INVESTIGATING THE LACK OF USE OF TECHNOLOGY BY TEACHERS FOR INSTRUCTIONAL ACTIVITIES IN THE CLASSROOM: A GAP ANALYSIS

by

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DEDICATION

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ABSTRACT

This research study applied the gap analysis problem-solving framework (Clark & Estes, 2008) in order to help develop strategies to increase the use of technology by teachers for instructional activities at Universal American School. The purpose of the study was to identify whether the knowledge, motivation and organization barriers were contributing to the identified gap. A mixed-method approach consisting of surveys, interviews and observations was used to collect data. Fifty-nine teachers participated in a survey; in addition, 6 teachers and 3 administrators were interviewed, and 3 classroom observations were conducted. The surveys, interviews and classroom observations helped validate the assumed causes that were formulated after conducting scanning interviews and reviewing published literature. The key findings were lack of factual knowledge of technology proficiency standards for teachers and students, lack of interest in attending professional development workshops, leadership did not set clear expectations on the use of technology, lack of incentives to use technology, lack of technical support during classroom time, and lack of peer support groups. Based on the gaps identified through the gap analysis framework (Clark & Estes, 2008), solutions to close the gaps, along with a timeline and an evaluation plan for the proposed solutions are discussed in the last two chapters of the study.

CHAPTER 1

OVERVIEW OF THE STUDY

With the reality of a flattened global landscape (Friedman, 2005) and the advent of the knowledge economy, there are many countries with national initiatives focusing on improving 21st century problem solving skills by utilizing technology across schools and universities (Inan & Lowther, 2010). In order to prepare students for future job roles that require proficiency in problem solving, a significant emphasis is placed on technology implementation and utilization in classrooms to enhance these skills. To do this effectively, teachers need to be proficient in the use of technology in classrooms. According to the National Education Technology Plan (NETP) (U.S. Department of Education, 2010) and Protheroe (2005), the focus is on radically changing traditional pedagogical practices to develop new methodologies in classroom instructional practices utilizing advancements in technology.

There are several specific ways in which students use technology-related skills in the context of 21st century problem solving. For example, students world-wide use technology-aided modeling in various research experiments to solve complex problems. Online communication technologies are used by students to collaborate in virtual teams along with teachers and other peer groups. Another common use of technology is for online research and information gathering for analysis and evaluation. According to Hew and Brush (2007), one of the major barriers for teachers in integrating technology into instructional activities in classrooms is the lack of specific technology knowledge and skills, technology supported pedagogical knowledge and skills and technology-related classroom management knowledge and skills.

Context of the Problem

Universal American School (UAS) is located in Dubai, United Arab Emirates (U.A.E.) and is part of the Educational Services Overseas Limited (ESOL) organization, which has seven other international schools that operate in the Middle East region. UAS is an international school that offers the International Baccalaureate Diploma Program (IBDP) at the high school level (grades 11 and 12) along with the option of graduating with an American diploma. For grades 7 to 10, a concept-based curriculum is offered. It focuses on key concepts around which all learning activities are centered, and students collaborate to deepen their knowledge and understanding and make connections among themselves, their peers and the world around them. At the elementary school level (Pre-K through Grade 6) the Primary Years Program (PYP) is offered along with the common core standards of the United States.

The enrollment for the academic year of 2012-2013 was 1300 students. There are 140 teachers and 150 support staff. The majority of the student population are from expatriate families from various countries such as U.S.A., Canada, Korea, Middle Eastern and South East Asian countries and the minority comes from the indigenous population of U.A.E. The teachers are recruited internationally from other international school settings that offer the International Baccalaureate (IB) curriculum and have varying levels of teaching experience. Although teachers sign up for a minimum two-year commitment, on average, they stay for four years.

Mission and Organizational Problem

The mission of Universal American School is for its students to pursue their interests with a high level of passion and contribute positively as active citizens in their respective communities. In order to realize this mission, one of the goals of Universal American School is to increase 21st century problem solving skills by utilizing technology. The management strongly

believes that graduates with a high degree of technology and media literacy will have a higher potential for employment and, as a result, contribute to the economic progress of their community (Culp, Honey, Mandinach, & Bailey, 2003). Over the past five years, Universal American School made significant investments in technology with the goal of preparing students with 21st century skills in problem solving. Upon graduation, all students are expected to be proficient in problem solving utilizing technology, which is determined through their test scores and e-portfolio scores. Based on all the technology initiatives undertaken at Universal American School, the graduating students have not demonstrated the desired level of proficiency, and this can have a negative impact on the reputation of the school and, hence, risk the future enrollment figures of the school.

The organizational problem is the lack of utilization of technology for instructional activities in the classroom and is best described by the discrepancy model based on the Gap Analysis Model (Clark & Estes, 2008). In general, teachers are slow in adopting technology and, with the introduction of any new technology, it takes an average of 2 to 3 years for 50% of teachers to use it at an acceptable level. There is evidence to suggest that clearly defined goals outlining the use of technology, the appropriate level of teacher training for the use of these technologies, and integration of these technologies in instructional activity can lead to improved student achievement levels (Shapley, Sheehan, Maloney, & Caranikas-Walker, 2010).

Organizational Goal

One of the goals for Universal American School (UAS) is for all students, upon graduation, to be proficient in the 21st century problem solving skills utilizing technology as measured by the academic achievement scores and e-portfolio scores. The UAS goal is to have this in place by September 2016. Proficiency in the use of technology for students will be

measured against the National Educational Technology Standards for Students (NETS.S) prescribed by the International Society for Technology in Education (ISTE). These standards were adopted by the leadership team at Universal American School with the consideration of alignment of the internal standards to an internationally accepted standard.

Stakeholders

The stakeholders at Universal American School include teachers, students, administrators, and parents. The teachers play a key role in ensuring that there is daily use of technology incorporated into the instructional activities in the classroom. The teachers have varying levels of technology proficiency. All newly recruited teachers are provided with a basic technology orientation session before the start of the school year. During the course of the academic year, they are encouraged to attend in-depth sessions regarding utilization of various technologies that will enhance their instructional activities in the classroom. Most of these sessions are not mandatory, and, hence, the attendance at these sessions is very low.

The students use technology for daily communication with peers and parents. This type of usage is categorized as part of the daily routine activity and not used for measuring increase in their problem solving skills. The use of technology during instructional activities in the classroom can serve to gauge the level of proficiency in terms of problem solving. The secondary level students (grades 7 through 12), on average, own three devices that they bring to school daily. The students have a high level of access to technology at school and home.

The administrators are of the view that use of technology is vital to achieving the organizational goal of increasing students' proficiency in 21st century problem solving skills. The administration is very supportive when it comes to the proposed technology initiatives and ensures that there are adequate funds for the procurement of the specified technology. However,

they do not mandate the use of technology in the classrooms, and, hence, the teachers do not make an effort to integrate technology into their daily instructional activities in the classroom.

The parents, as well as the administration, are of the opinion that use of technology for instructional activities enhances the proficiency for problem solving. They encourage the use of technology and support their students with adequate access to technology as needed. The parents will not be averse to the idea of providing their children with the appropriate technology devices required for instructional activities in the classroom or integration of technology into the key assessments of the school. Every stakeholder of the organization wants to ensure that the organizational goals are met, and they track the progress of the achievement of the set goals.

Stakeholder for the Study

The active participation of 100% of the teachers and administrators will be required to ensure that the stated objective of 100% of students becomes proficient in the use of technology upon graduation. The primary stakeholders for this study were the teachers at Universal American School. In order to achieve the organizational goal of enhancing students' proficiency in 21st century problem solving, the teachers will have to increase use of technology in daily instructional activities in the classrooms and integrate technology in their key assessments. The teachers will need to be provided an adequate level of knowledge, motivation and organizational support to ensure that they can do so.

Background of the Problem

In today's globally connected landscape, many countries are revamping their educational systems with the integration of technology in order to produce a technologically proficient workforce capable of propelling them to become leaders among the emerging knowledge economies of the world (Inan & Lowther, 2010). These national initiatives along with rapid

advancements in technology and the availability of technology are enabling the integration of technology into the educational experiences for students and teachers all the way from kindergarten to university. The key skills that employers look for in today's workforce are critical thinking, problem solving, digital media literacy and ability to collaborate in virtual teams (Dede, 2010). With these types of skills in high demand, many developed and developing countries are revising their K-12 curricula to incorporate these skills into the educational experiences of students and teachers.

Due to the rapid progress in technological innovation and the impact of globalization, the need for employees to have the relevant technology skills will continue to grow. Shifts in the nature of operations of global organizations with an emphasis on knowledge-based work will require non-routine cognitive skills such as critical thinking, problem solving, and collaboration (Karoly & Panis, 2004). The reality of the future market landscape is going to require all employed individuals to constantly upgrade their skill sets to remain gainfully employed.

The goal of developing lifelong learners is now part of many educational organizations' mission statements and goals. Thus, there is a big impetus to reflect this value in the educational practices of their institutions. There is constant competition among the developed and developing economies worldwide to become leaders in the global knowledge economy landscape by having the best qualified workforce. The right qualified workforce will ensure a robust economy and sustainability of high quality of lifestyle for the citizens of countries that can achieve it. As per a report published by Stuart and Dahm (1999), titled *21st Century Skills for 21st Century Jobs*, the skill sets needed to succeed in the modern job market are rapidly changing. The executive summary states:

> In the workplace of the 21st century, the Nation's workers will need to be better-educated to fill new jobs and more flexible to respond to the changing knowledge and skill requirements of existing jobs. Meeting the challenge of employment and training will call not only for the best efforts of employers, educators, trainers, labor unions, and individual Americans, but also for new forms of cooperation and collaboration among those groups. Lifelong skills development must become one of the central pillars of the new economy. (p. iii)

The art of gathering data from legitimate online resources and using it to drive initiatives across organizations is gaining momentum as one of the top skills that will be needed in the 21st century job market. This skill is referred to as "Digital Storytelling." Czarnecki (2009) posits that, like traditional storytelling, digital storytelling helps to build conceptual skills such as understanding a narrative and using inductive reasoning to solve problems, but the creation of digital stories also requires the creator to build technology skills through the use of software and other digital tools. These skills are useful to both children who need them for an increasingly technology-oriented future job market, and to adults who need them to keep up with a changing world.

The Stuart and Dahm (1999) report breaks modern skill sets down into basic skills (reading, writing, and computation), technical skills (computer), organizational skills (communication, creative thinking, problem solving, analytical), and company-specific skills. The digital storytelling skill incorporates three of the components (basic, technical and organizational) deemed as necessary as per the breakdown by the US Department of Education.

According to Dede (2010), there is a magnified emphasis on students worldwide to acquire the "21st century skills," with various organizations having diverse definitions of what

21st century skills are. Dede (2010) further states that certain major frameworks have been developed to bring about clarity on the definitions of 21st century skills. The framework chosen as a standard for measuring the technology proficiency of students at Universal American School (UAS) is the National Educational Technology Standards for students (NETS.S) prescribed by the International Society for Technology in Education (ISTE). The six standards for students are (1) creativity and innovation, (2) communication and collaboration, (3) research and information fluency, (4) critical thinking, problem solving and decision making, (5) digital citizenship, (6) technology operations and concepts.

On a more practical application level, the ISTE standards for students stress the creation of content at personal and group level by using modern technology tools for collaboration, the use of models and simulations for problem solving, the ability to recognize patterns and trends to forecast outcomes, the ability to validate the authenticity of information gathered from various online resources, the safe and legal use of information and technology, and the ability to troubleshoot systems and applications and learn new technologies.

The educational sector recognized the paradigm shift in the global market landscape requiring individuals to have a high degree of technology proficiency, and, hence, there is continuous focus on ensuring students' technology proficiency across all segments of the educational system.

Importance of the Problem

The current trends in the global labor market requiring the 21st century skills highlight the need to focus on technology proficiency in the key areas of collaboration and digital media literacy skills in K-12 education. The focus on students' development of 21st century skills utilizing technology has become a priority for schools and universities across the world (Dede,

2010). This priority for students to attain the desired level of technological proficiency is reflected in the organizational goal of Universal American School. The attainment of technology proficiency for graduates of Universal American School is a valuable asset that gives them the necessary advantage during their college careers.

In general, the parent communities of international schools in Dubai are well connected to each other. This raises the possibility that perceptions are shared regionally and internationally, via social networking forums, amongst parents potentially looking to move to Dubai. As a result, negative feedback amongst parents about problems faced by students due to lack of technology proficiency can cause damage to the reputation of Universal American School, with a direct negative impact on student enrolment numbers. Prospective parents view the level of technology being used and displayed during schools visits as a key measure in the decision making process for the enrolment of their children. Hence, the leadership at Universal American School has made it an organizational priority and goal to ensure that students achieve the desired level of technology proficiency. In order for students to attain the desired level of technology proficiency, technology needs to be explicitly integrated into the learning, teaching and assessment activities at Universal American School. Therefore, one of the key goals for the school is to support the teachers in integrating technology into classroom instructional activities.

Purpose of the Study

The purpose of this study was to conduct a gap analysis to examine the root causes of the lack of desired technological proficiency among students at UAS. The analysis focused on causes for this problem due to teacher knowledge and skill, motivation, and organizational gaps.

Case Study Questions

The questions that guided this study are the following:

1. What are the knowledge, motivation, and organization barriers that might prevent teachers at Universal American School from the use of technology in classrooms?
2. What are the recommended solutions to close the knowledge, motivation, and organization gaps that prevent teachers at Universal American School from achieving their goal of being proficient in teaching 21st century skills using technology?
3. What technologies are being used by teachers in the classroom?
4. How is the use of technology being evaluated in the classroom setting?

Methodological Framework

A systematic and analytical method to clarify organizational goals and identify the gap between the actual performance level and the preferred performance level was implemented to understand the potential issues and address the potential solution to the problem. Assumed causes were validated by using surveys, focus groups and interviews.

CHAPTER 2

LITERATURE REVIEW

Importance of 21st Century Skills

The 21st century is dominated by technology-enabled information flow. Chris Dede (2009) highlights the difference between 21st century skills and 20th century skills:

> The 21st century is quite different than the 20th in the capabilities people need for work, citizenship, and self-actualization. 21st century skills are different than 20th century skills primarily due to the emergence of very sophisticated information and communications technologies. For example, the types of work done by people—as opposed to the kinds of labor done by machines—are continually shifting as computers and telecommunications expand their capabilities to accomplish human tasks. (p. 1)

The information explosion created a new set of skills requiring a high degree of metacognition to create knowledge to perform tasks based on the accumulated information (Dede, 2009). For example, what a skilled physician does when all diagnostic results are within normal limits, but the patient is still feeling unwell is expert decision making: inventing new problem-solving heuristics when all standard protocols have failed. “Complex communication requires the exchange of vast amounts of verbal and nonverbal information. The information flow is constantly adjusted as the communication evolves unpredictably” (Levy & Murnane, 2004, p. 94). A skilled teacher is an expert in complex communication, able to improvise answers and facilitate dialogue in the unpredictable, chaotic flow of classroom discussion.

Ability to collaborate in work groups is regarded as another important 21st century skillset. In an interconnected world, in which people from the various knowledge economies work synchronously in different time zones and spanning different cultures, a high of degree of

collaboration is required (Karoly & Panis, 2004). Employees are expected to work in collaborative teams that involve a high degree of information sharing and communication with a strong focus on timelines, quality of work and customer satisfaction.

Global Demand for 21st Century Skills

Many countries revamped their school curricula to incorporate technology to ensure their future labor forces have the necessary 21st century skills to sustain economic advantage in a globally connected landscape. Global competition, the Internet, and widespread use of technology all suggest that the economy of the 21st century will create new challenges for employers and workers. As suggested by the "21st Century Skills for 21st Century Jobs" report published by Stuart and Dahm (1999), for America to compete in this new global economy, it can either create low-wage, low-skilled jobs or take full advantage of the nation's labor force and create high-performance workplaces. If economic success is going to ensure a high quality of life for all Americans, it will require adopting organizational work systems that allow worker teams to operate with greater responsibility, authority, and accountability.

Stuart and Dahm (1999) posit that advancements in technology will require a high magnitude of change in employee skills in the 21st century. Fifty-six percent of establishments report that restructuring and the introduction of new technology increased the skill requirements for non-managerial employees. Based on the categorization of skills by Stuart and Dahm (1999), employers seek employees with a portfolio of basic, technical, organizational and company-specific skills as described below:

- Basic Skills: The academic basics of reading, writing, and computation are needed in jobs of all kinds. Reading skills are essential, as most employees increasingly work with information on computer terminals, forms, charts, instructions, manuals, and

other information displays. Computation skills are needed to organize data for analysis and problem solving. Writing is an essential part of communications, conveying guidance to others, and in establishing a permanent base of information.

- Technical Skills: Computer skills are well on their way to becoming baseline requirements for many jobs. Workers use a growing array of advanced information, telecommunications, and manufacturing technologies, as employers turn to technology to boost productivity and efficiency and to deliver services to customers in new ways. In 1986, business spending on information technology represented 25 percent of total business equipment investment. By 1996, information technology's share had risen to 45 percent. For some industries — such as communications, insurance, and investment brokerages — information technology constitutes over three-quarters of all equipment investment. Forty-two percent of production and nonsupervisory employees in manufacturing and service establishments now use computers. Moreover, information technology changes rapidly, requiring workers to frequently upgrade their skills for competency in successive generations of technology.
- Organizational Skills: New systems of management and organization as well as employee customer interactions require a portfolio of skills in addition to academic and technical skills. These include communication skills, analytical skills, problem-solving and creative thinking, interpersonal skills, the ability to negotiate and influence, and self-management. More than half of non-managerial employees participated in regularly scheduled meetings to discuss work-related problems, indicating the need for these skills.

- Company-Specific Skills: New technology, market changes, and competition drive companies to innovate, constantly upgrade products and services, and focus on continuous improvement of work processes. As a result, employees must frequently acquire new knowledge and skills specifically relevant to the company's products and services, and their production processes or service delivery modes.

Based on the research by Karoly and Panis (2004), the global labor market will demand knowledge-based job roles that require strong technology skillsets. Be it any of the latest emerging technologies -- information technology, biotechnology, nanotechnology, the pace of technological change will rapidly increase in the next 10 to 15 years, which will increase the demand for highly skilled workers who can develop new technologies and can exploit the same for production of improved goods and services. The information systems utilized by industries and corporations now generate vast amounts of data that can be analyzed further to find new streams of profit, which will require knowledge-workers with skills in critical thinking, problem solving, and communication to facilitate generating and conveying knowledge for decision making.

Need for 21st Century Skills in Education

Education and training are now considered a lifelong process to stay competitive in the labor market have an impact on the economic progress of a country in a global landscape. The interconnectedness of the global labor market is going to affect not only the low skilled labor workforce but also the highly skilled labor workforce in terms of remaining competitive. Hence, lifelong learning will be a needed skill for survival (Karoly & Panis, 2004). Technology offers the potential to support lifelong learning either as part of the job training or through traditional public and private learning institutions. Both employees and employers will need to share the

burden of sustaining a culture of lifelong learning to ensure their companies remain competitive in an interconnected global economy.

According to the National Education Technology Plan (NETP) report by the U.S. Department of Education (2010), education and a highly skilled workforce will be highly important for USA's economic growth, prosperity and ability to stay competitive in a globally connected world. The NETP recognizes that technology is at the core of virtually all aspects of our daily lives and, hence, technology must be leveraged to provide engaging learning experiences and for the assessment of learning in more accurate and meaningful ways. The challenging and rapidly changing demands of the global economy tell what people need to know and who needs to learn. There are a lot of advances in learning sciences that show us how people learn, and technology makes it possible for us to act on this knowledge and understanding. As we enter the second decade of the 21st century, there has never been a more pressing need to transform American education or a better time to act. The NETP is a 5-year action plan that responds to an urgent national priority and a growing understanding of what the United States needs to do to remain competitive in a global economy.

References are frequently made to economic and social shifts that have made technology skills critical to the future employment of today's students, and, more broadly, to the importance of technology innovation in maintaining the economic and political dominance of the United States globally (Culp, Honey, Mandinach, & Bailey, 2003). Technology is a central force in economic competitiveness. The report "Technically Speaking: Why All Americans Need to Know More About Technology" provides a compelling argument for the urgency of investing in technological literacy, broadly defined, stating that increasing the technological literacy of the

public would improve decision making, increase citizen participation, support a modern workforce, enhance social well-being, and narrow the digital divide.

As narrated in the report by the Partnership for 21st Century Skills advocates, "To cope with the demands of the 21st century, people need to know more than core subjects. They need to know how to use their knowledge and skills—by thinking critically, applying knowledge to new situations, analyzing information, comprehending new ideas, communicating, collaborating, solving problems, making decisions" (2003, p. 9).

Increased Use of Technology in K-12 Sector

With the evolution of technologies, the expectations of student learning also changed significantly. There is increased use of technology in schools worldwide for enhancing instruction and student learning. One of the factors that drive technology investments in the K-12 sector is the belief that technology can change teaching and learning for the better, improve productivity of education by lowering its costs, and raise the quality of teaching and learning (Milton, 2003). Teachers and students use technology as a tool for their own learning by collaborating in learning communities. Learning communities extend relationships beyond the classroom, engaging parents, community members and experts. Learners become more skillful in choosing their own goals, constructing their own strategies, assessing their own knowledge and monitoring their own progress. Work produced by students is available for access by subsequent groups working on similar problems. Usage of interactive models and simulations, especially in mathematics and science, is particularly valuable in helping more learners grasp usually abstract concepts.

According to the research report by Protheroe (2005), technology, when used appropriately, stimulates increased teacher-student interaction and encourages cooperative

learning, collaboration, problem-solving, and student inquiry skills. Students from computer-rich classrooms demonstrated better behavior and had lower absentee and dropout rates than students from classrooms lacking computers. When properly implemented, computer technology had a significant effect on student achievement, as measured by test scores across subject areas and with students at all levels.

As per the National Education Technology Plan (NETP) report by the U.S. Department of Education (2010), technology is leveraged to provide access to more learning resources than are available in classrooms and connections to a wider set of "educators," including teachers, parents, experts, and mentors outside the classroom. It can be used to enable 24/7 and lifelong learning. The NETP presents a model of learning powered by technology, with goals and recommendations in five essential areas: learning, assessment, teaching, infrastructure, and productivity. An infrastructure for learning is always on, available to students, educators, and administrators regardless of their location or the time of day. It supports not just access to information, but access to people and participation in online learning communities. The NETP recognizes that technology is at the core of virtually every aspect of our daily lives and work, and we must leverage it to provide engaging and powerful learning experiences and content as well as resources and assessments that measure student achievement in more complete, authentic, and meaningful ways. Whatever the subject of study, 21st-century competencies, such as critical thinking, complex problem solving, collaboration, and multimedia communication, should be woven into all content areas. These competencies are necessary to become expert learners, which we all must be if we are to adapt to our rapidly changing world over the course of our lives.

Technology Competency Standards in K-12

There are different technology competency standards being advocated for K-12. Current conceptual frameworks for "21st Century Skills" include the Partnership for 21st Century Skills (2006), the Metiri Group and NCREL (2003), the American Association of Colleges and Universities (2007), the Organization for Economic Cooperation and Development (2005), and the revised International Society for Technical Education (ISTE) student standards for technology in the curriculum (2007) as well as digital literacy standards from the Educational Testing Service ICT Literacy Panel (2007). All these technology competencies not only represent skills students should master for effective 21st century work and citizenship, but also describe the learning strengths and preferences people who use technology now bring to educational settings.

Measuring the use of technology against a defined set of standards is a challenge in the K-12 sector (Dede, 2009). Beyond curricular issues, classrooms today typically lack 21st century learning and teaching in part because high-stakes tests do not assess these competencies. Assessments and tests focus on measuring students' fluency in various abstract, routine skills, but typically do not assess their strategies for expert decision making when no standard approach seems applicable.

Research studies in education demonstrate that the use of technology (e.g., computers) can help improve students' scores on standardized tests (Bain & Ross, 1999), improve students' inventive thinking (e.g., problem solving) (Chief Executive Officer [CEO] Forum on Education and Technology, 2001), and improve students' self-concept and motivation (Sivin-Kachala & Bialo, 2000) but, with all the investments that have been made in the education sector for

technology, research shows that the adoption and use of technology in instructional practices has not been significant (Schrum & Glassett, 2006).

Barriers to Using Technology by Teachers in Classrooms

There are barriers that prevent teachers from using technology in their instructional practices in classrooms, and these barriers can be categorized into the following three groups of assumed causes based on the Gap Analysis Framework provided by Clark and Estes (2008): Knowledge and Skills, Motivation and Organizational Culture.

Knowledge and Skills

The lack of specific technology knowledge and skills, technology-supported pedagogical knowledge and skills, and technology-related-classroom management knowledge and skills is a major barrier to technology integration (Hew & Brush, 2007). Lack of specific technology knowledge and skills is one of the common reasons given by teachers for not using technology (Snoeyink & Ertmer, 2002; Williams, Coles, Wilson, Richardson, & Tuson, 2000). First, focusing on technology knowledge and skills is clearly important because technology integration cannot occur if the teacher lacks the knowledge or skills to operate computers and software. Snoeyink and Ertmer (2002) found that teachers did not see the value of technology integration until they developed basic skills such as logging onto the network and basic word processing.

Anderson and Krathwohl (2001) provide a framework to categorize knowledge into four different types: factual, conceptual, procedural and metacognitive. Lack of knowledge of technology competency standards by teachers is categorized as lack of factual knowledge. Lack of knowledge regarding which of the available technologies can be used to perform what activity is categorized as contextual knowledge. Lack of knowledge regarding how to use the specific types of technology available in the classrooms is categorized as procedural knowledge. Lack of

knowledge regarding when to use the specific technology to enhance the instructional activity is categorized as metacognitive knowledge. Assessments of which types of knowledge teachers lack need to be performed to address the lack of the particular type of knowledge.

The curriculum has to be reworked with a focus of integrating technology into the various lesson activities to engage the learners differently. This requires new knowledge and skills (Protheroe, 2005). In order to effectively teach with technology, teachers will need to learn to manage the complex interactions among three distinct bodies of knowledge: pedagogical knowledge, content knowledge, and technological knowledge (Koehler & Mishra, 2008). Technological pedagogical and content knowledge (TPCK) is a framework for thinking about the knowledge teachers need for making instructional decisions with respect to integrating digital technologies as learning tools. Teachers are expected to provide the necessary experiences required for developing the knowledge, skills, and dispositions that teachers need. This integrated knowledge is referred to as technological pedagogical content knowledge (TPCK) and is distinct from knowledge from the three domains acquired individually (AACTE Committee on Innovation and Technology, 2008).

It is generally believed that TPCK is best acquired through candidates' participating in the design process as they apply integration skills in real contexts (Koehler & Mishra, 2008). Both Koehler and Mishra (2005) and Angeli and Valanides (2005) conducted studies that found statistically significant growth in student technology integration knowledge when they engaged in designing technology-rich instruction. To facilitate the development of TPCK, it is important that candidates have opportunities to see technology integration modeled in classes as well as in field experiences. Hall (2006) found that, when university instructors modeled technology integration, teachers were able to design lessons that effectively integrated technology to support

student learning. Additional research has shown that teachers need models and coaches to help them integrate technology effectively (Glazer, Hannafin, & Song, 2005; West & Graham, 2007).

The lack of technology-related-classroom management knowledge and skills is another barrier to technology integration into the curriculum. Traditionally, classroom management includes "the provisions and procedures necessary to establish and maintain an environment in which instruction and learning can occur and the preparation of the classroom as an effective learning environment" (Fraser, 1983, p. 68). Classroom management is identified as the most important factor influencing student learning (Wang, Haertel, & Walberg, 1993). Although the rules and procedures established in a non-technology integrated classroom can apply in a technology-integrated one, there are additional rules and procedures to be established in the latter due to the inclusion of computers, printers, monitors, CD-ROMs, and other technology resources (Lim et al., 2003). Thus, in a technology-integrated classroom, teachers need to be equipped with technology-related classroom management skills such as how to organize the class effectively so that students have equal opportunities to use computers, or what to do if students run into technical problems when working on computers.

Teachers need to be aware of the metacognitive aspect of learning to apply technology in their instructional practices. The term metacognition refers to the ability to actively control thinking during learning and problem-solving (Flavell, 1979). When individuals learn to use strategies, principles or schemas that could help in the process of problem-solving and invention, they are more likely to be aware of their own thinking during the process of problem-solving and inventive design and reflect on their experience after accomplishing a task. Zimmerman and Schunk (1989) define self-regulated learning (SRL) in terms of self-generated thoughts, feelings and actions that are systematically oriented toward the attainment of students' own goals.

Research shows that learning about complex and challenging topics and domains in computer-based learning environments typically involves the use of numerous self-regulatory processes, such as planning, knowledge activation, metacognitive monitoring and regulation, strategy deployment, and reflection (Azevedo 2005; Jonassen & Reeves 1996; Lajoie & Derry 1993).

Specifically, technological environments that support learning are often presented as "cognitive tools," "metacognitive tools" and "motivational tool" because these technologies can assist learners in (1) accessing information, (2) developing ideas, (3) communicating with others, (4) making decisions regarding their learning goals or how much support is needed from contextual resources, (5) intentionally choosing problem-solving strategies, and (6) effectively receiving and using feedback from their tutors, peers or technological means (Barak, 2010).

Motivation

First and foremost, if teachers do not value the use of technology in classrooms, then they will not use technology in their instructional practices. Teachers have to be convinced of the value of using technology to be motivated to use it in the classrooms. Lack of clarity on the role of technology in enhancing student achievement could contribute to lack of use. Two surveys by Project Tomorrow (2010) and Gray et al. (2010) revealed conflicting results from teachers and administrators on identifying specific technologies that are effective in teaching and learning. As examples, communication and collaboration tools, mobile computers and devices, Internet access, and interactive whiteboards were identified in the Project Tomorrow survey. The survey by Gray et al. identified computers, interactive whiteboards, word processing, presentation software, and projectors as important.

Teacher attitudes and beliefs towards technology can be another major barrier to use of technology for instructional practices in classrooms (Hermans, Tondeur, Valcke, & Van Braak,

2006). According to Simpson, Koballa, Oliver, and Crawley (1994), attitudes can be defined as specific feelings that indicate whether a person likes or dislikes something. In the context of technology integration, teacher attitudes toward technology may be conceptualized as teachers liking or disliking the use of technology. Beliefs can be defined as premises or suppositions about something that are felt to be true (Richardson, 1996). Specifically, teachers' beliefs may include their educational beliefs about teaching and learning (i.e., pedagogical beliefs), and their beliefs about technology (Ertmer, 2005). Researchers have found that beliefs determine a person's attitude (Bodur, Brinberg, & Coupey, 2000).

Ertmer (2005) argued that the decision of whether and how to use technology for instruction ultimately depends on the teachers themselves and the beliefs they hold about technology. For example, in an investigation of one elementary school in the United States, Ertmer, Addison, Lane, Ross, and Woods (1999) found that teachers' beliefs about technology in the curriculum shaped their goals for technology use. Teachers who viewed technology as merely "a way to keep kids busy" did not see the relevance of technology to the designated curriculum. Computer time was commonly granted after regular classroom work was done and as a reward for the completion of assigned tasks. To these teachers, other skills and content knowledge were more important. Research has shown teacher beliefs about technology to be a major barrier to technology integration.

It is well known that motivation and creativity are positively correlated. Deci (1975) and Amabile (1996) distinguished between the roles of extrinsic versus intrinsic motivation in the creative process. Intrinsic motivation exists when fulfillment is reached by merely engaging in a task and attaining a solution to a problem. It has been found that intrinsic motivation promotes commitment to work and encourages exploration, flexibility, spontaneity and risk-taking in

invention and problem-solving (Collins & Amabile, 1999). Extrinsic motivation means that individuals engage in an activity in order to meet given requirements or to expect some reward, beyond the self-satisfaction of accomplishing a challenging task. In the school context, external motivation frequently has to do with evaluation and grades. Since it is commonly accepted that intrinsic motivation spurs creativity more than external motivation, the challenge for educators is how to design instruction that engages students in interesting assignments that sparks their imaginations and intrinsic motivation.

Zimmerman et al. (1992) stress that self-regulation depends strongly on self-efficacy beliefs because perceived self-efficacy influences the level of goal challenge people set for themselves, the amount of effort they mobilize, and their persistence in the face of difficulties. Self-efficacy is defined as people's beliefs in their capability to produce designated levels of performance that exercise influence over events that affect their lives (Bandura 1997). It is a belief that one has the capabilities of executing the courses of actions required to manage prospective situations. It is important to understand the distinction between self-esteem and self-efficacy. Self-esteem relates to a person's sense of self-worth, whereas self-efficacy relates to a person's perception of his/her ability to reach a specific goal. Self-efficacy is a better predictor of task-specific goals and performance than more global evaluations, such as self-concept and self-esteem. Studies in which general or global self-concept was compared to specific achievements reported weak correlations (Pajares and Schunk 2001).

According to Bandura's (1997) social-cognitive theory, learners with low self-efficacy avoid difficult tasks and have low aspirations and a weak commitment to goals. They interpret poor performance as low aptitude, and they lose faith in their capabilities. Bandura (1997) maintains that self-efficacy beliefs are constructed from four principal sources of information:

(1) an active mastery of experience that serves as an indicator of capability; (2) vicarious experience that alters efficacy beliefs through the transmission of competencies and comparison with the attainment of others; (3) verbal persuasion and allied types of social influences that one possesses to master a given task; and (4) physiological and emotional states that affect people's judgment of their capabilities. Bandura (1997) indicates that the relevant information for judging personal capabilities, whether conveyed inactively, vicariously, persuasively or physiologically, is not inherently enlightening. It becomes instructive only through cognitive processes of efficacy formation and through reflective thought.

Regarding teaching and learning in school, it is important to acknowledge that an individual's self-efficacy beliefs are context bound. A learner may have high self-efficacy with respect to knowledge and skills in a particular school subject, but low self-efficacy as regards another subject. Therefore, technology education provides tools for fostering students' self-efficacy beliefs that are less common in other areas learned at school. This point is especially important in efforts aimed at increasing the self-efficacy beliefs of low-achieving students in technology education (Barak 2004).

Organizational Culture

There are several barriers that are categorized as organizational and cultural barriers that prevent teachers from using technology in their instructional practices in classrooms, and lack of adequate professional development opportunities has been reported as a major one (Milton, 2003). School administrators need to factor in adequate levels of professional development opportunities for teachers. This has to be part of the school schedule planning efforts. Teachers and administrators participated in a 2009 survey by Project Tomorrow where teachers revealed that, in order to use technology, there are five very important in which they need training:

technology in classroom (75%), incorporating digital resources in a lesson (68%), locating and using electronic teaching aides (67%), creating and using video or podcasts (57%), and using electronic productivity tools (57%) (Project Tomorrow, 2010). The school administrator participants of the survey (90% district administrators and 92% principals) acknowledged the need for training and reported that effective implementation of instructional technology is important or extremely important to their mission (Project Tomorrow, 2010).

Evidence indicates that professional development plays an important role in education (Guskey, 2000) and technology practice (Chen, 2008; King, 2002; Lumpe & Chambers, 2001). In a two-year study of 307 teacher participants, Lumpe and Chambers (2001) found 14 categories of contextual factors which influence teachers' beliefs in using technology: "resources, professional development, internet access, quality software, classroom structures, administrative support, parental support, teacher support, technical support, planning time, time for students to use technology, class size, mobile equipment, and proper connections" (p. 103). In a similar study related to technology use, Chen reported that teacher training, classroom pedagogy, and perceived capability have a direct effect on Internet use, with teacher training as the most significant determinant of Internet use. Prior research conducted by King indicated that professional development not only improved pedagogy but also practice in using educational technologies. This study included 175 experienced teachers over 36 months incorporating a mixed research approach of qualitative and quantitative research, reconfirming the importance of professional development for instructional technology integration. The body of professional research suggests that teacher training, or professional development, is one of the more important factors influencing the use of classroom technologies among teachers.

According to a National Center for Education Statistics survey (2000), almost all (99%) public school teachers had access to computers and the Internet at school and more than half (66%) indicated that they used computers or the Internet for classroom instruction. Teachers who had completed at least 32 hours of professional development reported that they felt very well prepared and were more willing to create assignments for computer and Internet use than those teachers who received less than 32 hours of professional development in the last three years.

Jenson and Rose (2001) offer an operative list of the characteristics (best practices) for professional development for successful technology integration: it must be scalable and sustainable, allow for on-site work in schools and classrooms, include appropriate incentives in a facilitating environment, be activity based and allow for discovery, be flexible and offer ongoing support. The support needed is in curriculum and pedagogy as well as technical services.

According to Hew and Brush (2006), lack of technical support is seen as another major organizational and cultural barrier. Teachers need adequate technical support to assist them in using different technologies. Employing a limited number of technical support personnel in a school severely hinders teachers' technology use. More often than not, these technical support personnel were overwhelmed by teacher requests and could not respond swiftly or adequately (Cuban et al., 2001). Without good technical support in the classroom, teachers cannot be expected to overcome the barriers preventing them from using technology (Lewis, 2003). Pelgrum (2001) found that, in the view of teachers, one of the top barriers to use of technology in classrooms was lack of technical support.

Lack of leadership support is seen as another barrier to teachers' use of technology in classrooms during their instructional practices. Administrators were critical to the success of the community because, as Gibson (2001) states, "[t]he number one issue in the effective integration

of educational technology into the learning environment is not the preparation of teachers for technology use, but the presence of informed and effective leadership" (p. 502). Since effective professional development combines researchers' expertise in theory with school-level practical considerations, Peel, Peel, and Baker (2002) suggest that teacher-educators as well as school administrators have to be part of the training programs. Lack of clarity of goals and expectations from leadership of the school as to what needs to be achieved with the use of technology in classrooms is a major component of leadership support. According to Schrum and Glassett (2006), teachers only do what they are told to do, so, unless leadership of the school clearly states what is expected of teachers, they will not use technology to meet the curriculum requirements. Lack of institutional support, from encouragement by administrators to try new technologies to providing funding specifically for technical support and technology purchases, becomes a major barrier to the infusion of new technologies in an institution. Institutional and technical supports are inseparable due to the administrative privilege of hiring personnel (Rogers, 2000).

Lack of peer support group or a professional learning community is seen as another barrier for teachers' use of technology in their classroom instructional practice. An organizational culture of collaboration caters positively to the learning environment and facilitates sharing of best practices. As per the research study by Cifuentes, Maxwell and Bulu (2011), presence of professional learning community in schools supports technology integration in classroom instruction. The professional learning community facilitated expansion of teachers' technical skills and knowledge of resources and implementation and classroom management strategies when integrating technologies. At the school level, DuFour (2004) says that professional learning communities "require the school staff to focus on learning rather than

teaching, work collaboratively on matters related to learning, and hold [themselves] accountable for the kind of results that fuel continual improvement" (p. 6).

Several theorists provided a rationale for creating professional learning communities to support educational practices. For instance, Michael Fullan (2002) suggests that information only becomes knowledge through dialogue and meaning making. According to Pert (1993), adults need to complete challenging tasks in collaboration with others and with a minimal level of threat or risk in order to learn new skills. Buzan (1991) identifies some of the factors that support successful adult learning: a state of relaxed alertness, allowing an emotional effect, and supporting multiple pathways to memory (Gregory & Parry, 2006).

Being part of a learning community increases the likelihood that such factors will be present during professional development. Professional learning communities provide a social context for dialog and experimentation to support teacher growth. Being part of a professional learning community helps to improve teachers' confidence in the use of technology as they feel they have a peer level network support group they rely on for support.

Summary

Acquiring 21st century skills is deemed necessary for competing at an individual level for jobs and also at a national level for economic sustainability. The 21st century skills require the knowledge of using technology in a variety of ways to gather, decipher and communicate information within groups. The 21st century jobs require metacognitive knowledge based skillsets rather than routine and repetitive skillsets. To address these demands, countries changed their school curricula to incorporate the use of modern technology into their instructional practices. Determining how best to support and advance high-quality use of educational

technology in K-12 settings continues to be a prominent concern for both practitioners and policymakers.

Technology presents the potential to act as change agent to make the shift from a teacher-centered classroom to that of learner-centered practice, which puts the learner in control of his/her learning. This shift in the teaching and learning practice requires teachers to become more proficient in the use of technology. Just providing teachers access to technology does not create the required change in the instructional practice. In order to bring about the desired change, there is a need for a deliberate plan of action involving providing teachers the required knowledge and skills, along with a supportive organization culture that motivates the teachers to use technology for enhancing student learning.

CHAPTER 3

METHODOLOGY

The goal at Universal American School is that all students, upon graduation, will be proficient in 21st century problem solving skills utilizing technology. The leadership team of the school wants to ensure that the teachers at Universal American School become proficient in their use of technology for instructional practices in the classroom and that the school is considered a pioneer in this regard as one of leading providers of K-12 education in Dubai, United Arab Emirates.

The purpose of this study was to investigate the reasons teachers do not use technology for instructional practices during class periods to achieve the desired level of technology proficiency standards using technology at Universal American School (UAS). The analysis focused on causes for this problem due to gaps in the areas of knowledge and skill, motivation, and organizational issues. Currently, only 30% of teachers are assessed as being technology proficient. The organizational goal is that 100% of teachers will be proficient in the use of technology during instructional activities in the classroom. The gap that currently exists is 70%.

Case Study Questions

The questions that guide this case study are the following:

1. What are the knowledge, motivation, and organization barriers that might prevent teachers at Universal American School from the use of technology in classrooms?
2. What are the recommended solutions to close the knowledge, motivation, and organization gaps that prevent teachers at Universal American School from achieving their goal of being proficient in teaching 21st century skills using technology?

3. What technologies are being used by teachers in the classrooms?
4. How is the use of technology being evaluated in the classroom setting?

The framework used for analysis of the data gathered was the Gap Analysis Model (Clark & Estes, 2008) as mentioned in *The 3 Dimensions of Improving Student Performance* (Rueda, 2011). The three key dimensions were teacher knowledge and skill, teacher motivation, and organizational and contextual factors. The key stages in process model were to determine the goals, measure the current achievement, and measure the gap between current achievement and desired goal, analyze the causes for the gaps, recommend solutions, implement the recommended solution and evaluate of the implemented solution. The gap analysis process is depicted in Figure 1 below.

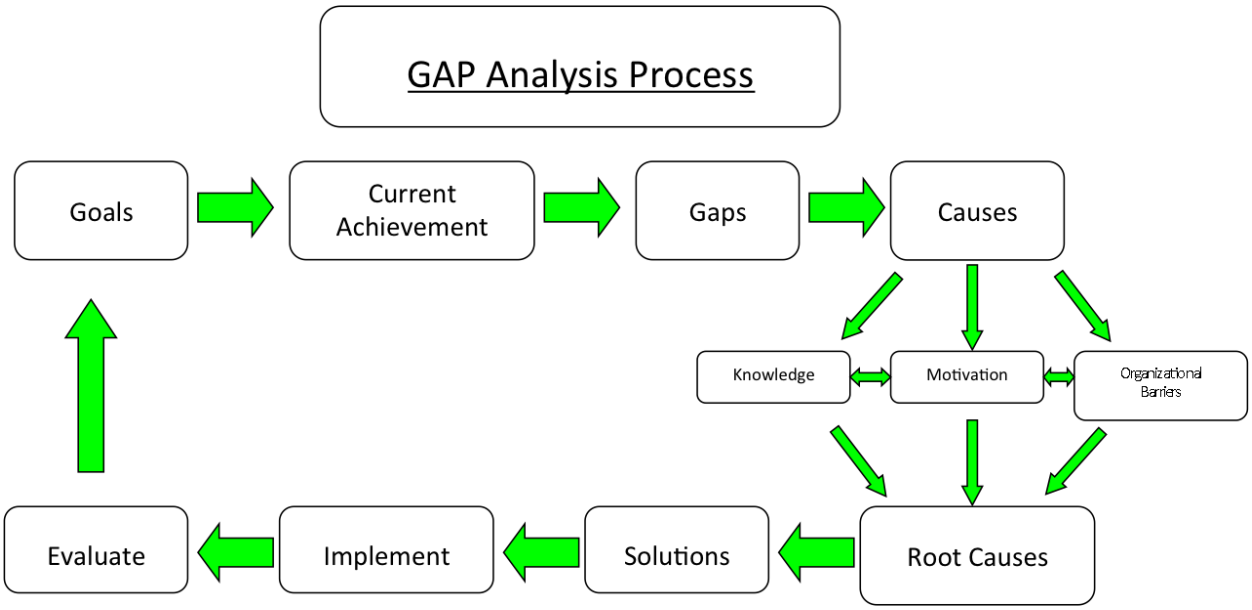

Figure 1. The Gap analysis process

Assumed Causes of the Performance Gap

In many organizations, there is a tendency to prescribe quick solutions based on presumptions without taking a systematic approach understanding the root cause of performance-related problems. In many instances, these quick solutions do not bring about the desired outcomes of change in performance and lead to wasted time and effort. A thorough investigation into the causes of performance gaps should include three components: (1) informal interviews with stakeholders; (2) learning, motivation, and organization/culture theory; and (3) review of the literature on the specific topic under question.

Scanning Interviews

Personal knowledge and informal interviews with stakeholders provide the first valuable source of information about the performance problem addressed. These causes are discussed next in the categories of knowledge, motivation and organization.

Knowledge and skills. Based on the informal discussions and personal knowledge gathered, the teachers lack knowledge in identifying and setting the goals of what needs to be achieved by integrating technology into classroom activities. The teachers currently also lack skills regarding how to use technology for the various classroom activities.

Motivation. Based on personal observation, it appears that, if teachers face issues in the first attempt of using technology, then the motivation to make further attempts drops substantially to the point they almost become “technophobic.” The primary reason given by teachers is that the number one fear factor for any teacher is to be perceived as unknowledgeable by his/her class group and, hence, lose control of the class group. The lack of motivation by teachers to master any technology is compounded by fear that, by the time they master a particular technology, it becomes outdated and they have to master new one.

Organization. The teachers feel that, along with adequate professional development plans, there needs to be sufficient technology support staff to be available during the initial phase of implementation to ensure that technical issues are fixed in a timely manner. The general perception among teachers is that the leadership team does not convey a strong commitment to the use of technology for classroom activities. This sends mixed signals to the teachers and they are left with the choice of not using it.

Learning and Motivation Theory

Anderson and Krathwohl (2001) provide a framework to categorize knowledge-related assumed causes. They discuss knowledge issues stemming from a lack of factual, conceptual, procedural and metacognitive knowledge. This framework was applied in the context of the stakeholder performance problem below. When it comes to motivation, the Clark and Estes (2008) gap analytic framework identifies three key indices of choice, persistence and mental effort. Assumed motivational causes of the performance problem at hand are discussed based on this framework. Finally, Clark and Estes (2008) address organizational and cultural barriers that need to be considered when analyzing performance problems and these will be applied to the performance problem at the end of the section.

Based on Clark and Estes (2008), teacher beliefs have a direct impact on their effectiveness in terms of what they attempt to learn. Most teachers seem to be convinced that they are not capable of learning to use technology effectively in classrooms and are very skeptical when it comes to trying new technology. As a result, they choose not to attend the training workshops and explore ways to integrate technology for classroom activities.

Knowledge and skills. UAS teachers lack the factual, conceptual, procedural and metacognitive knowledge necessary to use technology in their instructional practices. In

addition, the teachers do not know how to self-regulate their learning about technology in order to integrate it into the instructional activities in their classrooms. The teachers are not metacognitively aware of how they can change their teaching strategies by integrating technology in their daily lesson plans.

Motivation. Teachers exhibit a lack of choice that may stem from the lack of value they seem to place in the approach of using technology in classroom activities. Some teachers, after choosing to use technology, do not put forth the mental effort and persistence necessary to effectively integrate technology into their curriculum. The teachers do not understand the implications of not attending the training workshops and other professional development opportunities. Per Clark and Estes (2008), they lack the persistence to attempt again with some additional knowledge and master the skills needed to use technology in the instructional activities.

Organization. With regard to the organization and cultural factors that add to the organizational issues, lack of goals and procedures to measure progress is a key organizational factor. Lack of alignment of structures and processes with goals is another key factor. Lack of continuous monitoring and support by the leadership team is another key factor. Lack of a professional learning group for teachers to share experiences and learn from their peers, within Universal American School, can be rationalized as cultural problem. There are no rewards or incentives for teachers who do integrate well into the instructional activities in the classroom.

Assumed Causes from the Review of the Literature

An important source for generation of assumed causes is the topic-relevant literature, including empirical, peer-reviewed research, “white papers,” government documents and other relevant sources. This body of research allows for the problem to be examined from a larger

context to ensure that assumed causes that did not emerge from personal knowledge or theory are also considered. The knowledge, motivation and organizational causes are discussed from the review of relevant literature.

Knowledge and skills. A key component to ensure that teachers use technology in classrooms is to provide them with an appropriate level of professional development along with an adequate amount of technical support during the initial phase of implementation (King, 2002). Appropriate levels of professional development need to be factored into any technology initiative along with adequate technical support, particularly during the initial implementation phase.

Motivation. The integration of technology into the classrooms is likely to be unsuccessful unless there is an understanding of how teachers' attitudes and beliefs can affect the use of technology in classrooms (Pedersen, 2006). Teachers' attitudes and beliefs need to be addressed in a manner that can have a positive impact on the use of technology in classrooms. Teachers need professional development sessions with a focus on highlighting the benefits of using technology for classroom instruction. This is in addition to the professional development sessions that focus on the procedural use of technology in classrooms (Mulqueen, 2001).

Organization. Leadership commitment is a key component to ensure that teachers get the consistent message and importance of the goal (Greaves, 2012). As per the research findings of Milton (2003), it is difficult to define the achievement of success in any technology integration initiative in the absence of explicitly stated objectives and outcomes. Clearly defined goals and milestones will provide a roadmap for teachers to ensure their activities are aligned towards achieving the goals. The next critical factor is dedicated time in the weekly schedule of teachers for incorporating the newly acquired knowledge into practice (Hew & Brush, 2007).

Summary. A summary of the sources of assumed causes categorized as Knowledge, Motivation, and Organization is found in Table 1.

Table 1

Summary of Assumed Causes for Knowledge, Motivation, and Organizational Issues

Sources / Causes	Knowledge	Motivation	Organizational
Scanning interviews, personal knowledge	1) Lack of clear personal goals identifying what needs to be achieved using technology 2) Lack of skills in how to integrate technology into classroom activities	1) If teachers face issue with technology during the first attempt, then there is lack of persistence to try again 2) Teachers feel that by the time teachers master any particular technology, the existing technology becomes outdated and they have to now put in effort to learn the new technology. 3) Being an international school, the teachers feel that they are here only for a short period of time, thus taking the effort to develop the technology proficiency is not necessary	1) Inadequate professional development on the use of technology 2) Shortage of technical staff to provide the necessary assistance during class periods 3) Realistic expectation of timeframes for adoption and use of technology need to in place 4) The leadership does not communicate effectively to teachers about their commitment to the integration of technology

Table 1, continued

Sources / Causes	Knowledge	Motivation	Organizational
Learning and motivation theory	1) Not knowing they can change their own thinking and self-regulate lack of both conceptual and procedural knowledge necessary to integrate technology 2) Lack of self-regulation and not knowing how to monitor and adjust their learning (metacognition)	1) Teachers are not motivated to attend technology workshops that are held at school 2) The teachers don't want to put in the mental effort to learn the ways of integrating technology in classroom activities 3) If the technology fails does not work in the intended way, then the teachers are discouraged to use it again during their class periods which reflects a lack of persistence on their behalf	1) There are no rewards or incentives for those teachers that integrate technology well in classrooms 2) Lack of clear goals and ways to measure progress 3) Lack of support from leadership team 4) Lack of a professional learning group for teachers to share experiences and learn from peers
Background and review of the literature	1) Ensuring that there is adequate level of professional development provided to teachers	1) Teachers do not feel that technology enhances the quality of instruction. As a result they place a low value on the use of technology. 2) Self-efficacy affects teachers choice, persistence and effort	1) Leadership commitment is an absolute necessity to bring about the desired organizational change 2) Clear expectation of outcomes have to be outlined by school leadership for teachers

Sample and Population

The unit of analysis for this study is the teachers at Universal American School. The population for the study consisted of 143 teachers, of which a total of 59 returned the survey. Six interviews were conducted, with three from each group identified based on the survey responses. Three classroom observations were conducted as a follow-up to the interviews. Document analysis was conducted with the appraisal document used by the administration as a way to assess the level of technology integration in the classroom. The three administrators were the Director, Principal of Secondary school and the Principal of Elementary school. All participants were over 18 years of age, and participation was voluntary. The competencies used to measure the level of technology proficiency of teachers were the same for the entire sample.

Instrumentation

The methods used in this study to gather data for analysis were a mix of qualitative and quantitative data. According to Patton (1990), a mix of both qualitative and quantitative methods is essential to make a research case study strong, and triangulation of data help with validation of the results. The quantitative set of data was gathered in the form of survey responses of teachers and administrators. The qualitative aspect included in-depth individual interviews of teachers and administrators, classroom observations, and document analysis of feedback forms of technology workshop sessions, teacher evaluations of technology integration specialists to gather as much information about teachers' perspectives on the barriers they face to achieve technology proficiency.

Survey. In order to measure the gaps in knowledge, motivation and organizational culture, a survey instrument was created based on the questions outlined in the survey builder worksheet attached as Appendix A. The survey was used to identify the various kinds of

knowledge gaps (factual, conceptual, procedural and metacognitive). The survey used closed questions with responses captured using a Likert scale. The survey was anonymous and set up as an online survey. An email was sent to all the participants outlining the purpose of the survey and an embedded link to access the survey. A copy of the survey builder worksheet is attached as Appendix A.

Interviews. In order to triangulate data, in-depth interviews of teachers and administrators were conducted. The interview questions were open-ended to identify the gaps in knowledge, motivation and organizational culture. In addition, questions regarding technology that is most suited to classroom instruction and validating level of technology proficiency during the recruitment process and evaluation of technology use in classrooms were included in the interview. A copy of the interview builder worksheet is attached as Appendix B.

Observations. Classrooms sessions were part of the observations to identify and document the various actions being performed by teachers with regards to the use of technology in the classrooms. The observation protocols were as follows: to be set up prior to the start of the class session and observe preliminary action taken by teachers prior to the start of the class. Particular attention was paid to the interaction between students and teachers, the use of technology in classrooms, and technology troubleshooting procedures. A copy of the observation builder worksheet is attached as Appendix C.

Document analysis. The following documents, such as the feedback forms from the technology workshops, teacher evaluations documents, and faculty meeting minutes pertinent to the discussions of technology use were analyzed to gather information regarding the gaps in knowledge, motivation and organization. A copy of the document analysis builder worksheet is attached as Appendix D.

Data Collection

Survey. The quantitative data was collected in the form of online surveys using Qualtrics or similar technology on a hosted cloud-based solution for ease of administration and generation of required reports. The survey was voluntary and the identity of participants was kept anonymous. The data was stored in an online secure account and was only accessible with administrative privileges. The administrative privileges to access survey response data resided only with the case study researcher. The data was stored until the end of the study.

The survey gathered demographic information as to grade level, subject (if applicable), years of teaching experience at Universal American School and total years of teaching experience. The survey gathered details on knowledge, motivation and organizational aspects with regards to use of technology in classrooms. Data was collected in the forms surveys, interviews, observations and document analysis. Surveys were sent to 143 teachers.

Interviews. In-depth interviews with six teachers and three administrators were conducted to gather qualitative data. The interview was based on open-ended questions to gather details on the knowledge, motivation and organizational aspect of lack of technology use in classrooms. Additional questions to gather details on any specific technology that may be regarded as helpful for classroom instruction, assessing the level of technology proficiency at the time of recruitment and methods to evaluate the use of technology in classrooms were included as part of the interviews.

Observations. Classroom observations were divided into three parts. The first part of the observations was conducted ten minutes prior to the start of the class to gather details on the nature of activity being performed for technology setup. The second part was the teacher and student interaction during the class session to gather details on what kind of technology is used

and how it is used. The third part was observation of the activity of troubleshooting of technology during class session when applicable.

Documents. To triangulate the data and validate the findings, documents such as feedback forms from prior technology workshops, prior teacher evaluations by technology integration specialists in the use of technology, technology reports sent to leadership of the school, faculty meeting minutes were used to gather relevant data.

Table 2

Gap Analysis Validation Method Worksheet

Assumed Cause	Survey/ Assessment	Interview	Observation	Document/ Artifact
Knowledge				
Lack of knowledge about the technology proficiency standards for the school (6 teacher competencies)	I am able to list the technology proficiency standards at UAS	Can you please elaborate on the technology proficiency standards of UAS?		Review any existing documents outlining the technology proficiency standards of the school
Lack of skills in how to integrate technology into classroom activities	A survey question to identify the level of confidence in using the various technologies in the classroom		Observations during class sessions to observe the nature of instructional activity with technology	
Lack of knowledge how to use which technology for what classroom activity	I know how to classify the technology activities into the appropriate technology proficiency standards	How do you make a determination of which technology to be used for the required classroom activity?	Observations during class sessions to identify which technology is being used when	

Table 2, continued

Assumed Cause	Survey/ Assessment	Interview	Observation	Document/ Artifact
Motivation				
Teachers do not choose to attend technology workshops	I learn a lot from the technology workshops	Do you find the technology workshops useful?	Observations during technology workshops to determine the attendance and activity in the workshop sessions	
Teachers are not willing to put the mental effort to learn how to integrate technology into the classrooms	I make a consistent effort to implement the knowledge gained from technology workshops	What are the barriers that you face when attempting to use technology in classrooms?		
Due to the rapid pace of technology updates teachers are not willing to apply the necessary mental effort to master the available technology	I am not interested in mastering the technology proficiency standards	Do you find the introduction of new technology very frequently deters you from learning the use of technology in classrooms?		
The length of the employment contract (2 years) deters them from learning any new technology effectively	I am not interested in learn new technology as the I intend to stay only for the length of my employment contract (2 years)	Do you find the length of the employment term to be de-motivational factor in your attempts of mastering technology?		Review of documents provided to teachers at the time of recruitment

Table 2, continued

Assumed Cause	Survey/ Assessment	Interview	Observation	Document/ Artifact
Organization				
Lack of adequate professional development	I get adequate professional development for use of technology as per the required technology proficiency standards	Do you get the adequate level of professional development opportunities in the area of use of technology in classrooms?		
Lack of technical support during class periods	I am provided with adequate technical support to use technology effectively in classrooms	Do you get adequate level of technical support for the effective use of technology in classrooms?	Observations during class time to identify the level of technical support available for teachers	
Lack of clear communication by leadership on the expectation of the use of technology	I am clear on the expectations on the use of technology set by the leadership of the school	Do you have clear expectations from leadership in terms of the use of technology in classrooms?	Observations during faculty meetings on discussion of technology	Review of the school technology plan document
Lack of incentives for effectively using technology in classrooms	I am provided with incentives for effective use of technology in classrooms	Are you provided with additional incentives to use technology effectively in classrooms?		
Lack of evaluation methodologies to measure the use of technology in classrooms	I am aware of evaluation methodologies for the measuring the use of technology in classrooms	Are you provided with a good understanding of how you will be evaluated in the use of technology in the classrooms?		Review of any teacher evaluation documents in the use of technology
Lack of assessment of prior technology skills	I have been assessed on my technology skills prior to my start date	Do you think prior assessment of technology proficiency of teachers will be a good practice during the hiring process?		

Data Analysis

The quantitative data collected from the surveys was analyzed using Microsoft Excel to calculate mean, median, mode, variance and standard deviation. Frequencies and common themes categorized into knowledge, motivation and organization were analyzed. When coding whether the gap is caused by lack of knowledge and skills, types of knowledge were categorized as factual, procedural, conceptual, and metacognitive knowledge. When assessing whether there is a lack of motivation, items addressing active choice, persistence and metal effort, variables associated with motivation were looked at in terms of interest, self-efficacy, attributions, and goal orientation. For organization and culture, policy procedures, resources, values and culture were analyzed.

For the qualitative data collected through interviews, the text of the transcripts were coded using symbols that represent the categories of knowledge and skills, motivation and organization to capture and analyze relevant information and identify causes. The qualitative data gathered through observations were categorized into the three gaps of knowledge, motivation and organization. The qualitative data collected through document analysis provide a comprehensive way to compare what is learned through observations, the survey, and the interviews.

CHAPTER 4

RESULTS AND FINDINGS

One of the goals for Universal American School (UAS) is for all students, upon graduation, to be proficient in the 21st century problem solving skills utilizing technology. In order for students to be proficient in the use of technology in accordance with the standards, the teachers at Universal American School need to be proficient in the use of existing technology for instructional purposes. The aim of this research study was to identify the causes for the lack of use of technology by teachers in classrooms and to recommend solutions to increase the use of technology by teachers in classrooms. The Clark and Estes (2008) Gap Analysis Process Model served as the framework for the project. The model identifies whether the lack of use of technology in classrooms by teachers is caused by lack of knowledge, motivation or cultural/organizational barriers.

The methods used in this study to gather data for analysis were a mix of qualitative and quantitative data by means of a teacher survey, interviews, classroom observations and document analysis. An electronic survey was sent to 143 teachers, of which a total of 59 survey responses were received. Two groups were identified based on the analysis of survey responses according to the level of usage of technology. A total of six interviews were conducted, with three from each group identified based on the survey responses. Three classroom observations were conducted as a follow-up to the interviews. The document analysis involved reviewing the appraisal document used by the administration as a way to assess the level of technology integration in the classroom. The document analysis was conducted prior to the interviews. The results of survey and data analysis of interviews and classroom observation were organized by the categories of the assumed causes: knowledge, motivation and organization.

Participating Stakeholders

The teachers of Universal American School from grades (K-12) were the main stakeholders from whom the data were collected to validate the assumed causes. The teachers interviewed and observed in the classrooms were from both elementary (K to 6) and secondary (7 to 12). Of the total number of survey respondents, 74% (44) were female and 26% (15) were male. The years of teaching experience of the respondents varied from zero to over twenty years, with 22% (13) in the five years or less category, 44% (26) in the six to ten years category, 15% (9) in the eleven to fifteen years category, 5% (3) in the sixteen to twenty years category, 14% (8) in the twenty plus years category. Three administrators were interviewed to address case study question 4 on how teachers were evaluated on the use of technology.

Case Study Question: What are the knowledge, motivation, and organization barriers that might prevent teachers at Universal American School from the use of technology in classrooms?

In order to assess the barriers that prevent teachers at Universal American School from using technology for instructional purposes in the classroom, a mixed-method study involving surveys, interviews and classroom observations was conducted. The survey was designed to assess the lack of knowledge, motivation and organizational factors for all the three main technologies provided by the school to be used in the classrooms by teachers and students, namely the interactive white boards (smartboards), the learning management system (portal) and the mobile devices (laptops and tablets). The knowledge was further categorized by the four types of knowledge: factual, conceptual, procedural and metacognitive.

The survey included questions on knowledge about the technology proficiency standards for teachers and students at Universal American School. The survey had questions to assess knowledge of the available online software subscriptions provided by the school and to assess

the use of this software. The concluding questions of the survey assessed the choice of preferred technology (among the three main technologies provided by the school) for instructional activity by teachers and to identify whether there is preference for a laptop over a tablet or for a MAC over a PC device. The following tables present the demographic and professional characteristics of the survey and interview respondents.

Table 3

Survey Respondents (Teachers)

Gender		
Male		15
Female		44
	Total	59
Grade Level		
Grade 4		7
Grade 5		3
Grade 6		4
Grade 7 -12		45
	Total	59
Years of Teaching Experience		
0 - 5		13
6 - 10		26
11 - 15		9
16 - 20		3
20 Plus		8
	Total	59

Subject		
English		10
Science		7
Social Science		7
Arabic/AFL		2
Language		2
ICT		3
Math		6
Performing Arts		5
P.E.		3
Other		11
Elementary (Grade 4 - 6)		3
	Total	59

Table 4

Interview Respondents (Teachers)

Gender		
Male		2
Female		4
	Total	6
Grade Level		
Grade 4		2
Grade 7 -12		3
Grade 9-12		1
	Total	6
Years of Teaching Experience		
0 - 5		2
6 - 10		3
11 - 15		1
16 - 20		
20 Plus		
	Total	6

Subject		
Performing Arts		2
Elementary (Grade 4 - 6)		1
Science		1
Other		2
	Total	6

Table 5

Interview Respondents (Administrators)

Gender		
Male		2
Female		1
	Total	3

Years of Teaching Experience		
0 - 5		
6 - 10		
11 - 15		
16 - 20		2
20 Plus		1
	Total	3

The survey was conducted using a five-point Likert scale. In response to the statements on the survey, teachers indicated their responses as “very well”, “somewhat” or “not at all”. The coding of the answer choices were represented with “very well” as 5, “somewhat” as 3, and “not at all” as 1. Of the 59 responses, the survey results were analyzed to form two groups: one that used technology frequently for instructional purposes in the classroom and one that did not use technology as needed for instructional purposes in the classroom.

A total of six interviews were conducted with two teachers from the group that used technology frequently and four teachers from the group that did not use technology as needed. Two teachers from the group that used technology were not able to commit to the interview schedules. Additionally, three classroom observations of teachers from the group that did not use technology as needed were conducted to gather details on how many times technology was used and the specific tasks that were done using technology. The observations lasted for thirty minutes during the allocated fifty minute class period. Lastly, two administrators were interviewed to identify how teachers were evaluated on the use of technology to answer case study question 4.

Results and Findings for Knowledge Causes

Findings from the Survey

In the survey, knowledge was assessed based on the learning taxonomy and grouping the statements into the four categories of knowledge: factual, conceptual, procedural and metacognitive. Factual knowledge was confirmed by asking teachers questions regarding knowledge of technology proficiency standards for teachers and students, basic operational knowledge of smartboards, using learning management systems, and available online subscriptions. Conceptual knowledge was assessed by statements on operations of the smartboard software when needed, using the learning management system for posting lesson

plans, homework assignments and news announcements as needed. In order to identify the procedural knowledge of teachers using the technology, statements on operational procedures of specific tasks on smartboards and learning management system were included. Metacognitive knowledge was assessed by asking teachers about the use of specific features of smartboards and the learning management system and about when students were allowed to use mobile devices in the classroom.

Table 6 summarizes the results corresponding to the statements of knowledge for all technology. The highest means, 4.27 and 3.84, was for statements on factual knowledge corresponding to learning management system, followed by 3.45 for smartboards, then by 3.43 for online subscriptions. The lowest means, 2.49 and 2.40, were for factual knowledge on statements corresponding to technology proficiency standards for teachers and students, respectively. For procedural knowledge, the highest mean, 3.92, was on the statement for learning management system with lower means of 2.55 and 2.10 for statements on smartboards. For metacognitive knowledge, the highest mean of 3.28 was on the statement regarding when to use mobile devices in the classroom, followed by the mean of 3.11 for the statement of use of specific function on the learning management system. Overall, the teachers scored higher on all four types of knowledge for learning management system than for smartboards, meaning that they knew more about the learning management system than they did about smartboards and allowing students to use mobile devices in classrooms. The lowest factual scores corresponded to the lack of knowledge of technology proficiency standards for students and teachers.

Table 6

Knowledge Statements, Types of Knowledge, Technology Category, Mean and Standard Deviation (Descending Order by Mean)

Statement	Type of Knowledge	Technology Category	M	SD
Familiar with posting class announcements	Procedural	Learning Management System	4.27	1.03
Familiar with organizing resource folders	Procedural	Learning Management System	3.92	1.30
Familiar with posting homework assignments	Procedural	Learning Management System	3.84	1.30
Familiar with basic operational functions	Procedural	Smartboards	3.45	1.02
Awareness of online subscriptions	Factual	Online Subscriptions	3.43	1.09
Posting class announcements	Procedural	Learning Management System	3.39	1.54
Manage the use of mobile devices in classrooms	Metacognitive	Mobile Devices	3.28	1.31
Use of discussion boards	Metacognitive	Learning Management System	3.11	1.48
Use of online subscriptions in classrooms	Metacognitive	Online Subscriptions	3.07	1.30
Familiar with Smart Notebook Software	Conceptual	Smartboards	2.85	1.21
Using Smart Notebook software to create interactive lesson plans	Procedural	Smartboards	2.55	1.26
Technology proficiency standards for students	Factual	Proficiency Standards	2.49	1.34
Technology proficiency standards for teachers	Factual	Proficiency Standards	2.40	1.17
Familiar with recording feature	Procedural	Smartboards	2.10	1.26

Findings from Interviews

The interview questions were separated by the various technology categories (smartboards, learning management systems, mobile devices, online subscriptions and technology proficiency standards for teachers and students). Teachers were asked to elaborate on the features of smartboards they find useful for instructional purposes in the classrooms and all the teachers interviewed were able to identify features that found useful. Four out of the six referred to it as a "valuable tool" in the classroom.

Teachers were asked to describe the challenges they faced in using the smartboards, and one of the teachers stated that "learning a new technology is always a challenge at the beginning" and this theme was identified in the responses of the other teachers as well. Five of the six teachers conveyed in their responses that they have the basic level of knowledge for the operations of the smartboards and what they need is the knowledge to use the more advanced features of the smartboards. In response to the question regarding which new features they had learnt this year, all of the teachers responded that they had not learnt any new features by themselves or through having them demonstrated to them. This suggests that they have not been shown any new features that they could use in the classroom.

All the teachers responded with specific examples to narrate the usefulness of the learning management system as a tool to enhance communication with students and parents along with sharing and distributing learning resources. The responses suggest that the learning management system is used in many different ways that benefit the teachers in their instructional activity in the classroom.

When asked to describe the challenges, two teachers responded by saying that "the user interface of the portal needed improvement to make it more user-friendly" and one teacher

mentioned “the need for more formal professional development at the beginning of the school year”. Given that the learning management system is specific to Universal American School, it needs dedicated training time allocated during the teacher orientation week at the start of the school year.

When teachers were asked to describe the new features they learnt this year, four teachers identified the new features and functionality that were added to the learning management system this year. Overall, the teachers had a positive reference about they experience or had heard from their peers and students about the new features of the portal.

All six teachers responded with no knowledge of the technology proficiency standards for teachers and students at Universal American School. This seemed to be an area where all the teachers displayed the same level of lack of knowledge or awareness of the technology proficiency standards for teachers and students.

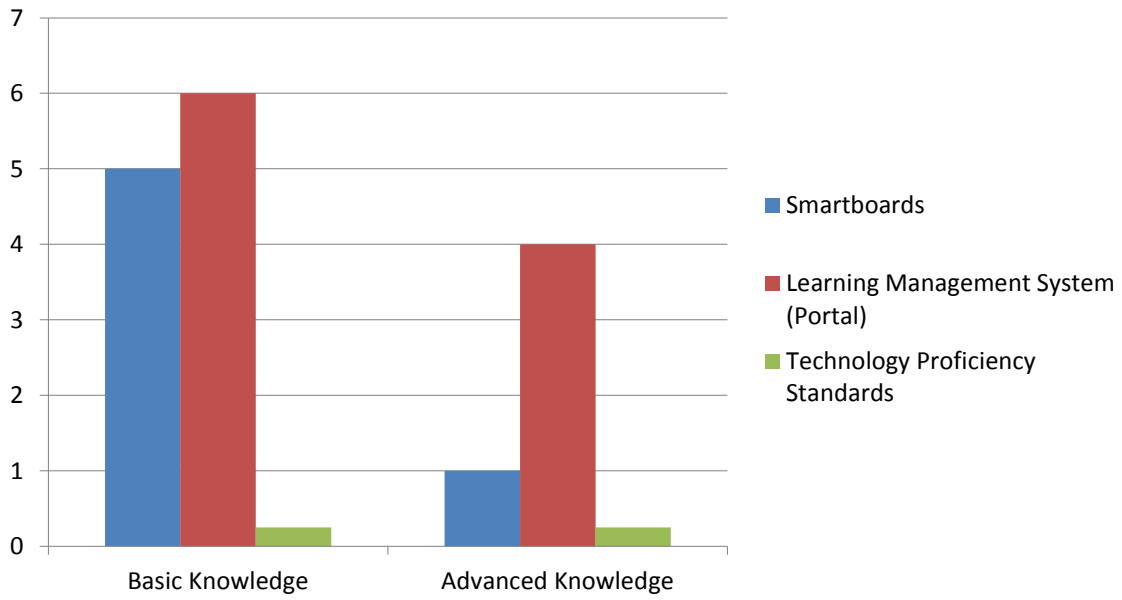

Figure 2. Visual representation of interview findings highlighting the difference between basic and advanced level of usage of all three technologies

Findings from Observations

The classroom observation protocol was structured in such a way as to track the number of times the technology was used and categorize the various tasks performed with technology. There were items on the classroom observation protocol to track the number of technical support issues that resulted during the operation of the technology in the classroom and the number of times the information technology department had to be called for assistance. During all the three classroom observations done during the thirty minutes, the basic features of the smartboard were used more than five times, and the advanced features were used three times. This suggested that teachers had the knowledge to use the basic features of the smartboard.

The learning management system was used to access learning resources, and it was used three times. Videos and other animated presentations downloaded from publicly available sites such as YouTube were accessed from the shared network drives as part of the instructional process. During one of the classroom observations, out of seventeen students, ten students (60%) had laptops and iPads in front of them on their tables. The students frequently took notes and used the Google search engine to access information as the instructor introduced terms and concepts during the instruction. There were no technology support requests made during the period of the observation.

Findings from Document Analysis

The document analysis was conducted prior to the interviews. The document analysis consisted of reviewing the document used by administration along with the technology integration coordinator to assess the level of technology integration in the classroom by teachers. The sample document collected had five different categories to categorize the level of technology integration by teachers. This document was adapted from Sandholtz, Ringstaff and

Dwyer's (1997, 2008) five stages in technology integration. The assessment was performed two times a year and individualized goals would be set for every teacher to progress from his/her baseline assessment to the next level. Based on the interviews with administration, this assessment was yet to be a formal part of the appraisal process, as it was considered to be in a conceptual stage waiting to be approved by the leadership of the school.

Synthesis of Results and Findings for Knowledge Causes

Based on the survey results, the responses with the lowest means were those measuring factual knowledge of the technology proficiency standards for teachers and students. It was evident in the responses during the interviews that teachers did not have any knowledge of the technology proficiency standards for teachers and students at Universal American School. The survey and interview responses revealed that the teachers lacked procedural skills for the use of the advanced features of the smartboards. The analysis of the responses of the surveys indicating the lower measures for the mean and responses to the interview questions confirmed the teachers' lack of metacognitive skills for the use and management of mobile devices and the advanced features of the learning management system as part of their instructional practice in the classrooms.

Results and Findings for Motivation Causes

Survey Results

Motivation was assessed in the survey by including statements about teachers' value, interest, self-efficacy and attributions to the use of technology for instructional purposes in the classroom. Teachers' value was assessed by statements about how important they feel that the smartboards and the learning management system are for classroom instructional activity. Interest was measured by statements seeking to understand how often they use the particular

technology features of smartboards and learning management system. Self-efficacy is an indicator to identify whether teachers will persist if they face a challenge. Self-efficacy was measured by statements to find out how often teachers took the time to learn new features of the smartboards on their own and whether they would attend the professional development workshops to learn more about the portal. Statements for assessing attribution included how often teachers felt overwhelmed when it came to learning new features on smartboards and the learning management system.

Table 7 summarizes the results for statements measuring motivation. In addition, the table indicates what was measured: value, interest, self-efficacy, and attribution. Among the statements that measured value, the statement with a mean 3.05 was highest for smartboards, then followed by mobile devices, and by learning management system. For statements that measured interest, the range of the mean was between 3.32 and 1.61 with statements that have higher means for learning management system than smartboards. The statements measuring self-efficacy had a higher mean of 2.59 for the learning management system when compared to smartboards. The results for statements measuring attribution suggested that teachers had found it more difficult to use smartboards than the learning management system which had a higher mean of 3.09.

Table 7

Motivation Statements, Types of Measure, Technology Category, Mean and Standard Deviation (Descending Order by Mean)

Statement	Type of Measure	Technology Category	M	SD
How frequently do you post class announcements on the portal	Interest	Learning Management System	3.32	1.17
To what extent do you feel overwhelmed when it comes to learning new features of the Smart Notebook software	Attribution	Smartboard	3.09	1.32
To what extent do you find Smartboards to be an important aspect of your classroom instructional activity	Value	Smartboard	3.05	1.29
To what extent do you encourage the use of mobile devices for classroom activities	Value	Mobile Devices	3.00	1.40
To what extent do you consider the portal to be an important tool for classroom instruction	Value	Learning Management System	2.97	1.38
How frequently do you upload lesson plans and other learning resources to the portal	Interest	Learning Management System	2.90	1.47
How often do you post homework assignments to the portal	Interest	Learning Management System	2.77	1.51
To what extent do you attend the professional development workshops for the use of the Smartboards	Self-Efficacy	Smartboards	2.76	1.18
To what extent do you attend the professional development workshops for the use of the portal	Self-Efficacy	Learning Management System	2.59	1.31
To what extent do you use the Smart Notebook software to create interactive lesson plans	Interest	Smartboards	2.34	1.26
How often do you take the time to learn new features of the Smart Notebook software on your own	Self-Efficacy	Smartboards	2.19	1.14
How frequently do you use the discussion board feature of portal for online discussion with students	Interest	Learning Management System	2.03	1.24
To what extent do you use the recording feature of smartboards to record lesson plans for students to access later	Interest	Smartboards	1.61	1.12

Findings from Interviews

In response to the question of what new features of smartboards they learnt this year, all of the teachers responded that they had not learnt any new features by themselves or through having these demonstrated to them. This suggests that they have not had the intrinsic motivation to learn any new features on their own.

When teachers were asked about the challenges they faced in the use of the learning management system, two out of the four teachers from the group that did not use technology as much cited technical difficulties as being the main reason for the lack of motivation to use the learning management system. One of them was quoted saying "I just want something that works". Two of the teachers also mentioned that parents and students often complained about having technical difficulties in accessing the learning management system, and this also contributed to the lack of motivation.

All six teachers responded favorably when asked their views about allowing students to bring their mobile devices to the classroom. However, two teachers felt that it may not be suited for the elementary classes, and it would require more direct supervision by teachers for the use of the mobile devices in the classroom for instructional activities.

Findings from Observations

During all the three classroom observations conducted during the thirty minutes, the basic features of the smartboard were used more than five times and the advanced features were used three times. This suggested that teachers were motivated to use the smartboard in the classroom for instructional purposes. With regards to the usage of mobile devices in the classroom, the observation suggested that, although students were using them as tools for their personal learning, these were not considered for interactive exercises during instructional time in the

classroom. During one of the observations, the teacher experienced minor technology related issues with the animation not being displayed properly; however, this did not deter the teacher from using any technology for the rest of the observation period.

Synthesis of Results and Findings for Motivation Causes

The survey results indicate that the teachers show a lack of interest in attending the professional development workshops. The survey responses to statements regarding how overwhelmed teachers felt when trying to learn new features of the smartboard had high mean scores, indicating low motivation. The interview responses revealed that none of the teachers interviewed had learned any new features and, when further questioned, their response was they had not been shown any new features. This confirms very low self-efficacy and a lack of self-motivation on the part of teachers.

The higher mean scores of the survey statements regarding the value of technology confirm that the teachers value technology as an important aspect of their instructional practice. Additionally, the responses to the interview question about their openness to encourage students to bring mobile devices during classroom instruction indicated that teachers do value the impact that can mobile devices can have in the classroom.

The survey statements that measured the means for the learning management system combined with the interview responses indicated that the teachers did consider the learning management system to be valuable and confirmed the interest in the use of the learning management system as part of their instructional practice in the classroom. One of the suggestions provided as part of the interview response was to have one-on-one sessions for professional development rather than a large group in a classroom. The larger group professional

development sessions could be the reason that teachers are not interested in attending the professional development workshops.

Results and Findings for Organization Causes

Survey Results

In order to assess the organizational gaps in the survey, the teachers responded to statements about the extent to which they were provided with professional development opportunities to learn about the technologies and technical support, expectations from leadership about the intended use of the technologies, incentives to increase the usage of technologies and asking for recommendation of a peer learning group to support the learning process. The statement with highest mean, 3.40, was that regarding leadership expectations and goals being set for the use of the learning management system followed by expectation set for mobile devices and then by expectations for smartboards. The statements for assessing the level of IT support had a higher mean, 3.16, for the learning management system than smartboards. The statements assessing the professional development opportunities for both smartboards and learning management system had the same mean, 2.79. Overall, based on the mean scores, the data suggested that there was better organizational support for learning management system than for smartboards. Table 8 summarizes the results for statements for culture and organization.

Table 8

Statement Results for Culture and Organization Category, Mean and Standard Deviation (Descending Order by Mean)

Statement	Technology Category	M	SD
To what extent do you feel that leadership has set goals for use of the portal	Learning Management System	3.40	1.12
To what extent are you provided with IT support for the use of the portal	Learning Management System	3.16	1.07
To what extent do you recommend having a peer learning group to help you in the use of Smartboards in classrooms	Smartboards	3.02	1.27
To what extent do you recommend having a peer learning group to help you in the use of portal in classrooms	Learning Management Systems	2.89	1.15
To what extent are you provided with professional development for the use of the smartboards	Smartboards	2.79	1.10
To what extent are you provided with professional development for the use of the portal	Learning Management Systems	2.79	0.99
To what extent are you provided with IT support for the use of smartboards in classrooms	Smartboards	2.60	1.21
To what extent do you feel that leadership has set expectations for use of the mobile devices	Mobile Devices	2.49	1.31
To what extent do you feel that leadership has set goals for use of the smartboards	Smartboards	2.47	1.17
To what extent do you feel you are provided with incentives from the leadership team for the use of the portal	Learning Management System	2.42	1.25
To what extent do you feel you are provided with incentives from the leadership team for the use of the Smartboards	Smartboards	2.15	1.17

Findings from Interviews. When asked about ways that could help increase the use of smartboards, two of the four teachers from the group that did not use technology as much responded by saying that modeling the use of advanced features by experts or the heads of department would be very useful. Overall, the responses from all the teachers suggest that more professional development with a particular focus on the advanced features of the smartboards is needed. Teachers shared the view that leadership needed to set clear expectations on the use of smartboards' advanced features. One of the teachers stated that having administrators performing classroom observations strictly for the use of advanced features would be helpful.

When asked about the challenges faced in the use of the learning management system, two teachers mentioned the need for on-going professional development of the learning management system during the course of the school year. When asked about improving usage of learning management system, one of the responses was having leadership set clear expectations and guidelines in the use of the portal. The responses referring to the technical difficulties faced by teachers in the use of the portal suggested that more technical support is required to increase the use of the portal.

With regards to the viewpoint of allowing students to bring mobile devices to classrooms, the general consensus among teacher responses was that having a secure network and physical environment was an important prerequisite.

Findings from Observations

During the three classroom observations, there was only one occurrence of the teacher experiencing difficulty with one of the animations that were downloaded as a learning resource for demonstration of the concepts taught. However, that occurrence did not stop the teacher from

proceeding with the planned activities for the rest of the class. There were no requests for technical support made during the three classroom observations.

Findings from Document Analysis

Based on the document sample submitted by the administration to illustrate assessment of levels of technology integration in classrooms by teachers the leadership took steps to ensure that technology integration in the classroom for instructional purposes was part of the strategic plan.

Synthesis of Results and Findings for Organization Causes

The lower mean scores on the survey results indicate that leadership did not set clear expectations on the use of technology in general. Of the three main technologies, the lower scores were evident for smartboards and mobile devices. Hence, there are no clear goals on what is to be achieved through the use of these technologies.

The interview responses confirmed the need for focused professional development opportunities to increase the use of the advanced features of smartboards and the learning management system. There were many suggestions provided during the interviews regarding how professional development opportunities can be improved to bring about the necessary adoption of technology usage in the classrooms. Based on the survey responses, the lack of technical support provided to teachers during the use of technology in the classrooms is considered another key factor in the organizational setup for the lack of use of technology by teachers in the classroom for instructional purposes.

Lack of incentives from leadership was also confirmed as one of the main reasons for the lack of use of technology in the classrooms. The survey responses and the answers to the interview questions showed that collaboration among peer support groups could increase technology usage in the classrooms.

Summary

The following section summarizes the gaps in knowledge, motivation and organizational setup found by triangulation of data gathered through surveys, interviews, observations and document analysis.

Knowledge and Skills

The survey and interviews confirm the teachers' lack of factual knowledge of technology proficiency standards for students and teachers. The survey and interview responses revealed that the teachers lacked procedural skills for the use of the advanced features of the smartboards. The analysis of the responses to the surveys indicating the lower measures for the mean and responses to the interview questions confirmed the teachers' lack of metacognitive skills regarding the use and management of mobile devices and the advanced features of the learning management system as part of their instructional practice in the classrooms.

Motivation

The survey results indicate that the teachers show a lack of interest in attending the professional development workshops. The survey responses regarding how overwhelmed teachers felt when trying to learn new features of the smartboard had high mean scores, indicating low motivation. The interview responses revealed that none of the teachers interviewed had learned any new features and, when further questioned, their response was they had not been shown any new features. This confirms very low self-efficacy and a lack of self-motivation on the part of teachers.

Organization

The survey responses combined with the answers to the interview questions confirmed that the leadership did not set clear expectations on the use of technology in the classroom for

instructional practices. Lack of professional development opportunities were stated in the interview responses and also indicated by the lower measures of the mean for the survey responses. Suggestions for improvement to the professional development methodologies were provided by teachers during the interviews.

Lack of incentives from leadership was also confirmed as one of the main reasons for lack of use of technology in the classrooms. Based on the survey responses, the lack of technical support provided to teachers in the use of technology in the classrooms was also validated as one of the reasons. Finally, the survey responses and the answers to the interview questions showed that the lack of peer support groups among teachers was another major factor in the organizational setup for the lack of use of technology use for instructional purposes.

Table 9

Summarizes the List of Validated Causes from the List of Assumed Causes from Table 2 for Knowledge, Motivation and Organizational Culture

	Validated Causes
Knowledge	Lack of factual knowledge of technology proficiency standards for teachers and students
	Lack of procedural skills in the use of technology in classrooms
	Lack of metacognitive skills in the use of the appropriate technology in the classrooms for the designated activity
Motivation	Lack of interest in attending professional development workshops
	Lack of self-efficacy in learning new technologies
Organization Culture	Lack of clear communication by leadership on the expectation of the use of technology
	Lack of adequate professional development
	Lack of incentives for effectively using technology in classrooms
	Lack of technical support during class periods
	Lack of peer support groups

Case Study Question: What are the recommended solutions to close the knowledge, motivation, and organization gaps that prevent teachers at Universal American School from achieving their goal of being proficient in teaching 21st century skills using technology?

The recommended solutions to close the knowledge, motivation and organization gaps are discussed in further detail in Chapter 5.

*Case Study Question***:** What technologies are being used by teachers in the classrooms?

Based on the analysis of the survey and interview questions, the technologies that are used by teachers, in order of preference, are smartboards, mobile devices and learning management system. Based on the survey responses, the top three online resources that are favored by teachers are Brainpop, EBSCO and RAZ Kids. Teachers prefer having both laptops and iPads as mobile devices to be provided by the school. Sixty percent of the teachers surveyed prefer an Apple Mac laptop over a PC laptop.

*Case Study Question***:** How is the use of technology being evaluated in the classroom setting?

Based on the interview responses of the administrators at Universal American School, there are classroom observations conducted and a model to assess the stages of technology integration in the classroom. The use of smartboards is assessed by reviewing the smart lesson plans during classroom observations and the use of various features of the smartboard, ranging from basic to advanced. Use of the learning management system is assessed by the reports it generates that provide details on the number of learning resources, lesson plans, announcements, and homework assignments posted by teachers.

The feedback from parents is also taken into consideration as part of the usage assessment. The mobile devices have been a recent introduction and, hence, evaluation methodologies are under development.

In order to evaluate the use of technology at Universal American School, Kirkpatrick's (2006) four levels of evaluation were used to determine whether the solutions, in fact, lead to the desired goal. This framework is presented in further detail in Chapter 5.

CHAPTER 5

SOLUTIONS

The Clark and Estes (2008) Gap Analysis Process Model was used as a guide and framework to help Universal American School reach its goal of increasing teachers' use of technology instructional activities in the classroom. Following the gap analysis model, Universal American School identified the goal of narrowing the gap between the desired outcome and current performance. Scanning interviews and observations helped identify potential causes of the gaps and, along with previous research, literature guided the construction of a survey and a set of questions to test potential causes of the gap. The gaps were identified through teacher surveys, teacher interviews and classroom observations. This chapter identifies potential solutions Universal American School may adopt in order to reach the goal of increasing teachers' use of technology for instructional activities. This chapter offers suggestions to the school in the process of implementation of the solutions. The following chapter discusses how to evaluate the solutions in order to ensure these are, indeed, helping to close the identified gaps.

Validated Causes Selection and Rationale

All of the validated causes summarized in Table 9 of Chapter 4 mentioned under the categories of knowledge, motivation and organization based on the Clark and Estes (2008) gap analysis model were selected to provide solutions for the causes. All of the validated causes are interconnected and hence providing solutions for all of them in an integrated manner will have a significant impact on achieving the goals of the organization.

Solutions for Knowledge Causes

Increasing Factual Knowledge of Teachers About the Technology Proficiency Standards for Teachers and Students

The first validated cause for the teacher knowledge and skills gap is lack of knowledge regarding the technology proficiency standards for teachers and students adopted at Universal American School. Anderson and Krathwohl (2001) described factual knowledge as knowledge of specific information and details. Teachers' lack of awareness of the technology proficiency standards represents a factual knowledge gap. Teachers cannot help students achieve technology proficiency standards if they do not know what these are at Universal American School.

Increasing factual knowledge of teachers about the technology proficiency standards for teachers and students can be achieved by dissemination of the information during orientation, by creating awareness during the course of the school year at various teacher professional development sessions, and sharing of the information through a centralized data repository. Daugherty et al. (2008) asserted that changes in the curriculum can be advanced through establishment of sound educational goals and outcomes. Once the teachers value the role of technology in the advancement of student learning outcomes, teachers will adopt the technology proficiency standards and engage in applying them in their instructional practices. Teachers can be provided with the technology proficiency standards during the orientation day, and these can also be made available for discussions during the school year's scheduled professional development days. This idea has been implemented in the Salem K-12 district (Cannistraci, 2011).

According to the study by Saavedra and Opfer (2012), using technology to enhance collaboration activity among teachers can aid with increasing their factual knowledge about the

technology proficiency standards for students and teachers. The concept of deploying a digital repository was emphasized in the study by Saavedra and Opfer (2012) to promote collaboration among teachers and as way to model this behavior among students as well. As posited in the study by Polly (2011), teacher participation in activities for development of technology-based instructional resources deepens their understanding of the technology standards and, hence, improves the factual knowledge acquisition process.

Increasing the Procedural Skills of Teachers on How to use Technology in Classrooms

Anderson and Krathwohl (2001) defined procedural knowledge as the sequence of steps and decisions that must be made in order to achieve the problem or learning objective. For this type of learning gap, teachers need to engage in constructivist learning through activities that support the construction of meaning (Anderson & Krathwohl, 2001). Mayer (2011) provides examples of constructivist/meaningful learning that engages the learner in activities that take him/her through the step-by-step process. The activities build upon what the learner already knows and allow the learner to build new knowledge from existing knowledge. It is only when teachers reinforce their learning by applying the knowledge they gained in their daily instructional activities that they will become proficient at the use of technology. Research focused on supporting teachers' learning related to technology integration found that teachers are more likely to develop knowledge and skills associated with technology when learning addresses technology, content and pedagogy (Mishra & Koehler, 2006).

In the context of teacher learning, teachers would be expected to gain a deeper understanding of content and pedagogies when they create or build artifacts related to their learning. For example, teachers could create interactive lesson plans using the smartboard software, interactive assessments using the tools available in the learning management system,

and learn to incorporate some of the advanced features of the smartboards to make the instructional session more engaging for the students. This constructionist paradigm of increasing the procedural skills of teachers in the use of technology has been advocated by Polly (2011).

Increasing the Metacognitive Skills of Teachers in the Appropriate Use of Technology in the Classrooms for the Designated Activity

Research suggests that metacognitive knowledge plays a critical role in being successful at learning. Schraw (1998) defined metacognition as knowledge of cognition and regulation of cognition. Knowledge of cognition refers to the students' knowing about their cognition in general. He also suggested that metacognition is teachable. Schraw (1998) identified three types of cognition: declarative, procedural, and conditional. Declarative knowledge is "knowing" about things. This includes knowing about oneself as a learner and what factors influence one's performance. Students who know what factors influence their performance appear to have more knowledge about different aspects of memory such as capacity limitation, rehearsal, and short study sessions (Schraw, 1998). The second type of cognition is procedural knowledge, which Schraw (1998) defines as knowing how to do a task. Students with high procedural knowledge are able to perform a task automatically without having to think of each step. In addition, students with high procedural knowledge are more likely to be familiar with many different strategies, and they know how to sequence strategies. These students tend to integrate and categorize new information. The third type is conditional knowledge: "knowing" the why and when (Schraw, 1998). Conditional knowledge is being able to use declarative and procedural knowledge together. Conditional knowledge is important because it helps students choose their resources and use strategies more effectively. This type of knowledge also helps students adjust to different types of situation demands of a specific learning task (Schraw, 1998).

The second aspect of metacognition, according to Schraw (1998), is regulation of cognition, which refers to a set of activities that aid students in controlling their learning. Research supports the idea that metacognitive regulation improves performance and helps students use resources appropriately by using existing strategies (Schraw, 1998). Students reported significant improvement in learning regulatory skills and understanding how to use these skills when they are included as part of the classroom instruction (Schraw, 1998). The essential aspects that make up regulating skills are planning, monitoring, and evaluation. Planning is selecting the appropriate strategies and the resources that affect performance. This includes making predictions before reading, strategy sequencing, and allocating time to learning. Monitoring is the awareness of comprehension and task performance. This includes self-testing to make sure one understands the intended task (Schraw, 1998). Evaluation is the act of reviewing the end product and the efficacy on one's learning. Usually, this is when students re-evaluate their goals and conclusions. Once teachers have the factual, conceptual and procedural knowledge, then it is important for them to know which technology to use for the designated instructional activity. For example, when engaging in a classroom lecture, the interactive whiteboard (smartboard) will be the preferred choice. When engaging in classroom activity involving multiple students, having them use their mobile devices to access the relevant task activity from the desired online resource or the learning management system would be the preferred choices.

Solutions for Motivation Causes

Increasing Interest in Attending Professional Development Workshops

As per the expectancy value theory (Eccles & Wigfield, 2002), motivation is influenced by a person's expectancy for success and value for the task. Value is a strong predictor of active

choice and expectancy is a strong predictor of achievement once the choice has been made. In order for teachers to feel motivated to attend the professional development workshops to learn the use of technology, they need to value the use of technology during instructional activities and have the belief that this use can increase student learning. The professional development workshops have to be relevant for teachers to address their challenges and needs on a daily basis. The teachers have to find value in attending the professional development workshops.

As per Bandura (1997), individuals can acquire much information about their capabilities through knowledge of how others perform. Comparison with a peer is a cue for gauging one's self efficacy (Schunk, 1995). Based on this principle, observing peers succeed can raise teachers' self-efficacy and motivate them to try the task because they are apt to believe that, if others can do it, then they can as well. The application of this principle can increase the interest of teachers in professional development workshops through modeling of effective use of technology. Specific challenges and needs can be addressed during these workshops by experts within Universal American School or from external organizations. Observing the demonstrations by peers or external experts can have an impact on the beliefs of the teachers and, as a result, can have an impact on the value placed by teachers on the professional development workshops, leading to an increased interest in attending these.

Increasing Self-efficacy in Learning New Technologies

Self-efficacy refers to perceived capabilities for learning or performing actions at designated levels (Bandura, 1997). Bandura (1997) maintains that self-efficacy beliefs are constructed from four principal sources of information: (1) an active mastery of experience that serves as an indicator of capability; (2) vicarious experience that alters efficacy beliefs through the transmission of competencies and comparison with the attainment of others; (3) verbal

persuasion and allied types of social influences that one possesses to master a given task; and (4) physiological and emotional states that affect people's judgment of their capabilities. Self-efficacy can influence the choices people make and the courses of action they pursue. Self-efficacy also helps determine how much effort people will expend on an activity, how long they will persevere when confronting obstacles and how resilient they will be in the face of adverse situations.

Fifteen to twenty minute demonstration sessions of the new features provided by technology integration specialists to address the immediate needs of teachers will increase their self-efficacy and will motivate them to take control of their own learning experience with technology. The demonstration sessions may have to be repeated to allow teachers the time needed for mastery of the new features, and this can have a positive impact on the self-efficacy of teachers. The teachers will be motivated to learn, try new features on their own and foster a culture of collaboration among their peers.

Solutions for Organization Causes

School Leadership Needs to Set Clear Expectations on the Use of Technology

The data gathered from the surveys and interviews of teachers revealed that teachers did not use technology for instructional activities, even though they had the knowledge and had strong beliefs about the positive impact of using technology for student learning. This is due to the school leadership's not explicitly outlining clear goals and outcomes for what needs to be achieved with the use of technology. Goal setting is one of the central concepts of socio cognitive theory (SCT), that provides the view that people not only learn, but use forethought to identify the desired outcomes and plan accordingly to achieve those outcomes. The solution of

establishing clear goals and outcomes regarding what needs to be achieved using technology is based on this concept of SCT.

Getting the school leadership to set clear goals and expectations will create a level of accountability which will motivate teachers to meet them. The approach will help with the integration of solution from both organizational and motivational aspects. The leadership can model the desired behavior by attending the technology workshops and by using technology in their interactions with teachers, which will help establish credibility with teachers. The leadership needs to hold teachers accountable, with clear consequences, if they do not meet the established goals and objectives. To take the solution implementation to the next level, the school leadership can also be involved in modeling the use of technology in their staff meetings and other engagements with school community.

Per the research by Greaves (2012), leadership commitment is a key component to ensuring that teachers receive the consistent message and importance of the goal. It is difficult to have a definition for achieving success in any technology integration initiative in the absence of explicitly stated objectives and outcomes (Milton 2003). Clearly defined goals and milestones will provide a roadmap for teachers to ensure their activities are aligned towards achieving the goals.

Establishing Peer Support Groups

The social cognitive theory (SCT) by Bandura (1977) emphasizes that learning occurs in a social context, and is gained through observation. One of the core concepts of SCT is observational learning/modeling which is based on the premise that people learn through observation or modeling. Live demonstrations of a behavior or skills by a peer member can

facilitate the learning process. The solution of providing professional development by other exemplary peer teachers or technology integration specialists is based on this aspect of SCT.

According to Vygotsky's (1997) sociocultural theory, there is a strong connection between the learning processes of an individual and that his/her social interactions with others. From this perspective, as learners participate in a broad range of joint activities and internalize the effects of working together, they acquire new strategies and knowledge of the world and culture. Sociocultural theory is applied in the recommendation of creating a professional learning community that allows for teachers to share and learn from each other's experiences with using technology in the classrooms.

Vygotsky (1978) also introduced the concept of the zone of proximal development (ZPD) in which the learning process is associated with the development process. In other words, development occurs when learners learn concepts and principles that can be applied to new tasks and problems. This concept is also applied as part of the solution whereby teachers are given tasks during the professional development sessions to apply new learning as form a practice, and they are assessed on their learning.

Increasing the Opportunities for Professional Development

According to Section 9101 of the No Child Left Behind Act of 2001 (2002), high quality professional development activities enable teachers to become highly qualified by improving and increasing their knowledge of the academic subjects they teach. These activities are an integral part of broad school-wide and district-wide plans to improve teachers' classroom management skills and are aligned with and directly related to state academic content. They are high-quality, sustained, intensive, and classroom-focused for a positive and lasting impact upon classroom instruction and teacher performance. The legislation supports a variety of professional

development programs, including those that provide training for teachers and principals in the use of technology, so that its applications are effectively used in the classroom to (1) improve teaching and learning in the curricula and core academic subjects in which the teachers teach; (2) provide instruction in methods of teaching children with special needs; (3) include instruction in the use of data and assessments to inform and instruct classroom practice; and (4) provide follow-up training to teachers who have participated in activities that are designed to ensure that the knowledge and skills learned by the teachers are implemented in the classroom.

Educational technology is linked to student achievement and school improvement, yet many teachers do not believe that they are prepared to use technology as part of their classroom instructional practice (Kurt & Ciftci, 2012). In response, the Clinton Administration started the Technology Innovation Challenge Grant program to provide research-based professional development activities in the area of technology to K-12 teachers. Four different types of professional development were recommended, including a coaching/mentoring model, face-to-face training, train-the-trainer model, and web-based training (Poplin, 2003). The coaching and mentoring method trains a small cadre of teachers to conduct demonstration technology lessons and provide other types of support for a larger group of classroom teachers. A major benefit of this model is the relationships built among the coaches or mentors and the teachers who use the technology. In addition, this approach can to continue year-to-year since the coaches and teachers work collegially at the same location. The results from a study of this approach showed that, after the third year of the project, two-thirds of the teachers had become technology integrators.

Another proven method of professional development is that of face-to-face training. This training removes teachers from their own classrooms and places them into technology-rich

learning environments in which they are encouraged to work cooperatively with their peers. In this type of training, the most beneficial approach is one in which the teachers create integrated, thematic units with embedded technology. Teachers are then asked to model technology integration for each other and to use team teaching. This type of face-to-face training continues to be effective when teachers have opportunities for technology practice, collaboration, and unit development. Many school districts use the train-the-trainer approach to technology staff development. In this system, it is easy to reach a large number of teachers efficiently.

Per the study by Chew (2013), teachers need ongoing professional development that encourages them to reflect on their own practices while engaging in more meaningful opportunities to observe what practices are effective in other classrooms creating a specific context in which to better understand the relationship the identified effective practices have to their own.

Introducing Incentives for the Use of Technology

Student engagement is critical to student motivation during the learning process. Increasing student engagement in the classroom is considered to be a significant incentive for the teachers. The more students are motivated to learn, the more likely it is that they will be successful in their efforts. Numerous factors influence student motivation, including parental involvement, teacher motivation and skills, and effective use of technology. Technology can be utilized to create a motivating classroom environment where students are engaged in learning. An environment where technology is used in innovative ways leads to improved learning and teaching (Wishart & Blease, 1999). Finally, technology provides opportunities for teachers to meet the needs of students with various learning styles through the use of multiple media (Bryant & Hunton, 2000).

Providing teachers with an opportunity to demonstrate their technology proficiency amongst their peers is an incentive for teachers to further their career aspirations into administrative roles. Because technology opens new avenues for instruction, and because its use is often linked to professionalism, some schools have intended for technology implementation to improve teacher morale. Hadley and Sheingold (1993) conducted a survey of 608 teachers in 576 schools throughout the country that were known for their efforts at integrating computer technology into teaching. They found that, when teachers were asked to identify incentives for integrating computers in their teaching, two trends emerged: student accomplishment, rather than their own external rewards, was most motivating for the teachers, followed by students' being able to use computers as a tool for their own purposes. As they state, ''in the daily professional life of these teachers, it is the psychic payoff of student's learning and engagement that appears to matter most'' (p. 281). Teachers also cited increased self-esteem, through recognition, advancement, development, and financial reward, as a motivating factor. When asked to identify barriers, three factors considered in the past persisted as barriers: too few computers and peripheral equipment, not enough time to prepare computer-based lessons, and challenges with scheduling enough computer time for different teachers' classes.

Increasing the Level of Technical Support during Class Periods

According to research by Hew and Brush (2007), employing adequate levels of staff to provide technical support on the use of technology during classroom instruction is a requirement for the success of a technology integration initiative. As the technology environment becomes more sophisticated with the evolution of technology, recruiting specialized talent is not the optimal use of resources; rather, a better approach is collaboration among teachers, technology

coaches and technology support personnel to find an optimal balance for providing the adequate level of technology support for classroom instructional practice (Polly, 2011).

According to the research study by Voyiatzaki and Avouris (2012), technical support can be provided remotely during classroom instruction, and staff does not have to be available in the classroom. In technology enabled classrooms, wherein the students use complex communication and collaboration tools, the teachers have to be empowered in order to meet the new challenges of such a setting and integrate these new tools to their practice. They have to become accustomed to monitoring the progress of a lesson through a computer screen (at the teacher workstation) instead of by moving from student to student.

Bryzcki and Dudt (2005) posit that the technical support staff recruited for providing technology support not only needs to be technically competent but also be supportive and provide an encouraging attitude towards the teachers. This type of a supportive attitude promotes self-confidence, enriches the learning experience for the teachers and has a positive impact on the students.

Implementation Plan

The solutions for all gaps found are interrelated. The solutions offered for closing the gap of knowledge will also aid in closing the gap of motivation and of fostering a supportive organizational culture. The solutions proposed will help teachers overcome the barriers to using technology for instructional purposes in the classroom. Table 10 summarizes the causes, solutions and implementation of the solutions to aid in closing the gap for knowledge/skill, motivation and culture/context. Table 11 outlines the organizations goals, which are broken down by short-term goals that will aid in reaching the main goal of the organization. Table 12

summarizes the performance goal, time frame of the implementation and how the performance goals will be measured.

Solution Integration

Table 10

Summary of Causes, Solutions, and Implementation of the Solutions

	Knowledge & Skills	Motivation	Culture/Context/ Capital/Policy
Causes	Lack of factual knowledge of technology proficiency standards for teachers and students Lack of procedural skills in the use of technology in classrooms Lack of metacognitive skills in the use of the appropriate technology in the classrooms for the designated activity	Lack of interest in attending professional development workshops Lack of self-efficacy in learning new technologies	Lack of clear communication by leadership on the expectation of the use of technology Lack of adequate professional development Lack of incentives for effectively using technology in classrooms Lack of technical support during class periods Lack of peer support groups
Solutions	Increasing factual knowledge of teachers about the technology proficiency standards for teachers and students Increasing the procedural skills of teachers on how to use technology in classrooms Increasing the metacognitive skills of teachers in the appropriate use of technology in the classrooms for the designated activity	Increasing interest in attending professional development workshops Increasing self-efficacy in learning in new technologies	School leadership needs to set clear expectations on the use of technology Establishing peer support groups Increasing the Opportunities for Professional Development Introducing incentives for the use of technology Increasing the level of technical support during class periods

Table 10, continued

	Knowledge & Skills	Motivation	Culture/Context/ Capital/Policy
Implementation	Ensure that all teachers get a copy of the published technology proficiency standards for students and teachers Ongoing professional development workshops on the use of technology for instructional activities in the classroom Professional development to include activities for helping teachers to understand when to use a particular kind of technology to enhance instructional practice	Demonstrate the advantages of using technology for instructional practice by peers to enhance the interest in attending professional development workshops By having focused demonstration sessions that highlight specific features of the technology that can utilized immediately in the classroom will increase the confidence of teachers to try other new features on their own	Ensure that school leadership provides a clear set of expectations on the use of technology in the classroom by setting examples Allow teachers to form groups that can collaborate and share ideas on the use of technology, by year level or by department Plan a professional development schedule for the year which lists topics and activities that will be covered during each session Provide incentives such as time for learning and planning and opportunities for attending external professional development sessions Provide support mechanisms to promote the use of technology in the classrooms

Stakeholder Cascading and Performance Goals

An organization's goal is achievable by scaffolding steps. According to Clark and Estes (2008), "effective performance goals cascade or follow from organizational goals" (p. 22). Table 8 summarizes hierarchical goals that begin with the overall organizational goal; subsequent goals are identified to scaffold the achievement of the organizational goal.

Table 11

Summary of Organization's Main Goal, Short Term Goals, Cascading Goals, and Performance Goals

Organizational Goal: Universal American School's organizational goal is that 100% of teachers will be proficient in the use of technology during instructional activities in the classroom by September 2016		
Stakeholder 1 Goal: Teachers will focus on using technology for instructional activities in the classroom (Academic Year 2014-2015)	**Stakeholder 2 Goal:** School Administration will provide the organizational support for teachers to use technology in the classroom for instructional practices (Academic Year 2014-2015)	**Stakeholder 3 Goal:** Teachers will help students with increasing their technology proficiency upon graduation (Academic Year 2015-2016)
Stakeholder 1 Cascading Goal 1: Teachers will have a clear understanding of the technology proficiency standards for students and teachers (May 2014)	**Stakeholder 1 Cascading Goal 2:** School Administration will set clear expectations for teachers on the use of technology for instructional purposes in the classroom (September 2014)	**Stakeholder 1 Cascading Goal 3:** Teachers will attend the professional development activities for instructional purposes in the classroom for engaging students more effectively (Ongoing 2014)
Stakeholder 1 Performance Goal: Teachers will review and be able to comprehend and apply the technology proficiency standards (September 2014)	**Stakeholder 1 Performance Goal:** Teachers will accept the vision and expectations set by school leadership for the use of technology for instructional purposes in the classroom (September 2014)	**Stakeholder 1 Performance Goal:** Teachers will be able to use and apply the appropriate technology for specific learning activities in the classroom (May 2015)
Stakeholder 1 Performance Goal: Teachers will attempt to see the value of using technology for instructional purposes in the classroom for engaging students more effectively (Ongoing 2014)	**Stakeholder 1 Performance Goal:** School administration will provide incentives to teachers for the use of technology in classrooms (Ongoing 2014, & 2015)	**Stakeholder 1 Performance Goal:** Teachers will be able to share ideas and learn from their peers (January 2015)
Stakeholder 1 Performance Goal: Teachers will garner the confidence to learn new features of the existing technologies on their own (May 2015)	**Stakeholder 1 Performance Goal:** School Administration will provide the adequate level of technical support for teachers during class periods (September 2014)	**Stakeholder 1 Performance Goal:** Teachers will be able to monitor their progress and evaluate if changes are needed in order to reach their goals by the end of 2014.

Table 12

Summary of Performance Goals, Timeline and Measurement of Performance Goals

Stakeholder Performance Goal	Goal Measure
Teachers will review and be able to comprehend and apply the technology proficiency standards Implement by: September 2014 Evaluate Progress by: December 2014	By asking teachers to list the technology proficiency standards for teachers and students.
Teachers will attempt to see the value of using technology for instructional purposes in the classroom for engaging students more effectively Implement by: Ongoing 2014 Evaluate Progress by: Ending of Academic Year 2014-2015	By classroom observations and also the number of professional development workshops attended
Teachers will garner the confidence to learn new features of the existing technologies on their own Implement by: May 2015 Evaluate Progress by: Ending of Academic Year 2014-2015	Teachers will demonstrate the new features they have learned and applied to the school administration during their appraisals
Teachers will accept the vision and expectations set by school leadership for the use of technology for instructional purposes in the classroom Implement by: September 2014 Evaluate Progress by: December 2014	Teachers will be able to explain the vision and expectations to the school administration
School administration will provide incentives to teachers for the use of technology in classrooms Implement by: Ongoing 2014 Evaluate Progress by: Ending of Academic Year 2014-2015 & 2015-2016	School administration will list all the available incentives they have devised for teachers for the use of technology for instructional purposes in the classroom
School Administration will provide the adequate level of technical support for teachers during class periods Implement by: September 2014 Evaluate Progress by: December 2014	School administration will recruit qualified technology support staff or deploy the appropriate software that can be used to support teachers during class periods
Teachers will be able to share ideas and learn from their peers Implement by: January 2015 Evaluate Progress by: Ending of Academic Year 2014-2015	Teachers will be able to list the ideas that were developed during their engagement with their peer support groups

Summary

Research literature about the impact of teacher knowledge and skills, motivation, and organization gap solutions were the basis of the solutions and implementation proposed in this chapter. The literature focused on empirically-based educational strategies that may assist Universal American School in reaching its organizational goal of 100% of the teachers being proficient in the use of technology for instructional purposes in the classroom. The purpose of this literature was to present solutions of effective, sound educational practices to address the knowledge and skills, motivation and organizational gaps as per the Gap Analysis Model by Clark and Estes (2008). In order to monitor the progress and effectiveness of the proposed solutions and implementation, a system of evaluation is presented in Chapter 6.

CHAPTER 6

EVALUATION AND DISCUSSION

Purpose

The purpose of this study was to investigate the reasons for teachers' not using technology for instructional practices during class periods to achieve the desired level of technology proficiency standards at Universal American School (UAS). The organizational problem of Universal American School is the lack of utilization of technology for instructional activities in the classroom and is best described by the discrepancy model based on the Gap Analysis Model (Clark & Estes, 2008). The primary stakeholders for this study were the teachers at Universal American School. In order to achieve the organizational goal of enhancing students' proficiency in 21st century problem solving, the teachers will have to increase use of technology in daily instructional activities in the classrooms and integrate the use of technology in their key assessments. The teachers will need to be provided with adequate level of knowledge, motivation and organizational support to ensure that they can do so.

The analysis focused on causes for this problem due to gaps in the areas of knowledge and skill, motivation, and organizational issues. Currently, only 30% of teachers are assessed as being technology proficient. The organizational goal is that 100% of teachers will be proficient in the use of technology during instructional activities in the classroom. The gap that currently exists is 70%.

Results

The following section summarizes the gaps in knowledge, motivation and organizational setup found by triangulation of data gathered by surveys, interviews, observations and document analysis.

Knowledge and Skills

The results of the survey and interviews indicated the teachers' lack of factual knowledge of technology proficiency standards for students and teachers. The survey and interview responses revealed that the teachers lacked procedural skills for the use of the advanced features of the smartboards. The analysis of the survey responses confirmed the teachers' lack of metacognitive skills for the use and management of mobile devices and the advanced features of the learning management system as part of their instructional practice.

Motivation

The survey results indicate that the teachers show a lack of interest in attending the professional development workshops. The survey responses to the statement regarding how overwhelmed teachers felt when trying to learn new features of the smartboard had high mean scores indicating low motivation. The interview responses revealed that none of the teachers interviewed had learned any new features and, when further questioned, their response was they had not been shown any new features. This confirms very low self-efficacy and a lack of self-motivation on the part of teachers.

Organization

The survey responses combined with the answers to the interview questions confirmed that the leadership did not set clear expectations on the use of technology in the classroom for instructional practices. Lack of professional development opportunities were stated in the interview responses and also indicated by the lower measures of the mean for the survey responses. Suggestions for improvement to the professional development methodologies were provided by teachers during the interviews.

Lack of incentives from leadership was also confirmed as one of the main reasons for lack of use of technology in the classrooms. Based on the survey responses, the lack of technical support provided to teachers during the use of technology in the classrooms was also validated as one of the reasons. Finally, the survey responses and the answers to the interview questions by teachers showed that the lack of peer support groups among teachers was another major factor in the organizational setup for the lack of use of technology in the classrooms.

Recommendation Implication

The implementation of the solutions will help close the gap of knowledge, motivation and organization. The first step, as part of the solution implementation, will be for the leadership of Universal American School to set expectations for teachers with regards to the use of technology in the classroom. This will involve ensuring that teachers receive the required documentation on the technology proficiency standards for students and teachers during the orientation week prior to the start of the school year. The next step is to focus on the professional development activities for teachers during the next academic year (2014-2015) to identify and use the appropriate school-provided technology (smartboard, portal and mobile devices) for the designated classroom activities. This step of the implementation will take time, as the teachers have to value the use of technology and then focus on learning to use it correctly to have the desired impact on students during the classroom activities.

To enhance the outcomes of the professional development activities for teachers, the school leadership will need to provide the necessary support as outlined in Chapter 5: help teachers establish peer support groups, provide incentives for the exemplary use of technology, and provide technical support during classroom time. These additional steps will have an impact on the school budget and require additional approval from the school management board.

In order to increase the use of technology in the classrooms, one of the proposed interventions will be to provide the appropriate level of professional development to the teachers, and to have the effectiveness of this intervention through an evaluation program. The model that will be used to design the evaluation will be the Kirkpatrick's (1998) Four Level Evaluation model (reaction, impact of the program, transfer, bottom line). Prior to outlining the agenda and curricula of the professional development plan, the teachers will be assessed on their current level of classroom technology skills with a focus on the following classroom technologies: smartboards, portal and mobile devices.

Evaluation

Based on this initial assessment, the professional development sessions will be planned for three groups: basic, intermediate and advanced. The goal of attending these professional development sessions will be to advance the teachers' current level of assessment to the next level.

Level 1: Reaction

At the reaction level, the experience of teachers attending the professional development session will be assessed. A survey will be answered in anonymity prior to attendance at the professional development session to assess how much they value the use of technology in classrooms, their current knowledge in the use of the specified classroom technology and their level of confidence in using the technology. After the professional development session is completed, a post-session survey will be conducted to gather information on whether there has been any change in how they value the use of technology, how they feel about their level of knowledge in the use of technology and their level of confidence in using the technology. The survey will include open-ended questions to solicit feedback on what can be changed to enhance

the value of the program with questions such as “What do you find most useful about the program?” and “What would like to change about the program to make it more useful for you?”

The researcher’s expectation is to see positive feedback gathered from the survey to indicate that the implementation of the professional development plan was successful at the reaction level. The design of the evaluation for the reaction level should be done as one-group pre-test, post-test design. As described above, the design will include a pre-test measure followed by a treatment and a post-test for the group in consideration. The reliability of the survey will be established based on the analysis of responses to ensure that there is consistency in the responses over a period of time. The validity of the measure will be based on establishing that the responses of the attendees on the surveys are correlated to what they are able to demonstrate during the professional development session and in a real-time classroom setting.

Level 2: Learning

At the learning level, demonstration of the learning that teachers acquired during the professional development session is an effective measure of evaluation of the professional development program (Kirkpatrick, 1998). If the solutions offered are effective, the observation of teachers in the classrooms will indicate the professional development program has an impact on their learning in a positive way. The key aspect of this level is to provide as many opportunities for teachers to practice the activity as much as possible. The more practice teachers can get during the professional development program, the better they will be able to transfer the skills and knowledge back into the classroom sessions. Modeling by experts in the use of technology for the teachers attending will be an important component of the professional development program.

During the course of the professional development session, teachers can be assessed in two ways: one with written tests to assess factual knowledge and a practical demonstration of the use of technology from a procedural standpoint. The practical demonstration component can be evaluated with a set of criteria (evaluation checklist) that will be developed as per the technology proficiency standards of the school along with consultation with the technology integration coordinators. The steps for basic, intermediate and advanced levels of use will be identified on the check list for all the classroom technologies for which the professional development plan has been developed.

Level 3: Transfer

At the transfer level, teachers are assessed to see whether they are able to use technology in classrooms based on the professional development sessions they received. This can be assessed by observing the teachers in the classrooms with the same evaluation checklist that was used in the professional development session. The evaluation will be conducted after three months from the professional development program. The results gathered from the evaluation would help determine whether the teachers are using the technology in the classrooms as needed and this would indicate that the professional development program has been successful.

The design of the evaluation will be static group comparison, also called post-test only with nonequivalent groups. The teachers who attended the professional development session and teachers who did not attend the professional development session will be observed and assessed using the evaluation checklist. If there is a significant increase in behavior of teachers who attended the professional development session on the use of technology in the classroom then, that will indicate that the professional development program is a successful intervention.

Level 4: Impact

This level investigates whether there is progress toward the organization's goal. At the impact level, the key measure will be student engagement levels in the classroom, which will be assessed through classroom observations. If there are enhanced levels of student engagement in the classrooms of teachers who attended the professional development sessions as compared to teachers who did not, then it is a positive indicator that professional development contributed to the increased levels of student engagement. Over a five-year time period, the student engagement levels should have a positive correlation with student achievement and test scores. The researcher expects the student discipline issues to decrease, and this can be measured through students' behavior records.

The assessments can be conducted in many classes where teachers attended the professional development programs. Validating that the performance changes have an impact at the results level solely due to the professional development program can be done as per the staged innovation design by Clark and Snow (1975). The staged innovation design is way of measuring the impact of the intervention by implementing it in different departments or locations of the same organization at different times. The result will provide information about the exact contribution of the performance improvement in terms of closing the gap and influencing the results level while having an impact on the organizational goals. It is the only comprehensive design for measuring all fours levels of evaluation if organizations want to ensure that the program in question was the cause of the measured changes in the bottom line.

Strengths and Weaknesses of the Approach

The gap analysis framework aids in helping the institution to reach its goal step-by-step. This framework takes into consideration that each organization is distinct and the cause of the

problem is unique. The framework helps quantify the gap that needs to be closed, which provides clear goals and measurable outcomes. The strength of the gap analysis approach is that the entire process is personalized to the organization's needs. The solutions' recommendations are based on data collected within the organization to identify site-specific needs. Additionally, solutions and implementation recommendations are cascaded into tiered goals, thus scaffolding mini-activities that will lead to the organizational goal's eventual achievement. Another strength of the gap analysis approach is that the performance goals set deadlines for evaluating the effectiveness of the solutions. These formative checkpoints are helpful because it allows the organization to make adjustments in a timely manner.

The challenge with regard to the gap analysis approach is finding the time to thoughtfully analyze the gaps of the organization and time to analyze research in order to make appropriate solutions and recommendations. One of drawbacks of the framework is the time commitment. In a school environment, there is pressure from the decision-makers to achieve positive results in very reduced timeframes when, in fact, the solutions need more time to be implemented and for the targeted results to be realized. The gap analysis requires time and commitment from the organization. In addition, solutions to close a gap can cause other gaps to occur (Clark & Estes, 2008). If goals of the organization are not met, the process needs to be repeated until the right solution closes the gap.

Kirkpatrick's (1998) four-level framework is a tool that will help the school evaluate the effectiveness of the solutions. Many times, organizations skip the evaluations or use basic level one evaluation without investigating whether the solutions are helping to close the gap. The framework is detailed, which helps implement the evaluations process.

Limitations

The survey for teachers was distributed during the mid-term assessments of the first quarter, which was a busy time for the teachers to respond, and, hence, the survey participation rate was affected. Self-reported nature of surveys could have limitations when the teachers were made aware of the "who and why" of the study. The survey and interview responses might not be an accurate representation of their true feelings due to the fact that the study was conducted by the person working in a leadership capacity at the school.

The researcher of the project works at the school, and this could bring bias to the project. It could be that the author interprets the data to confirm or disconfirm personal beliefs as to the cause of the gap. Patton (1990) suggests that the researcher can influence the data by his/her own opinions and judgments. It is possible that the author was not objective and confirmation bias played a role.

The technology usage in the classroom between elementary and secondary teachers was very different due to the age range of the students that were present at these grade levels and hence this wide variability in the level of technology usage in the classrooms could have impacted the survey and interview responses. This project was a case study on a single school. The recommendations are only applicable to Universal American School. The gaps identified and the solutions recommended cannot be functional for a different school setting because these are particular to Universal American School.

Future Research

Literature on the barriers to the use of technology in a K-12 environment was easily accessible. The available literature on the use and adoption of technology in a K-12 classroom environment shows that there has been an evolution of the barriers moving from accessibility of

technology and technology maturity to that of teachers' beliefs and attitudes in adopting technology. Research literature on the measures of the use of technology being linked to tangible student achievement scores and non-tangible 21st century skills of problem solving and critical thinking were hard to find, and this is an area that can be recommended for future research. Another consideration for future research is based on action-oriented research with mixed-methods studies that examine teachers in actual practice through observations and do not rely on self-reported data.

Given the aforementioned points, it is recommended that ESOL Education, the parent organization of Universal American School, consider a broader research study across all its schools to create the instructional technology roadmap to close the gaps in knowledge, motivation and organization to achieve the learning outcomes for the students and the teaching expectations for teachers. One of the areas to consider for future research is the varying levels of technology usage between elementary and secondary school teachers, since they cater to different ages of students, the technology needs in the classroom to engage these different age ranges could be significantly different.

Conclusion

As per the Gap Analysis Framework Model (Clark & Estes, 2008) that was utilized in identifying the gaps in knowledge, motivation and organization, there were several findings that contributed to the lack of use of technology by teachers in the classroom for instructional practice. One of the key findings was that teachers were not made aware of the technology proficiency standards for students and teachers at Universal American School. Another major finding was that the school leadership did not set clear expectations regarding what needs to be achieved with the use of technology in the classroom.

Setting clear expectations regarding what needs to be achieved with the use of technology, as per the adopted technology proficiency standards for students and teachers, and professional development were the key factors in the proposed solution to reduce the identified gaps. An evaluation model for the proposed solution based on Kirkpatrick's (1998) four-level framework is recommended for monitoring the implementation of the proposed solution. A two-year timeframe has been recommended for the implementation of the solution.

The experience gained in conducting this study using the Gap Analysis Framework can be applied to determine the gaps for the other problems within the organization and could be adopted as a standard approach to establishing a culture of a data-driven practice in the organization. The methods of data collection surveys, interviews and observations provide the opportunity to engage with the stakeholders from a scientific research-oriented standpoint, which enhances the credibility of the proposed solutions and potentially increases their rate of adoption. Overall, the time and effort dedicated to this study has been a very valuable experience for this researcher to gain insight into the research-oriented approach of problem solving.

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APPENDIX A

SURVEY BUILDER WORKSHEET

Assumed Cause	Knowledge	Motivation	Organization
Lack of knowledge of technology proficiency standards	I am able to list the technology proficiency standards at UAS		
Lack of knowledge of classification of technology activities	I know how to classify the technology activities into the appropriate technology proficiency standards		
Lack of skills in how to integrate technology into classrooms			
	I know how to look up online information using the available databases (EBSCO, Newsbank, Google Scholar)		
	I know how to use Smartboards in my classrooms		
	I know how to create interactive Smart Lesson Plans		
	I know how to use the Smart recorder to record my class activity		
	I know how to create video using Smart tools or other media tools		

Assumed Cause	Knowledge	Motivation	Organization
	I know how to post announcements on the LMS		
	I know how to post homework assignments on the LMS		
	I know how to post lesson material to the resources folders on LMS		
	I know how to organize my resource folders to match my curriculum topics		
	I know how to send emails to parents using Tag List on student management system		
	I know how to look up the student assessment data (external & internal) to use in my lesson planning activities		
	I know how to model good digital citizenship etiquette to my students		
	I demonstrate use of new technologies in my classroom as way to model new kinds of learning to students		
Lack of knowledge in determining which technology to be used for which activity	I know how to choose which technology is best for the various learning activity		

Assumed Cause	Knowledge	Motivation	Organization
Teachers do not choose to attend technology workshops		I learn a lot from the technology workshops	
Teachers are not willing to put the mental effort to learn how to integrate technology into the classrooms		I make a consistent effort to implement the knowledge gained from technology workshops	
Due to the rapid pace of technology updates teachers are not willing to apply the necessary mental effort to master the available technology		I am not interested in mastering the technology proficiency standards	
The length of the employment contract (2 years) deters them from learning any new technology effectively		I am not interested in learn new technology as the I intend to stay only for the length of my employment contract (2 years)	
Lack of adequate professional development			I get adequate professional development for use of technology as per the required technology proficiency standards
Lack of technical support during class periods			I am provided with adequate technical support to use technology effectively in classrooms

Assumed Cause	Knowledge	Motivation	Organization
Lack of clear communication by leadership on the expectation of the use of technology			I am clear on the expectations on the use of technology set by the leadership of the school
Lack of incentives for effectively using technology in classrooms			I am provided with incentives for effective use of technology in classrooms
Lack of evaluation methodologies to measure the use of technology in classrooms			I am aware of evaluation methodologies for the measuring the use of technology in classrooms
Lack of assessment of prior technology skills			I have been assessed on my technology skills prior to my start date

APPENDIX B

INTERVIEW BUILDER WORKSHEET

Assumed Cause	Knowledge	Motivation	Organization
Lack of knowledge of technology proficiency standards	Can you please elaborate on the technology proficiency standards of UAS?		
Lack of knowledge of classification of technology activities	How do you classify the various technology activities as per the technology proficiency standards?		
Lack of skills in how to integrate technology into classrooms			
Lack of knowledge in determining which technology to be used for which activity	How do you make a determination of which technology to be used for the required classroom activity?		
Teachers are not motivated to attend technology workshops		Do you find the technology workshops useful?	
Teachers are not willing to put the mental effort to learn how to integrate technology into the classrooms		What are the barriers that you face when attempting to use technology in classrooms?	
Teachers lack of motivation for mastery of use of technology due to availability of new technology every so often		Do you find the introduction of new technology very frequently deters you from learning the use of technology in classrooms?	

Assumed Cause	Knowledge	Motivation	Organization
The length of the employment contract (2 years) deters them from learning any new technology effectively		Do you find the length of the employment term to be de-motivational factor in your attempts of mastering technology?	
Lack of adequate professional development			Do you get the adequate level of professional development opportunities in the area of use of technology in classrooms?
Lack of technical support during class periods			Do you get adequate level of technical support for the effective use of technology in classrooms?
Lack of clear communication by leadership on the expectation of the use of technology			Do you have clear expectations from leadership in terms of the use of technology in classrooms?
Lack of incentives for effectively using technology in classrooms			Are you provided with additional incentives to use technology effectively in classrooms?

Assumed Cause	Knowledge	Motivation	Organization
Lack of evaluation methodologies to measure the use of technology in classrooms			Are you provided with a good understanding of how you will be evaluated in the use of technology in the classrooms?
Lack of assessment of prior technology skills			Do you think prior assessment of technology proficiency of teachers will be a good practice during the hiring process?

APPENDIX C

OBSERVATION BUILDER WORKSHEET

Assumed Cause	Knowledge	Motivation	Organization
Lack of knowledge of technology proficiency standards			
Lack of knowledge of classification of technology activities			
Lack of skills in how to integrate technology into classrooms	Observations during class sessions to observe the nature of instructional activity with technology		
Lack of knowledge in determining which technology to be used for which activity	Observations during class sessions to identify which technology is being used when		
Teachers are not motivated to attend technology workshops		Observations during technology workshops to determine the attendance and activity in the workshop sessions	
Teachers are not willing to put the mental effort to learn how to integrate technology into the classrooms			
Teachers lack of motivation for mastery of use of technology due to availability of new technology every so often			

Assumed Cause	Knowledge	Motivation	Organization
The length of the employment contract (2 years) deters them from learning any new technology effectively			
Lack of adequate professional development			
Lack of technical support during class periods			Observations during class time to identify the level of technical support available for teachers
Lack of clear communication by leadership on the expectation of the use of technology			Observations during faculty meetings on discussion of technology
Lack of incentives for effectively using technology in classrooms			
Lack of evaluation methodologies to measure the use of technology in classrooms			
Lack of assessment of prior technology skills			

APPENDIX D

DOCUMENT ANALYSIS BUILDER WORKSHEET

Assumed Cause	Knowledge	Motivation	Organization
Lack of knowledge of technology proficiency standards	Review any existing documents outlining the technology proficiency standards of the school		
Lack of knowledge of classification of technology activities			
Lack of skills in how to integrate technology into classrooms			
Lack of knowledge in determining which technology to be used for which activity			
Teachers are not motivated to attend technology workshops			
Teachers are not willing to put the mental effort to learn how to integrate technology into the classrooms			
Teachers lack of motivation for mastery of use of technology due to availability of new technology every so often			

Assumed Cause	Knowledge	Motivation	Organization
The length of the employment contract (2 years) deters them from learning any new technology effectively		Review of documents provided to teachers at the time of recruitment	
Lack of adequate professional development			
Lack of technical support during class periods			
Lack of clear communication by leadership on the expectation of the use of technology			Review of the school technology plan document
Lack of incentives for effectively using technology in classrooms			
Lack of evaluation methodologies to measure the use of technology in classrooms			Review of any teacher evaluation documents in the use of technology
Lack of assessment of prior technology skills			

APPENDIX E

ADMINISTRATOR INTERVIEW QUESTIONS

Introduction for the Participants

I would like to request your participation in this interview for a case study for my dissertation topic called "Investigating the Lack of Use of Technology by Teachers for Instructional Purposes in the Classroom". The main goal of this interview is to understand what tools in the classroom are effective for teachers in their instructional purposes. The names of the participants will be kept anonymous and no personal identity will be revealed. I would like to request that you provide me the permission to do an audio recording of this interview for transcribing purposes. You can be rest assured that the recordings will be destroyed after the transcription process. Please let me know, if this not acceptable and only written notes will be taken during the interview.

Administrator Interview Questions

Role: (Administrator)
Years of Teaching Experience: (0 – Any)

Technology Proficiency Standards for Teachers

1) What are your views on the current technology proficiency standards for teachers? (K,M,O)

Smartboards

2) What are expectations and goals you have set with teachers on the use of Smartboards as instructional tool in classrooms? (K,M,O)

3) What would be some of the ways you can recommend to increase the use of Smartboards in classrooms? (K,M,O)

LMS (Portal)

4) What are expectations and goals you have set with teachers on the use of the Portal in the classroom? (K,M,O)

5) What would be some of the ways you can recommend to increase the use of Portal in classrooms? (K,M,O)

Mobile Devices

6) What are your views about having students bring their own mobile devices to the classrooms? (K,M,O)

Assessment of Use of Technology in Classrooms

7) How would you go about assessing the use of Smartboards in classrooms?
8) How would you go about assessing the use of Portal by teachers?
9) How would you go about assessing the use of mobile devices in classrooms?

APPENDIX F

CLASSROOM OBSERVATION PROTOCOL

The classrooms observations will be selected based on the survey response analysis to identify the groups of respondents that use technology frequently and those that do not use technology as desired. The classroom observations will be done after the survey response analysis and the interviews of the appropriate respondents from each group.

The areas of observation:

- Elementary School Classrooms (Grade 4 – 6), 3 classrooms
- Secondary School Classrooms (Grade 7 – 12), 3 classrooms

The length of time for each observation – 30 minutes of the 50 minute class period

Observation Item	No of Times action being performed									
Using Basic Smartboard Features	1	2	3	4	5	6	7	8	9	10
Using Advanced Smartboard Features	1	2	3	4	5	6	7	8	9	10
Accessing Resources from Portal	1	2	3	4	5	6	7	8	9	10
Using Mobile Devices to Engage with students	1	2	3	4	5	6	7	8	9	10
Requesting IT Help	1	2	3	4	5	6	7	8	9	10
IT Issues restricting class activity	1	2	3	4	5	6	7	8	9	10
Number of time Online Resources being accessed	1	2	3	4	5	6	7	8	9	10
Online Resource being used										

APPENDIX G

TEACHER SURVEY

I would like to request your participation in this survey for a case study for my dissertation on the use of technology in the classroom. The main goal of this interview is to understand what tools in the classroom are effective for teachers in their instructional purposes. Your responses will be kept anonymous and no personal identity will be revealed.

Teacher Survey Questions

Gender: (Radio Button: Male/Female)
Grade Level: (Drop down list of Grade 4 – Grade 12)
Subject: (Drop Down List of Subjects)
Years of Teaching Experience: (0 – Any)

Smartboards

1) How familiar are you with the basic operational functions of Smartboards? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

2) To what extent are you familiar with the SMART Notebook software? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

3) How familiar are you with using the Smart Notebook Software to create interactive lesson plans? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

4) How familiar are you with using the recording feature of Smartboards? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

5) To what extent do you find Smartboards to be an important aspect of your classroom instructional activity? (M)

(Not at all)		(Somewhat)		(Extremely high)
1	2	3	4	5

6) To what extent do you use the Smart Notebook Software to create interactive lesson plans? (M)

(Not at all)		(Sometimes)		(Always)
1	2	3	4	5

7) To what extent do you use the recording feature of Smartboards to record lesson plans for students to access later? (M)

(Not at all)		(Sometimes)		(Always)
1	2	3	4	5

8) How often do you take the time to learn new features of the Smart Notebook software on your own? (M)

(Not at all)		(Sometimes)		(Always)
1	2	3	4	5

9) To what extent do you feel overwhelmed when it comes to learning all the new features of the Smart Notebook software? (M) (note the reverse-scoring of this item and recode when analyzing)

(Not at all)		(Sometimes)		(Extremely overwhelmed)
1	2	3	4	5

10) To what extent do you attend all the professional development workshops for the use of Smartboards? (M)

(Not at all)		(Some)		(All)
1	2	3	4	5

11) To what extent are you provided with IT support for the use of Smartboards in classrooms? (O)

(Not at all)		(Somewhat)		(Every time)
1	2	3	4	5

12) To what extent do you feel you are provided with professional development sessions for the use of Smartboards? (O)

(Not at all)		(Somewhat)		(More than I need)
1	2	3	4	5

13) To what extent do you feel that leadership has set goals for use of Smartboards in classrooms? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

14) To what extent do you feel you are provided with incentives from leadership for use of Smartboards in classrooms? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

15) To what extent do you recommend having a peer learning group to help you in the use of Smartboards in classrooms? (O)

(Not at all)		(Somewhat)		(Strongly recommend)
1	2	3	4	5

LMS (Portal)

18) How familiar are you with posting class announcements on the Portal? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

19) How familiar are you with posting homework assignments on the Portal? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

20) How familiar are you uploading lesson plans to the Portal for later use by students? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

21) How familiar are you with organizing the resource folders on the portal as per the learning topics? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

22) How familiar are you with using discussion boards feature of portal for online discussions with students? (K)

(Not at all)		(Somewhat)		(Very familiar)
1	2	3	4	5

23) To what extent do you consider the portal to be an important tool for classroom instruction? (M)

(Not at all)		(Somewhat)		(Extremely high)
1	2	3	4	5

24) How frequently do you post class announcements on the portal? (M)

(Not at all)		(Somewhat)		(Very frequently)
1	2	3	4	5

25) How frequently do you post homework assignments on the portal? (M)

(Not at all)		(Somewhat)		(Very frequently)
1	2	3	4	5

26) How frequently do you upload all lesson plans and other learning resources to the portal? (M)

(Not at all)		(Somewhat)		(Very frequently)
1	2	3	4	5

27) How frequently do you use the discussion boards feature of portal for online discussions with students? (M)

(Not at all)		(Somewhat)		(Very frequently)
1	2	3	4	5

28) To what extend do you attend all the professional development workshops for use of the Portal? (M)

(Not at all)		(Somewhat)		(Always)
1	2	3	4	5

29) To what extent are you provided with IT support for the use of the Portal? (O)

(Not at all)		(Somewhat)		(Every time)
1	2	3	4	5

30) To what extent are you provided with professional development for the use of the Portal? (O)

(Not at all)		(Somewhat)		(More than I need)
1	2	3	4	5

31) To what extent do you feel that leadership has set goals for use of the Portal? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

32) To what extent do you feel you are provided with incentives from the leadership team for use of the Portal? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

33) To what extent do you recommend having a peer learning group to help you in the use of the Portal? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

Mobile Devices (Laptops, iPads, Smartphones)

36) To what extent do you feel you can manage the use of mobile devices by students in classrooms? (K)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

37) To what extent do you encourage the use of mobile devices for classrooms activities? (M)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

38) To what do you feel that expectations have been set by the leadership for the effective use of mobile devices in classrooms? (O)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

Online Resources

41) To what extent are you aware of all the online subscription resources available for classroom instruction? (K)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

42) To what extent do you use the online subscriptions at UAS in the classrooms? (M)

(Not at all)		(Somewhat)		(Very well)
1	2	3	4	5

Technology Proficiency Standards for Teachers

44) To what extent do you know the technology proficiency standards for teachers at UAS? (K)

1	2	3	4	5	6
(Low)					(High)

Most popular technology for use in classrooms by Teachers at UAS

45) Please rank the following technologies in order of its effectiveness as a teaching tool **for you** in the classroom: (CSQ3)

Smartboards	(1-3)
Portal	(1-3)
Mobile Devices	(1-3)

46) Please list the top three Online Subscription resources at UAS you find valuable (in order): (CSQ3)
(Ebsco, Mathletics, Brainpop)

APPENDIX H

TEACHER INTERVIEW QUESTIONS

Introduction for the Participants

I would like to request your participation in this interview for a case study for my dissertation topic called "Investigating the Lack of Use of Technology by Teachers for Instructional Purposes in the Classroom". The main goal of this interview is to understand what tools in the classroom are effective for teachers in their instructional purposes. The names of the participants will be kept anonymous and no personal identity will be revealed. I would like to request that you provide me the permission to do an audio recording of this interview for transcribing purposes. You can be rest assured that the recordings will be destroyed after the transcription process. Please let me know, if this not acceptable and only written notes will be taken during the interview.

Teacher Interview Questions

Grade Level: (K-12)
Subject:
Years of Teaching Experience: (0 – Any)

Smartboards

1) Can you please elaborate on the features of the smartboards that you find useful for instructional purposes? (K). Please provide examples.

2) What are some of the challenges you face is using smartboards in the classroom? (K,M,O)

3) What are some of the new features you have learnt this year for instructional purposes in the classroom? (K,M) Can you please provide examples?

4) What would be some of the ways you can recommend to increase the use of smartboards in classrooms? (K,M,O)

LMS (Portal)

5) Can you please elaborate on the features of the portal that you find useful for instructional purposes in the classroom? (K)

6) What are some of the challenges you face in using the portal for instructional purposes in the classroom? (K,M,O)

7) What are some of the new features you have learnt this year that could be useful for you in the classroom? (K,M,O)

8) What would be some of the ways you can recommend to increase the use of Portal in classrooms? (K,M,O)

Mobile Devices

9) What are your views about having students bring their own mobile devices to the classrooms? (K,M,O)

Technology Proficiency Standards for Teachers

10) What are your views on the current technology proficiency standards for teachers? (K,M,O)

11) From your experience at Universal American School, what is the most effective technology for instructional practices in the classroom? (CSQ3)