability, relative advantage, observability of results, complexity/simplicity, and compatibility with the existing practices as subscales. The researcher selected the 13 items in this scale from Albirini's (2006)

study in Syria and Hammond and Shameem's (2012) study in the Maldives. These researchers used 16 items in four subscales—relative advantage, compatibility, complexity, and observability—and reported high reliability with an overall alpha of .86 and .81, respectively. From the original 16 items, the researcher removed three items with the lowest correlation with other items and confusing wording. The final scale consisted of 13 items, as listed in Table 4. The scale uses a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The composite score for the perceptions of technology attributes scale was generated by adding the scores of the 16 items, and the possible composite scores ranged from 16 – 80.

Table 4

Items for Perceptions of Technology Attributes Scale

Sub-Scale	Item
Relative Advantage	Teaching with computers offers real advantages over traditional methods of instruction
Relative Advantage	Computer technology can improve the quality of students' learning.
Relative Advantage	Using computer technology in the classroom would make the subject matter more interesting.
Relative Advantage	Computers have a place in schools.
Compatibility	Computer use fits well into my lessons.
Compatibility	Computer use suits my students' learning preferences and their level of computer knowledge.
Compatibility	It would be easy for me to learn to use the computer in teaching.
Complexity/Simplicity	I have no difficulty in understanding the basic functions of computers.
Complexity/Simplicity	Use of technology simplified my task in the classroom.
Complexity/Simplicity	Everyone can easily learn to use a computer.
Observability	I have seen computers at work.

Observability	Computers have proved to be effective learning tools worldwide.
Observability	I have seen computers being used as an educational tool.

Section D: Teacher autonomy scale. This scale was adapted from Pearson and Hall's (1993) teacher autonomy instrument. The scale consists of 18 items, as shown in Table 5, and uses a 4-point Likert-type scale, ranging from 1 (definitely false) to 4 (definitely true) to eliminate a neutral response. According to Pearson and Moomaw (2006), a teaching autonomy instrument is based on theoretical aspects in the literature and provides a reliable and valid measure of teacher autonomy. The creators of this scale reported good internal consistency with a reliability of .80 with two subscales. For the negatively worded items (e.g., My job does not allow for much flexibility on my part.), the responses were reverse coded prior to analysis. The items in this scale were based on micro culture of school building, curriculum, and individual teacher autonomy. The composite score for the teacher autonomy scale was generated by adding the scores of the 18 items and the possible composite scores ranged from 18 – 72.

Table 5

Items for Teacher Autonomy Scale

Item
I am free to be creative in my teaching approach.
The selection of student-learning activities in my class is under my control.
Standards of behavior in my classroom are set primarily by myself.
My job does not allow for much flexibility on my part.[a]
In my teaching, I use my own guidelines and procedures.
I have little control over the content and skills that are selected for teaching.[a]

The scheduling of use of time in my classroom is under my control.
My teaching focuses on those goals and objectives I select myself.
I rarely use alternative procedures in my teaching.
I follow my own guidelines on instruction.
I am not allowed to resolve major problems independently.
What I teach in my class is determined for the most part by myself.
I have little control over how classroom space is used.[a]
The materials I use in my class are chosen for the most part by myself.
The evaluation and assessment activities are selected by others.
I select the teaching methods and strategies I use with my students.
I have little say over the scheduling of use of time in my classroom.[a]
The content and skills taught in my class are those I select.

Note. [a] Negatively worded items: These were reverse-coded before analysis.

Section E: Access to technology scale. The access to technology scale consists of three items that measure the frequency of access to technology at different places for teachers (Table 6). The researcher based these items on Hammond and Shameem's (2012) study in the context of the Maldives. The overall access was derived from the pattern of answers in the individual items, guided by the literature. The items that gauged the teachers' access to technology (i.e., three questions pertaining to the location of access—school, home, or other locations) were identified as competing items. If teachers reported daily access to technology at home and school, they are less likely to have daily or high access to technology at other places. Thus, the aggregate scale combined the information regarding frequency and place of access to technology in a more meaningful classification (1 = no access, 2 = daily access at other places but no daily access at home or school, 3 = daily access at school, 4 = daily access at home, and 5 = daily access at

home and school). The possible aggregate scores for access to technology scale range from 1-5.

Table 6

Items for Access to Technology Scale

Please identify how often you have access technology in the following contexts:				
1. At Home.				
Daily	2 or 3 times a week	Once a week	Once a month	Never
2. At School.				
Daily	2 or 3 times a week	Once a week	Once a month	Never
3. Others (Like cyber cafes, etc.).				
Daily	2 or 3 times a week	Once a week	Once a month	Never

Section F: Demographics. The demographic questions were used collect data to understand the study participants and their context better. Questions included in the demographic section were age, gender, name of the school, country, number of computers available in the classroom, number of computers available in school, subject taught, grade level, technology training, and years of teaching experience. The demographic variables school and subject-taught was dummy coded to allow for analysis of micro-culture.

In order to identify the extent of technology training undertaken by teachers, the researcher developed a new scale that reflects the time of training and kind of training. The researcher based these scales on previous research, which highlighted that technology integrators are resourceful in their training practices. A number of researchers emphasized the importance of different types of training opportunities, which include: (a) pre-service as well as in-service professional development, (b) self-learning, (c) attending conferences and workshops, and (d) seeking out information and support for technology integration from multiple sources including peers and computer specialists (Hadley & Sheingold, 1993). In this scale, teachers were asked to

identify any type of technology training they had participated in within the past 24 months.

Table 7

Items for Technology Training Scale

Identify if you had any of the following technology-related trainings in the past 24 months or earlier (Please check all that apply):			
	Never	*Not in the past 24 months*	*With the past 24 months*
Pre-service technology course during teacher training			
Technology professional development training offered at my school			
Self-studied how to use technology			
Attended training/workshops at technology related conference			
Participated in an online professional learning community (Online training)			
Other in-service technology trainings			

The list of trainings includes pre-service training for technology use in teaching as well as categories of professional development opportunities available for teachers. Teachers identified if they had any of these trainings in the past 24 months or not (Table 7). The aggregate score for training scale was created using the following classification: (1 = no pre-service and in-service training in the past 24 months; 2 = only pre-service training in the past 24 months; 3 = pre-service training and one other in-service training in the past 24 months; 4 = no pre-service training but more than one in-service training in the past 24 months; and 5 = pre-service training and more than one in-service training in the past 24 months). The possible aggregate scores for this scale range from 1- 5.

Data Collection

Upon approval from the heads of the schools, the researcher contacted the teachers in each school (i.e: those teaching grades 8-12) via email to solicit their participation. Participation in the study was on voluntary basis and the head of school, or a delegate, forwarded the email introducing the study with a link to the survey. Participants provided their informed consent by continuing participation in the survey and checking a box that they consented to participate. Each school was assigned a unique link to the survey on Qualtrics.com so as to determine the response rates per school. Each school population received a customized email letter for their school. The link was sent three times during a 4-week period to encourage a higher response rate.

Numerical data was exported from Qualtrics.com directly into the Statistical Package for the Social Sciences (SPSS) software version 22.0 for Windows to preserve integrity of the data. Once in SPSS, the data was analyzed according to the proposed data analysis procedures. Descriptive statistics in the form of frequency tables were used to describe the data in terms of demographics and nominal variables, such as gender and ethnicity. The researcher used means and standard deviations to calculate for continuous variables of interest, such as age and only the researcher had access to the data.

Pre-analysis data screen. Survey responses were collected from a total of 385 participants. The data were examined for completion and accuracy. Several participants did not complete significant portions of the survey and a total of 97 removals were made to ensure that full survey responses were utilized. Outliers were examined via calculation of standardized values, or *z*-scores. Z-scores falling outside of the range $\pm$ 3.29 standard deviations away from the mean were considered outliers (Tabachnick & Fidell, 2013). Although there were a few cases for outlying responses, Cook's distance (D) was utilized to determine whether these cases

caused potential bias to the regression models, which is indicated by Cook's distances greater than 1 (Field, 2009). Between the two regression models, the Cook's distance values ranged from $D = 0.00$ to $D = 0.83$, suggesting that the identified outliers are not significantly influencing the model. As such, the corresponding participants were not removed. The final sample size consisted of 288 participants.

Descriptive Statistics

The distribution of participants split between 107 males (37.20%) and 181 females (62.80%). The participants were approximately evenly divided through three countries: Jordan ($n = 99$, 34.40%), the Maldives ($n = 94$, 32.60%), and the USA ($n = 95$, 33.00%). Approximately 30 participants were sampled from each of the nine schools. Most participants taught in a Languages subject area ($n = 108$, 37.5%). Years of experience was approximately divided fairly equally between the potential categories, with most participants having between 6-10 years of experience ($n = 88$, 30.6%). Ages of participants ranged from 22 to 65 years, with $M = 37.08$ years and $SD = 9.30$. Frequencies and percentages of the demographic characteristics are presented in Table 8. Means and standard deviations of participants' ages are presented in Table 9.

Table 8

Descriptive statistics for demographics and categorical variables

Demographic	*n*	%
Gender		
Male	107	37.20
Female	181	62.80
Country		
Jordan	99	34.40
Maldives	94	32.60
USA	95	33.00
School		
Maldives1	30	10.40
Maldives2	34	11.80
Maldives3	30	10.40
Jordan1	33	11.50
Jordan2	35	12.20
Jordan3	31	10.80
U.S.1	33	11.50
U.S.2	30	10.40
U.S.3	32	11.10
Subject area		
Math	51	17.7
Sciences	72	25.0
Languages	108	37.5
No response	57	19.8
Years of experience		
1-5 years	71	24.7
6-10 years	88	30.6
11-15 years	59	20.5
> 15 years	68	23.6
No response	2	0.7

Note: Due to rounding error, all percentages may not sum to 100%.

Table 9

Means and Standard Deviations for Participants' Ages

Continuous variables	Min	Max	*M*	*SD*
Age	22	65	37.08	9.30

The three schools in each of the three countries that participated in the study were quite representative of the sample expected but not of the nations as a whole—see Limitations section in Chapter 1, above. The participating schools in each country did not differ in size, teacher demographics, and access to technology. In Jordan, the three international schools selected from the capital Amman differed slightly based on the program offered—one school was a boarding school with slightly higher percentage of non-Jordanian teachers while the other two schools were day schools with mostly Jordanian teachers. In the Maldives, two schools were high schools with grades11 and 12 only, while one school only had grades 8-10. All three schools were from the capital island, Male', and had high access and leadership support for technology integration. In the United States, the three high schools were from suburban school districts in Pennsylvania. All three schools had some form of one-to-one laptop program where each student had their own laptop to use in the classroom. The teachers in the three selected schools in the United States were protected by a teacher union organized at the district level where as the teachers from the Maldives were protected by the civil services commission and thus is not fired easily but can only be transferred to another school. In Jordan, the three schools were independent private schools, thus the teachers in the three selected schools are likely to have more autonomy than the public school teachers in Jordan.

Data collected from the survey showed that the sample of teachers from the U.S. was more experienced (M = 12.13, SD = 4.34) and their average age was 40(SD = 8.96) while the sample from Jordan and the Maldives reported an average of 10 and 11 years teaching respectively. Also, as seen from Table 10, the U.S. sample reported the highest level of access to technology (M = 4.98, SD = 0.21) compared to Jordan (M = 4.86, SD = 0.63) and the Maldives (M = 4.61, SD = 0.83). However, as expected, both the Maldives' and Jordan's teachers reported

a higher level of cultural perceptions towards technology (*M* = 24.69, *SD* = 3.85) compared to the United States. Jordanian teachers' reported the lowest level of training (*M* = 3.92, *SD* = 1.03) and lowest level of attitudes towards technology (*M* = 61.09, *SD* = 9.2) as well as self reported level of autonomy (*M* = 46.58, *SD* = 6.29) compared to the other two countries in the sample.

Table 10

Descriptive statistics for demographics and categorical variables for by country and the entire sample

	Jordan (Amman)		Maldives (Male')		USA (Penn.)		Entire Sample	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Years of teaching	9.51	5.24	10.72	4.87	12.13	4.34	10.7	4.94
Age	35.62	9.51	34.80	7.22	40.85	8.96	37.08	9.30
Technology Training	3.92	1.03	4.16	0.93	4.68	0.53	4.25	0.91
Access to technology	4.86	0.63	4.61	0.83	4.98	0.21	4.82	0.62
Cultural perceptions	23.25	4.11	24.69	3.85	22.71	3.34	23.54	3.86
Technology attributes	54.42	6.81	55.49	10.03	54.64	5.06	54.84	7.55
Attitudes towards technology	61.09	9.2	66.27	6.86	62.16	6.66	63.13	7.98
Teacher autonomy	46.58	6.29	48.65	5.77	49.9	4.99	48.35	5.86

Validity. The researcher developed the initial set of constructs for all scales through an analysis of existing literature. To determine the construct validity of the instruments, responses in each of the four scales scale were analyzed via exploratory factor analysis (EFA) using principal component analysis (PCA) including a promax rotation and internal correlations. The researcher used the following set of criteria to determine which factors and items to retain: (a) a loading of 0.50 or higher, (b) cross-loading items must have a difference of 0.15 or higher, and (c) there must be a minimum of three items per factor. To determine the optimal number of factors for each scale, the eigenvalues were calculated in a correlation matrix with all the corresponding survey items. The Kaiser criterion states that the optimal number of factors is

determined by the number of eigenvalues greater than 1. However, the Kaiser rule is not absolute and often does not generate the most optimal result (Costello & Osborne, 2005). For this dataset, eigenvalues above 2 were used as the threshold. Each EFA showed that one factor could be drawn from each set of questions, suggesting that the one factor was an optimal number for each of the scales. Accordingly, the sub-scales for the instruments were not used in this analysis but rather the overall score.

Reliability. Cronbach's alpha was used to assess the internal consistency of the composite scores. The Cronbach's alpha provides mean correlation between each pair of survey items and the number of items in the scale (Brace, Kemp, & Snelgar, 2012). The alpha values were interpreted using the guidelines suggested by George and Mallery (2013), where $\alpha \geq .90$ excellent, $\alpha \geq .80$ good, $\alpha \geq .70$ acceptable, $\alpha \geq .60$ questionable, $\alpha \geq .50$ poor, and $\alpha < .50$ unacceptable. Teacher attitudes towards technology was generated through a sum of 15 Likert-scale items ranging from 1 = strongly disagree to 5 = strongly agree. Teacher autonomy was generated through a sum of 15 Likert-scale items ranging from 1 = definitely false to 4 = definitely true. Cultural perceptions toward technology was generated through a sum of six Likert-scale items ranging from 1 = strongly disagree to 5 = strongly agree. Technology attributes was generated through a sum of 13 Likert-scale items ranging from 1 = strongly disagree to 5 = strongly agree. Results for all four scales met at least the acceptable threshold ($\alpha > .70$) for internal consistency and the findings are presented in Table 11.

Table 11

Cronbach's Alpha Reliability for Composite Scores

Composite Score	α	Number of items
Teachers attitudes towards technology	.87	15
Teacher autonomy	.80	15
Cultural perceptions toward technology	.77	6
Technology attributes	.91	13

Analysis Procedures

Research Question 1: To what extent are teachers' cultural perceptions of technology significant predictors of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

H_a1: Teachers' cultural perceptions of technology are significant predictors of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics.

In order to address Research Question 1, the researcher conducted a hierarchical linear regression. The hierarchical linear regression was an appropriate statistical analysis to conduct because the goal of the study was to assess if a statistically significant relationship exists between a series of predictor variables and a continuous outcome, while controlling for the effect of some demographic or already established variables (Tabachnick & Fidell, 2012).

Within a hierarchical linear regression, the control variables were entered into the first steps of the model, and then the remaining predictors were entered into the subsequent blocks.

The hierarchical regression first assessed how much variance in the criterion variable could be accounted for by the covariates. Then the model assessed how much additional variance could be explained by the inclusion of the predictor variables.

In this analysis, the researcher first entered the demographics—age, gender, and years of teaching—into the model. The established variables—access to technology, technology attributes, and technology training—were entered into the second step of the model. The researcher entered the emergent (predictor) variable, cultural perceptions toward technology, into the third block as shown in Figure 5. The criterion variable corresponded to teachers' attitudes toward technology. Gender was dummy coded into 0 = Male and 1 = Female. Age, years of teaching experience, access to technology, technology attributes, technology training, cultural perceptions, and teachers' attitudes toward technology were all be treated as continuous level data.

First Block: $Y = \alpha + B_1X_1 + B_2X_2 + B_3X_3 + \varepsilon$

Second Block: $Y = \alpha + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + \varepsilon$

X_1 : age, X_2: gender, X_3: years of teaching, X_4: access to technology, X_5: technology attributes, X_6: technology training, Y: attitudes toward technology

The researcher assessed the assumptions of the hierarchical linear regression as an inherent step of the regression analysis, including normality and homoscedasticity of standardized residuals, and absence of multicollinearity. Normality was assessed by interpreting a histogram plot of standardized residuals. The assumption of normality was met if the data did not vary much from the normality line. Homoscedasticity was assessed by examining a plot between the predicted values and the residuals. The assumption of homoscedasticity was met if the data points did not display any pattern (e.g., linear increase or decrease, conic, or parabolic).

Multicollinearity is a statistical phenomenon in which the predictor variables are highly correlated together (i.e., when Pearson's *r* is larger than .80; Field, 2014). Presence of multicollinearity can frequently lead to incorrect inferences regarding the association between the independent and dependent variables. Variance inflation factors measured the severity of multicollinearity. Variance inflation factors with values larger than 10 suggested that multicollinearity was present among the predictor variables, and the assumption was violated (Stevens, 2009).

Research Question 1:

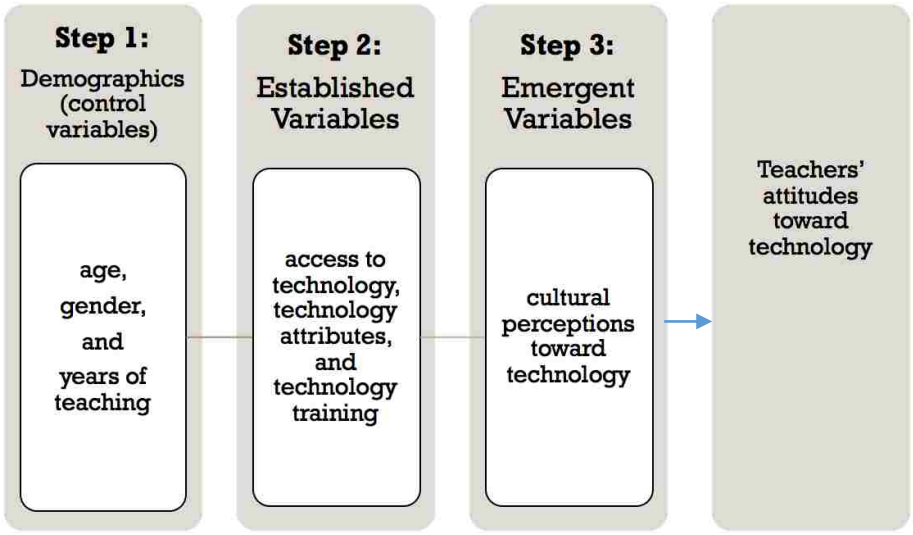

Figure 5. Variables entered at different steps of the hierarchical regression analysis in research question 1.

Research Question 2: Are there significant differences in teachers' attitudes toward technology between curricular-instructional context (i.e., subject-area and school)?

H_a2: There are significant differences in teachers' attitudes toward technology between curricular-instructional context (i.e., subject-area and school)?

To address Research Question 2, the researcher conducted a factorial analysis of variance (ANOVA) to determine whether significant differences exist in teachers' attitudes toward

technology between curricular-instructional context (i.e., subject-area and school). The factorial ANOVA was an appropriate statistical analysis because the goal of the research was to examine whether simultaneous mean differences exist on a continuous dependent variable by two or more grouping variables. The continuous dependent variable in the analysis corresponded to teachers' attitudes toward technology. The independent grouping variables in this analysis corresponded to subject-area and school. Subject area was broken up into three levels—math, science, and language. School was broken up into nine levels (School 1 up to School 9).

Prior to analysis, the researcher assessed the assumptions of the ANOVA, normality and homogeneity of variance. Normality assumed that the continuous dependent variable is normally distributed. To assess for normality, the researcher reported the skewness and kurtosis statistics. Skewness values between $\pm$ 2.0 and Kurtosis values between the range $\pm$ 7.0 met the criteria for normality. Homogeneity of variance was assessed using Levene's test and checked the assumption that the groups had equal error variances.

The ANOVA utilized the *F* test, which is a ratio between two independent estimates of variance and was used to determine if significant differences existed with each grouping variable. If the ANOVA model was found to be statistically significant, then the researcher conducted pair-wise comparisons to determine where the significant differences existed (Tabachnick & Fidell, 2012).

Research Question 3: To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

$H_0$3: Teachers' self-reported autonomy is not a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics.

H_a3: Teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics.

In order to address Research Question 3, the researcher conducted a hierarchical linear regression to determine whether teachers' self-reported autonomy was a significant predictor of teachers' attitudes toward technology within each nation, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics.

In this analysis, the demographics—age, gender, and years of teaching—were first entered into the model. The researcher entered the established variables—access to technology, technology attributes, and technology training—into the second step of the model. The emergent variable, cultural perceptions, was entered into the third block. The researcher entered the predictor variable, teachers' self-reported autonomy, into the fourth and final block as shown in Figure 6. The criterion variable corresponded to teachers' attitudes toward technology. Gender was treated as a dichotomous nominal variable. Males were treated as the reference group and were coded with 0, and females were coded with a 1. Age, years of teaching experience, access to technology, technology attributes, technology training, cultural perceptions, teachers' self-reported autonomy, and teachers' attitudes toward technology were all be treated as continuous level data. The researcher assessed the assumptions of the hierarchical linear regression as an inherent step to the inferential analysis.

First Block: $Y = \alpha + B_1X_1 + B_2X_2 + B_3X_3 + \varepsilon$

Second Block: $Y = \alpha + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + \varepsilon$

Third Block: $Y = \alpha + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + \varepsilon$

X_1 : age, X_2: gender, X_3: years of teaching, X_4: access to technology, X_5: technology attributes, X_6: technology training, X_7: cultural perceptions, Y: attitudes toward technology

Research Question 3:

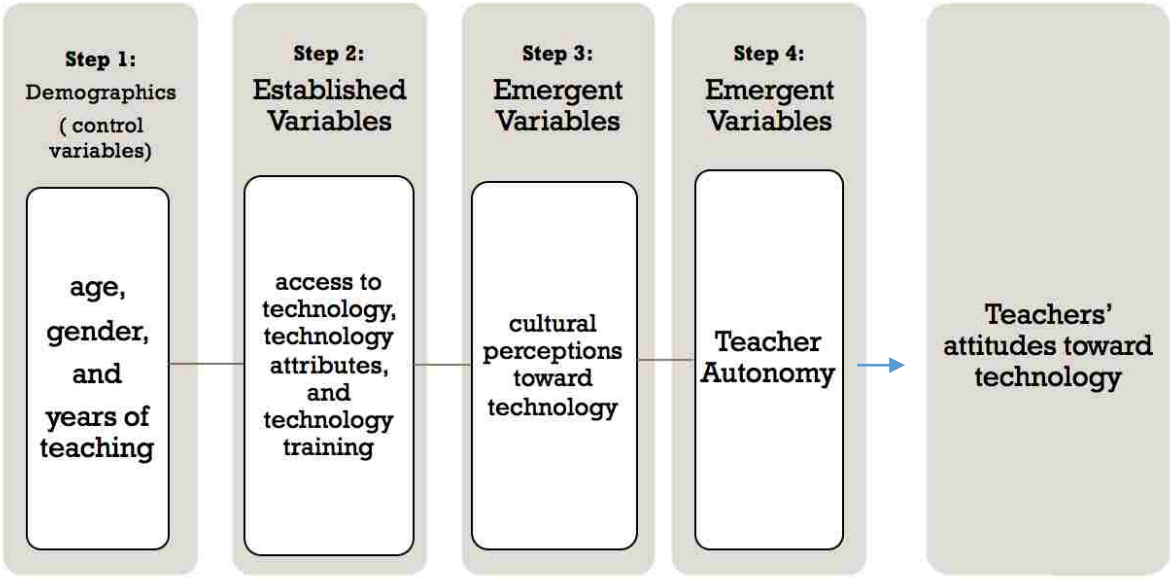

Figure 6. Variables entered at different steps of the hierarchical regression analysis in research question 3.

Summary

This chapter described the methodology for exploring teachers' attitudes in context by delving into the socio-cultural components to understand the contextual differences in teachers' attitudes toward technology leading to adoption. This chapter presented the research design, procedures, and the data analysis techniques that were used in this study to answer the research questions. First, the chapter outlined the research methodology in this study. Second, the

population and sample of the study was described. Third, the researcher explained the instrument used to collect the data, followed by a description of the proposed data analysis techniques for the study.

CHAPTER FOUR: RESULTS

The purpose of this quantitative study is to explore the association between teachers' attitudes toward technology and cultural perceptions, based on the premise that teachers are important decision makers and that their attitudes—and eventually their decisions—to integrate technology are influenced by the social and cultural context of schools and nations. The influence of culture at the macro or the national cultural level was determined using cultural perceptions towards technology scale while at micro level, culture was examined via the teacher autonomy scale and the dummy-coding for school and curricular context. Descriptive statistics were summarized to describe the sample variables. To address the research questions, hierarchical/blockwise linear regressions and a factorial ANOVA were used. Finally, this chapter ends with a brief chapter summary and transition to the discussion. Significant findings were established at the generally accepted alpha level, $\alpha = .05$.

Descriptive Statistics for Continuous Variables

As described in Chapter 3, the composite scores were generated by a sum of survey items. Table 12 presents the descriptive statistics for the continuous level variables. Means and standard deviations for teacher attitudes toward technology between schools and subject areas are presented in Table 13 and 14, respectively.

Tables 12

Means and Standard Deviations for Continuous Variables

Continuous variables	Range		*M*	*SD*
Teachers' attitudes towards technology	25.00	75.00	63.13	7.98
Access to technology	2.00	5.00	4.82	0.63
Technology attributes	13.00	65.00	54.84	7.55
Technology training	1.00	5.00	4.25	0.91
Cultural perceptions toward technology	6.00	30.00	23.54	3.86
Teacher autonomy	29.00	60.00	48.35	5.86

Table 13

Means and Standard Deviations of Teacher Attitudes towards Technology between Schools

School	*M*	*SD*
Maldives1	67.52	2.20
Maldives2	68.58	1.45
Maldives3	67.16	1.66
Jordan1	57.87	2.65
Jordan2	63.57	1.47
Jordan3	65.12	1.66
U.S.1	59.59	2.00
U.S.2	61.26	1.57
U.S.3	63.50	1.47

Table 14

Means and Standard Deviations of Teacher Attitudes towards Technology between Subject Areas

School	*M*	*SD*
Math	65.20	6.23
Sciences	63.97	8.15
Languages	62.50	8.12

Detailed Analysis

Research Question 1

To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

$H_0$1: Teachers' cultural perceptions of technology are not significant predictors of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics.

H_a1: Teachers' cultural perceptions of technology are significant predictors of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics.

To address research question one, a hierarchical linear regression was conducted. A hierarchical linear regression is an appropriate statistical analysis when assessing the predictive relationship between a series of predictors on a continuous criterion variable, while controlling for additional variables (Tabachnick & Fidell, 2013). In this analysis, the demographic variables – age, gender, and years of teaching – were entered first into the model. Next, access to technology, technology attributes, and technology training were entered into the second block. The macro-culture level variable cultural perceptions towards technology was entered into the third block. The criterion variable corresponds to teachers' attitudes toward technology. Although the perceptions of technology attributes and the attitudes towards technology scale

consists of sub-scales based on literature, this study only used the composite score because the focus of the current study is on teachers' attitudes towards technology rather than the sub-scales of attitudes as well as on teachers' overall perceptions of attributes of technology rather than individual factors. Furthermore, as reported in Chapter 3, the EFA showed that all items in each of these two scales loaded on one factor confirming that one composite scale is appropriate in the analysis.

Assumptions of the hierarchical linear regression. Prior to analysis, the assumptions of a hierarchical linear regression were assessed. The hierarchical linear regression operates on the assumptions that the data is normally distributed, that there is homoscedasticity of the standardized residuals, and that there is an absence of multicollinearity.

Normality was assessed by interpreting a histogram plot of standardized residuals. The residuals did not excessively vary from the normality plot (see Figure 7), indicating that the assumption was met. Homoscedasticity was assessed by examining a plot between the predicted values and the residuals. The assumption of homoscedasticity was met, as the data did not show a distinct pattern (see Figure 8). Multicollinearity was examined using variance inflation factors (VIF). All VIF levels were well below 10, indicating that no multicollinearity was present and that the assumption was met (Stevens, 2009). The VIF values are presented in each regression table below. Potential outliers can be identified in Figures 1 and 2. Cook's distance (*D*) for the cases in this regression model ranged from $D = 0.00$ to $D = 0.83$, suggesting that the outliers are not a cause for concern as they do not significantly influence on the model (Field, 2009).

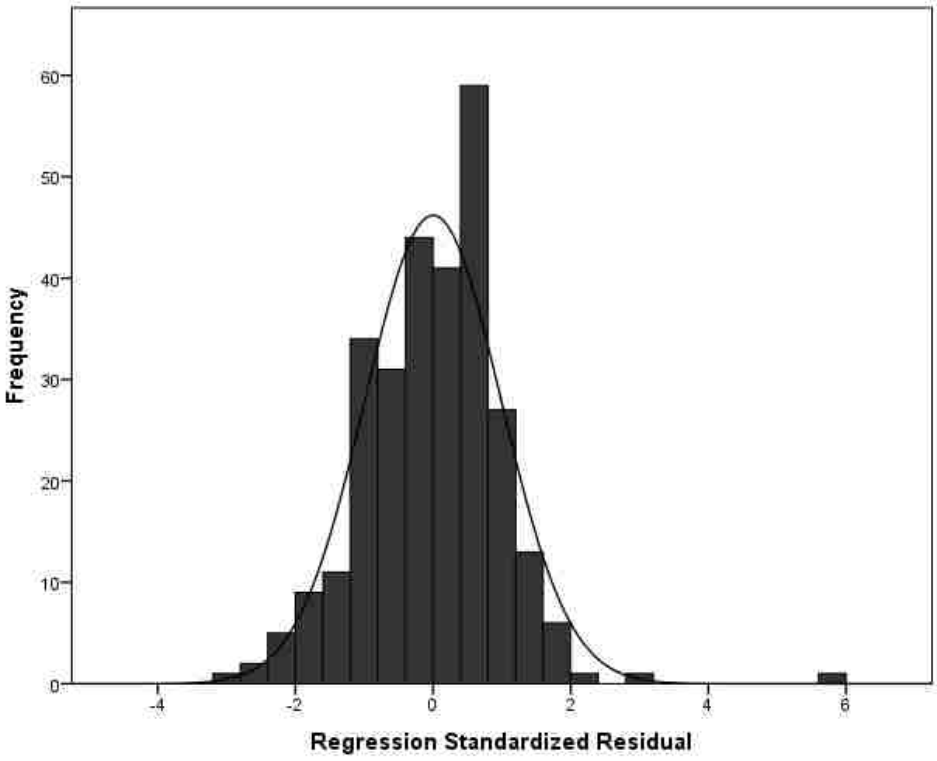

Figure 7. Normality plot of standardized residuals for research question 1.

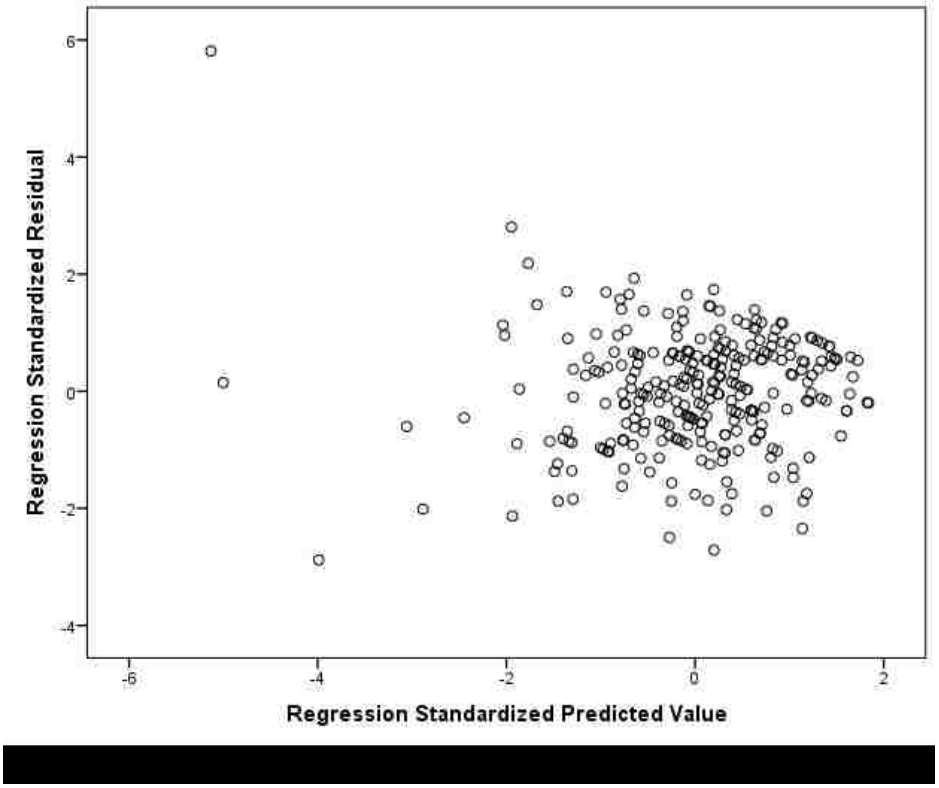

Figure 8. Scatterplot of the standardized residuals for research question 1.

Results for step 1 of hierarchical linear regression. The results for step one of the hierarchical linear regression were not statistically significant, $F(3, 282) = 0.75$, $p = .521$, $R^2 = .008$, suggesting that the covariates of age, gender, and years of teaching experience do not have a collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that approximately 0.80% of the variability in teacher's attitudes towards technology can be explained by the demographic variables. Table 15 presents the results for Step 1 of the hierarchical linear regression.

Table 15

Hierarchical Linear Regression with Demographic Variables Predicting Teacher's Attitudes towards Technology (Step 1)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	63.43	2.75			23.05	<.001
Age	-0.09	0.08	-.11	2.50	-1.16	.248
Gender	0.88	0.99	.05	1.02	0.89	.373
Years of teaching experience	0.16	0.15	.10	2.49	1.03	.305

Note: Overall model fit: $F(3, 282) = 0.75$, $p = .521$, $R^2 = .008$

Results for step 2 of hierarchical linear regression. The results for step two of the hierarchical linear regression were statistically significant, $F(6, 279) = 19.88$, $p < .001$, $R^2 = .300$, suggesting that the demographic variables, access to technology, technology attributes, and technology training have a collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that the aforementioned predictor variables account for 30% of the variability in teacher's attitudes towards technology. An additional 29% of variability in attitudes toward technology can be explained by the inclusion of the predictor variables.

Upon further examination of the predictor variables in Step 2, technology attributes (t = 9.72, $p < .001$) was found to be a significant predictor of teachers' attitudes towards technology. While holding constant all the other effects in the model, with every one-unit increase in technology attributes, the predicted scores for teacher's attitudes towards technology increased by 0.53 units. Table 16 presents the results for Step 2 of this regression.

Table 16

Hierarchical Linear Regression with Demographic Variables, Access to Technology, Technology Attributes, and Technology Training Predicting Teacher's Attitudes towards Technology (Step 2)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	24.71	4.71			5.25	<.001
Age	-0.51	0.07	-.06	2.54	-0.75	.456
Gender	0.66	0.84	-.04	1.03	0.79	.433
Years of teaching experience	0.11	0.13	.07	2.51	0.88	.380
Access to technology	1.27	0.66	.10	1.08	1.93	.055
Technology attributes	0.53	0.06	.50	1.07	9.72	< .001
Technology training	0.66	0.45	.08	1.07	1.46	.147

Note: Overall model fit: $F(6, 279) = 19.88$, $p < .001$, $R^2 = .300$, $\Delta R^2 = .292$

Results for step 3 of hierarchical linear regression. The results for Step 3 of the hierarchical linear regression were also statistically significant, $F(7, 278) = 25.67$, $p < .001$, $R^2 = .393$, suggesting that the demographic variables, technology attributes, access to technology, technology training, and cultural perceptions toward technology have a collective effect on teacher's attitudes towards technology. The coefficient of determination (R^2) suggests that the aforementioned predictor variables account for 39.3% of the variability in teacher's attitudes towards technology. An additional 9.3% of variability in attitudes toward technology could be explained by the inclusion of cultural perceptions toward technology measured as the macro level culture in the model.

Upon further examination of the predictor variables in Step 3, access to technology (t = 2.09, p = .038), technology attributes (t = 5.28, p < .001), and cultural perceptions toward technology (t = 6.53, p < .001) were found to be significant predictors of teacher's attitudes towards technology. While holding constant all the other effects in the model, with every one-unit increase in access to technology, the predicted scores for teacher's attitudes towards technology increased by 1.28 units. While holding constant all the other effects in the model, with every one-unit increase in technology attributes, the predicted scores for teacher's attitudes towards technology increased by 0.32 units. While holding constant all the other effects in the model, with every one-unit increase in macro cultural factor cultural perceptions toward technology, the predicted scores for teacher's attitudes towards technology increased by 0.76 units. The null hypothesis ($H_0$1) can be rejected, suggesting that teachers' cultural perceptions of technology is a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics. Table 17 presents the results of Step 3 of this regression.

To sum up, the first research question asked: "To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?" The results from hierarchical linear regression suggested that teachers' cultural perceptions of technology or the national culture is a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly

established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics.

Table 17

Hierarchical Linear Regression with Demographic Variables, Access to Technology, Technology Attributes, Technology Training, and Cultural Perceptions of Technology Attributes Predicting Teacher's Attitudes towards Technology (Step 3)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	19.24	4.47			4.31	<.001
Age	-0.05	0.06	-.06	2.54	-0.77	.441
Gender	0.75	0.78	.05	1.03	0.97	.335
Years of teaching experience	0.12	0.12	.08	2.51	1.01	.131
Access to technology	1.28	0.62	.10	1.08	2.09	.038
Technology attributes	0.32	0.06	.30	1.50	5.28	< .001
Technology training	0.41	0.42	.05	1.07	0.96	.337
Cultural perceptions towards technology	0.76	0.12	.37	1.44	6.53	< .001

Note: Overall model fit: $F(7, 278) = 25.67$, $p < .001$, $R^2 = .393$, $\Delta R^2 = .093$

Research Question 2

What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)? To explore these possible differences, an ANOVA was conducted.

$H_0$2: There are no significant differences in teachers' attitudes toward technology between curricular-instructional context (i.e., subject-area and school)?

H_a2: There are significant differences in teachers' attitudes toward technology between curricular-instructional context (i.e., subject-area and school)?

To address research question two, a factorial ANOVA was conducted. A factorial ANOVA is an appropriate statistical analysis when assessing for differences in a continuous variable between multiple grouping variables (Tabachnick & Fidell, 2013). The continuous

dependent variable in this analysis corresponds to teachers' attitudes toward technology. The independent grouping variables corresponds to dummy coded micro culture variables subject-area and schools.

Assumptions of the ANOVA. Prior to analysis, the assumptions of the ANOVA were assessed – normality and homogeneity of variance. Normality assumes that the continuous dependent variable is normally distributed. To assess for normality, the researcher reported the skewness and kurtosis statistics. Skewness values between $\pm$ 2.0 and Kurtosis values between the range $\pm$ 7.0 met the criteria for normality (Kline, 2011). The skewness and kurtosis values fell within the specified ranges, and the assumption of normality was met. Table 18 presents the skew and kurtosis values for the attitudes toward technology.

Table 18

Descriptive Statistics for Teachers' Attitudes toward Technology

Continuous variables	*M*	*SD*	*Skew*	*Kurtosis*
Attitudes toward technology	63.13	7.78	-0.89	1.55

Homogeneity of variance was assessed using Levene's test, which checks the assumption that the groups had equal error variances (Howell, 2013). Levene's test was significant (p = .024), indicating that the assumption was not met. As such, further interpretation of the ANOVA will be made with caution.

Results of factorial ANOVA. The results of the factorial ANOVA indicated significance by school ($F(8, 204) = 3.73$, $p < .001$, partial $\eta^2 = .128$), suggesting that there were significant differences in attitudes toward technology between the nine schools. The results of the ANOVA did not indicate significance by subject area ($F(2, 204) = 0.79$, $p = .455$, partial $\eta^2 = .008$), suggesting that there were not significant differences in attitudes toward technology

between the three subject areas. The interaction term, subject area*school was also not significant ($F(16, 204) = 0.80$, $p = .691$, partial $\eta^2 = .059$). Due to significance of school as a main effect, the null hypothesis for research question two ($H_0 2$) was partially rejected. The results of the ANOVA are presented in Table 19.

Post-hoc tests were examined by the Scheffe method to determine which schools had significant differences in attitudes toward technology scores. The school with the highest average scores for attitudes toward technology was Maldives2 ($M = 68.58$), and school with the lowest average scores for attitudes toward technology was Jordan1 ($M = 57.87$). The Jordan1 school ($M = 57.87$) had significantly lower attitudes toward technology scores than Maldives1 ($M = 67.52$), Maldives2 ($M = 68.58$), and Maldives3 ($M = 67.16$). The Maldives1 school ($M = 67.52$) had significantly higher scores in comparison to Jordan1 ($M = 57.87$). The Maldives2 school ($M = 68.58$) had significantly higher scores in comparison to Jordan1 ($M = 57.87$). The Jordan2 school ($M = 63.57$) did not have significantly different scores in comparison to any of the other schools. The Jordan3 school ($M = 65.12$) did not have significantly different scores in comparison to any of the other schools. The U.S.1 school ($M = 59.59$) did not have significantly different scores in comparison to any of the other schools. The U.S.2 school ($M = 61.26$) did not have significantly different scores in comparison to any of the other schools. The U.S.3 school ($M = 63.50$) did not have significantly different scores in comparison to any of the other schools. The Maldives3 school ($M = 67.16$) had significantly higher scores in comparison to Jordan1 ($M = 57.87$).

The second research question asked: "What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)?" The results of the factorial ANOVA indicated a significance for school but not subject area, thus suggesting

that there were significant differences in attitudes toward technology between the teachers in the nine schools thus suggesting that micro level culture at school is a significant factor that influence teachers' attitudes towards technology.

Table 19

Factorial ANOVA for Teachers' Attitudes towards Technology between Schools and Subject Area

Source	*SS*	*df*	*MS*	*F*	*p*	*Partial* η^2
Subject area	84.29	2	42.15	0.79	.455	.008
School	1592.91	8	199.14	3.73	< .001	.128
Subject area*school	678.48	2	42.41	0.80	.691	.059
Error	10884.42	204				

Research Question 3

To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

$H_0$3: Teachers' self-reported autonomy is not a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics.

H_a3: Teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics.

To address research question three, a hierarchical linear regression was conducted. In this analysis, the demographic variables (age, gender, and years of teaching) were first entered

into the model. Next, access to technology, technology attributes, and technology training were entered into the second block. Cultural perceptions towards technology was entered into the third block. Micro level culture factor teacher autonomy was entered as a predictor into the fourth and final block. The criterion variable corresponded to teachers' attitudes toward technology. Although the perceptions of technology attributes, attitudes towards technology scale and teacher autonomy scale consists of sub-scales based on literature, this study only used the composite score for each of these scale because the focus of the current study is on teachers' overall attitudes towards technology, overall perceptions of attributes of technology and overall autonomy rather than the sub-scales of attitudes or individual attributes of technology, or distinct influence on the general autonomy and curricular autonomy. Furthermore, as reported in Chapter 3, the EFA showed that all items on each of these scales loaded on one factor confirming that one factor or composite score for each scale is appropriate in the analysis.

Assumptions of the hierarchical linear regression. The assumptions of a hierarchical linear regression were assessed again. Due to the addition of one predictor to the findings of research question one, it was not expected that the assumptions tests would produce significantly different findings between the models. Normality was assessed by interpreting a histogram plot of standardized residuals. The data did not excessively vary from the normality plot (see Figure 9), indicating that the assumption was met. Homoscedasticity was assessed by examining a plot between the predicted values and the residuals. The assumption of homoscedasticity was met, as the data did not show a distinct pattern (see Figure 10). Multicollinearity was examined using variance inflation factors (VIF). All VIF levels were well below 10, indicating that no multicollinearity was present and that the assumption was met (Stevens, 2009). The VIF values are presented in each regression table below. Potential outliers can be identified in Figures 3 and

4. Cook's distance (*D*) for the cases in this regression model ranged from *D* = 0.00 to *D* = 0.76, suggesting that the outliers are not a cause for concern as they do not significantly influence the model (Field, 2009).

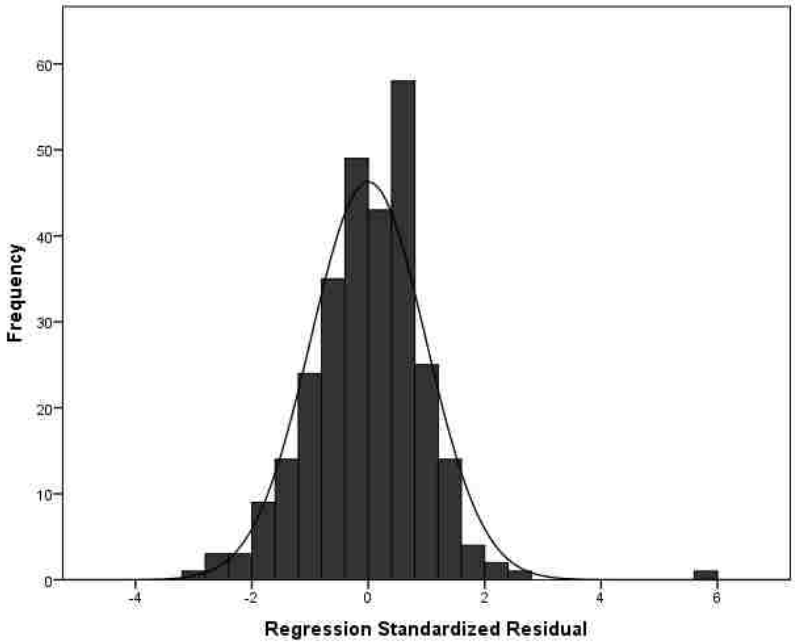

Figure 9. Normality plot of standardized residuals for research question 3.

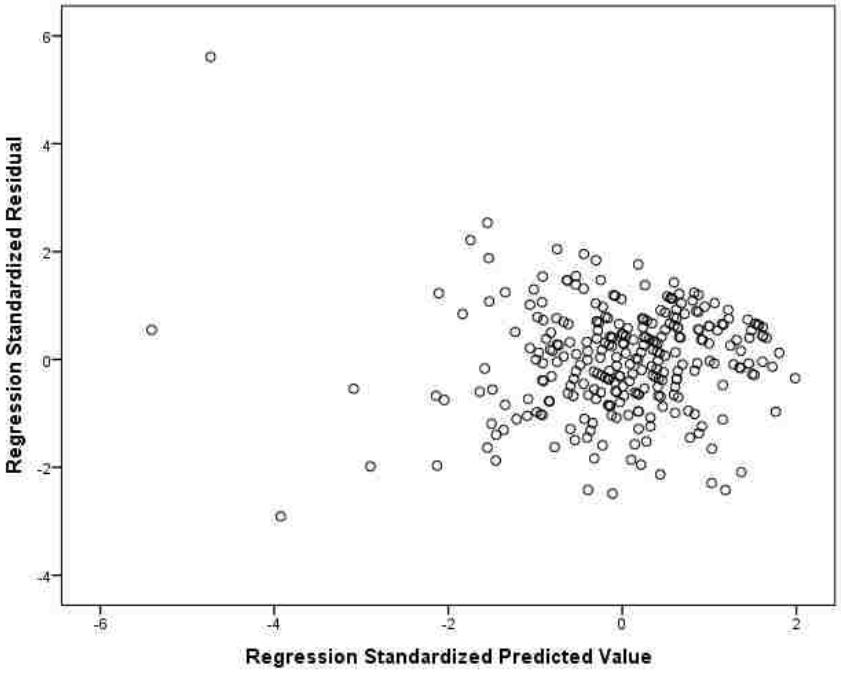

Figure 10. Scatterplot of the standardized residuals research question 3.

Results for step 1 of hierarchical linear regression. The results for step one of the hierarchical linear regression were not statistically significant, $F(3, 282) = 0.75$, $p = .521$, $R^2 = .008$, suggesting that the covariates of age, gender, and years of teaching experience do not have a collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that approximately 0.80% of the variability in teacher's attitudes towards technology can be explained by these demographic variables. Table 20 presents the results for Step 1 of the hierarchical linear regression.

Table 20

Hierarchical Linear Regression with Demographic Variables Predicting Teacher's Attitudes towards Technology (Step 1)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	63.43	2.75			23.05	<.001
Age	-0.09	0.08	-.11	2.50	-1.16	.248
Gender	0.88	0.99	.05	1.02	0.89	.373
Years of teaching experience	0.16	0.15	.10	2.49	1.03	.305

Note: Overall model fit: $F(3, 282) = 0.75$, $p = .521$, $R^2 = .008$

Results for step 2 of hierarchical linear regression. The results for step two of the hierarchical linear regression were statistically significant, $F(6, 279) = 19.88$, $p < .001$, $R^2 = .300$, suggesting that the demographic variables, access to technology, technology attributes, and technology training have a collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that the aforementioned predictor variables account for 30% of the variability in teacher's attitudes towards technology. An additional 29% of variability in attitudes toward technology could be explained by the inclusion of the predictor variables.

Upon further examination of the predictor variables in Step 2, technology attributes (t = 9.72, $p < .001$) was found to be a significant predictor of teachers' attitudes towards technology. While holding constant all the other effects in the model, with every one-unit increase in technology attributes, the predicted scores for teacher's attitudes towards technology increased by 0.53 units. Table 21 presents the results for Step 2 of this regression.

Table 21

Hierarchical Linear Regression with Demographic Variables, Access to Technology, Technology Attributes, and Technology Training Predicting Teacher's Attitudes towards Technology (Step 2)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	24.71	4.71			5.25	<.001
Age	-0.51	0.07	-.06	2.54	-0.75	.456
Gender	0.66	0.84	-.04	1.03	0.79	.433
Years of teaching experience	0.11	0.13	.07	2.51	0.88	.380
Access to technology	1.27	0.66	.10	1.08	1.93	.055
Technology attributes	0.53	0.06	.50	1.07	9.72	< .001
Technology training	0.66	0.45	.08	1.07	1.46	.147

Note: Overall model fit: $F(6, 279) = 19.88$, $p < .001$, $R^2 = .300$, $\Delta R^2 = .292$

Results for step 3 of hierarchical linear regression. The results for Step 3 of the hierarchical linear regression were also significant, $F(7, 278) = 25.67$, $p < .001$, $R^2 = .393$, suggesting that the demographic variables, technology attributes, access to technology, technology training, and cultural perceptions toward technology have a collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that the aforementioned predictor variables account for 39.3% of the variability in teacher's attitudes towards technology. An additional 9.3% of variability in attitudes toward technology could be explained by the inclusion of the macro culture level predictor variable cultural perceptions toward technology in the model.

Upon further examination of the predictor variables in Step 3, access to technology (t = 2.09, $p < .038$), technology attributes (t = 5.28, $p < .001$), and cultural perceptions toward technology (t = 6.53, $p < .001$) were found to be significant predictors of teacher's attitudes towards technology. With every one-unit increase in access to technology, scores for teacher's attitudes towards technology increased by 1.28 units. With every one-unit increase in technology attributes, scores for teacher's attitudes towards technology increased by 0.32 units. With every one-unit increase in cultural perceptions toward technology, scores for teacher's attitudes towards technology increased by 0.76 units. Table 22 presents the results of Step 3 of this regression.

Table 22

Hierarchical Linear Regression with Demographic Variables, Access to Technology, Technology Attributes, Technology Training, and Perceptions of Technology Attributes Predicting Teacher's Attitudes towards Technology (Step 3)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	19.24	4.47			4.31	<.001
Age	-0.05	0.06	-.06	2.54	-0.77	.441
Gender	0.75	0.78	.05	1.03	0.97	.335
Years of teaching experience	0.12	0.12	.08	2.51	1.01	.131
Access to technology	1.28	0.62	.10	1.08	2.09	.038
Technology attributes	0.32	0.06	.30	1.50	5.28	< .001
Technology training	0.41	0.42	.05	1.07	0.96	.337
Cultural perceptions towards technology	0.76	0.12	.37	1.44	6.53	< .001

Note: Overall model fit: $F(7, 278) = 25.67$, $p < .001$, $R^2 = .393$, $\Delta R^2 = .093$

Results for step 4 of hierarchical linear regression. The results for Step 4 of the hierarchical linear regression were also significant, $F(8, 277) = 23.69$, $p < .001$, $R^2 = .406$, suggesting that the demographic variables, technology attributes, access to technology, technology training, cultural perceptions toward technology, and teacher autonomy have a

collective effect on teacher's attitudes towards technology. The coefficient of determination, R^2, suggests that the aforementioned predictor variables account for 40.6% of the variability in teacher's attitudes towards technology. An additional 1.3% of variability in attitudes toward technology could be explained by the inclusion of the teacher autonomy in the model.

Upon further examination of the predictor variables in Step 4, technology attributes (t = 4.96, $p < .001$), cultural perceptions toward technology (t = 6.74, $p < .001$), and teacher autonomy (t = 2.52, $p < .001$) were found to be significant predictors of teacher's attitudes towards technology. While holding constant all the other effects in the model, with every one-unit increase in technology attributes, the predicted scores for teacher's attitudes towards technology increased by 0.30 units. While holding constant all the other effects in the model, with every one-unit increase in cultural perceptions toward technology, the predicted scores for teacher's attitudes towards technology increased by 0.77 units. While holding constant all the other effects in the model, with every one-unit increase in teacher autonomy, the predicted scores for teacher's attitudes towards technology increased by 0.17 units. The null hypothesis ($H_0$3) can be rejected, suggesting that teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics. Table 23 presents the results of Step 4 of this regression.

The third research question was focusing on identifying the extent of teachers' self-reported autonomy as a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?" The results of the hierarchical linear regression showed that the micro level cultural factor

teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics.

Table 23

Hierarchical Linear Regression with Demographic Variables, Access to Technology, Technology Attributes, Technology Training, Perceptions of Technology Attributes, and Teacher Autonomy Predicting Teacher's Attitudes towards Technology (Step 4)

Source	*B*	*SE*	β	VIF	*t*	*p*
(Intercept)	13.70	4.94			2.77	.006
Age	-0.08	0.06	-.09	2.61	-1.18	.239
Gender	0.71	0.77	.04	1.03	0.91	.363
Years of teaching experience	0.11	0.12	.07	2.51	0.96	.338
Access to technology	1.08	0.61	.09	1.10	1.76	.079
Technology attributes	0.30	0.60	.28	1.53	4.96	< .001
Technology training	0.44	0.42	.05	1.08	1.05	.296
Cultural perceptions of technology	0.77	0.16	.38	1.45	6.74	< .001
Teacher autonomy	0.17	0.07	.12	1.12	2.52	.012

Note: Overall model fit: $F(8, 277) = 23.69$, $p < .001$, $R^2 = .406$, $\Delta R^2 = .013$

Chapter Summary

This chapter began with a restatement of the research purpose, followed by descriptions of the pre-analysis data treatment and the sample demographics. The null hypothesis for research question one ($H_0 1$) was rejected, suggesting that teachers' cultural perceptions of technology is a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics. The results of the factorial ANOVA for research question two indicated significance for school but not subject area. Therefore, the null hypothesis for research question two ($H_0 2$) was partially rejected. The

null hypothesis for research question three ($H_0$3) was rejected, suggesting that teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics. The next chapter will further discuss the findings, as well as the strengths and limitations of the study. Future suggestions for research will also be provided.

CHAPTER FIVE: CONCLUSIONS AND DISCUSSION

This study investigated the influence of culture on teachers' attitudes toward technology beyond the established factors such as perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience). The overarching questions for the study are: (a) To what extent do cultural perceptions predict teachers' attitudes toward technology? and (b) Which level best describes the critical aspects of teachers' culture: the national/macro level or the local autonomy/micro level? There were three research questions that guided this study:

1. To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?
2. What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)?
3. To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?

To answer these research questions, the researcher collected data using an online questionnaire developed based on validated instruments in the literature—Teachers Attitudes Towards Technology Survey by Albirini (2006) and Teacher Autonomy Scale by Pearson and Hall (1993). Cultural factors related to teachers' attitudes toward technology was measured as

variables (i.e., cultural perceptions toward technology and teacher autonomy) to understand the influence of culture on the macro and micro level. The influence of culture at the macro or the national cultural level was measured using cultural perceptions towards technology scale while at micro level, teacher autonomy scale measured the cultural influence based curricular instructional context (school and subject area). The questionnaire consisted of 49 items in three sections with items for the six scales used to gauge the study variables: (a) teacher autonomy, (b) teachers' attitudes toward technology, (c) access to technology, (d) technology training, (e) cultural perceptions related to technology, and (f) perceptions of technology attributes. This instrument required teachers to rate on a Likert-scale for each item. Also, the last part of the survey gathered demographic information related to the teachers.

The survey was conducted at nine secondary schools (grades 8-12) in three countries (Jordan, the Maldives, and the United States) during the academic year 2015-2016. Request for participation was sent via email to all teachers in the nine schools and a total of 288 teachers completed the survey. Participation was voluntary and no individual identifying data were collected. Descriptive statistics were summarized to describe the sample characteristics. To address the research questions, hierarchical/blockwise linear regressions and a factorial ANOVA were used.

Findings

Descriptive data was presented in chapter 4 to describe the sample of teachers in the study. The demographic data showed that:

- Participants were split between 107 males (37.20%) and 181 females (62.80%).
- Ages of participants ranged from 22 to 65 years, with M = 37.08 years and SD = 9.30.
- Most participants taught languages (n = 108, 37.5%).

- Years of experience was approximately divided fairly equally between the potential categories, with most participants having between 6-10 years of experience (n = 88, 30.6%).
- The participants were approximately evenly divided through three countries: Jordan (n = 99, 34.40%), the Maldives (n = 94, 32.60%), and the USA (n = 95, 33.00%).
- The final sample included approximately 30 participants from each of the nine schools.

Descriptive statistics for the continuous level variables showed that participating teachers' overall attitudes toward technology were positive with an overall mean of 63.13 and a standard deviation of 7.78. Participants reported a high level of access to technology with an overall mean of 4.82 and standard deviation of 0.63. The participants also reported having high levels of autonomy (M=48.35, S.D. = 5.86). Insofar as the perceptions of technology attributes, the mean score of the participants was 54(SD = 7.55), indicating positive perceptions towards technology. The overall cultural perceptions towards technology score of the participants was midway between neutral and positive (M= 23.54, SD = 3.86).

Findings related to Question 1

The first research question was: "To what extent are teachers' cultural perceptions of technology a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics (i.e., age, gender, and years of teaching experience)?" This question was answered by running a hierarchical linear regression whereby the demographic variables – age, gender, and years of teaching – were entered first into the model. Next, access to technology, technology attributes, and technology training were

entered into the second block. Cultural perceptions towards technology was entered into the third block. The criterion variable corresponds to teachers' attitudes toward technology.

The results suggested that teachers' cultural perceptions of technology is a significant predictor of teachers' attitudes toward technology, while controlling for the more thoroughly established variables such as access to technology, technology training, perceptions of technology attributes, and demographic characteristics.

Findings related to Question 2

The second research question was: "What differences exist in teachers' attitudes toward technology across curricular-instructional contexts (i.e., subject-area and schools)?" To explore these possible differences, an ANOVA was conducted.

The results of the factorial ANOVA for research question two showed a statistically significant differences between group means for schools but not for subject area, thus suggesting that there were significant differences in attitudes toward technology between the teachers in the nine schools. However, it also showed that there is no significant difference in teachers' attitudes towards technology based on subject area specialization.

Findings related to Question 3

The third research question was: "To what extent is teachers' self-reported autonomy a significant predictor of teachers' attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology, technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience)?"

The results of the hierarchical linear regression showed that teachers' self-reported autonomy is a significant predictor of teachers' attitudes toward technology, while controlling

for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics.

Discussion of Major Findings

The most important contribution from this study is the validation that cultural perceptions toward technology among teachers is an important but often overlooked element that needs to be understood in order to facilitate the adoption of technology in education (Albirini, 2006b; Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010; Stanley, 2003). This finding is in accordance with other researchers (Albirini, 2006a; Ebrahimi, Singh, & Tabrizi, 2010; Ertmer, 2005; Straub, Loch, Aristo, Karahanna, & Srite, 2002), who suggested that the context surrounding technology integration plays a significant role in the acceptance or rejection of technology among teachers. This study aligns with their arguments and affirms it by testing it across three different national settings.

The findings from this study confirmed that the emergent variable cultural perceptions towards technology measured as the national level is a significant factor in explaining the variance in teachers' attitudes towards technology beyond the established variables. This is especially true in the context of developing countries. Based on a study in Syria, Albirini (2006a), claimed that cultural perception was the missing factor in the context of developing countries and Samak (2006) as well as Hammond and Shameem (2011) confirm the same in two different developing countries. Thus, the research model (known hereafter as Teacher Attitudes Toward Technology Version 2, or TATT2) of factors influencing teachers' attitudes towards technology should be accepted. This model rooted in technology adoption research and includes the factors influencing teachers' attitudes towards technology represents a research model for exploring teachers' attitudes towards technology and the influence of culture. When studying

teachers' attitudes towards technology in countries other than the developed world, we should incorporate the cultural perceptions scale as highlighted in the model in Figure 11.

The TATT2 model is based on the understanding that culture is complex and the cultural context of teachers is not merely their national culture. It includes the culture of the school and the findings from research question two showed that the building level differences contributed significantly to teachers' attitudes towards technology. Thus the model includes both macro culture (national culture) and micro culture (school or building culture) to unpack the complex cultural perceptions and expand upon Rogers' construct of 'compatibility with existing practices'. The context of national culture was initiated by Albrini (2006b). To create a purposeful, cross-cultural sample, the author used Hofstede's (1980) model of cultural dimensions to select three countries that had useful variation in *individualism/collectivism*, *power distance*, and *uncertainty avoidance*. The second context of existing practice was curricular culture—math and science teachers have different curricular requirements and practices than language and social studies, for example Howard, Chan, and Caputi (2015) showed that different subject area specializations contribute to teachers' beliefs about technology integration. Furthermore, Koehler and Mishra (2005) highlighted that effective technology integration requires not only the subject-specific content knowledge but also knowledge about technology, pedagogy and their relationships with each other. The third context of practice was the level of the school building itself. This is because each school has its own administrative priorities, messaging, technology infrastructure, level of access, and parent community to which it must respond. A fourth and final context, acting as a check on the other three, was the autonomy that each individual teacher perceived, as originated by Pearson and Hall (1993).

Among these cultural contexts, only some presented significant effects in the model. The macro level factor cultural perceptions towards technology as well the micro level factor—school building is significant. Furthermore, the newly added micro level factor teacher autonomy factor also explained significant variance in teachers' attitudes towards technology beyond established factors. However, this finding regarding teacher autonomy need to be further studied so as to validate as a critical factor in the study of attitudes towards technology. Furthermore, there was no significant difference in attitudes based on the subject-area specializations group of the teachers.

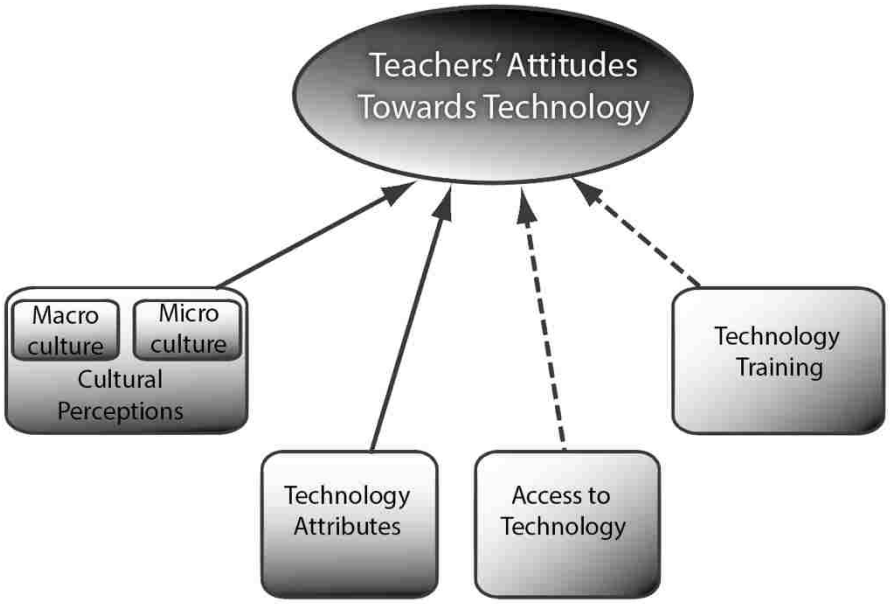

Figure 11. Teacher Attitudes Towards Technology version 2 (TATT-2) for exploring factors influencing teachers' attitudes towards technology.

In addition to the cultural perceptions, the TATT-2 model shown in figure 11 highlights that access to technology and technology training should be part of any study exploring teachers' attitudes towards technology despite the lack of statistical significance in the current study. The

author believed that it is important to include these factors based on findings from previous studies that suggest that these factors play a vital role in technology integration, if not in the attitudes of teachers.

One factor that is consistently used previous attitudinal studies is technology attributes. The technology attributes or characteristics (trialability, relative advantage, observability of results, complexity/simplicity, and compatibility with the existing practices) identified by Rogers (1995) have been applied and consistently upheld researchers in multiple fields, including instructional technology (Albirini, 2006a; Greenhalgh et al., 2005; Jacobsen, 2000; Rogers, 2004). In the context of this study, Rogers' framing again proved useful: Having a positive perception of technology attributes correlated with more positive attitudes towards technology among our respondents, thus technology attributes is an important part of the research model.

Given the differences in the cultures that are believed to exist between the schools, it is tempting to conclude cultural perception as socioeconomic status; however, the researcher would argue that it will be deficient to conclude cultural perceptions only relates to socioeconomic status although it may overlap with the socioeconomic status. The class or wealth level of teachers and the school may exert broad sociocultural influences on teachers and teaching profession. Those schools and nations with a high socioeconomic status may be able provide greater access to technology at schools while those teachers with high socioeconomic status is likely to own more technology tools. In this study, the possible effects of technology gap or what is known as "digital divide" (Valadez & Duran, 2007) that may be due to socioeconomic status is taken into consideration by including access to technology factor in the model. However, the impact of socioeconomic status on teachers' attitudes and integration needs to be explored in-depth by studying the individual teachers or organizations social standing or class. Nevertheless,

unlike some other studies, this study was able to explore the culture using both micro and macro lenses. The findings showed that the culture of the school, and the nation contributed to teachers' attitudes towards technology. There were no statistically significant differences in attitudes towards technology between different subject-area teacher teams. Thus, it is fair to conclude that the national and school culture was the major contributing factor to the cultural perceptions towards technology. This observation confirms Hofstede (1980) model as well as Rogers' (1995) compatibility factor: to be adopted, the technology must be compatible with existing beliefs or practices.

Given that the goal of the study was to explore teachers' attitudes in context by delving into the socio-cultural context to understand the contextual differences in teachers' attitudes toward technology leading to adoption, one of the findings in this study is that teachers' self-reported autonomy is a significant predictor of their attitudes toward technology, while controlling for cultural perceptions, perceptions of technology attributes, access to technology training, and demographic characteristics (i.e., age, gender, and years of teaching experience). This is consistent with Hofstede's (1980) model where he argued that the difference in autonomy in different countries can explain the difference in the national culture or societal values. As such, it was expected that the individuals in Jordan and the Maldives will have lower and somewhat similar autonomy based on the national culture whereas those in the United States will have a significantly higher autonomy. However, looking at the self-reported teacher autonomy data from these three countries, it showed that the Maldivian teachers had higher autonomy (M = 48.65, SD=5.77) than the Jordanian teachers (M = 46.58, SD=6.29). The difference in autonomy between the Maldives and the United States was not high as expected. This may be because the teachers in the Maldives' public schools are civil servants with many, many protections against

being terminated or fired. This difference in job security may allow them to have a higher level of autonomy than the teachers in Jordan. Furthermore, despite the statistical significant shown in the regression model, the teacher autonomy did not explain a considerable amount of variance in teachers' attitudes. Thus, more conclusive evidence is needed to confirm that teacher autonomy should be included in the study of attitudes towards technology among teachers. Thus, the author suggests that more research should be done to understand teacher autonomy and how it interacts with both macro and micro level cultural perceptions and how it influences teachers' attitudes towards technology.

In keeping with the findings discussed above, the TATT-2 research model of teacher attitudes towards technology shown in Figure 11 should be used to guide research on teacher attitudes towards technology in the context of developing countries. While a number of individual and contextual factors affect the attitudes as identified in the literature, only a few key variables may be sufficient to explain or understand teachers' attitudes. This will help understand and integrate salient cultural factors to study teachers' attitudes towards technology and ultimately to support technology integration. The findings from this study shed light on the importance of cultural perceptions when studying teacher attitudes. It also alerts the researcher to be cautious of interacting factors as highlighted in this study, including but not limited to: technology attributes, cultural perceptions, technology training, access to technology and other demographic characteristics.

Limitations of the Study

The above conclusions are limited due to this study's sampling procedure, sample size and the instrument. This study was limited to a sample of in-service teachers in three urban secondary schools in each of the three countries. Accordingly, the findings do not generalize to

other educational levels or to the entire country or even to other regions of the countries. For example, teachers and schools in rural areas of the United States, teachers in the atolls of Maldives, or teachers in government schools in Jordan would not be comparable to the teachers and schools in this study. Also, teachers at the elementary or intermediate levels of schooling in these countries may be very different. Despite the formal support from the head of school or the district, enlisting participants in the study was extremely difficult and the entire population of teachers did not complete the survey. The most common reason for refusing or failing to follow through on participating was lack of time. In hindsight, the problem of soliciting support from school administration as well as participation from teachers within the schools seems to be a marketing problem. Also, it is important to note that I, as researcher, was requesting teachers' time, a limited and precious resource from schools and teachers. In future studies, I will plan to develop a more precise marketing plan that will include personal visits to the schools, in addition to email and phone contact. Across the sampled schools, the teachers' attitudes towards technology and the factors influencing attitudes were exclusively identified through the use of the survey instrument developed based on existing instruments. Considering the exploratory nature of this study, the purposeful sample of schools may be considered sufficient; however, data collected using a self-reporting survey instrument on a voluntary basis may lead to a common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). It may be possible that the results of the anonymous survey used for the study include self-report bias because one teacher may have completed more than one survey or some may have completed the survey with the help of another teacher.

To remediate the survey design flaw, perhaps a mixed method study design using quantitative, as well as qualitative data, would provide a better understanding of teachers'

attitudes towards technology use in the classroom and how the attitudes are formed. Using open-ended questions and a structured interview of a purposeful sample of participants would have provided a better understanding of what prohibits or inhibits the use of technology and what factors contributed to the formation of positive or negative attitude toward technology.

Another limitation of the study was the time of year that the data was collected from teachers at each school. In some schools, the data collection was done at a very challenging time of the academic year when teachers were busy grading exams and in other schools it was done right before or after a long holiday. This made it difficult to get a higher response rate from some schools and required teachers to be reminded in person by the school administrators.

Additionally, the regression analysis was conducted using top-level variables (technology attitudes, technology attributes) rather than using sub-scales (e.g., affective, cognitive, and behavioral for technology attitudes; advantage, compatibility, complexity, and observability for technology attributes). A more granular approach to the analysis, surfacing the sub-scales as variables, may be helpful. Finally, some components of the survey displayed low internal consistency (for instance, the Cultural Perceptions scale). While the overall reliability was roughly consistent with previous research (Albirini, 2006a), researchers should continue to refine the instrument and closely monitor its consistency. In light of these concerns, the application of the findings presented should be considered cautiously, and the predictors identified should be considered suggestive rather than definitive.

Implications for professional development

Despite the limitations, the findings of this study has implications pointing to issues that were beyond the scope of the research questions, but that are likely to affect how technology is integrated in developing countries. The following implications are related to teacher professional

development for technology integration.

Incorporate cultural perceptions factor in attitudinal research studies as confirmed in this study: In the past, most studies of teachers' attitudes towards technology focus on the factors other than cultural perceptions. Such studies yielded decontextualized accounts of teachers' attitudes towards technology because the contextual or cultural perspectives of teachers were not taken into account. For example, Kusano et al. (2013) investigated the effects of the ICT environment regarding teachers' attitudes and technology integration in Japanese and United States elementary schools and found that teachers' attitudes were connected to their age and teaching experience. Their findings also showed that the Japanese teachers' gender significantly predicted teachers' perceived ease of use and usability, perceived usefulness, and attitudes toward using technology, while the American teachers' gender did not (Kusano et al., 2013). This study merely compared the two groups of teachers rather than looking into the cultural factors, thus the findings were limited and difficult to explain. However, the current study draws on the theoretical framework of Hofstede (1980) and Rogers (1995) to confirm the importance measuring cultural factors rather than merely conducting a cross-cultural comparison on existing factors. The findings from this study confirmed a cross-culturally validated instrument for measuring cultural perceptions towards technology among teachers as well as a research model for understanding the factors influencing teachers' attitudes towards technology. Thus, when doing research in developing countries or across developing/developed countries, researchers should begin with the theoretical model in figure 11 and include cultural perceptions in their instrumentation.

Be responsive to national culture: When doing a technology initiative in a developing country, consider the national culture (or cultures). The findings from this study confirmed that

cultural perception is a significant factor in determining teachers' attitudes toward technology in all three different countries, thus highlighting that school administrators and decisions makers interested in promoting technology integration must look into the importance of socio-cultural context. For example, a blended learning program at a high school in the Maldives would need to be implemented differently than a similar initiative in the United States or Jordan. During the technology integration process, the teachers at the Maldivian school may require more time and support compared to the teachers in the United States. Furthermore, resistance to a planned technology implementation may signal some cultural dimensions that need to be addressed. Strategies that take the national culture into account can be developed to overcome resistance. Thus, technology integration should be treated as a socio-cultural process to make sure cultural factors are taken into account when planning to new technology initiatives as well as when supporting teachers to integrate technology.

Consider school building-level differences: In this study, teachers' attitudes were significantly different based on the school building-level culture. This shows that different schools are more likely to have successful technology integration if their own cultural perceptions match or fit the values embedded within the technology. For example, according Abuhamid's (2011) study of three different ICT professional development courses offered for teachers in Jordan, teachers in some schools needed more time for training and preferred face-to-face interaction as follow-up on the training. The data from this study showed that the overall score for teachers' attitudes towards technology in each of the three schools from Jordan is different. The Jordan1 school (M = 57.87) was the school with the lowest average scores for attitudes toward technology. The Jordan2 school (M = 63.57) and Jordan3 school (M = 65.12)

also had different scores. Thus, we need to pay attention to the school buildings level differences to facilitate successful technology integration.

Be sensitive to issues around teacher autonomy: Although teacher autonomy is a new construct in the study of teachers' attitudes towards technology, previous studies have found that teachers that have high autonomy and are more self-determined in their work (Deci, et al., 1982). The study also showed that teacher autonomy is a significant factor in explaining teachers' attitudes thus is considered as an emergent factor to be explored in future studies. Thus, it is necessary to be sensitive to issues around teacher autonomy when implementing technology initiatives and when providing technology professional development.

According to Putnam (2000), three key components—experience, reflection, and support—can support teacher learning and ultimately positive attitudes towards technology. Consequently, technology professional development of teachers in developing countries such as Jordan and the Maldives should include both personal and vicarious learning experiences (Ertmer, 2005) in which teachers either practice the use of technology or observe others' use. Such initiatives should provide avenues that simultaneously change in all three domains of attitudes, thus leading to the change in overall attitudes (Wegener & Carlston, 2005).

In addition to providing teacher learning, technology integration initiatives in different countries should not be designed as mere replication of successful implementations in other contexts. The policy makers and school administrators should take into consideration the contextual factors such as cultural perceptions based on national culture and school-building culture. For example, based on the findings from this study, another key issue that needs to be addressed in any technology integration is teacher autonomy.

Technology integration should be regarded as a socio-cultural process rather than merely a technical and financial undertaking. Since the culture surrounding technology predicts teachers' attitudes towards technology, the socio-cultural approach suggested by Somekh (2008) would lead to the creation of more positive attitudes towards technology by creating a more accepting culture in the schools. Several researchers have suggested the formation of learning communities as a possible solution whereby teachers not only share their knowledge and opinions, discuss new methods and strategies, but also support each other (Ertmer, 2005).

Recommendations for Future Research

This study advances the work begun by Albirini (2006b) and others in considering the complexities of applying technology integration research – which has historically been done in North America, western Europe, and similar contexts – in new, cross-cultural settings. Albirini (2006b) studied a single population, Syrian teachers, and included a scale on cultural attitudes toward technology. Samak (2006) replicated Albirini's (2006b) study in Jordan using a sample of EFL teachers in Amman. Hammond and Shameem (2012) drew upon this work to propose a model for technology attitudes that incorporated culture and then tested in the Maldives; they also made several refinements and additions to the instrument. The final survey instrument consisted of four scales (cultural perceptions scale, perceptions of technology attributes scales, perceptions of teachers' attitudes towards technology scale, and teacher autonomy scale) with items derived from literature. Figure 12 shows a summary of refinements and additions to the instrument. The overall internal consistency of the composite scores (see Table 10) met at least the acceptable threshold ($\alpha > .70$), unlike Albirini's (2006) original instrument which required a number of changes to the scales to improve internal consistency when replicated in the Maldives by Hammond and Shameem (2012). The results of exploratory factor analysis (EFA) using

principal component analysis (PCA) including a promax rotation and internal correlations showed that one factor could be drawn from each set of questions, suggesting that the one factor was optimal number for each of the scales. The resulting instrument is therefore psychometrically sound: the items are internally consistent and well defined by the items derived from earlier work. The study also tested the research model and the survey instrument more rigorously in populations across three national settings and explored multiple contexts of teachers' culture (national culture, curricular-instructional culture, building culture, etc.). Thus, the survey instrument is a valid instrument that can be used in future studies of teacher attitudes towards technology.

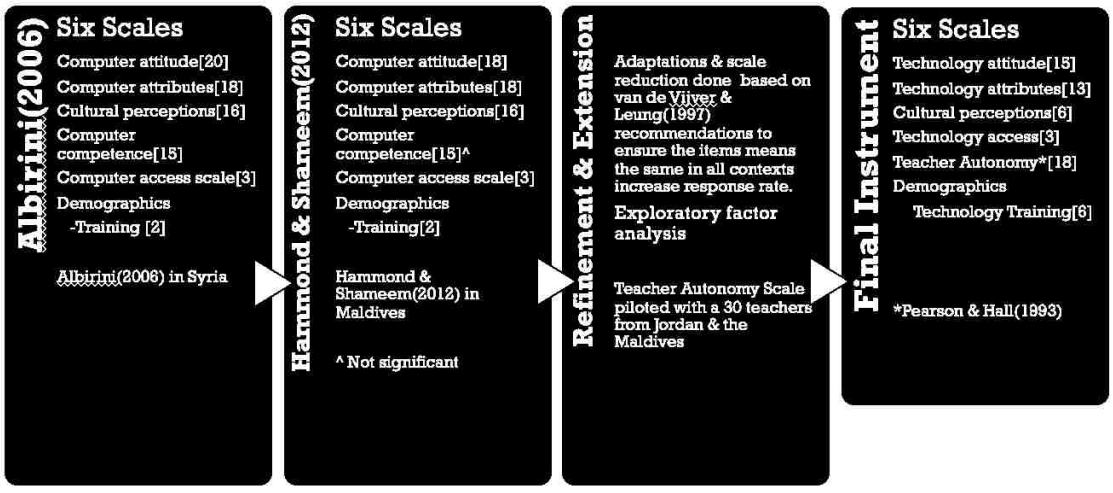

Figure 12: Refinement and extension of the instrument with the scales.

While the model and instrumentation around culture is firmly established, the role of teacher autonomy is less clear. In order to better understand the influence of autonomy with in teachers' cultural contexts and also the influence of autonomy on teachers' attitudes towards technology, future studies should study the association between teachers' cultural values and autonomy. It will be interesting to examine if teachers' cultural values are more important than their autonomy, as well as how autonomy may be influenced by employment contexts, such as

protection by unions or civil service laws. Additionally, future studies may be designed to look into the potential impact on teacher autonomy especially at schools where a technology-enriched curriculum adopted. In such studies, it may be useful to look into the influence of sub-scales of teacher autonomy on the sub-scales of attitudes.

Together, the cultural perceptions towards technology and teacher autonomy as a measure of the national and school level culture influence teachers' attitudes towards technology. One area in need of expanding research that is highlighted in this study is culture's influence on a multinational, culturally diverse teacher population such as those found in international schools. Given the trend towards international education and the growth number of international schools with foreign teachers, more research needs to be conducted to examine how these diverse teachers' values complement, or contradict each other as the technology integration efforts grow at schools.

Future investigations could extend this study with additional variables. The addition of more context-specific and demographic factors such as teachers' workload, technology support, and pedagogical beliefs can increase understanding of attitudes (Hew, & Brush, 2007; Teo, Lee, & Chai, 2008). Additionally, some of the variables included in the study—such as cultural perceptions and previous training—should be examined more closely. For example, future studies could refine or create new instruments that provide more reliable measurements of technology training and overall access to technology, particularly in the context of developing countries.

In addition, this researcher would also suggest a series of follow up questions for the teachers who participated in the study. It was not known from the study what impact the teachers' attitudes towards technology had on the participants or how they integrated technology

in their teaching.

Chapter Summary

This study supports the growing body of research on the relationship between teachers' attitudes towards technology and cultural perceptions. Despite vast differences in culture, educational systems and schools, the teachers in this study indicated that cultural perceptions towards technology is an important factor in their attitudes towards technology. Findings from the study also showed that teacher autonomy is a significant factor along with the established factors such as perceptions of technology attributes, access to technology and cultural perceptions towards technology. Although the results from this study should be interpreted with caution, findings from this study will be valuable because it will help schools and nations to successfully integrate technology to enhance students learning by understanding teachers' attitudes towards technology.

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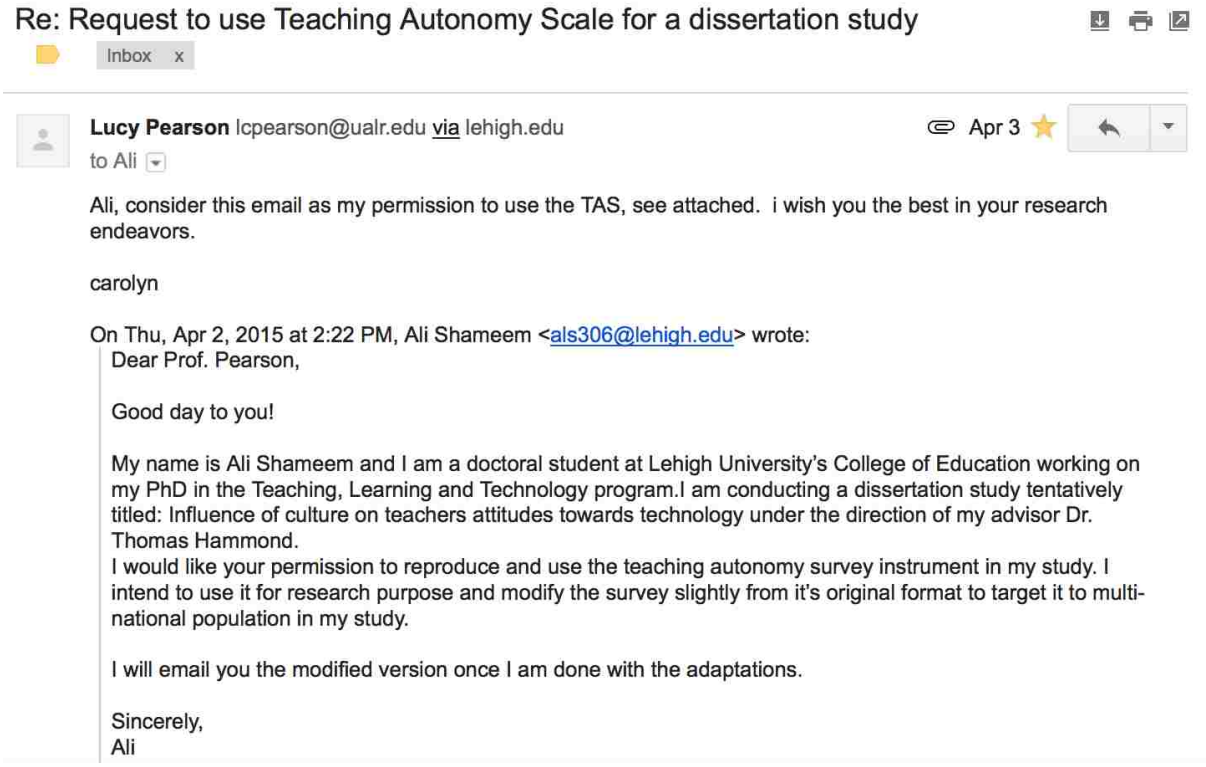
APPENDIX A

Permission to use Teaching Autonomy Scale



Re: Request to use Teaching Autonomy Scale for a dissertation study

Inbox x

Lucy Pearson lcpearson@ualr.edu via lehigh.edu Apr 3

to Ali

Ali, consider this email as my permission to use the TAS, see attached. i wish you the best in your research endeavors.

carolyn

On Thu, Apr 2, 2015 at 2:22 PM, Ali Shameem <als306@lehigh.edu> wrote:

> Dear Prof. Pearson,
>
> Good day to you!
>
> My name is Ali Shameem and I am a doctoral student at Lehigh University's College of Education working on my PhD in the Teaching, Learning and Technology program.I am conducting a dissertation study tentatively titled: Influence of culture on teachers attitudes towards technology under the direction of my advisor Dr. Thomas Hammond.
> I would like your permission to reproduce and use the teaching autonomy survey instrument in my study. I intend to use it for research purpose and modify the survey slightly from it's original format to target it to multi-national population in my study.
>
> I will email you the modified version once I am done with the adaptations.
>
> Sincerely,
> Ali

APPENDIX B

Teachers Attitudes Towards Technology Survey

This survey contains several questions and may take about 15-20 minutes to complete. Please respond to all statements and return to the person who handed the survey to you!

For the purposes of this study, the researcher is primarily interested in digital technologies (e.g., computers, mobile devices, and interactive whiteboards) that would be used in a classroom setting by a teacher or student.

Please complete all items even if you feel that some are redundant. Usually it's best to respond with your first impression, without over-thinking the question. Once again, your answers will remain anonymous.

Q1 Teacher Decision Making

For each of the items below concerning your decisions related to teaching, please select the appropriate number for each item.

	Definitely false	Probably False	Probably True	Definitely True
I am free to be creative in teaching my lessons.	❍	❍	❍	❍
I control the selection of learning activities in my class.	❍	❍	❍	❍
I set the standards of behavior in my classroom.	❍	❍	❍	❍
My job does NOT allow for much flexibility on my part.	❍	❍	❍	❍
In my teaching, I use my own guidelines and procedures.	❍	❍	❍	❍
I control the scheduling of use of time in my classroom.	❍	❍	❍	❍
I select the goals and objectives for my teaching.	❍	❍	❍	❍
I rarely teach differently than other teachers in my department.	❍	❍	❍	❍
I follow my own guidelines on instruction.	❍	❍	❍	❍
I determine what I teach in my class.	❍	❍	❍	❍
I have little control over how classroom space is used.	❍	❍	❍	❍
I choose the materials that I use in my classes.	❍	❍	❍	❍
Other people select the evaluation and assessment activities for my class.	❍	❍	❍	❍
I select the teaching methods and strategies I use with my students.	❍	❍	❍	❍
I select the content and skills taught in my class.	❍	❍	❍	❍

Q2 Teacher Attitudes Toward Technology

For each of the statements below, please check the box that indicates how strongly you AGREE or DISAGREE:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I enjoy using technology.	❍	❍	❍	❍	❍
I do NOT like talking with other teachers about technology.	❍	❍	❍	❍	❍
I enjoy working with technology.	❍	❍	❍	❍	❍
I dislike using technology in teaching.	❍	❍	❍	❍	❍
Technology saves time and effort in teaching.	❍	❍	❍	❍	❍
Students must use technology in all subjects.	❍	❍	❍	❍	❍
Learning about technology is a waste of time.	❍	❍	❍	❍	❍
Technology would motivate students to study more.	❍	❍	❍	❍	❍
Technology provides a fast and efficient means of getting information.	❍	❍	❍	❍	❍
I do NOT think I would ever need technology in my classroom.	❍	❍	❍	❍	❍
Technology can enhance students' learning.	❍	❍	❍	❍	❍
If I had the money, I would buy a computer, tablet, or smartphone.	❍	❍	❍	❍	❍
I would avoid technology as much as possible.	❍	❍	❍	❍	❍
I would like to learn more about technology.	❍	❍	❍	❍	❍
I have NO intention to use technology in the near future.	❍	❍	❍	❍	❍

Q3 Culture & Technology

For each of the statements below, please check the box that indicates how strongly you AGREE or DISAGREE:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Our students need to know how to use technology for their future jobs.	❍	❍	❍	❍	❍
Using technology will make our lives easier.	❍	❍	❍	❍	❍
Knowing about technology earns one the respect of others.	❍	❍	❍	❍	❍
Technology will improve our way of life.	❍	❍	❍	❍	❍
Working with technology does NOT diminish people's relationships with others.	❍	❍	❍	❍	❍
Technology use should be a priority in our education system.	❍	❍	❍	❍	❍

Q4 Access to Technology

Please identify how often you have access technology in the following contexts:

	Never	Once a month	Once a week	2 or 3 times a week	Daily
At Home.	❍	❍	❍	❍	❍
At School.	❍	❍	❍	❍	❍
Others places (for example, a cyber cafe, public library, etc).	❍	❍	❍	❍	❍

Q5 Technology Training Experiences

Identify what technology-related training experiences you have had (if any). Please check all that apply.

	Never	Not in the past 24 months	With the past 24 months
Pre-service technology courses during teacher training.	❍	❍	❍
Technology professional development training offered at my school.	❍	❍	❍
Self-studied how to use technology.	❍	❍	❍
Attended training/workshops at technology related conference.	❍	❍	❍
Participated in an online professional learning community or an online course.	❍	❍	❍
Other in-service technology training.	❍	❍	❍

Q6 Perceptions of Technology

For each of the statements below, please check the box that indicates how strongly you AGREE or DISAGREE:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Teaching with technology offers real advantages over traditional methods of instruction.	❍	❍	❍	❍	❍
Technology can improve the quality of students' learning.	❍	❍	❍	❍	❍
Using technology in the classroom would make the subject matter more interesting.	❍	❍	❍	❍	❍
Computers have a place in schools.	❍	❍	❍	❍	❍
Technology use fits well into my lessons.	❍	❍	❍	❍	❍
Technology use suits my students' learning preferences and their level of technological knowledge.	❍	❍	❍	❍	❍
It would be easy for me to learn to use the technology in teaching.	❍	❍	❍	❍	❍
I have no difficulty in understanding the basic functions of computers.	❍	❍	❍	❍	❍
Use of technology simplified my task in the classroom.	❍	❍	❍	❍	❍
Everyone can easily learn to use a computer.	❍	❍	❍	❍	❍
I have seen computers at work.	❍	❍	❍	❍	❍
Technology has proved to be effective learning tools worldwide.	❍	❍	❍	❍	❍
I have seen technology being used as an educational tool.	❍	❍	❍	❍	❍

Q7 What is your gender?

❍ Male

❍ Female

Q10 What is your age? _____

Q8 If you are a trained/certified teacher, where did you do your teacher training?

Country _____

Name of the Institute or University _____

Q9 How long have you been a teacher, including this year?

❍ 1	❍ 4	❍ 7	❍ 10	❍ 13	❍ more than 15 years
❍ 2	❍ 5	❍ 8	❍ 11	❍ 14	
❍ 3	❍ 6	❍ 9	❍ 12	❍ 15	

Q11 How would you describe your experience with computers?

❍ I have never used technology to teach, and I don't plan to do so anytime soon.

❍ I have never used technology to teach but I would like to learn.

❍ I rarely use technology for instruction in the classroom -- a few times a month, at most.

❍ I frequently use technology for instruction in the classroom -- one or more times a week.

❍ I always use technology for instruction in the classroom -- every day or almost every day.

Q12 Do you own (or have a school-issued) computer, laptop, tablet, and/or smartphone? (Check all that apply)

❑ Computer ❑ Laptop ❑ Tablet ❑ Smartphone

Q13 How many computers do students have access to in your classroom?

❍ none	❍ 11-20
❍ 1-5	❍ One computer for each student
❍ 6-10	❍ Other _____

Q14 How many computers do students have access to in your school?

❑ none	❑ 11-20
❑ 1-5	❑ one computer for each student
❑ 6-10	❑ Other _____

Q15 Please select the core subject(s) you teach/taught this past school year (Please check all that apply)

❑ Science	❑ Mathematics	❑ Technology
❑ Languages (for example, English, Arabic or Divehi) (3)	❑ Art & Design	❑ Other Subject (please specify below)
❑ Social Studies	❑ Business Studies	_____

Q17 What grade(s) do you teach? (Please check all that apply)

❑ 8 ❑ 9 ❑ 10 ❑ 11 ❑ 12

Q16 Name of the school you work at?

_____

End of Survey
Thank you for your time!

APPENDIX C

Inform Consent and Translations in Arabic and Dhivehi

Informed Consent Form

You are invited to be in a research study of about teachers' attitudes towards technology. You are selected as a possible participant because of your school principal's willingness to support the study. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This research is being conducted by Ali Shameem, a doctoral student at Lehigh University's College of Education under supervision of Dr. Thomas Hammond. The objective of this study is to examine the influence of culture on teachers' attitudes toward technology. Data will be collected from nine schools in three countries—USA, Jordan, and the Maldives. The survey is sent to all teachers at the selected schools in each country.

Risks/Discomforts
There are no anticipated risks or discomforts from participating in this study beyond those of participating in any other online survey of job-related attitudes. To reduce these risks, we are holding all data confidentially (including your decision to participate or not), and we have limited the number of questions in the survey so that it can be completed in no more than 30 minutes.

Benefits
The information collected will not benefit you directly, but the findings from this study should provide general benefits to teacher trainers, administrators, and researchers.

Confidentiality
All data obtained from participants will be kept confidential; only the researchers will see any personally identifying information. Any report of the research will present aggregated responses (i.e., combined results) and never individual responses. No one will know whether you participated in this study. Nothing you say on the questionnaire should in any way influence your present or future employment with your school. The data collected will be stored in the HIPAA-compliant secure database until it has been deleted by the primary investigator.

Compensation
There is no compensation from the researchers for participation; your participation would be a voluntary service from you.

Participation
Participation in this research study is completely voluntary. You have the right to withdraw at anytime or refuse to participate entirely. Nothing you say on the questionnaire should in any way influence your present or future employment with your school. If you desire to withdraw your consent and to discontinue participation at any time, simply close your internet browser without any penalty.

Questions about the Research
If you have any questions about this project or if you have a research-related problem, you may contact me, Ali Shameem at als306@lehigh.edu or my advisor, Dr. Thomas Hammond at hammond@lehigh.edu.

Questions about your Rights as Research Participants
If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact Naomi Coll of Lehigh University's Office of Research Integrity at (610) 758-3021 or inors@lehigh.edu. All reports or correspondence will be kept confidential.

Continue to next page if you agree to participate in this study.

Informed Consent Form translated to Arabic

نموذج موافق

أنت مدعو للمشاركة في دراسة بحثية عن سلوك المعلمين نحو التكنولوجيا. لقد تم اختيارك كمشارك محتمل بناءً على رغبة مدير مدرستك في دعم هذه الدراسة. ندعوك لقراءة هذا النموذج وتوجيه أي سؤال قد يدور ببالك قبل الموافقة على المشاركة في هذه الدراسة.

يقوم بهذا البحث طالب الدكتوراه في كلية التعليم في جامعة ليهاي علي شميم تحت إشراف الدكتور توماس هاموند. وتهدف هذا الدراسة لبحث تأثير الثقافة على سلوك المعلمين تجاه التكنولوجيا. وسيتم جمع البيانات من تسع مدارس موزعة على ثلاثة بلدان هي الولايات المتحدة الأمريكية والأردن وجزر المالديف. وسيتم إرسال الاستبيان لجميع المعلمين في مدارس مختارة في كل من هذه البلاد الثلاثة.

المخاطر/المضايقات
لا يوجد أي مخاطر أو مضايقات متوقعة من المشاركة في هذه الدراسة بما يتعدى القيام بالمشاركة في أي استبيان آخر عبر الانترنت من السلوكيات المتعلقة بالعمل. وللحد من هذه المخاطر، فإننا نتعامل مع جميع البيانات بسرية تامة (بما في ذلك قرارك في المشاركة أو الرفض)، كما قمنا بوضع عدد محدد من الأسئلة لضمان أن يتم استكمال الرد عليها في مدة لا تتجاوز النصف ساعة.

الفوائد
إن المعلومات التي يتم جمعها لن تعود بالنفع عليك بشكل مباشرإلا أنَ نتائج هذه الدراسة سيكون لها فوائد عامة على مدربي المعلمين والإداريين والباحثين.

السرّية
سيتمكن الباحث والمشرف عليه فقط من الاطلاع على معلومات التعريف الشخصية في حين ستبقى جميع البيانات التي يتم الحصول عليها من المشاركين سرية. وسيُقدَّم أي تقرير يتعلق بالبحث الإجابات ككل (أي نتائج كلّية) وليس على شكل إجابات فردية كما لن يتمكن أيَ كان من معرفة ما إذا قمت بالمشاركة أم لا. وفي أي حال من الأحوال لن يؤثر ما تقوله في الاستبيان على عملك الحالي والمستقبلي في مدرستك. كما سيتم تخزين البيانات التي يتم جمعها في قاعدة بيانات آمنة - HIPAA إلى أن يتم حذفها من قبل الباحث.

التعويض
لا يوجد أي تعويض من قبل الباحثين للمشاركين في هذا الاستبيان، فمشاركتك هي بمثابة عمل تطوعي.

المشاركة
المشاركة في هذه الدراسة البحثية هي طوعية تماماً. فلديك الحق في الانسحاب في أي وقت تشاء أو رفض المشاركة من أساسه. فلن يتسبب ما تدلي به في الاستبيان في أي حال من الأحوال بالتأثير على عملك في المدرسة في الحاضر والمستقبل. وإذا كنت ترغب في سحب موافقتك والتوقف عن المشاركة في أي وقت من الأوقات، فقم ببساطة بإغلاق متصفح الانترنت الخاص بك ودون أن يترتب عليك أي عقوبة.

أسئلة حول البحث
إذا كان لديك أي أسئلة حول هذا المشروع أو إذا كان لديك مشكلة تتعلق بالبحث، فيمكنك الاتصال بي – الباحث علي شميم - عبر البريد الإلكتروني als306@lehigh.edu أو الاتصال بالمشرف على الدراسة الدكتور توماس هاموند على البريد الإلكتروني hammond@lehigh.edu.

أسئلة حول حقوقك كمشارك في البحث
إذا كان لديك أي أسئلة أو استفسارات بشأن هذه الدراسة وتود أن تتحدث لشخص آخر غير الباحث (أو المشرف عليه)، فأنت مدعو للاتصال بـ نعومي كول من مكتب نزاهة الأبحاث في جامعة ليهاي على 3021-758 (610) أو من خلال البريد الإلكتروني inors@lehigh.edu . وستُعامل جميع التقارير والمراسلات بسرية تامة.

Informed Consent Form translated to Dhivehi

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als306@lehigh.edu

hammond@lehigh.edu

(610) 758 3021

inors@lehigh.edu

Curriculum Vitae

ALI SHAMEEM

King's Academy,
P.O Box 9,
Madaba, Manja,
16188, Jordan
+962-7799-05405
alishamym@gmail.com

INNOVATIVE TECHNOLOGY LEADER/COMPUTER SCIENCE EDUCATOR

Positioned to lead and provide an outstanding education through purposeful integration of technology

- Avid instructional technologist with several years of experience in teaching with technology as well as supporting teachers to integrate technology.
- Experienced computer science teacher dedicated to guiding students and teachers to learn with technology while inspiring a lifelong interest in coding.
- Proven problem-solving abilities with both students and teachers.
- Recognized for outstanding leadership, technology support, and mentoring.
- Spearheaded several technology integration initiatives focused on improving student outcomes and overall teaching and learning at schools.
- Experienced in working with diverse teams of staff, teachers, students, and parents from multi-cultural backgrounds.

AREAS OF EXPERTISE

- Policy & Procedure Compliance
- Technology Planning & Integration
- ICT Research
- Technology Operations & Communications
- Innovative Curriculum Design
- Teaching Computer Programming
- Technology Support & Training
- Systems & Database Management
- Exceptional Communications Skills
- Strong Analytical and Problem solving Skills
- Team Development and Management

EDUCATION

- **PhD - Teaching, Learning and Technology** 2009 - 2016
  Lehigh University - Pennsylvania, USA
- **Master of Science in Instructional Technology** May 2008
  Lehigh University - Pennsylvania, USA
- **Bachelor of Science (HONS) in Computer Science** May 2004
  Coventry University - United Kingdom
- **Diploma in Teaching Secondary School** Dec 2000
  Physics & Mathematics

Maldives College of Higher Education-Maldives (Accredited by Macquarie University - Australia)

PROFESSIONAL EXPERIENCE

DIRECTOR OF EDUCATIONAL TECHNOLOGY

King's Academy - Jordan ***Aug 2012 - Present***

- Spearheaded the development and maintenance of several key partnerships and communication with local and international vendors including an effective Education Alliance Agreement with Microsoft and a Partnership agreement with Orange, Turning Technologies etc.
- Executed quality improvement initiatives to improve technology support and developed standard operating procedures, service catalogue, service ticketing system for technology Helpdesk.
- Supported faculty and staff to develop technology integration initiatives including the 1:1 laptop program, iPad Pilot program, Bring Your Own Device program and online learning program.
- Functioned as Technology Coach for the faculty, while chairing the Technology Taskforce unit.

SELECTED ACHIEVEMENTS

- Planned, implemented, evaluated, and directed delivery of high-quality, cost-effective technology support services for the campus community of 800 users.
- Formulated and implemented several initiatives/systems including the Bring Your Own Device 1:1 laptop program, Office365, Google Apps in Education, flipped and video-based teaching and learning.

HEAD OF DEPARTMENT - Computer Science

Kings Academy - Jordan ***Aug 2011 – Present***

- Perform, document, and reviewed teaching and learning of computer science.
- Taught Introduction to Java Programming and AP Computer Science.

SELECTED ACHIEVEMENTS

- Designed, and implemented innovative teaching curricula to teach computer programming to all students to meet the Academy's graduation requirements.
- Successfully implemented a hybrid learning program that enhanced student engagement for learning.

GRADUATE ASSISTANT

Lehigh University, USA ***Aug 2009 - June 2011***

- Supported faculty and staff of Teaching, Learning and Technology (TLT) program at Lehigh University College of Education.
- Participated actively in staff meetings to address collective support, management in institute and other pressing concerns.

DEPUTY PRINCIPAL ***Aug 2008 - Aug 2009***

Dharumavantha School, Maldives

- Responsible for the day-to-day operation of the morning session with approximately 800 students in grades 9 and 10.
- Demonstrated ability to lead and interact at developmentally appropriate levels with 9th through 10th grade students.

GRADUATE ASSISTANT ***Aug 2007 - May 2008***

Lehigh University, USA

- Worked closely with the instructional technology team to support faculty and students at the College of Education.

ACADEMIC SUPERVISOR ***Dec 2005 - Aug 2006***

Dharumavantha School, Maldives

- Worked in a collaborative team of supervisors and teachers to plan, implement, monitor, and review teaching and learning as well as extra and co-curricular activities.
- Assisted with interactive programs to enhance study curriculum utilizing technology competently and comfortably.

HEAD OF DEPARTMENT – Computer Science ***June 2005 - Aug 2006***

Dharumavantha School, Maldives

ADJUNCT LECTURER ***July 2004 - Aug 2009***

Maldives College of Higher Education, Maldives

MATHEMATICS TEACHER ***Jan 2000 - Aug 2001***

Majeediyya School, Maldives

RECENT ICT CONSULTANCY/TRAININGS/INSTRCUTIONAL DESIGN/CONFERENCES

2015

- Panelist at Microsoft in Education Global Forum – Dubai on "Blueprints for successful School transformations in K12.
- Attended International Society for Technology in Education (ISTE) Annual Conference, Philadelphia
- Completed AP Computer Science A: Experienced Teachers Training at AP Summer Institute – Texas Christian University.
- Conducted a 3-day teacher training program on facilitating learning in a "Bring Your Own Device" at GIS, Maldives.