EDUCATIONAL TECHNOLOGY: THE CASE OF AZERBAIJAN

by
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Abstract

Despite serious investments in technology, computer equipment, and teacher training across the education system of Azerbaijan, meaningful use of information and communication technologies to support teaching and learning in K-12 is still elusive. The literature and the needs assessment study revealed several barriers hindering the implementation of educational technology such as lack of communication, absence of shared vision and ICT integration plan, limited access to technology, limited effective training, teacher knowledge, and teacher beliefs. I designed and developed a cognitive apprenticeship-based professional learning program that addressed factors that emerged as important in my needs assessment study. This quasi-experimental study assessed the effectiveness of the intervention and identified changes associated with the program. A total of 24 individuals, two school administrators and four teachers from each of four public schools located in Baku participated in this study. The school administrator component of the intervention lasted 20 hours, while teachers were engaged in a 40-hour long professional learning opportunity. Quantitative data were collected from postworkshop survey and preintervention and postintervention questionnaires. Teachers enjoyed this professional learning program and found it useful; they particularly appreciated the mentoring component of the program. Comparison of preintervention and postintervention responses revealed that the program significantly increased both teachers’ technology integration knowledge as well as their self-efficacy for educational technology. Qualitative data were gathered from focus group interviews and document analysis. Participation in this professional learning opportunity helped school administrators develop both a vision relative to pedagogical use of technology and
school-based ICT integration plans. These plans met most of the requirements found in the reviewed literature. Classroom observations were used to capture the ways in which the teachers used ICT within their instruction. Numerous ICT tools were used in geography and history lessons in both during and after-intervention lessons. The purpose for which the teachers used the technology changed toward the end of the program; the application of ICT served to activate prior knowledge, advance students’ understanding of geographical or historical content, demonstrate students’ comprehension of geographical or historical content, promote their geographical or historical thinking skills, develop their critical thinking skills, assess and reinforce student learning.

Keywords: educational technology, cognitive apprenticeship, professional learning, vision, ICT integration plan, technology integration knowledge, self-efficacy

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Dedication

I dedicate this dissertation to my dear parents Hasan and Nisa, loving husband Fuad, and our wonderful daughters Suada and Banu. Their love, encouragement, patience, and optimism both supported and inspired me through the entire process of pursuing this doctoral degree. I am extremely happy to have them in my life!

Thank you for trusting in me!
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This dissertation reflects endless guidance, support, contributions, and mentorship of several individuals, who are unique in so many ways that I would love to collaborate with them throughout my professional life.

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Executive Summary

Recent fundamental changes in the global economy have shaped the workplace and demand a highly-skilled workforce. Technology has supported these changes and new emerging industries have applied numerous technology-based solutions (Greenhill & Petroff, 2010). According to a survey conducted by American Management Association (2010), businesses require a workforce with new skills such as information, media, and technology competencies beyond literacy and numeracy to further develop their companies. This skill set is defined as “the ability to use technology to develop 21st century content knowledge and skills, in the context of learning core subjects” (Dede, 2010, p. 5). For this purpose, heeding a call to implement the use of technology in education is essential.

To support students’ development of these skills, some countries have reconsidered core educational standards and promoted the use of information and communication technologies (ICT) in the classroom by launching numerous education reforms and equipping schools with technology (Pelgrum & Law, 2008). Educational use of ICT can prompt the development of authentic and meaningful learning experiences (Richardson, 2007) and provide prospects to engage and motivate children in the learning process (Department for Education and Skills, 2003). Employing technology as a tool in the classroom allows teachers to achieve learning objectives set forth by the curricula, create individualized learning processes, facilitate collaboration among students, enhance learning by producing various learning materials, and improve students’ individual performance (Midoro & Admiraal, 2003). Nevertheless, evidence suggests that regardless of serious investments in technology infrastructure, computer equipment, and teacher
training, the adoption, utilization, and uptake of ICT for educational purposes in K-12 is a slow process (Gulbahar, 2007).

**Problem of Practice**

My problem of practice focuses on the level of technology use for teaching and learning in public schools in Baku, Azerbaijan. The government of Azerbaijan implemented two state programs related to the integration of ICT into education and most school teachers took part in training workshops. However, my professional classroom observations show that effective usage of technology in the classroom has not yet occurred. Effective integration of educational technology should result in meaningful learning with technology; that is, students should be engaged in active, constructive, intentional, authentic, and cooperative activities (Howland, Jonassen, & Marra, 2013). Although the Ministry of Education (MoE) has not published any reports on the level of technology use in public schools, anecdotal reports indicate that there are barriers to the use of technology in our schools.

**Theoretical Framework**

Considering the centralized nature of education system in Azerbaijan, Bronfenbrenner’s (1979) ecological systems theory (EST) provides me with a framework for understanding the development of a teacher in relation to his/her environment and the interaction between the two. The ecological levels represent five nested structures (i.e., chronosystem, macrosystem, exosystem, mesosystem, and microsystem), each inside the other. He draws an analogy to Russian dolls for the purpose of explanation. EST (Bronfenbrenner, 1979, 1994) demonstrates that the diversity, quality, and type of interconnected relationships in different settings affect teachers’ behavior and is,
therefore, a suitable framework for understanding and analyzing the myriad factors associated with the integration of educational technology in schools.

Factors Associated with Integration of Educational Technology

The level of technology use in the classroom to augment student learning is influenced by the complicated interaction of barriers at macro-, meso-, and micro-level:

- **Macro-level:** lack of communication among the members of the educational community relative to the role of technology in teaching and learning (Frank, Zhao, & Borman, 2004) and lack of time to develop technology-supported lessons or experiment with ICT in the classroom (Bauer & Kenton, 2005)

- **Meso-level:** absence of a clear vision and/or technology integration plan (Chang, 2012), scarce technological resources and/or limited access to technology (Shiue, 2007), and insufficient effective training (Wachira & Keengwe, 2011)

- **Micro-level:** Limited ICT skill and technology integration knowledge essential for conducting technology-enhanced lessons (Hew & Brush, 2007); teachers’ beliefs, specifically, pedagogical beliefs about the value of technology as a tool to augment teaching and foster student learning (Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013), and low self-efficacy beliefs toward teaching with ICT (Wozney, Venkatesh, & Abrami, 2006); and attitudes toward technology and the implementation of this innovation (e.g., Albirini, 2006; Rabah, 2015).
Needs Assessment Study

To understand factors related to technology integration within teachers’ microsystem, mesosystem, and exosystem, I conducted a mixed-methods study in public schools in Baku. I focused on general secondary level (i.e., grades five to nine) and collected data using semi-structured interviews, paper-based survey, classroom observations, and focus group discussions. My research participants were key stakeholders (i.e., government officials of the organizations accountable for the execution of previously mentioned state programs), school administrators, teachers, students, and parents.

The needs assessment study identified several barriers to technology integration in Baku public schools. Lack of communication about the importance of instructional technology in a school culture was found to be as an important factor. Both key stakeholders and school administrators acknowledged significant communication issues at the system and school level. One way of communicating the value of this innovation could be through a school vision on educational technology and/or ICT integration plan; however, absence of such management tools was prevalent in all selected schools. Unsystematic or inadequate professional learning programs was another major impediment to ICT uptake. Infrequent use of ICT in the classroom was also affected by insufficient technology, shortage of time, and limited knowledge and skills ascertained from the qualitative data collected during individual interviews and from open-ended questions on teacher survey. My stakeholders particularly stressed a need for professional learning of history and geography teachers relative to educational technology.
Intervention Theoretical Framework

Several theoretical frameworks and/or approaches support my thinking about adult learning related to professional learning and provide the foundation for my intervention. Learning occurs when a learner creates meaning from his/her own experience (Ertmer & Newby, 2013). It is also a process where knowledge is co-constructed through social interactions (Vygotsky, 1978) and is meaningful when learning and cognition are situated within a particular context (Wilson & Meyers, 2000). Situated learning occurs in an authentic context through legitimate peripheral participation (Lave & Wenger, 1991), where an apprentice moves toward full participation as he/she masters the skill(s). Ultimately, the knowledge gained becomes easily transferrable to situations where learners recognize a real and practical benefit to that knowledge (Cobb & Bowers, 1999). Meaningful learning and transfer of learning, as indicated by Brown et al. (1989), can be achieved through the use of cognitive apprenticeship.

As an approach to professional learning, the cognitive apprenticeship model introduces educators to the nature of learning and practice. In other words, it allows educators to observe the expert practice, enhance their existing knowledge and skills or acquire new ones by working closely with the expert, and transfer this knowledge and skills to concrete, real-world situations (Dennen, 2004; Nichol & Turner-Bisset, 2006). This model is considered to be an effective approach for facilitating teacher professional learning and advancing one’s capacity to incorporate technology into classroom practice from a beginner level to a more experienced one (Browne & Ritchie, 1991; Glazer, Hannafin, Polly, & Rich, 2009).
Technology Integration Interventions

Diverse professional learning programs implemented in different parts of the world to address barriers to technology integration conveyed several messages:

- Professional learning programs should help school leaders develop and promote a school’s vision for educational technology and prepare possible policies for incorporating ICT into teaching and learning (Mwawasi, 2014);

- School-based ICT policies and/or plans can be in three types: as a technology policy plan as a vision blueprint, a technical inventory, and a detailed ICT integration plan (Vanderlinde, Dexter, & van Braak, 2012);

- School leaders learn more effectively through job-embedded professional development that involves hands-on experience and collaboration with others (Abdul Razzak, 2013; Zhang & Brundrett, 2010);

- Effective professional development programs should base on contemporary research (Mouza, 2009), contain practical tasks with the use of technology (Brinkerhoff, 2006; Uslu & Bumen, 2012), and respond to educators’ needs (Walker et al., 2012);

- Mentoring is considered to be the core tenet of successful professional learning initiatives (Darling-Hammond, Hyler, & Gardner, 2017; Kopcha, 2012);

- Professional learning initiatives should embed content, pedagogy, and technology within the actual context of a regular classroom by hinting at a more specific type of professional learning for ICT integration (Crisan,
Lerman, & Winbourne, 2007; Doering, Koseoglu, Scharber, Henrickson, & Lanegran, 2014);

- Professional learning of geography and history teachers should consider the giving-prompting-making model for social studies instruction to explain the relationship between teachers’ pedagogical content knowledge and technology (Hammond & Manfra, 2009; Mishra & Koehler, 2006).

**Evaluation of Cognitive Apprenticeship-based Professional Development Program**

The intervention, cognitive apprenticeship-based professional development (CAPD) program, aimed at school administrators and teachers intended to mitigate some of these barriers and support the application of technology into the classroom in Baku schools. The purpose of this study was to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ aptitudes to implement educational technology that could potentially boost student learning. The research questions included both process and outcome questions. The study employed a quasi-experimental mixed methods design to understand whether the intervention might be associated with any changes in teachers’ technology integration knowledge and self-efficacy toward educational technology. The study involved one group of participants and the dependent variable was measured before and after the treatment. I collected data concurrently using both quantitative and qualitative data that allowed for triangulation (Creswell & Plano Clark, 2011).

I implemented the intervention in four public schools located in Baku. Two school administrators, a principal, a vice principal, and four general secondary grade (i.e., five to nine) teachers from each school, a total of 24 individuals participated in this study.
My intervention targeted geography and history teachers and only teachers of these subject areas (i.e., two geography and two history teachers per school) benefited from the program. To evaluate the implementation of the CAPD program, I collected data using postworkshop survey and focus group interview protocols. Then, the same focus group interview protocols, plus two questionnaires, and an observation protocol were applied to measure any changes in outcomes. Moreover, I performed document analysis to evaluate the ICT integration plans prepared during the CAPD program.

**Intervention**

I designed and developed the CAPD program, which addressed the factors that emerged as important in my needs assessment study. The aim was to have two groups of participants, school administrators and teachers; hence, the components targeting each group differed. Two experts on educational technology who teach geography and history were recruited to serve as mentors. The school administrator component of the CAPD program lasted 20 hours in the form of group meetings and school-based consultations. Participating school leaders crafted their own school-based ICT integration plans during this program. The teacher component concentrated on teachers’ technology integration knowledge, self-efficacy toward educational technology, and meaningful classroom experiences with the use of ICT to advance student learning. The duration of this component of CAPD was 40 hours. Teachers first attended a 20-hour virtual workshop on the educational uses of ICT with the adoption of a problem-based approach to increase teachers’ knowledge about possible uses of technology in geography and history classes to support student learning. Then they received a 20 hours of mentoring support
implemented during March-May 2021. With the assistance received from mentors, teachers designed and implemented technology-enhanced instruction.

**Findings**

The intervention was implemented as planned, I adhered to the original program design, and the dosage of each CAPD component remained unchanged. Generally, participants enjoyed this professional learning opportunity and found it quite useful. School-based consultations were especially beneficial as administrators could focus on their products and make essential improvements. Participation in the CAPD program helped school administrators develop a vision relative to pedagogical use of ICT. Six out of eight administrators agreed that having a vision for education technology was equal to having a unified approach across the school. They also crafted the school-based ICT integration plans during program, which means that the intervention was effective at increasing school leaders’ knowledge as intended. With these plans, principals and vice principals determined their objectives for technology integration and scrutinized ICT infrastructure of the school, teachers’ professional learning concentrated on pedagogical use of ICT, and training of students and other pertinent stakeholders.

Teachers attended the 20-hour virtual workshop followed by 20 hours of mentoring support. They learned how to incorporate technology to advance student learning, became acquainted with several subject-specific ICT tools, and developed technology-mediated lessons in connection with curricula goals. Participants found mentoring as one of the most beneficial aspects of CAPD. The intervention resulted in significant increases in teachers’ technology integration knowledge and self-efficacy toward educational technology. Moreover, the relationship between these two variables—
technology integration knowledge and self-efficacy toward educational technology—postintervention was positive, significant, and strong. In other words, teachers’ knowledge about pedagogical use of ICT is associated with their belief or confidence level in their abilities to implement this innovation. Furthermore, teachers used numerous applications of ICT tools in both geography and history lessons. In mid-intervention lessons, teachers mainly incorporated technology for activating prior knowledge or presenting new topics, whereas toward the end of CAPD, they advanced their teaching practice and utilized these tools to deepen students’ geographical or historical content knowledge, to promote their geographical or historical thinking as well as critical thinking skills and assessed and reinforced their learning. This implies that CAPD was successful and achieved short and medium-term outcomes.

My anecdotal observations showed that school administrators had inadequate knowledge about the general management of an educational institution, in this case, a public school. Most of them demonstrated minimal information about the basic principles of school management. For instance, school administrators had seen annual action plans sent by upper organizations but never developed one and even struggled to construe such plans. Likewise, they expressed a need for better information technology infrastructure and more equipment for schools, yet were unaware of the procedure for requesting it from the MoE. School leaders also possessed limited big picture thinking abilities and focused on trivial details, which might hinder their professional growth.

The difficulties faced by teachers varied in nature. All of them were experienced geography or history teachers in public schools but they seemed to be unfamiliar with the geography or history subject curriculum despite regular teaching. They demonstrated
difficulties in not only understanding standards and/or learning outcomes described in curricula but also in assessment of and for learning. They also exhibited limited pedagogical knowledge with respect to effective instructional strategies in social studies classroom and outdated content knowledge, particularly in the case of geography. Their perceptions of inquiry-based instruction or geographical inquiry and of historical reasoning very much differed from mine. Perhaps, this is why teachers encountered difficulties fostering students’ higher-order thinking skills, bolstering historical reasoning through exploration and inquiry, or engaging them in geographical inquiry. All these once again highlight the importance of primary forms of knowledge plus technological pedagogical content knowledge as described by Mishra and Koehler (2006).
Chapter One

Barriers to Technology Integration

Recent fundamental changes in the global economy have shaped the workplace and demand a highly-skilled workforce. This workforce has to meet the requirements of the “service economy driven by information, knowledge, innovation and creativity” (Greenhill & Petroff, 2010, p. 7). Technology has supported these changes and new emerging industries have applied technology-based task teams, dispersed decision making, information sharing, flexible work arrangements, and interaction between organizations (Greenhill & Petroff, 2010). According to a survey conducted by American Management Association (2010), these aspects of businesses require a workforce with new skills beyond literacy and numeracy to further develop their companies. Critical thinking, complex problem-solving, effective communication, collaboration, emotional intelligence, creativity and innovation, design and programming skills have become more pivotal to business endeavors as they strive to get integrated with the knowledge economy (World Economic Forum, 2018). Today, business leaders across the world are trying to manage global competition and the speed of this change, which eventually results in demanding much more from their employees. The Partnership for 21st Century Learning (P21, 2016) has developed a vision for 21st century student success and labeled the above-mentioned skills as today's survival skills necessary not only for leading a successful career but also for leading a quality life. Information, media, and technology competency skills are one set of skills required in the competitive global job market. This skill set is defined as “the ability to use technology to develop 21st century content knowledge and skills, in the context of learning core subjects” (Dede, 2010, p. 5). For this
purpose, heeding a call to implement the use of technology in education is essential. The shift in worldwide technology usage and the need for a computer literate workforce stimulated the application of information and communication technologies (ICT) to various fields. We use technologies in our daily lives and, for many of us, leading a life without interacting with some sort of computing device is almost unimaginable. Since computers were made available for the wider public, a variety of programs have been implemented in schools worldwide aimed at facilitating teaching and learning through technology. Computer usage for educational purposes can, in fact, be traced back to the early 1960s, when Seymour Papert introduced the idea of providing children with computers to be used as a tool for thinking (Bull, 2005). However, educators around the globe began employing computers more as a teaching and learning tool only since the early 1980s (Johnstone, 2003).

As computers became more accessible and affordable, the demand for this technology increased, which in turn resulted in more frequent use of computer technologies in schools (Cuban, 2001). To support students’ development of skills necessary to successfully enter and thrive in the 21st century work environment, some countries have reconsidered core educational standards and promoted the use of technology in the classroom by launching numerous education reforms and resources in schools with ICT (Pelgrum & Law, 2008). Consistent with Bransford, Brown, and Cocking (2000), technology has the capacity to support learning; it has the potential to create “new opportunities for curriculum and instruction by bringing real-world problems in the classroom for students to explore and solve” (p. 207). Educational use of technology can instigate the development of authentic and meaningful learning
experiences (Richardson, 2007) and provide prospects to engage and motivate children in the learning process (Department for Education and Skills [DfES], 2003). Hence, there is a great demand on all educational stakeholders to integrate ICT into education to cultivate necessary skills and knowledge in students.

Before exploring the topic further, I want to define the terminology used in this manuscript. I have adopted Gillespie’s (2006) explanation of the term ICT, which is “a range of hardware (machines) and software (applications of the machines)” (p. 3). Throughout this study, I use the terms ICT and technology interchangeably. These generic terms for technology are contrasted with the term educational technology by which I refer to the use of ICT to enhance and facilitate teaching and learning. This definition is derived from the Association for Educational Communications and Technology’s definition of educational technology, which is “the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (Richey, Silber, & Ely, 2008, p. 24).

Educational technology can make teaching more student-centered and interactive, develop a highly engaged environment, and urge students to build deeper connections with the content taught and generate meaning (Overbay, Patterson, Vasu, & Grable, 2010). The interactivity of technologies is a significant attribute for learning because it makes it easy for teachers to provide feedback to students about their thought process and for students to modify their work. Employing technology as a tool in the classroom may allow teachers to achieve learning objectives set forth by the curricula, create individualized learning processes, facilitate collaboration among students, enhance
learning by producing various learning materials, and improve students’ individual performance (Midoro & Admiraal, 2003). Research shows that students enjoy using technology during lessons, perceive the advantages of technology-enhanced self-directed learning, and develop necessary technology literacy skills to better prepare for the future (Dornisch, 2013; Li, 2007). Similarly, use of technology within an educational context motivates students to acquire content knowledge, develop critical-thinking skills, and work with information (Morgan, 2013). Nevertheless, evidence suggests that regardless of serious investments in technology infrastructure, computer equipment, and teacher training, the adoption, utilization, and uptake of ICT for educational purposes in K-12 is a slow process (Gulbahar, 2007; Mumtaz, 2000).

**Problem of Practice**

My problem of practice focuses on the level of technology use for teaching and learning in public schools in Baku, Azerbaijan. The government of Azerbaijan implemented two state programs related to the integration of ICT into education and the majority of school teachers took part in training workshops (discussed below); however, my professional classroom observations show that effective usage of technology in the classroom has not yet occurred. Effective integration of educational technology should result in meaningful learning with technology; that is, students should be engaged in active, constructive, intentional, authentic, and cooperative activities (Howland, Jonassen, & Marra, 2013). Such activities may “increase students’ abilities to understand complex ideas and learn challenging content using technology” (Ashburn & Floden, 2006, p. 2). Although the Ministry of Education (MoE) has not published any reports on the level of technology use in public schools, anecdotal reports indicate that there are barriers to the
use of technology in our schools. In this context, the term barrier refers to “the things which prevent teachers from utilizing the full potential of ICT in teaching and learning” (Gillespie, 2006, p. 4.).

**Context of Professional Practice**

The Cabinet of Ministers and MoE of the Azerbaijan Republic oversee education in Azerbaijan. The Cabinet of Ministers makes decisions on the education strategy and supervises the implementation of the Education Law, while MoE is the central body administering the education system (UNESCO-International Bureau of Education, 2011). The education system of Azerbaijan is divided into five stages and some stages contain levels: preschool education, general education, vocational education, secondary professional education, and higher education. General education includes four levels: preparation to school (age 5-6), primary (i.e., grades one to four), general secondary (i.e., grades five to nine), and complete secondary (i.e., grades 10-11) education. The Education Law of Azerbaijan sets nine years of general education (grades one to nine) as compulsory, provided free of charge in public schools (E-Qanun, 2009). The school year in Azerbaijan consists of 34 working weeks with five to seven lessons per day, on average. Each lesson lasts 45 minutes (E-Qanun, 2020). Azerbaijani, the official language of the country, is the main medium of instruction in public schools (E-Qanun, 2009).

Recent educational reforms realized in Azerbaijan include two state programs relative to the use of technology in schooling. MoE administered the “Provision of Educational Establishments in the Republic of Azerbaijan with Information and Communication Technologies” program in 2005-2007 (E-Qanun, 2004) and supplied schools with computers, uninterruptible power supplies, networking equipment (i.e.,
switch, cables, and connectors), and laser printers. The computer-student ratio significantly improved and reached 1:28 in grades five to 11 by the end of the program (Trend, 2013). Major achievements of this program apart from the supply of ICT equipment were an introduction of the new concept, ICT for Education, and workshops conducted for the first groups of teachers in Baku (i.e., the capital city of Azerbaijan) and several other regions on the educational use of technology. The second “State Program on Informatization of Educational System in the Republic of Azerbaijan in 2008-2012” focused on the enhancement of education through the integration of technology in schools (E-Qanun, 2008). A key success of this state program was the establishment of the Bureau on ICT for Education in 2008 whose mission is to ensure application of technology in all stages of education through infrastructure development, e-management, e-content, and professional learning (Bureau on ICT for Education, 2018). The particular program provided Internet connectivity to many schools in cities, developed a national database of the web and e-Learning resources, and initiated in-service training of teachers and school administrators. Most public school teachers across the country participated in training courses on technology-enhanced collaborative learning, pedagogical aspects of technology, ICT-assisted problem and project-based learning, one-to-one computing, and so on. Workshops conducted for school administrators focused on the use of technology for school administration and management. Additionally, the Bureau on ICT for Education developed digital content to supplement textbooks and launched numerous competitions motivating the use of technology for educational purposes (ICTNews, 2012). All of these initiatives continued with the approval of the “State Strategy on Development of Education”, the policy that considered reforms in the areas of content,
teacher quality, governance, infrastructure, and financing. It included several strategic objectives, of which one was to modernize the education system through the use of ICT and expand access to Internet in public schools across the country (E-Qanun, 2013). To better understand the context of professional practice of Azerbaijan, it is important to understand the general stance toward pedagogy during those years in Azerbaijan.

**General Stance toward Pedagogy**

After gaining its independence in 1991 as a result of collapse of the Soviet Union, Azerbaijan decided to undertake fundamental educational reforms and started active collaboration with international organizations such as the World Bank. One of the strategic reforms targeting general education, the Education Sector Development Project implemented in 2003-2008, intended to improve governance, shift to standards-based curriculum in general education, advance teacher professional learning, and prepare new textbooks (MoE, n.d.-a). The subject curricula that were developed contained content domains, content standards, learning outcomes, and suggested active learning strategies. Furthermore, a new national assessment policy was adopted, and Azerbaijan participated in the Programme for International Student Assessment administered by the Organization for Economic Cooperation and Development (UNESCO-International Bureau of Education, 2011) for the first time. The main channel of communication to disseminate core messages of these reforms and similar initiatives was the Curriculum Journal founded in 2007 (MoE, n.d.-b). This journal not only published articles about and the results of the reforms but also increased readers’ awareness about modern approaches to education and pedagogy.
The aforementioned reforms in Azerbaijan instigated change in the general perspective toward pedagogy. Traditional views about education, shaped predominantly during the Soviet Union, have been teacher-centered with focus on repetition and memorization of facts. This perspective started shifting slowly to learner-centered approaches, which put students at the center of the learning process and actively engages them in their own learning (Jones, 2007). According to Azerbaijani scholars Mehrabov and Abbasov (2010), learner-centered pedagogy stimulates accumulation of valuable knowledge and skills with significant attention to social development and needs of a child. This approach cultivates students’ ability to think critically, communicate effectively, overcome challenges, use diverse technologies to find feasible solutions to real-world problems, create and innovate, as well as engage in self-directed learning to grow both personally and professionally (Memmedov, 2010). Technology should serve as a tool in the process of teaching and learning to achieve these goals and prepare digitally literate students, ready to join the labor market (Memmedov, 2010). For this purpose, MoE allocated significant funding to train teachers in technology-enhanced pedagogy.

Professional development programs focusing on educational technology implemented in Azerbaijan aimed to increase participants’ technology literacy as well as provide in-depth information about modern approaches to teaching and learning. Content of these programs incorporated constructivist learning theory, Bloom’s (1956) taxonomy, coaching or mentoring, and technology-enhanced instruction. Pedagogical approaches taught to teachers within these programs were comprised of collaborative learning, problem-based learning, and project-based learning. Technology-enhanced instruction included designing technology-rich learning activities, developing lesson plans with the
use of ICT, producing project portfolios, and engaging with Web 2.0 technologies, and subject-specific e-resources. For instance, Intel Teach to the Future, a 48-hour training program conducted in Azerbaijan, built teachers’ capacity in project-based learning and encouraged participants to develop education projects and work with multimedia presentations (Madad Azerbaijan, 2010). Similarly, Educational E-resources is also a 48-hour training program that focuses on the use of subject-specific electronic educational resources that may enrich teaching and learning. Teachers used Microsoft Mouse Mischief, Publisher, OneNote, Microsoft Interactive Classroom in addition to other Microsoft Office programs during this professional development initiative (Madad Azerbaijan, 2011). Although these programs addressed numerous issues related to the topic of educational technology in Azerbaijan, anecdotal evidence showed that educators seemed to have difficulties in employing the full potential of ICT to enhance instruction, stimulate students’ learning experiences, and eventually, change the nature of learning.

**Theoretical Framework**

Bronfenbrenner (1979) believed that a person’s development was affected by everything in his/her surrounding environment. Considering the centralized nature of our education system, his ecological systems theory (EST) provides me with a framework for understanding the development of a teacher in relation to his/her environment and the interaction between the two. As noted by Fullan (1993), a teacher is the change agent in the case of technology integration; consequently, he/she is in the center of all other contextual factors related to ICT uptake. According to Bronfenbrenner (1979), the ecological levels represent nested structures, each inside the other. He draws an analogy to Russian dolls for the purpose of explanation. These structures or the five levels called
the chronosystem, macrosystem, exosystem, mesosystem, and microsystem influence teacher development and behavior. The general explanation of each level starting with the outer one in relation to teachers in my context is provided below (see Figure 1.1).

![Diagram of Ecological Systems Theory](image)

**Figure 1.1.** Ecological systems theory in relation to teachers in my context

The chronosystem is represented as the most outer ring within the EST model and denotes the dimension of time. This system shows that the changes and environmental events occurring over time can affect multiple phenomena within the system. In my context, time and historical influences as well as recent changes happening in the education system can influence teachers. For example, recent state programs implemented in the country on the use of educational technology discussed in the previous section along with rapid development and implementation of technology such as
massive subject-specific open resources available on the Internet, web 2.0 technologies, and smart boards may affect teachers’ perspectives about education and use of ICT.

The next level is the macrosystem, which represents the cultural environment in which we live. This level includes the largest and most distant set of people and things to the phenomenon that still have positive or negative influences. The macrosystem includes cultural values, traditions, social norms, economy, and politics. A good example of this would be duration of each lesson (i.e., 45 minutes) in schools, which is determined by the Cabinet of Ministers and treated as a social norm or tradition in our society. Many teachers claim that they lack time to prepare technology-supported learning activities and/or utilize of ICT in the classroom (Al Mulhim, 2014). This may also limit teachers’ ability to incorporate technology because it requires giving up some degree of authority.

The exosystem does not directly involve the focal individual as active participant but decisions taken at this level are still influential. In my setting, the resolutions of the educational departments or MoE guide teachers’ behavior even though they do not participate in the decision-making process. For instance, according to MoE (n.d.-c), teachers are required to have some level of technology literacy because recruitment protocol requires submission of an online application and computer-based exams. In addition, the government of Azerbaijan supports innovations in education and encourages teachers to use computers in the classroom. Some of the actions taken by MoE consist of improving the ICT infrastructure in education facilities, expanding the coverage of connected schools, and launching grants competitions, where one of the priorities addresses the use of technology in schooling (MoE, 2019), implementing initiatives such
as Science, Technology, Engineering, Art, and Mathematics (MoE, 2020a), etc.

Ultimately, all these events may influence teachers’ uptake of technology.

The following level, the mesosystem, describes relationships and interactions between different parts of the microsystem. These interactions and connections between teachers, students, colleagues, and/or school administration may strongly influence implementation of educational technology. When teacher’s colleagues use ICT in classroom activities they may help the teacher explore new ways of utilizing technology for educational purposes. On the contrary, if school administration has negative attitudes toward computers and think that technology distracts students from learning, then the teacher will be less likely to employ technology within education (Polizzi, 2011).

The microsystem is the level closest to the focal individual and encompasses the direct environment of this individual. Families, friends, colleagues, neighbors, and other people who are in direct contact with the individual are in the microsystem. As the most influential sphere, it includes interactions and bidirectional relationships. Individual’s reactions to people in the microsystem translate to their reactions to this individual; thus, the connections between the people present in this setting are equally important. In my context, a teacher’s microsystem is comprised of family, friends, students, colleagues, and school administration. Teachers’ colleagues may not only collaborate but also strongly compete with each other in Azerbaijan. In this respect, if one teacher receives oral or written recognition for effective technology integration it may motivate others as well (Schneckenberg, 2010).

EST (Bronfenbrenner, 1979, 1994) demonstrates that the diversity, quality, and type of interconnected relationships in different settings affect teachers’ behavior and is,
therefore, a suitable framework for understanding and analyzing the myriad factors associated with the integration of educational technology in schools.

**Factors Associated with Integration of Educational Technology**

Several crucial factors affect the use of technology in teaching and learning. Numerous researchers (e.g., Al Mulhim, 2014; Bingimlas, 2009; Hew & Brush, 2007; Pape & Prosser, 2018) used the term barrier when delineating obstacles to ICT integration into education and classifications of these barriers differ. Ertmer (1999) considered equipment, time, training and support to be extrinsic or institutional barriers, while attitudes, beliefs, practices and resistance to be intrinsic or personal barriers. Pelgrum (2001) grouped an inadequate number of computer devices or software as material, and scarce ICT knowledge, difficulty in applying technology to education, and lack of teaching time as non-material obstacles. The British Educational Communications and Technology Agency (Becta, 2004) labeled lack of time, lack of confidence, and resistance to change teacher-level, and lack of effective training and limited access to resources as school-level barriers.

This section includes a discussion of macro-, meso-, and micro-level barriers related to the educational use of technology underlined in the reviewed studies. Throughout this manuscript, I will use the terms barrier and obstacle interchangeably.

**Macro-level Barriers**

Education systems across the world vary from one country, state, or even district to another, and sometimes it is the system itself and/or the decisions taken in the macrosystem and exosystem level of the EST model that affect the technology integration process. Although some countries might be interested in using technology in teaching and
learning, the structure of a traditional schooling system potentially causes resistance to technology and its impact on education, which may impede the uptake and adoption of ICT in schools (Balanskat, Blamire, & Kefala, 2006). When governments do not change their traditional viewpoints and vision for education and continue applying restricted curricula as well as traditional assessment systems, effective implementation of educational technology will remain an issue (Balanskat et al., 2006). This corresponds to the arguments made by Daniels, Jacobsen, Varnhagen, and Friesen (2013), who state that education systems should revisit their existing visions to achieve success in technology integration at the macro level. Changes in the education systems are vital to adopt new and innovative approaches to teaching and learning to accommodate students’ needs and nurture them to become creative knowledge producers with the help of technology. However, before changes are implemented, they should be properly communicated to all stakeholders. One of the macro-level barriers found in the literature is lack of communication among the members of the educational community related to the role of ICT in future education (Condie & Simpson, 2004; Wisdom et al., 2007).

**Lack of communication.** To facilitate the uptake of technology in schooling, educational technology should be considered as innovation, and diffusion of any innovation requires proper communication within a social system. Consistent with Rogers (1983), communication “is a process in which participants create and share information with one another in order to reach a mutual understanding” (p. 5). Communication is imperative in the change management process as it is a tool to introduce the change and encourage pertinent individuals and/or organizations to participate in the implementation process (Lewis, 2000). Many studies (e.g., Condie &
Simpson, 2004; Frank, Zhao, & Borman, 2004) report that lack of communication about the importance of educational technology among relevant government officials, school principals, and teachers seems to hinder ICT integration. Wisdom et al. (2007) conducted semi-structured interviews and focus group discussions with 36 individuals from Northwest U.S. K-12 schools in four states. They reported that the communication gap between teachers, professional colleagues, administrators, and parents was one of the barriers that delayed ICT adoption. This reaffirmed the results of the study conducted by Frank et al. (2004); in other words, communication within the organization has a potential to change people’s views about the importance of innovation and these views then guide implementation.

When members of an organization have information about change, they can talk, help, and even exert pressure on each other to implement the change because they belong to a common social system. School leaders can also foster the development of a collaborative culture in the school community through communication (Zhu, 2013). When the school community promotes innovation, more and more people may become interested and accept novel educational approaches such as technology-enhanced learning environment. Equally, Niemi, Kynäslahti and Vahtivuori-Hänninen (2013) indicated that communication strategies about ICT integration should be included in the school strategy plan as one of the main characteristics of successful integration. While communicating the importance of educational technology, decision makers or management should also be ready to answer teachers’ questions related to lack of adequate time as an obstacle to technology integration.
Lack of time. Another common barrier that impedes the application of technology in education is lack or shortage of time. Lack of time is frequently discussed as a teacher-level barrier in the literature; however, in Azerbaijan, duration of each lesson is a political decision and teachers are not paid for planning and preparation for their lessons. Therefore, this section touches upon the issues that can and should be solved at the macro level.

Teachers in many studies reported that lack of time was a reason for not implementing technology in the classroom. For instance, in the study conducted by Pelgrum (2001) in 26 European countries, 54% of the participant teachers said that they did not use technology while teaching because they did not have time for it. Time required for preparing technology-enhanced lessons also seem to be a problematic issue in the United States and other countries (Hew & Brush, 2007). More than a decade later, an ethnographic study conducted by Pape and Prosser (2018) also highlighted time constraints with reference to planning and preparation, covering the material, and finding suitable resources to supplement instruction. Teachers in Bangladesh stated that they lacked time to attend the relevant training programs, learn to use technology, design strategies to incorporate ICT into lessons, and even to collaborate with their colleagues because most educational institutions offer classes in two shifts without increasing the number of teachers (Khan, Hasan, & Clement, 2012). Likewise, the vast majority of UK teachers pointed out that they needed additional time to experiment with ICT, develop ICT-based educational resources, and attend applicable professional development workshops (Becta, 2004). Having insufficient time to use computers, plan a lesson, and incorporate technology into teaching and learning may affect teachers’ level of
commitment to use technology to support and advance student learning. This corresponds to the results of a qualitative study carried out by Bauer and Kenton (2005); even tech-savvy teachers (n = 30), who were open to innovations and skilled in using ICT did not utilize technology during lessons on a consistent basis because they needed extra time to plan for technology-enhanced lessons.

In many countries, one lesson lasts 45 minutes and there is much to be covered during this short time period. Considering the number of students in each class, teachers not only lack time to prepare technology-rich learning activities and utilize ICT during the lessons but also face difficulties in managing the crowded classrooms when technology is used (Al Mulhim, 2014). Al Mulhim (2014) recommended longer lesson durations and reduced teacher load to enable them to prepare for lessons, meet lesson objectives and curriculum requirements, and apply technology to enrich teaching and learning. Although governments should address such issues, schools should also take active roles in the implementation of educational technology and be ready to concentrate on meso-level barriers.

**Meso-level Barriers**

Once governments revisit their existing visions about education and acknowledge the role of technology in schooling, schools will be able to demonstrate their positions with reference to technology’s place in education by tackling barriers to effective technology integration. This section discusses three meso-level barriers, (a) absence of shared vision and ICT integration plan, (b) limited access to technology, and (c) limited effective training frequently noted in the reviewed literature. These issues usually occur in the mesosystem of the EST model and involve interactions between school
administrators and teachers. One of the barriers found at this level is absence of shared vision about ICT uptake, which is linked to a technology integration plan, provision of hardware and software as well as targeted professional development (Chang, 2012; Gulbahar, 2007).

**Absence of shared vision and ICT integration plan.** Not having a clear vision and/or a plan is a barrier to technology integration (Gulbahar, 2007; Khan et al., 2012). Many schools have a school vision, policy, and/or strategic plan that reflects various issues including communication in a school culture. Creating a vision related to educational technology is the first step in planning ICT integration, which should be followed by the development of an ICT integration plan (Bennett & Everhart, 2003; Chang, 2012). Having a clear policy or integration strategy about innovation implementation may bolster the process and positively influence both communication about its importance and uptake of technology in schools (Hannafin, 2008; Overbay, Mollette, & Vasu, 2011). Tondeur, van Keer, van Braak, and Valcke (2008) analyzed local school educational technology policies and looked at the association between school policies and the actual level of technology integration. They conducted structured interviews with 53 school principals and administered a survey to 574 teachers. Participants pointed out that school-related policies such as ICT integration plan, technology support, and training focused on educational technology had substantial effects on the level of technology use in the classroom.

To investigate the ICT planning process, Gulbahar (2007) collected data from 105 teachers, 25 administrators, and 376 students in a private K-12 school in Turkey. All research participants expressed their perceptions about the current use of technology in
their school through a questionnaire. Additionally, the researcher organized unstructured interviews with the administrative staff to validate quantitative data. Gulbahar then provided input for the technology planning process; the suggestions obtained through descriptive data analysis included hardware and software resources, equity of access to resources, support services, reward systems, integration of technology into curriculum, and in-service training. Furthermore, she highlighted the importance of evaluation, which includes continuous revision and improvement of a technology plan to keep up with the rapid development of technology (Gulbahar, 2007). In another study, survey respondents (i.e., 1000 teachers) randomly selected from 100 Taiwanese elementary schools also emphasized the significance of developing a technology plan with shared vision and goals for a school (Chang, 2012). Chang reported “principals as technological leaders must develop and implement vision and technology plans for their schools, encourage the technological development and training of teachers, provide sufficient technological infrastructure support, and develop an effective school-evaluation plan” (p. 336).

Similarly, Khan et al. (2012) found that technology was not effectively integrated in most schools in Bangladesh due to an absence of school vision and ICT integration plan. Such plans should cover many aspects of technology planning including the availability of hardware and software; consistent with Afshari, Bakar, Luan, Samah, and Fooi (2009), effective use of technology in teaching and learning is contingent upon the availability of and equal access to resources by all stakeholders.

**Limited access to technology.** Shortage or absence of computers and other technologies, poor quality hardware and software, and/or insufficient access to ICT can create major limitations for teachers who are willing to practice technology-enhanced
teaching and learning. Data collected from 242 secondary science teachers in Taiwan indicate that access to computers influences the use of technology in schools (Shiue, 2007). This study supported the results obtained by Pelgrum (2001), which focused on the worldwide assessment of technology use in schools. Across 26 European countries, teachers reported that limited number of computers was the top barrier to technology adoption in schools. Seventy percent of survey respondents mentioned deficiency of hardware and software had serious negative effects on educational technology (Pelgrum, 2001). Twelve years later, insufficient or out-of-date ICT equipment, particularly lack or shortage of interactive whiteboards still remains as a key barrier to educational technology in Europe (European Commission, 2013). Wachira and Keengwe (2011) conducted a mixed method study to examine urban school teachers’ views about barriers to educational technology and analysis of qualitative data detected lack of hardware and appropriate software as the chief obstacle faced during the integration process. Teachers in Saudi Arabia were also concerned about the shortage of necessary computer technologies and declared that schools possessed inadequate number of computers available for teachers (Al Mulhim, 2014). Other studies (e.g., Albugami & Ahmed, 2015; Forgasz, 2006) reported that the number of computers for students' use did not match the number of students per class.

Along with the lack of devices, poor quality hardware and software may also hinder ICT uptake. The data collected through a validated questionnaire among 30 in-service teachers with ICT background in Fiji schools indicate that limited access to technology as well as old computers with poor maintenance are significant obstacles to utilizing technology in the classroom (Nath, 2019). Maintenance and technical problems
are difficult to manage, thus require technical support. The absence of technical support, too, negatively influences ICT integration when teachers face serious technical problems (Ensminger, Surry, Porter, & Wright, 2004; Kozma, 2008). Many survey respondents in the UK expressed that limited full-time technical support would lessen teachers' interest in adopting technologies for teaching and learning (Becta, 2004). Without consistent maintenance of technology and desired technical support in schools, teachers will not be willing to overcome technological barriers (Lewis, 2003). This was confirmed by the results of a study conducted by Usluel and Yildiz (2012) in Turkish schools; technical support was one of the main factors impeding the ICT integration process. Even if schools provide access to technology accompanied by technical support teachers may still require professional learning to effectively incorporate ICT into subject teaching.

**Limited effective training.** Another meso-level barrier to technology integration is limited effective professional development programs. Evidence (e.g., Becta, 2004; Pelgrum, 2001; Tearle, 2003) shows that most of the training courses offered to teachers on the educational use of technology were inconsistent in quality, focused specifically on device or computer programs rather than the combination of pedagogy and ICT, and failed to help teachers properly incorporate ICT into lessons. Empowering teachers to utilize technology in the classroom by designing and implementing subject-specific ICT professional learning to help them teach subjects with the help of technology and to meet curriculum goals is a critical component of the ICT integration process (Barton & Haydn, 2006; Francis-Pelton, Farragher, & Riecken, 2000; Yoshida, 2018). For instance, science teachers’ needs in terms of using technology during lessons might differ from those of mathematics teachers; hence professional learning should combine technology,
pedagogy, and content as well as demonstrate ways to use ICT in meaningful ways to support student learning (Osborne & Hennessy, 2003). However, most professional leaning events tend to concentrate on technical sides of ICT rather than exploring its potential to enhance student learning and suggesting strategies for maximizing its effectiveness. Bingimlas (2009) claimed that training courses conducted in Riyadh did not cover the pedagogical facets of technology to successfully integrate it into education. Similarly, Wachira and Keengwe (2011) reported that teachers received general professional development program, which did not “help them learn content-specific ways of technology integration” (p. 21).

In addition to combining technology with subject content, effective teacher training should also take place over longer periods, be continuous, allow teachers to use technology for personal and professional learning, and explain benefits of ICT for advancing student learning. As stated by Khan et al. (2012), one-shot short workshops are not enough for building teachers’ capacity to effectively employ technology in their instruction. Scarcity of continuous professional learning is one of the critical barriers to the use of educational technology in Pakistan as well (Majoka, Fazal, & Khan, 2013). These authors conducted a multiple case study examination of the role of a course, *ICTs in Education* (p. 42), in employing technology for instructional purposes. Data collected through survey and semi-structured interviews revealed that lack of continuous training was one of the factors that impeded teachers from integrating technology. Moreover, training should include collaborative learning activities, integrate practical tasks using technology, and build connection to classroom experiences (Lawless & Pellegrino, 2007; McCarney, 2004). Hsu (2010) administered a survey to research the relationship between
teachers’ technology integration ability and actual usage of computers and found a positive correlation between the two constructs. This study also suggested that well-trained teachers successfully applied ICT in teaching and learning and once more emphasized the quality of offered professional development programs. For this reason, successful professional learning designers should consider all of the aspects discussed here plus individual-level barriers to technology adoption.

**Micro-level Barriers**

As previously noted, teachers are the main change agents in the implementation of educational technology. Thus, it is important to understand the obstacles faced by them in the microsystem of the ecological system during the process of ICT integration. This section incorporates a discussion of four internal barriers pinpointed by a large number of researchers: limited ICT and technology integration knowledge (Albirini, 2006; Pac, 2008), pedagogical beliefs (Ertmer, 2005), and low self-efficacy toward teaching with technology (Curts, Tanguma, & Pena, 2008), and attitudes toward ICT (Palak & Walls, 2009; Vannatta & Fordham, 2004). Inadequate relevant knowledge is identified to be one of the main reasons why teachers struggle to leverage technology as meaningful instructional tools.

**Limited knowledge.** Limited ICT knowledge and/or lack of technology competence influence teachers’ use of technology in their classrooms (Becta, 2004; Hew & Brush, 2007). For more than a decade, many scholars (e.g., Bechtel & O’Sullivan, 2006; Borko & Putnam, 1995; Ertmer & Ottenbreit-Leftwich, 2010) emphasized expanding, advancing, and enhancing teachers’ knowledge systems to shape their decisions and facilitate a change in their instructional practices. In this respect, to apply
ICT within teaching and learning teachers first need technology knowledge (Lawless & Pellegrino, 2007). Limited ICT knowledge and skills make teachers feel nervous about adopting technology, especially when students know much more about computers than teachers themselves (Becta, 2004). Albirini (2006) found that insufficient ICT skills was the main obstacle Syrian teachers reported facing while utilizing technology in the classroom and this barrier affected their views about technology and its potential impact on student learning. This finding aligned with other studies conducted in different parts of the world. For instance, Peralta and Costa (2007) conducted a multiple case study in five European countries (i.e., Greece, Italy, Portugal, Spain, and the Netherlands) and invited 20 randomly selected teachers from each country to participate in the focus group discussions. These discussions were conducted in a semi-structured format and allowed participants to share their experiences and ideas about technology use in lessons. Using an a priori coding system, Peralta and Costa discovered that lack of teachers’ technology competence was one of the main barriers in making use of ICT for instructional purposes. This finding was reaffirmed by another study carried out in 31 European countries (European Commission, 2013); limited ICT knowledge/skills remained a hindrance for teachers in Greece, Turkey, Austria, and Belgium.

However, knowing how to use hardware and software is perhaps insufficient for effective application of ICT within teaching and learning; teachers should also possess technology integration knowledge. This term usually refers to technology-supported pedagogical knowledge and skills (Ertmer & Ottenbreit-Leftwich, 2010, Hew & Brush, 2007). In other words, the ability to use ICT as an instructional tool to create meaningful learning activities and bolster student learning requires a skill set at the intersection of
content, pedagogy, and technology. This is also known as the technological pedagogical content knowledge or TPACK, which is a framework for teacher knowledge to facilitate successful ICT integration (Mishra & Koehler, 2006). TPACK is an intersection of other knowledge areas such as content knowledge, pedagogical knowledge, technological knowledge, technological content knowledge, pedagogical content knowledge, and technological pedagogical knowledge (see Figure 1.2).


According to this framework, content knowledge is teachers’ knowledge about the subject area he/she teaches including “knowledge of central facts, concepts, theories, and procedures within a given field; knowledge of explanatory frameworks that organize and connect ideas; and knowledge of the rules of evidence and proof” (p. 1026). But just
possessing the content knowledge does not mean a teacher can teach the subject matter effectively. Understanding “the aspects of content most germane to its teachability” (Shulman, 1986, p. 9) requires pedagogical knowledge, which is teachers’ knowledge about and application of learning theories, understanding of how students learn, classroom management, lesson planning and implementation, as well as assessment. The ability to combine the knowledge of pedagogy and content and application of this combination to the teaching of subject area can be conceptualized as pedagogical content knowledge. Teachers should know pedagogical approaches and/or instructional strategies relevant for teaching the specific content by means of tailoring instructional materials, activating students’ prior knowledge, addressing learning difficulties and misconceptions to achieve meaningful learning. Representing the topics, ideas, and concepts taught in one subject area and making sure such representation is comprehensible to all learners suggests the use of technology, which in turn is a separate skill set. The ability to use ICT or technological knowledge refers to knowledge about and skills to work with technology, digital tools, and resources. This involves skills needed to use various hardware and software and be able to continually adapt to new ICT. Although technological knowledge is one of the primary forms of knowledge, it alone is insufficient for effective teaching; it should accompany content and pedagogical knowledge. Understanding of specific technologies for teaching the subject matter and how ICT application may change its content, referred to as technological content knowledge plus apprehending how the process of teaching and learning may alter as a result of employing ICT (i.e., technological pedagogical knowledge) are equally important. Technological pedagogical knowledge also entails knowledge of and ability to
choose a proper ICT tool for a particular task and utilize it in combination with pertinent pedagogical strategies. Nevertheless, these six components of TPACK will not result in meaningful teaching and learning with technology without its last and the foremost component, technological pedagogical content knowledge. This component stands at the heart of TPACK framework and combines all pieces—content, pedagogy, and technology as well as the interrelated knowledge forms between them. As evident, this framework delineates the subject matter content and pedagogy that forms the basis for effective implementation of educational technology to support and enhance student learning.

The importance of this set of knowledge was once more accentuated by Pac (2008) in a mixed-method descriptive study conducted in Connecticut school districts. She administered a survey to teachers and administrators, interviewed 10 teachers, and moderated three focus group discussions with 15 teachers to investigate barriers influencing the use of educational technology. Findings of this study indicated that one of the chief barriers to the implementation of educational technology was lack of technology integration knowledge for meeting curriculum goals (Pac, 2008). Thus, increasing teachers’ ICT knowledge and technology integration knowledge in parallel is crucial; yet, even teachers with knowledge of technology may not feel confident to employ various technologies as a teaching and learning tool since it entails strong beliefs.

Teacher beliefs. Teachers’ levels of ICT integration may vary even when they have strong technology integration knowledge. Such variations may signify differences in teachers’ beliefs; specifically, pedagogical beliefs about the value of technology as a tool to augment teaching and foster student learning (Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013), and low self-efficacy beliefs toward teaching with ICT (Wozney, Venkatesh, &
Abrami, 2006). It is generally deemed that teachers’ pedagogical beliefs derive from their teaching philosophy. Pedagogical beliefs refer to teachers’ beliefs about teaching and learning (Ertmer, 2005). The literature reviewed here focuses on two types of pedagogical beliefs, traditional or teacher-centered and constructivist or student-centered beliefs, in the context of educational technology. Evidence suggests that teachers holding constructivist beliefs about education are more likely to use technology than those with traditional beliefs (Judson, 2006; Overbay et al., 2010). A quantitative study of 582 pre-service teachers’ beliefs about teaching and ICT use conducted in Singapore revealed a positive correlation between constructivist beliefs and constructivist use of technology (Teo, Chai, Hung, & Lee, 2008). Likewise, teachers in a Midwestern state in the United States who implemented educational technology in the classroom reported beliefs aligned with student-centered pedagogy and described their practices as student-centric (Ruggiero & Mong, 2015). This study involved an online survey about ICT integration with 1048 teachers, 111 out of which then participated in follow-up interviews. The researchers employed simple descriptive statistics to analyze quantitative and the constant comparative method to analyze qualitative data. Teachers practicing student-centered approach expressed that technology-enhanced learning activities were the basis for boosting 21st century skills in students (Ruggiero & Mong, 2015).

Interestingly, the relationship between teachers’ pedagogical beliefs and their use of ICT is observed to be bi-directional. According to Tondeur, van Braak, Ertmer, and Ottenbreit-Leftwich (2017), effective use of technology in the classroom can trigger changes in teachers’ pedagogical beliefs. The collected qualitative evidence depicted that successful experiences with technology could act as a catalyst of change and generate a
significant paradigm shift from traditional beliefs to constructivist ones. This reinforced the findings of previous researchers. For example, an exploratory, longitudinal case study carried out in a city in Israel pointed out that not only teachers’ pedagogical beliefs but also their classroom practices changed because of the implementation of technology-rich teaching and learning (Levin & Wadmany, 2005). Similarly, Funkhouser and Mouza (2013) found that participation in a six-week long educational technology course comprised of diverse ICT-supported pedagogical strategies brought about changes in pre-service teachers’ beliefs about education and use of technology.

Teachers’ level of self-efficacy toward educational technology can be another impediment to ICT integration in the classroom (Albion, 1999; Ottenbreit-Leftwich, Liao, Sadik & Ertmer, 2018; Wozney et al., 2006). Bandura (1997) first defined the notion of self-efficacy as “beliefs in one’s capacity to organize and execute the courses of action required to produce given attainments” (p. 3). Strong self-efficacy affects people’s accomplishments and helps them withstand difficulties while performing an action. In this sense, self-efficacy in the context of technology integration may influence both teachers’ expectations and behaviors toward using ICT in education. Bauer and Kenton (2005) applied a mixed-method approach to study the classroom experience of 30 tech-savvy teachers who employed technology within teaching and learning. A great number of these teachers who used ICT in the classroom considered themselves as highly confident and showed a significant relationship between knowledge/skill and confidence, the combination of which shapes self-efficacy (Bauer & Kenton, 2005). In a survey of 438 Hispanic school teachers in south Texas, Curts et al. (2008) found that teachers’ self-efficacy for teaching with ICT had a positive effect on their comfort using technology for
pedagogical purposes. This finding concurs with those of Albion (1999; 2001) and Ball and Levy (2008) who depicted self-efficacy as an important determinant of integrating technology within classroom practices. In accordance with Conrad and Munro (2008), a positive relationship exists between computer self-efficacy and attitudes toward technology; those with high self-efficacy tend to have positive attitudes toward ICT. Consequently, attitudes toward technology is a factor that contributes to self-efficacy beliefs toward educational use of ICT.

**Attitudes toward ICT.** One more micro-level barrier to the uptake and integration of ICT within education is attitudes toward technology. As previously asserted, I consider educational technology an innovation and attitudes toward this change is a person’s “psychological tendency expressed by overall positive or negative evaluative judgment of a change” (El-Farra & Badawi, 2012, p. 163). Several researchers (e.g., Albirini, 2006; Baylor & Ritchie, 2002; Rabah, 2015) claim that teachers’ attitudes toward ICT have an effect on their use of computers in the classroom. The results of survey research of 659 in-service teachers in South Korea show that teachers’ attitudes toward technology is related to instructional use of ICT and instigates shifts in their beliefs (Shin, Han, & Kim, 2014). This finding echoes previous studies; despite limited technology knowledge and skills, there is a positive relationship between teachers’ attitudes and beliefs about ICT and its actual use for educational purposes (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Windschitl & Sahl, 2002). Using an explanatory mixed-method design, Palak and Walls (2009) first collected quantitative data via two previously validated surveys followed by multiple sources of qualitative data such as classroom observations, interviews, lesson plans, and teacher
reflections. In total, 113 teachers completed the surveys, of which four participated in the qualitative part. The study drew attention to teachers’ attitudes as one of the strongest predictors of ICT use within education. This was confirmed later by Ertmer et al. (2012), who labeled teachers’ attitudes toward ICT to be one of the main hindrances to educational technology. Analysis of the interview data of 12 teachers disclosed that once teachers realized the impact of technology on student learning they were more willing to employ it in everyday classroom activities (Ertmer et al., 2012). Hence, attitudes toward this innovation seems to be regarded as a continuum varying from positive attitudes to negative ones (Bouckenooghe, 2010). Teachers with positive attitudes are open and ready to embrace the change, whereas those with negative attitudes resist it.

Teachers’ openness to change can predict the use of technology in the classroom because their goal for effective student learning may lead to creation of meaningful learning opportunities with the help of ICT (Baylor & Ritchie, 2002). Vannatta and Fordham (2004) performed a multiple regression analysis with survey data from 177 Ohio school teachers and detected that openness to change was one of the best predictors; teachers with positive attitudes were willing to explore the benefits of ICT and likely to use it as a personal and/or instructional tool. Ottenbreit-Leftwich, Glazewski, Newby, and Ertmer (2010) support this finding. The analysis of qualitative data obtained in eight cases (i.e., eight award-winning teachers) through interview, observation, and electronic portfolio indicated that teachers who aimed to improve student learning were open to change; they developed classroom materials with the help of technology, organized engaging activities to involve students, and attempted to enhance student comprehension by integrating ICT (Ottenbreit-Leftwich et al., 2010). Comparably, some teachers are
resistant to change and think that there is no need to alter their current pedagogical strategies with the help of technology. Scholars (e.g., Howard, 2013, Vadachalam & Chimbo, 2017) have repeatedly discussed teachers’ resistance to educational technology in the literature. Consistent with Hicks (2011), ineffective ICT integration in the presence of tech-savvy students may damage teachers’ reputation, which might be one of the reasons to resist technology. Additionally, teachers may not recognize technology as a useful tool for teaching and learning. When teachers do not understand the advantages that ICT can offer education they usually oppose this innovation (Vadachalam & Chimbo, 2017). Similar to shifts in pedagogical beliefs, shifts in attitudes are also essential for designing and implementing meaningful, authentic learning experiences in combination with purposeful technology.

**Summary of Factors**

The level of technology use in the classroom to augment student learning is influenced by the complicated interaction of barriers discussed in this chapter. Ecological systems theory (Bronfenbrenner, 1979, 1994) helps us understand the role each barrier plays in teachers’ use of ICT. Historical events occurring in teachers’ lifespan and cultural changes evolving over time such as children’s growing interest in technology may urge teachers to use ICT in the classroom. The literature reviewed here indicates that lack of communication among the members of the educational community relative to the role of technology in teaching and learning influences ICT uptake from the macro level (Frank et al., 2004; Wisdom et al., 2007). The importance of educational technology should be properly communicated from government officials to heads of local education departments, from them to school administrators and educators, and from administrators
to the whole school community. The existence of a shared vision as well as ICT integration plan that emphasize the role of technology use in education are prime examples of this communication (Hannafin, 2008). Absence of a clear vision and/or technology integration plan is one of the meso-level barriers influencing the use of ICT in schools to boost student learning (Chang, 2012; Khan et al., 2012).

Another obstacle to effective ICT integration is lack of time; various studies report that teachers report not having time to develop technology-supported lessons or experiment with ICT in the classroom (Bauer & Kenton, 2005; Hew & Brush, 2007). Depending on the country, lack of time to employ technology can be an issue in either teachers’ exosystem or mesosystem. In the case of Azerbaijan, schools do not have the authority to make changes to the lesson time, but they can increase or reduce teachers’ workload. To better incorporate technology into lessons, government and/or schools should provide access to ICT and support to teachers through effective professional development programs (Afshari et al., 2009; Chang, 2012). Findings from Shiue (2007), Wachira and Keengwe (2011), and Khan et al. (2012) show that scarce technological resources and/or limited access to technology as well as insufficient effective training may be hindrances to ICT adoption at the meso level. Additionally, some researchers (e.g., Bingimlas, 2009; Hsu, 2010) claim that most of the offered professional development initiatives fail to consider micro-level barriers to technology integration.

Teachers need to be convinced that technology is imperative for achieving learning objectives and developing students’ 21st century skills. Decisions made in teachers’ exosystem as well as relations in the mesosystem may help achieve this. For instance, professional learning opportunities that combine pedagogy and technology are
significant to teachers’ development; they can advance their ICT knowledge, skills, and technology integration knowledge essential for conducting technology-enhanced lessons (Osborne & Hennessy, 2003). Equally, successful classroom experiences enriched with technology can bring about changes in teachers’ pedagogical beliefs and result in a paradigm shift from traditional to constructivist teaching approaches (Levin & Wadmany, 2005). Teachers’ interactions with people in their microsystem may also affect their beliefs and self-efficacy toward teaching with technology and attitudes related to ICT integration. When school leadership demonstrates positive attitudes toward the implementation of this innovation and colleagues understand the benefits of ICT-enhanced learning, they will more likely support teachers to carry out technology-supported lessons (Polizzi, 2011).

This discussion led to a rationale for identifying specific barriers to the implementation of educational technology in my context. I conducted a mixed-methods study in Baku public schools to understand the relationship between the role of communication, school vision and ICT integration plan, professional development, as well as teachers’ attitudes toward ICT. The conceptual framework exhibits the relationship between key underlying factors examined empirically in Chapter Two (see Figure 1.3).
As previously noted, lack of communication among education community members about the importance of innovation, in this case, educational use of technology, can obstruct ICT integration (Frank et al., 2004; Wisdom et al., 2007). It may also result in absence of shared vision about educational technology and ICT planning process (Hannafin, 2008), which in turn may lead to a deficiency of effective professional development (Chang, 2012). Both of these meso-level barriers may influence teachers’ attitudes toward ICT, one of the strongest predictors of pedagogical use of technology (Palak & Walls, 2009). The quality of offered teacher training plus teachers’ attitudes in relation to educational technology can determine the level of technology use in teaching and learning (Ertmer et al., 2012; Hsu, 2010; Shin et al., 2014). A needs assessment study investigated these barriers to technology integration at macro, meso, and micro-levels in Baku public schools. The context and findings of this study are described in Chapter Two.

*Figure 1.3. Conceptual framework of key underlying factors associated with integration of educational technology*
Chapter Two

Factors Associated with Implementation of Educational Technology

Barriers derived from an in-depth literature review guided me toward macro, meso, and micro-level obstacles to technology integration. To understand factors related to technology integration within teachers’ microsystem, mesosystem, and exosystem, I conducted a mixed-methods study in public schools in Baku. I applied a pragmatic paradigm approach to this study because it accepts the “value of both quantitative and qualitative research methods and the knowledge produced by such research in furthering our understanding of society and social life” (Feilzer, 2010, p. 14). I focused on a real problem and investigated it from various perspectives. Employing mixed methods allowed me to hear voices of all stakeholders and receive divergent viewpoints. This chapter contains a description of the context, assumptions, purpose of the study, method employed, and discussion of the findings.

Context of Study

Prior to conducting the needs assessment study, I observed ICT integration in Baku public school classrooms as part of my previous job within my professional context. My employer carried out professional development programs related to educational technology and monitored the use of ICT in lessons following these programs. As part of monitoring, I conducted several classroom observations and witnessed limited systematic technology integration. The level of instructional technology varied significantly from one school to another and from one teacher to another within a school. Based on these observations, half of the monitored schools in the 2014-2015 academic year did not have any ICT element despite the availability of
necessary infrastructure in the classrooms. Teachers who used technology for educational purposes mainly presented information about the lesson topic, demonstrated videos to students either at the beginning or at the end of the lesson, used projectors for completing some exercises, and/or presented rubrics for evaluating students electronically. Forty classroom observations of primary and general secondary level (i.e., grades one to nine) conducted during the 2015-2016 academic year exhibited nearly the same behaviors focused on lessons that were traditional, teacher-centered in nature and limited technology implementation. Those who employed ICT did not seem to be confident although they attempted to change their teaching styles with or without the use of technology.

Monitoring the context signaled issues regarding teacher trainings on the educational use of technology to enhance learning (I. Tagiyeva, personal communication, February 12, 2016). Officials of MoE, Baku Education Bureau, and the Bureau on ICT for Education acknowledged that the effective use of technology in lessons was still a challenging issue for many teachers across the country. These officials were especially interested in knowing the reasons why teachers in Baku public schools did not take advantage of technology given that schools were supplied with appropriate ICT infrastructure. When discussing the possible underlying causes of this problem, they mentioned insufficient technology knowledge and skills, teacher attitudes toward ICT, lack of personal interest, and the absence of a plan to monitor ICT use by relevant state officials.

Whether these issues were unique to Azerbaijan or commonly encountered in the world interested me greatly. Initial analysis of research studies related to technology in
education as well as reports of various initiatives revealed intense discourse on the topic. The nature of educational technology is new and diverse; it changes fast, setting new goals to explore, and its actual impact has led to substantial debate (Clark, 1983; Kozma, 1991). Even in a relatively recent article, Cuban and Jandric (2015) discuss historical relationships between schools and ICT, question whether technology does, in fact, change instructional practices and foster student learning, and touch upon the difficulties of balancing education with technology.

Assumptions

The Azerbaijan state programs related to public resources and funding discussed in Chapter One have been in place for more than 10 years without any systematic evaluation of their impact. Whether these state programs benefited teaching and learning as well as the school environment, in general, had not been looked into at the time of this needs assessment study. Anecdotal data pointed to sundry issues about ICT integration in classrooms in Azerbaijan. I made several conceptual assumptions based on my professional encounters and observations including:

1. ICT integration in Baku schools was inefficient due to a lack of necessary communication between germane stakeholders (i.e., conveying program goals and objectives from policy-makers to school leaders and from school leaders to teachers).

2. Issues such as sporadic professional development, lack of policy enforcement, and absence of monitoring and evaluation strategies prevented the integration of this innovation in schools.
3. Subject-specific ICT integration workshops contributed toward increased technology use within teaching and learning despite the limited scope.

Although these assumptions guided the design of my needs assessment study, I took a broad approach to the general examination by reflecting on the literature review and bringing the voices of all the possible stakeholders. For this reason, several government officials from different educational organizations were involved in the implementation of previously noted state programs, school administrators, teachers, students, and even parents of these students participated in this study.

**Purpose of Study**

To assess the need of educators in Baku relative to implementation of ICT, I designed and implemented a research study with a goal of examining the level of technology use in general secondary level (i.e., grades five to nine) in Baku public schools and reasons for this level of implementation. The assessment was directed by the following objectives:

- To study factors that affected teachers’ use of technology in classrooms.
- To compare and contrast these factors with the ones derived from the literature.
- To bring voices of all stakeholders and obtain differing viewpoints about the issue.
- To identify major factor(s) that potentially represent a point of intervention.

I developed the needs assessment study based on the factors identified from the in-depth literature review as well as from initial interviews with educational
professionals. As per the ecological systems theory (Bronfenbrenner, 1979, 1994), I grouped these factors with reference to their scope of impact and built variables to investigate.

- Macro-level: communication about the importance of technology in education;
- Meso-level: school vision and ICT integration plan, and professional development;
- Micro-level: teachers’ attitudes toward educational technology.

My research utilized a combination of qualitative and quantitative research methods to respond to five research questions that guided the data collection:

RQ1: What are the communications about school vision and/or ICT integration plan for technology integration in Baku schools?

RQ2: What do participants report about the quality and usefulness of prior professional development efforts focusing on technology integration within teaching and learning?

RQ3: How do teachers describe their attitudes toward educational technology?

RQ4: How is technology being used for educational purposes?

RQ5: What do participants report about the factors affecting the educational use of ICT?

The fourth research question helps me delve deeper into the current experiences with educational technology and comprehend whether ICT is being used effectively for pedagogical purposes. In addition to assessing the need for an intervention, the findings
of this empirical study can also inform the design and development of an appropriate intervention.

**Method**

The study took a concurrent, mixed-methods approach (Plano Clark & Creswell, 2010) to explore the influence of communication about the importance of technology in education, school vision and ICT integration plan, professional development, and teachers’ attitudes toward the use of ICT in schools as well as reveal existent practices with pedagogical technology.

**Participants**

Five population groups—key stakeholders (i.e., government officials of the organizations accountable for the execution of previously mentioned state programs), school administrators, teachers, students, and parents formed my research participants. Each sample varied in size and different data were collected from each (see Table 2.1). For instance, I administered a survey to teachers and conducted classroom observations. School administrators, teachers, students, and parents represented four public schools located in Baku. These schools were purposefully selected based on the feedback received from Baku Education Bureau, the Bureau on ICT for Education, and “Innovative Technologies in Education” Continuing Education Center (ITE), which is responsible for implementing numerous teacher professional learning programs across the country (ITE, n.d.). The four schools differed in their relative use of ICT from good to weak.
In total, three key stakeholders, eight school administrators, 120 teachers, 32 students and 16 parents took part in the study. Key stakeholders and school administrators were selected by convenience sampling, whereas other groups were approached by random sampling. Lessons of 16 teachers out of those surveyed were observed based on their willingness.

Ninety-five percent of survey respondents (i.e., teachers) were females and ranged in age with 58% above 46 years old and 39% between 26-45 years old. Teachers’
characteristics varied by years of professional experience; 79% ($n = 120$) had more than 11 years of teaching experience. Nearly half of teachers ($n = 52$ out of $112^1$; 46%) have been using ICT for instructional purposes for 1-3 years.

**Measures**

Quantitative and qualitative data were collected through a questionnaire, interview protocols, and observation log.

**Teacher ICT in Education Questionnaire.** The teacher ICT in education questionnaire (see Appendix A) contains 35 items including background questions. Items include seven multiple choice (i.e., one multi-select and six single-select), seven yes/no, 19 Likert, and two open-ended questions. This instrument contained questions about barriers at meso and micro level such as school vision and ICT integration plan, professional development, and attitudes toward ICT. The multi-select multiple choice question asked the respondent to identify all of the subject(s) the respondent taught. Six single-select multiple choice items queried how often teachers used technology in their daily lives and in lessons, how many years in total they had been implementing educational technology, and their gender, age, and years of teaching experience. Likert questions focused on teachers’ attitudes toward the use of educational technology. For example, one question asked participants the extent to which they agreed that the use of ICT in teaching and learning positively affected student creativity. Another item asked teachers the extent to which they used ICT to prepare educational materials. The response choices ranged from strongly disagree to strongly agree on a five-point scale. Sixteen

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1 Eight out of 120 teachers did not respond to this question. All data are reported with the number of respondents per item.
items were adapted from the Survey of Schools: ICT and Education (SSIE) designed and implemented by European Schoolnet and the University of Liege for the European Commission (European Commission, 2013). Although SSIE carried similar assessment goals, I modified the items to fit the locality and avoid ambiguity. The remaining items were built using the findings from the literature and discussions with educational professionals. Instrument validity was assessed by a panel of experts that consisted of two instructors of the Johns Hopkins University School of Education and my executive sponsor, who holds the Doctor of Education degree from the University of Edinburgh. The questionnaire was translated into Azerbaijani and the executive sponsor paid special attention to the validity of translated items. Reliability of Likert items ($\alpha = .90$) was established through a pilot study with teachers ($n = 30$) of Baku public schools. The pilot also allowed me to ensure accuracy of the included items. The scale had acceptable reliability ($\alpha = .83$) in the actual study.

**Interview protocols.** I employed two interview protocols for each component of the study: individual interviews and focus group interviews.

**Protocol for individual interviews.** Two interview protocols, one for key stakeholders and another for school administrators, were used in the study (see Appendices B and C). Each of these instruments has 13 questions developed to explore the issues drawn from the literature review. The tools shed light on macro- and meso-level barriers and mainly attended to the communication of the value of innovation, policy or plan on ICT integration, existing professional development initiatives, and factors affecting the application of technology within education. A doctoral advisor supervising this needs assessment study and my executive sponsor reviewed both
interview protocols and the translated questions were piloted with two key stakeholders and five school administrators. In these interviews, key stakeholders were asked whether the importance of educational technology was communicated, the role of communication in terms of technology adoption in a school culture, and how professional development influenced the use of ICT in teaching and learning. The school administrator interview protocol contained questions about communication about the importance of educational technology, factors influencing teachers’ use of ICT in classrooms, school vision and ICT integration plan, teacher training, and school ICT infrastructure. For example, participants were queried whether their school had a vision related to educational technology and policy or an ICT integration plan; another question asked the school leader to reflect on the adequacy of the current professional development opportunities for achieving effective use of ICT to support student learning. I adapted questions about school vision, ICT integration policy, professional development, and benefits of educational technology from the SSIE survey (European Commission, 2013) to triangulate school administrators’ responses with those of teachers.

Focus group interview protocols. Two focus group protocols, one for students and the other for parents, were used for data collection (see Appendices D and E). The previously mentioned SSIE survey (European Commission, 2013) guided the development of these protocols. For instance, the SSIE survey asked whether students used computer/Internet outside school and how often they took part in activities such as sending and reading emails, using online dictionaries, learning with educational software, playing online games, etc. Thus, the interview protocols adapted these questions to read,
“Do you use computers (or any portable device) at home? If yes, please explain the purposes of computer usage” and “How often do you use Internet and why?”

The student interview protocol included 10 questions about their use of ICT in and out of school, their views about educational technology, and experiences with technology-enhanced lessons. In these discussions, students were asked to describe their opinions about the use of technology for educational purposes, how their teachers integrated ICT into teaching and learning, and the learning activities with the use of technology that they liked the most. The protocol used with parents, also 10 questions in total, was comprised of questions similar to those on the student protocol with the addition of questions relative to parents’ attitudes toward educational technology. For example, one question queried if parents allowed their children to use computers and Internet at home and another asked whether they knew whether their children liked lessons with technology more or less than lessons taught without technology. A doctoral advisor supervising this study and my executive sponsor reviewed each protocol. The latter gave special consideration to the translated questions and examined the results of the pilot study conducted with four students and four parents.

**Observation log.** This instrument was an adapted version of checklists provided by Southwest Educational Development (1999) and Troy and Bulgakov-Cooke (2013) (see Appendix F). I further improved this tool upon the feedback obtained from my doctoral advisor and executive sponsor. The observation log was convenient for recording teachers’ and students’ behavior during the observed lessons, specifying what and how technology (i.e., projector, teacher computer, smart board, etc.) was used in the classroom, and writing detailed summaries of these lessons.
Procedure

This section outlines the steps taken for data collection and data analysis during the needs assessment study.

Data collection. I first interviewed three key stakeholders from related government organizations in their offices for 25-30 minutes. Then I met with school administrators of selected schools, explained the purpose of the research, and provided informed consent forms. I conducted semi-structured interviews and administered the paper-based survey during March 2016. Each interview lasted 30 minutes, and teachers completed the survey within 40 minutes on designated days. After completing the paper survey, 16 teachers agreed to classroom observations. Each teacher was observed two or three times for a total of 46 observations conducted during April-May 2016. With teachers’ permission, I videotaped classroom observations, took handwritten notes, and had follow-up discussions with teachers when necessary. Once observations were over, I collected parent assent forms from students and organized focus-group discussions with 32 students from observed lessons and 16 parents. The consent forms were distributed to and collected from all population groups (see Appendices G-K), observations were videotaped and individual interviews as well as focus group discussions were audiotaped, and transcripts were prepared immediately after each interview/discussion. Interviews with school administrators, teacher survey, classroom observations, and focus group discussions were organized at target schools.

Data analysis. As per the requirements of concurrent mixed-method design, I initially analyzed the quantitative and qualitative data separately, then combined them for further analysis and interpretation, and reported findings per research question. Each
school as well as each research participant was given a participant code to ensure anonymity. The qualitative data collected were both excessive and manifold. Therefore, I eliminated some data from the observation log and parent focus group discussions based on the relevance of the data following initial examination. Analysis of qualitative data was conducted using a web-based mixed methods analysis tool – Dedoose (Version 6.1.18). I first transcribed and translated the qualitative data gathered through interviews, focus group discussions, and classroom observations and uploaded transcribed texts to Dedoose. I read each source of data, grouped them per research question, and developed preliminary themes as they emerged. Then I read the data again, created codes, and re-read to identify patterns within the codes. Next, I compared the results against the initial factors identified from the literature review and read the transcripts one more time for final themes. Open-ended questions from the teacher survey were coded in a similar manner to that of the qualitative narrative text.

After cleaning and coding quantitative survey data responses, I entered them into a data matrix. All data are reported with the number of respondents per item. Frequencies were computed and reported for teachers’ survey responses. The Likert scale response choices, strongly disagree and disagree or strongly agree and agree, were merged and the results were reported in tables.

**Findings**

This section is organized to reflect the results obtained from both quantitative and qualitative data for every research question.
Communication about the Importance of Educational Technology (RQ 1)

Although two state programs were implemented in Azerbaijan, the importance of educational technology was still not properly communicated to the education community, which created some difficulties for ICT integration. Key stakeholders highlighted the importance of ICT within teaching and learning by not seeing “the future of education without technology” (Key stakeholder 1, Interview), yet they admitted that lack of communication of the value of this innovation stood at the core of the issues. This confirmed the findings of previous studies conducted by Lewis (2000) and Wisdom et al. (2007). One of the key stakeholders reported that absence of monitoring and evaluation mechanisms was an indication of government’s position with respect to educational technology. Without such mechanisms or other forms of political enforcement, “school administrators will less likely support the pedagogical use of technology” (Key stakeholder 1, Interview). Conversely, another key stakeholder emphasized the importance of various competitions administered by MoE as a way to demonstrate government’s attention to the topic. For instance, an annual multi-stage competition called “The Teacher of the Year” requires demonstration of innovative lessons in the second stage (MoE, 2016), and a “majority of participating teachers have conducted technology-enhanced lessons in the last several years” (Key stakeholder 2, Interview). Yet, how goals of such initiatives were communicated within schools or whether such communication occurred at all is unknown.

Government officials considered school leaders as crucial agents with respect to ICT integration processes and expected them to act as a bridge between policy makers and policy implementers by communicating the significance of educational technology to
other stakeholders, which supported the findings of prior research by Polizzi (2011). One key stakeholder stated, “Today, we are hiring more open-minded leaders to work as school administrators because we understand that a lack of or improper communication causes serious problems in the education chain. But we do need research studies like this to examine these problems from a different perspective” (Key stakeholder 3, Interview).

Six school leaders reported that they occasionally explained the benefits of technology for teaching and learning to teachers in discussions, meetings, and other school events. They did not realize, however, how the level and quality of communication within the school community could be increased. Although all administrators seemed to be aware of positive influence of technology on education and expressed its benefits in preparing “students to meet the 21st century’s demands” (School administrator 1, Interview), they had not developed communication strategies to disseminate policy goals. Two school administrators did not seem to understand why a public school should have communication strategies at all. One of them pronounced, “Why should schools develop such strategies? We do not have time for it!” (School administrator 5, Interview). On the other hand, the same principal acknowledged the value of having a school vision and technology integration policy to facilitate ICT uptake.

**School Vision and ICT Integration Plan (RQ 1)**

When asked about a school vision on educational technology as one way of communicating the value of this innovation, all school administrators demonstrated insufficient knowledge on the topic. They had no prior experience in creating a school vision or a policy and unanimously agreed that our public schools did not have any vision, policy, or strategic plan in general. This was verified by all key stakeholders and
97% of teachers ($n = 114$ out of $117$). Interestingly, six of the administrators expressed a desire to learn to develop a school vision. One principal said, “It is never too late to learn. If schools in other countries possess a school vision, why should we not do so as well?” (School administrator 6, Interview). Another made note of this “useful idea for future” (School administrator 8, Interview). Key stakeholders also emphasized the importance of having a school vision on the use of technology in education. One of them agreed that creation of a school vision should be covered in professional development programs offered for school administrators. He stated “Thank you for drawing our attention to this! It is certainly a useful topic to be added to our trainings for school leaders” (Key stakeholder 3, Interview).

School administrators were also inexperienced in terms of creating an ICT integration plan; again, none of the schools possessed such plans. This was reported not only by all key stakeholders and school administrators but also by 84% of teachers ($n = 98$ out of $117$). A possible reason for 16% of teachers who thought their schools had technology integration plans might be a misunderstanding of the term. One key stakeholder articulated a need for building school administrators’ capacity in this direction. She said, “In fact, schools should have strategic plans and ICT integration plan should be part of it” (Key stakeholder 1, Interview). Even though school leaders were not knowledgeable about ICT integration plans, they perceived that it was different from a technology inventory. Three school leaders confirmed that they had an inventory and showed it during the interview. “The only thing we have is this list of hardware and software provided by the Ministry, but I guess it is not what you mean” (School administrator 4, Interview). According to Gulbahar (2007), a technology plan should
focus on the pedagogical use of technology and student learning apart from being a technical inventory. Despite the emphasis on school vision and ICT integration plan in the literature (Chang, 2012; Gulbahar, 2007; Tondeur et al., 2008), there was not a single case of a school with a vision and/or technology integration plan to compare.

**Professional Development (RQ 2)**

Key stakeholders emphasized several challenges that impeded integration of educational technology in schools. Unsystematic professional development programs and lack of follow-up support was one of them, which corresponded to early findings (e.g., Khan et al., 2012; Wachira & Keengwe, 2011). This argument was repeated by all school administrators ($n = 8$). One principal declared that teacher trainings were periodic and, thus, could only build fragmented knowledge. She talked about her recent study visit to Turkish schools and said that teachers in those schools received professional development depending on their needs. “These schools had a professional learning plan for each teacher, and I found this quite useful. School leaders identified the gap in the knowledge of teachers and sent them to appropriate training events. Such plans incorporated teachers’ necessities on the educational use of ICT as well” (School administrator 3, Interview). This was an interesting finding although teacher professional development plans were not within the scope of my needs assessment study. In fact, professional development can be a component of comprehensive ICT integration plan (Chang, 2012; Gulbahar, 2007).

Teachers also drew attention to the lack of effective training as one of the major influencing factors related to ICT uptake. Ninety percent of them ($n = 103$ out of $114$), however, had attended training courses focusing on pedagogical technology. Considering
the fact that these events were not compulsory as reflected by 66% of teachers ($n = 73$ out of $111$), the attendance rate was quite high. All key stakeholders and school administrators confirmed this. Sixty-five percent ($n = 73$ out of $113$) of teachers reported that the professional development related to educational technology that they received was of good quality. Moreover, 70% of them ($n = 80$ out of $114$) agreed or strongly agreed that trainings were useful for effective integration of educational technology while 40% ($n = 45$ out of $113$) reported that these events were not enough (see Table 2.2). Six out of eight school administrators also agreed that existing professional learning was inadequate for bolstering the application of ICT within teaching and learning. This echoes prior research by Khan et al. (2012) and by Majoka et al. (2013) conducted respectively in Bangladesh and in Pakistan.

Table 2.2

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Disagree / Disagree</th>
<th>Neutral</th>
<th>Strongly Agree / Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, trainings received on educational technology were of good quality.</td>
<td>2 (0.02)</td>
<td>38 (0.33)</td>
<td>73 (0.65)</td>
</tr>
<tr>
<td>Received teacher trainings were useful for effective ICT integration</td>
<td>20 (0.18)</td>
<td>14 (0.12)</td>
<td>80 (0.70)</td>
</tr>
<tr>
<td>Received teacher trainings were enough for effective ICT integration</td>
<td>45 (0.4)</td>
<td>10 (0.09)</td>
<td>58 (0.51)</td>
</tr>
</tbody>
</table>

My unannounced visits to schools resulted in the observation of lessons with and without ICT. A few teachers did not use technology in any of the observed lessons. During follow-up conversations, I asked these teachers for a rationale for not including
technology within their lessons and they stated lack of technology integration knowledge and irrelevancy of teacher trainings. By irrelevance, they referred to professional development programs that did not demonstrate ways of applying technology to teach content and meet curricular goals, which is consistent with findings reported by Osborne and Hennessy (2003) and Wachira and Keengwe (2011). This finding contradicts teachers’ feedback about usefulness of existent professional development mentioned above and as summarized in Table 2.2. A possible explanation for this discrepancy might be inconsistency in teachers’ understanding of their future needs at the time of the training for such professional development program. Additionally, classroom observations revealed that not all teachers shared similar capacity in using technology during lessons, which might be due to the shortage of training programs in this direction. “Some teachers require lengthy trainings to utilize these tools and develop modern lessons” (School administrator 2, Interview). School administrators noted that teachers who were capable of conducting highly engaged and interesting lessons tended to make purposeful and effective use of technology, which resonated with Curts et al.’s (2008) findings.

One of the key stakeholders underlined the significance of continuous professional support and gave an example of the mentorship program initiated not long prior to the interview. All school administrators (n = 8) reported that this particular program had a positive impact on teachers. One of them said, “Mentorship program refreshed teachers’ knowledge, encouraged them to employ technology more effectively, and taught possible ways to deal with technological shortage” (School administrator 2, Interview). For instance, a mentor at one of the schools set up a schedule for using the
portable projector and teachers started developing ICT-enhanced lessons and borrowed the equipment for delivering these lessons (School administrator 3, Interview). Another school leader stated this program not only encouraged teachers to use ICT more frequently but also improved relationships among colleagues and increased teacher collaboration. Teachers participating in the mentorship program started providing feedback to each other’s teaching strategies and shared their experiences of lesson design and delivery. “Learning from colleagues inspired them to use technology in the classroom and urged to seek other innovative teaching methods to better student learning” (School administrator 8, Interview).

Teachers’ Attitudes toward Educational Technology (RQ 3)

The research literature indicates that teachers’ attitudes toward innovation is one of the factors influencing technology integration within education because attitudes are either positive or negative; attitudes can facilitate or impede ICT uptake (Vadachalam & Chimbo, 2017; Vannatta & Fordham, 2004). In general, participating teachers (n = 120) in Baku public schools reported positive attitudes toward ICT integration (see Table 2.3), but before discussing the details it is important to understand their attitudes to computers. Most of them (n = 90 out of 114; 79%) used computers either daily or weekly and this provided a rationale for a high percentage (n = 87 out of 113; 77%) of technology utilization in the classroom.

Positive attitudes toward educational technology were evidenced throughout the study. Most teachers (n = 79 out of 105; 75%) agreed or strongly agreed that employing technology for instructional purposes was vital for preparing students to live and work in the 21st century. According to survey respondents, application of ICT within education
had positive influences on student creativity \((n = 87\text{ out of } 115; \, 76\%)\), realization of learning outcomes \((n = 88\text{ out of } 114; \, 77.2\%)\), changes in teaching practices \((n = 88\text{ out of } 114; \, 77.2\%)\) (see Table 2.3). These attitudes toward ICT integration align with published literature. As explained by Midoro and Admiraal (2003) technology can help teachers achieve both educational objectives and learning outcomes. Furthermore, a study conducted by Levin and Wadmany (2005) suggested that technology integration could instigate changes in instructional practices. It was also found that pedagogical technology had positive effects on student engagement \((n = 86\text{ out of } 117; \, 74\%)\) and student achievement \((n = 83\text{ out of } 115; \, 72\%)\). Likewise, 70% of teachers \((n = 80\text{ out of } 114)\) assented that instructional use of ICT could foster students’ higher-order thinking skills, which is consistent with Baylor & Ritchie (2002). More than half \((n = 74\text{ out of } 110; \, 67\%)\) agreed that educational technology positively affected acquisition of content knowledge.

Table 2.3

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Disagree / Disagree</th>
<th>Neutral</th>
<th>Strongly Agree / Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n) (%)</td>
<td>(n) (%)</td>
<td>(n) (%)</td>
</tr>
<tr>
<td>Student engagement</td>
<td>18 (0.15)</td>
<td>13 (0.11)</td>
<td>86 (0.74)</td>
</tr>
<tr>
<td>Student achievement</td>
<td>14 (0.12)</td>
<td>18 (0.16)</td>
<td>83 (0.72)</td>
</tr>
<tr>
<td>Student creativity</td>
<td>12 (0.10)</td>
<td>16 (0.14)</td>
<td>87 (0.76)</td>
</tr>
<tr>
<td>Students’ higher-order thinking skills</td>
<td>15 (0.13)</td>
<td>19 (0.17)</td>
<td>80 (0.70)</td>
</tr>
<tr>
<td>Realization of learning outcomes</td>
<td>13 (0.14)</td>
<td>13 (0.14)</td>
<td>88 (0.772)</td>
</tr>
<tr>
<td>Acquisition of content knowledge</td>
<td>14 (0.13)</td>
<td>22 (0.20)</td>
<td>74 (0.67)</td>
</tr>
<tr>
<td>Changes in teaching practices</td>
<td>13 (0.114)</td>
<td>13 (0.114)</td>
<td>88 (0.772)</td>
</tr>
</tbody>
</table>
Teachers had similar responses about the purposes of most ICT use as well (see Table 2.4). For example, the vast majority of teachers agreed or strongly agreed that they mostly used technology for making presentations \((n = 95 \text{ out of } 118; 80.5\%)\) and preparing didactic materials \((n = 89 \text{ out of } 110; 81\%)\). This was validated by the classroom observations; in every case, teachers that incorporated ICT \((n = 40 \text{ out of } 46)\) presented new content by means of presentations or other resources typically created by them. The next two highest results were for searching for information \((n = 77 \text{ out of } 99; 77.8\%)\) and creating educational tasks or exercises for students \((n = 83 \text{ out of } 109; 76\%)\). The majority of survey respondents \((n = 70 \text{ out of } 105; 66.6\%)\) claimed that they benefited from technology for conducting assessments, which was observed during the classroom observations. These data also showed that 65.7% of teachers \((n = 71 \text{ out of } 108)\) used ICT for having students work in a collaborative way and this was in line with Midoro and Admiraal (2003). Only 47.6% of survey respondents \((n = 49 \text{ out of } 103)\) provided feedback to students about their learning with the help of ICT. Quite interestingly, 70% \((n = 72 \text{ out of } 103)\) of surveyed teachers claimed that technology served as a tool for seeking professional development programs. These findings suggest that teachers employed ICT both as a personal and/or professional tool and it pointed to their positive attitudes toward innovation. This echoes Ottenbreit-Leftwich et al. (2010) and Vannatta and Fordham (2004).
Table 2.4

Frequency of Teacher Reporting about Purposes of Most ICT Use.

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Disagree / Disagree</th>
<th>Neutral</th>
<th>Strongly Agree / Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>To search for information</td>
<td>17 (0.17)</td>
<td>5 (0.05)</td>
<td>77 (0.78)</td>
</tr>
<tr>
<td>To make presentations</td>
<td>18 (0.15)</td>
<td>5 (0.04)</td>
<td>95 (0.81)</td>
</tr>
<tr>
<td>To have students work in a collaborative way</td>
<td>23 (0.21)</td>
<td>14 (0.13)</td>
<td>71 (0.66)</td>
</tr>
<tr>
<td>To conduct assessment</td>
<td>22 (0.21)</td>
<td>13 (0.12)</td>
<td>70 (0.67)</td>
</tr>
<tr>
<td>To prepare tasks and exercises for students</td>
<td>18 (0.17)</td>
<td>8 (0.07)</td>
<td>83 (0.76)</td>
</tr>
<tr>
<td>To prepare educational materials</td>
<td>18 (0.16)</td>
<td>3 (0.03)</td>
<td>89 (0.81)</td>
</tr>
<tr>
<td>To provide feedback to students about learning</td>
<td>33 (0.32)</td>
<td>21 (0.20)</td>
<td>49 (0.48)</td>
</tr>
<tr>
<td>To seek professional development opportunities</td>
<td>20 (0.19)</td>
<td>11 (0.11)</td>
<td>72 (0.70)</td>
</tr>
</tbody>
</table>

Use of Educational Technology (RQ 4)

The fourth research question addressed experiences with the instructional use of technology in general secondary level (i.e., grades five to nine) in Baku public schools. As noted earlier, 77% of teachers (n = 87 out of 113) claimed that they employed ICT in lessons. When asked how often they integrated technology, their responses varied; 44% of survey respondents (n = 52 out of 118) implemented educational technology at least once a week, 18% (n = 21 out of 118) several times a month, 25% (n = 30 out of 118) once or twice a month, and 13% (n = 15 out of 118) never or almost never used technology in lessons. One of the reasons for infrequent technology use might be shortage of equipment; 61% of teachers (n = 73 out of 120) were not provided with a
computer and their classrooms lacked computer technology. This confirms the findings of previous studies such as Shiue (2007), Wachira and Keengwe (2011), and Al Mulhim (2014). Conversely, every administrator highlighted that teachers in primary schools regularly integrated ICT within education because almost all primary classrooms had sufficient technology infrastructure. “It is much easier to equip primary classrooms as students attend lessons only in one classroom rarely relocating for other subjects” (School administrator 3, Interview).

Both teachers and students pointed to subject matter as a factor influencing ICT integration. Distribution of technology use across subjects according to data obtained from classroom observations is presented in Table 2.5. Among 46 classroom observations, only six did not include technology use in the classroom. For this reason, the denominator (i.e., 40) remains the same when discussing the findings obtained through the observed lessons in subsequent paragraphs. Anecdotally, Azerbaijani language/literature and history teachers incorporated technology within teaching and learning more than other subject areas. This finding was verified by students’ responses. Most of them expressed excitement about technology application in geography, chemistry, history, and languages. “Sometimes we cannot carry out laboratory reactions and in such cases, our teachers demonstrate suitable videos during the lessons and then we hold discussions around these reactions” (Student 7, Focus group discussion).

Another student said, “Our English teacher uses a lot of resources available on the Internet. We play games in English and enjoy the class” (Student 22, Focus group discussion). However, 43% of students \( (n = 32) \) found implementation of ICT in subjects such as mathematics, handcraft, and physical education irrelevant. “We do not think
using technology in physical education will be meaningful” (Student 4, Focus group discussion). “Actually, our experience with ICT in mathematics classes was so irrelevant” (Student 13, Focus group discussion).

Table 2.5

<table>
<thead>
<tr>
<th>Subject</th>
<th>n (with ICT)</th>
<th>n (without ICT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>History/Geography</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Azerbaijani language/literature</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Russian language</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>English language</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Life Skills</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>

In all of the 40 cases, teachers primarily applied ICT for transferring new information to students (see Figure 2.1). In other words, teachers presented new learning material with the help of technology. This is in alignment with the data obtained from individual interviews, teacher survey, and focus group discussions. Seven school administrators mentioned that teachers often employed technology prior to lessons for finding or developing educational resources and in the classroom for presenting new material. One administrator highlighted that “MS PowerPoint is a popular tool among our teachers. They develop presentations for many lessons and sometimes these slides contain questions for brainstorming” (School administrator 4, Interview). Students also described technology as a main tool for delivering new content by means of
presentations, videos, photos or other visuals. “We sometimes watch interesting videos from YouTube during the lessons, especially in physics and chemistry” (Student 9, Focus group discussion). School administrators noted the use of YouTube as well. “Our teachers seem to be fond of YouTube. They not only demonstrate videos for explaining challenging content to students but also occasionally show pieces of movies about specific literary works or novels.” (School administrator 8, Interview). This corresponds to the strategies described by Ashburn and Floden (2006).

**Figure 2.1. Use of technology in observed lessons**

More than half of observed teachers engaged students in a limited form of inquiry-based learning with the help of technology in 34 observations out of 40. Students collected information about a topic from several sources, generated ideas, and presented a summary to answer posed questions. For instance, a history teacher asked students to compare and contrast the current territory of Azerbaijan to the one in the 17th century and display findings through the explanation of historical events that resulted in alterations in territory. Similarly, a geography teacher told students to learn about mud volcanoes by
querying, “What is mud volcanoes? Can mud volcanoes affect our lives? What role does Azerbaijan play in this miracle of nature?” (Teacher 7, Classroom observation). Students had to investigate these questions, evaluate evidence, and communicate their answers via PowerPoint or flipchart presentations. The majority of students seemed to enjoy inquiry-based classroom activities and expressed that technology supported their learning corroborating previous research (Bransford et al., 2000). One of them said, “I think searching information and trying to find best answers to our teachers’ questions is fun. I also enjoy presenting our findings in collaboration with my peers” (Student 29, Focus group discussion). Apparently, integration of educational technology facilitated the learning process through teamwork and bolstered students’ collaboration skills, which echoes Midoro and Admiraal (2003).

As seen from Figure 2.1, teachers who were observed gave students e-tasks and conducted assessments using technology equally in 14 out of 40 cases. Assignments or exercises to be completed on smart boards were referred as e-tasks by participating teachers. All groups involved in this study mentioned the usage of smart boards. Key stakeholders, school administrators, teachers, and students could describe some tasks on interactive boards, while parents were either uninformed of the existence of such technology in their children’s schools or had surface knowledge about its use in the classroom. “My daughter often speaks about the smart board exercises implemented during lessons. She says it is so exciting” (Parent 8, Focus group discussion). Key stakeholders considered this technology as “a wise investment” because they received positive feedback about its use for pedagogical purposes from both school administrators and teachers (Key stakeholder 1, Interview). “Introduction of Promethean boards in our
school changed educators’ approach to teaching. They started engaging students into learning more and more” (School administrator 2, Interview). Another administrator underlined that the application of this interactive board motivated students to learn and promoted creativity.

Smart board exercises were put into practice by observed teachers in 14 out of 40 lessons were somewhat similar to each other. A Russian language teacher divided students into two groups, displayed sundry pictures, and instructed them to write two stories on smart board based on the pictures. Students had to think through these visuals, communicate their initial thoughts, and create interesting stories. Likewise, an English teacher, who attempted to reinforce the learned material asked students to group words given on the board into grammatical categories. A third teacher developed a spelling game; once students spelled a word of an object shown on the board correctly they could hear the pronunciation. In 14 lessons out of 40, teachers utilized technology including smart boards for conducting assessments (see Figure 2.1) and provided feedback to students during the observation. In some cases, teachers displayed tests on the screen and had students respond to questions orally while in others, they developed interactive tests and students came to the board and answered the questions. In both cases, teachers gave oral feedback. Six out of eight school administrators and 66.6% of surveyed teachers ($n = 70$ out of 105) also claimed that teachers used ICT for this purpose quite regularly.

Although students accepted that instructional technology helped to develop skills necessary for their future and viewed it as the demand of the 21st century, their opinions on the topic greatly varied. Some students found technology to be interesting, while others did not think that technology made a big difference. When asked whether they
would prefer lessons with or without ICT integration, many students stressed the importance of teachers and their attitudes toward the teaching profession in general. One student said, “Not the technology but the teacher matters” (Student 21, Focus group discussion). Similarly, 64% of students \((n = 32)\) believed that teachers who were capable of producing engaging and stimulating lessons could do so with or without this innovation. “Interesting teachers use ICT in entertaining ways in the classroom. Their lessons are usually very thought provoking” (Student 13, Focus group discussion). This result resonates with previous findings reported in the literature (Baylor & Ritchie, 2002; Ertmer et al., 2012).

**Factors Affecting Educational Use of ICT (RQ 5)**

Several instruments employed in this needs assessment study included an item about factors affecting technology integration within teaching and learning to answer the last research question. Key stakeholders, school administrators as well as teachers provided interesting responses to this open-ended question. This section includes an overview of these findings.

**Insufficient technology.** Both quantitative and qualitative results revealed that deficiency of computers and other technological tools such as projectors and smart boards plus slow Internet speed or lack of Internet connection prevented teachers from using technology for educational purposes. All key stakeholders and school administrators acknowledged the existence of this hindrance and stated that the issue was being solved at the government level. Nevertheless, 30% of teachers \((n = 35\) out of 118) reported scarcity of ICT resources in Baku public schools as one of the major barriers to application of technology within education. This finding is consistent with the literature
As described earlier, 61% of teachers ($n = 73$ out of 120) were not provided with a computer and their classrooms were not equipped with computer technology. Hence, “Teachers developed a coordination mechanism, which allowed them to use classroom(s) with necessary devices one after the other” (School administrator 7, Interview). Three of the four schools participating in my study had two portable projectors and teachers borrowed them in turn. Moreover, out of 40 observed lessons that integrated ICT only four (10%) incorporated the Internet in their lesson. In the remaining instances, teachers prepared necessary learning materials such as videos, photos, and quizzes in advance and presented them using flash drives. Absence of internet access not only influenced instructional technology but also increased teachers’ lesson preparation time.

**Shortage of time.** All school administrators ($n = 8$) and 44% of teachers ($n = 52$ out of 119) considered lack of time as one of the factors impeding technology integration in schools. Some teachers ($n = 38$ out of 114; 33%) expressed their concerns related to developing technology-enhanced lessons and pertinent didactic materials; they said this process required a lot of time and energy, which confirmed the results of studies conducted by Bauer and Kenton (2005) and Khan et al. (2012). Moreover, one teacher said, “I usually spend too much time for dealing with technological problems in the classroom and this discourages me to use ICT within teaching and learning” (Teacher 31, Survey). This was in agreement with the data obtained from classroom observations. Almost every observed lesson with ICT element (i.e., 40) ended long after the bell rang keeping students from the break time. Technology arrangement, namely setting up laptop, smart board, or projector and connecting to the Internet often occupied most of the lesson
time and left approximately 30 minutes (out of 45) to deliver content and carry out learning activities. This corresponds to the findings of prior studies (e.g., Al Mulhim, 2014; Hew & Brush, 2007). Challenges with technology might be due to teachers’ limited technology knowledge as noted by seven out of eight school administrators.

**Limited knowledge and skills.** Teachers’ inadequate ICT knowledge and skills was found to be another barrier to ICT integration in Baku public schools. Key stakeholders and school administrators unanimously agreed that despite technology-focused professional development programs teachers still faced numerous difficulties while employing ICT for pedagogical purposes. This was verified by quantitative data obtained from teacher survey; 37% of respondents \( (n = 44 \text{ out of } 118) \) reported that scarcity of ICT resources in schools inhibited them from mastering technology skills and applying technological tools that they learned during training programs. Five out of eight school administrators also highlighted the importance of having technology integration knowledge. “Some of our computer-literate teachers still cannot make a proper use of technology in the classroom. I think this is because they do not know how to teach their subject matter with the help of ICT” (School administrator 2, Interview). A similar result was found in teachers’ responses to open-ended survey questions; some of them \( (n = 24 \text{ out of } 105; 23\%) \) thought their inability to effectively integrate technology within teaching and learning was one of the reasons for abandoning ICT. All three key stakeholders indicated the necessity of designing and delivering specific professional learning programs that combined technology, content, and subject-specific technology integration.
Discussion

The needs assessment study identified several barriers to technology integration in Baku public schools. Consistent with the research literature (e.g., Condie & Simpson, 2004; Wisdom et al., 2007) and assumptions made prior to conducting this study, lack of communication about the importance of instructional technology in a school culture was found to be as an important factor. Both key stakeholders and school administrators acknowledged significant communication issues at the system and school level. In other words, policy implementers anticipated school leaders to convey the peculiarities of the 21st century learning as well as stress the value of educational technology to school communities, while school leaders expected guidance and instructions from government officials to communicate the importance of ICT in teaching and learning. One way of communicating the value of this innovation could be through a school vision on educational technology and/or ICT integration plan; however, absence of such management tools was prevalent in all selected schools (Chang, 2012; Gulbahar, 2007; Tondeur et al., 2008). This was reported not only by key stakeholders and school administrators but also by the vast majority of teachers. Nonetheless, the government officials and school administrators seemed to understand the significance of these tools in the implementation of innovation and expressed a desire in learning to develop them.

Analysis of manifold data detected unsystematic or inadequate professional learning programs as another major impediment to ICT uptake (Tearle, 2003; Wachira & Keengwe, 2011). Although teachers attended trainings related to pedagogical use of technology, for some of them these professional development initiatives were insufficient confirming the results of previous research (Khan et al., 2012; Majoka et al., 2013). One
more factor influencing adoption of ICT identified within the literature was teachers’ attitudes toward an innovation (Ertmer et al., 2012; Vadachalam & Chimbo, 2017). Teachers participating in the present study, however, mostly reported positive attitudes. For instance, more than half of teachers agreed or strongly agreed that educational use of technology was crucial for preparing students to live and work in the 21st century. Some teachers also claimed that they applied ICT at least once a week. History teachers observed in the study tried to engage students in a limited form of inquiry-based learning with the help of technology, but they requested extra support for deepening their knowledge and skills. School administrators also stressed a need for professional learning of history and geography teachers relative to educational technology.

Infrequent use of ICT in the classroom was also affected by insufficient technology, shortage of time, and limited knowledge and skills ascertained from the qualitative data collected during individual interviews and from open-ended questions on teacher survey. In contrast, students’ use of technology in their daily lives and for learning motivated teachers to embrace this change. One teacher said, “Very often students search and find interesting things for homework assignments, which also encourages me to use ICT to be able to meet students’ learning needs” (Teacher 12, Survey). To equip teachers with necessary knowledge and skills population groups highlighted the importance of effective training as an accelerator of ICT integration (Barton & Haydn, 2006; Yoshida, 2018). All key stakeholders and school administrators articulated the need for more systematic and subject-focused training programs that could address teachers’ prior knowledge as well as build new ones to help them apply technology effectively within teaching and learning.
Chapter Three

ICT Integration Intervention Literature Review

To understand the obstacles associated with technology integration in Baku public schools, I conducted a mixed-methods needs assessment study. This study offered empirical evidence highlighting communication among pertinent stakeholders about the importance of educational technology, which aligns with prior research findings (Condie & Simpson, 2004) as an important barrier to technology implementation to support student learning. Key stakeholders ($n = 3$) and school administrators ($n = 8$) recognized that the value of this innovation was not properly communicated at both macro and meso level. Communication strategies could include creation of a school vision related to educational technology as an initial step in planning ICT adoption (Chang, 2012), followed by the development of ICT integration plan (Gulbahar, 2007; Tondeur et al., 2008). None of the schools, however, had either a shared vision or an integration plan at the time of data collection. Another barrier to educational technology reported by all school administrators and 40% of teachers ($n = 45$ out of 113) was sporadic or inadequate professional development. Although 90% of survey respondents ($n = 103$ out of 114) attended training courses on pedagogical use of technology, 23% of them ($n = 24$ out of 105) thought limited knowledge and skills was a hindrance to incorporating ICT within teaching and learning. Research participants considered specially designed professional learning as a possible solution to overcome these challenges as well as one of the major factors facilitating ICT integration, which corresponded with earlier studies (Hsu, 2010; Lawless & Pellegrino, 2007). All key stakeholders and school administrators emphasized
the necessity for well-planned, subject-specific, technology-enhanced professional learning programs to stimulate purposeful incorporation of technology in the classroom.

School-based professional learning programs as possible interventions usually focus on educators and aim to build their capacity for bolstering educational technology to support student learning. I scrutinized interventions targeted at school administrators and teachers designed and implemented in various education systems. Hence, the goal of this chapter is to provide a synthesis of the research literature on professional learning opportunities and their components that best support educators to make proper use of technology for educational purposes. I use the terms professional development and professional learning throughout this chapter and will distinguish them from one another in the following section.

**Theoretical Framework**

Several theoretical frameworks and/or approaches support my thinking about adult learning related to professional development and provide the foundation for my intervention. According to Ertmer and Newby (2013), learning occurs when a learner creates meaning from his/her own experience and changes behavior or develops capacity to behave accordingly. Yet, learning cannot be separated from its social context and is, therefore, a process where knowledge is co-constructed through social interactions (Vygotsky, 1978). Additionally, Wilson and Meyers (2000) argue that as an active process learning is meaningful when learning and cognition are situated within a particular context. Situated learning occurs in an authentic context through legitimate peripheral participation (Lave & Wenger, 1991), which is “a process in which newcomers enter on the periphery and gradually move toward full participation” (Dennen, 2004, p.
Learners’ interaction within that environment is a result of enculturation; they become apprentices in that learning culture by means of various tools (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). Ultimately, the knowledge gained becomes easily transferrable to situations where learners recognize a real and practical benefit to that knowledge (Cobb & Bowers, 1999). Meaningful learning and transfer of learning, as indicated by Brown et al. (1989), can be achieved through the use of cognitive apprenticeship.

**Cognitive Apprenticeship**

The cognitive apprenticeship approach stemmed from situated cognition and promotes learning in context, where an expert of a particular skill teaches that skill to a novice or an apprentice (Brown et al., 1989). Consistent with Collins, Brown, and Newman (1987), cognitive apprenticeship includes six strategies referring to expert’s actions: modeling, coaching, scaffolding, articulation, reflection, and exploration. These strategies develop the apprentice “from being a dependent observer to becoming an independent practitioner” (Leberman, McDonald, & Doyle, 2006, p. 16). Modeling is the explicit demonstration of the thinking process; the expert shares thoughts on how to perform a task. Coaching is observing apprentice’s performance and providing necessary guidance and feedback. Scaffolding denotes support provided by the experts to help the apprentice carry out the task and includes fading, which is gradual removal of support before the apprentice masters the skill. Articulation refers to having the apprentice enunciate his/her knowledge and thinking. Reflection involves self-analysis and/or self-assessment through the comparison of two performances—one by the expert and the other by the apprentice. Finally, exploration stimulates the apprentice’s independence in
both formulating and solving the problem. Ultimately, these strategies develop cognitive and metacognitive awareness, cultivate problem-solving skills, and establish learner autonomy (Collins et al., 1987).

As an approach to professional learning, the cognitive apprenticeship model introduces educators to the nature of learning and practice. In other words, it allows educators to observe the expert practice, enhance their existing knowledge and skills or acquire new ones by working closely with the expert, and transfer this knowledge and skills to concrete, real-world situations (Dennen, 2004; Nichol & Turner-Bisset, 2006; Peters-Burton, Merz, Ramirez, & Saroughi, 2015). For this reason, Collins et al. (1987) claimed that “the development of expert practice through situated learning and the acquisition of cognitive and metacognitive skills” are equally important (p. 5). This model is considered to be an effective approach for facilitating teacher professional learning and advancing one’s capacity to incorporate technology into classroom practice from a beginner level to a more experienced one (Browne & Ritchie, 1991; Glazer, Hannafin, Polly, & Rich, 2009; Saigal, 2012; Wang, 2008). Interaction between experts, who serve as mentors or coaches in cognitive apprenticeship-based teacher professional learning opportunities, and less experienced or novice teachers “makes tacit knowledge visible within a social, real-life context” (Tilley & Callison, 2007, p. 28). Novice teachers consider mentors and peer interaction as substantial components of the professional learning initiative while utilizing technology in lessons to create meaningful learning experiences (Bell, Maeng, & Binns, 2013).

Cognitive apprenticeship demonstrates how this model can support teachers’ professional learning on needed areas in an authentic context of subject matter teaching
and learning. It is, therefore, a suitable approach for designing a professional learning opportunity focusing on implementation of educational technology.

**Review of Intervention Literature**

The research literature discusses diverse professional learning programs as interventions implemented in different parts of the world to address barriers to technology integration. Most of these programs target school leaders and/or teachers and contribute to professional learning that aims to realize the full potential of ICT in education for boosting student learning. Before exploring the topic further, I define the terms professional development and professional learning used in this chapter. Recent trends and contemporary research in education give more preference to the term professional learning as it represents a continuous process and “when designed well, is typically interactive, sustained, and customized to teachers' needs” (Scherff, 2018, para. 3), whereas professional development may mean an episode or a short-term event. Darling-Hammond, Hyler, and Gardner (2017) define effective professional development as “structured professional learning that results in changes to teacher practices and improvements in student learning outcomes” (p. 1). For this purpose, I explored the key characteristics of effective professional development, then discussed technology-focused professional learning opportunities aimed at both school administrators and teachers in the reviewed research studies, and finally, synthesized the literature about the use of ICT in geography and history lessons since my intervention focused on teachers of these subject areas. These subjects were chosen to meet the expectations of my main stakeholders.
**Effective Professional Development**

Desimone (2011) notes “because professional development is a complex array of interrelated learning opportunities, it’s challenging to distinguish teachers’ learning activities from one another and to describe trends, associations, or effects of professional learning on knowledge, instruction, and student achievement” (p. 69). Although she spoke about professional development, this definition aligns with my use of professional learning opportunities within this dissertation. Learning Forward (2011) describes seven standards—crucial elements of professional learning that “function in synergy to enable educators to increase their effectiveness and student learning” (p. 14). These standards are learning communities, leadership, resources, data, learning designs, implementation, and outcome. Professional learning that occurs within learning communities fosters collective responsibility, demands continuous improvement through reflective practice, and reinforces alignment of individual, school, and system goals (Martin, Kragler, Quatroche, & Bauserman, 2014). Technological tools might be used to encourage community interaction, learning, knowledge construction, and sharing. Learning communities are necessary for the acquisition and transformation of knowledge and skills within the school system. The second important standard is leadership; skillful leaders recognize professional learning as a main strategy for continuous improvement by focusing on student results. They are open to learn, strengthen their own and colleagues’ capacity, lead by advocating for and supporting effective professional learning (Firestone & Mangin, 2014; Learning Forward, 2011). Prioritizing, monitoring, and coordinating human, fiscal, material, technology, and time resources is another standard mentioned by Learning Forward. Allocating resources may increase opportunities for professional
learning, which in turn may lead to school change and growth (Clarke & Hollingsworth, 2002). The next standard is using data from multiple sources to plan, assess the progress, and evaluate the results of professional learning. Data-driven professional learning may lead to increased quality of instruction and improved student performance (Guskey, 2014; Jensen, Sonnemann, Roberts-Hull, & Hunter, 2016; Learning Forward, 2011). Learning designs, the subsequent standard, entails combining learning theories, research, and models of human learning into the design of professional learning. In addition to considering how to build knowledge, develop skills, transform these into practice, and challenge attitudes and beliefs, learning designers should also promote active engagement to accomplish deep understanding and increase motivation to implement change (Learning Forward, 2011; Rohlwing & Spelman, 2014). Achieving changes in educator practice and increasing student learning also requires integration of change research, sustaining implementation support, and providing constructive feedback, which falls under the sixth standard—implementation. Engaging in constant reflection will reveal whether there is a need to refine strategies and facilitate progress (Learning Forward, 2011; Youngs & Lane, 2014). Outcomes, the last standard put forward by Learning Forward, indicates that professional learning aiming to increase results for all students should meet educator performance standards and address student learning outcomes as well as build coherence (Calvert, 2016; Jensen et al., 2016; Martin et al., 2014).

Apart from these standards, the literature points to other components of effective professional development that intend to augment educators’ knowledge, abilities, and classroom experience and result in improved student learning. Five core features of high-quality professional learning suggested by Desimone and Garet (2015) are content focus,
active learning, coherence, duration, and collective participation. Content focus refers to content of the specific subject matter and the ways learners acquire that content in the technology-rich environment (Desimone, 2009; Martin et al., 2014). The second feature denotes that teachers should learn collaboratively in authentic learning environments, engage in meaningful discussions, and obtain constructive feedback (Dagen & Bean, 2014). Coherence is the alignment between professional learning opportunities and the goals and objectives of schools and state reforms and policies (Desimone & Garet, 2015). Duration is the length of the professional learning initiatives necessary to accomplish observable changes in participants’ skills and knowledge. Desimone (2009, 2011) recommends 20 hours as the minimum number of contact time in these events. The last feature, collective participation, means groups of teachers from the same school or district should attend the professional learning opportunities at the same time to be able to form a community of learners for future collaboration and follow-up (Martin et al., 2014). Darling-Hammond et al. (2017) argue that effective professional development should also support collaboration in job-embedded contexts to encourage collective participation, use models of applicable practice, provide coaching and expert support, and offer feedback plus reflection. With these components in mind, I closely considered technology-mediated professional learning opportunities for both school administrators and teachers. In most of these studies cited here, the authors used the term professional development but the initiatives described carried most elements of high-quality professional learning, therefore, I did not change the language.
Professional Learning Opportunities for School Administrators

Implementing professional learning for school administrators is essential to help them advance their technology aptitude and to enable them to recognize their role in applying and using technology not only for administrative but also for instructional purposes. The outcomes of this professional learning may inspire them to advocate for new technological innovations (McGarr & Kearney, 2009; Stuart, Mills, & Remus 2009). Studies conducted in Iran (Afshari et al., 2009), Ireland (McGarr & Kearney, 2009), Kenya (Chepkonga, 2015), New Zealand (Stuart et al., 2009), and the United States (Berrett, Murphy, & Sullivan, 2012) found that ICT training for school administrators and their level of technology usage were positively associated with their technology competency, which in turn affected their willingness to be ICT champions. To lead the ICT integration process, school administrators should develop and promote a school’s vision for educational technology and identify possible strategies for incorporating ICT into teaching and learning (Mwawasi, 2014). As highlighted in Chapter One, having a shared vision and a school-based technology integration plan may foster adoption of technology within education (Hannafin, 2008; Overbay et al., 2011). Such plans should also include a school’s vision and philosophy about educational technology, set requirements for teachers’ and students’ ICT skills, and explain procedures for monitoring the usage of ICT (Baylor & Ritchie, 2002; Gulbahar, 2007; Vanderlinde, van Braak, & Dexter, 2012).

To understand how schools develop ICT plans or policies, Vanderlinde, van Braak, and Dexter (2012) conducted a mixed-method study with three Flemish primary schools. The research measures were comprised of interviews with school administration
and ICT coordinators, focus group discussions with and a survey among teachers, analysis of relevant school policies, and classroom observations. Analysis of quantitative and qualitative data revealed that planning of school-based ICT policies was a multi-sided process and should be treated accordingly. At the same time, such planning built common understandings among stakeholders and advanced the relationship between them to foster the technology integration (Vanderlinde, van Braak, & Dexter, 2012). This finding corroborated the results of earlier research (Tondeur, Cooper, Newhouse, 2010; Tondeur, Devos, van Houttle, van Braak, & Valcke, 2009). In an attempt to analyze the content of school-based ICT integration plans, Vanderlinde, Dexter, and van Braak (2012) carried out an exploratory study in 31 primary schools in Flanders, the Dutch-speaking region in Belgium. They performed content analysis of schools’ ICT policies and plans and conducted in-depth semi-structured interviews with 26 related school officials. Data were analyzed using constant comparative analysis and three types of plans were classified: a technology policy plan as a vision blueprint, a technical inventory, and a detailed ICT integration plan. Six schools did not have any plans, six schools used the first type and defined the schools’ vision on education in general, the role of technology in teaching and learning, and listed the technology-related activities to be organized and implemented. Three schools had technical inventories that presented the descriptions of hardware and software. Sixteen schools maintained comprehensive ICT policy plans, which consisted of a vision of education and technology application, activities, and professional development ideas to promote the use of ICT for educational purposes, hardware and software specification, and the role of ICT coordinators in the technology integration process. The authors stressed that ICT policy planning was a
dynamic process and required cooperation of stakeholders within schools (Vanderlinde, Dexter, & van Braak, 2012).

To guide and assist school leaders in developing school-based ICT integration plans, some governments in partnership with tool developers created new online tools or modified the existing ones, e.g., the Four in Balance tool used in the Netherlands, pICTos (Planning for ICT in Schools) used in Flanders, and the Self-review Framework used in the United Kingdom (Tondeur, Coenders, van Braak, ten Brummelhuis & Vanderlinde, 2009; Vanderlinde, van Braak, & Tondeur, 2010). Using a multiple case study, Vanderlinde et al. (2010) investigated the development of such plans and evaluated the role of pICTos in three Flemish primary schools. Data were collected by means of semi-structured interviews with principals and ICT coordinators, analysis of school websites, report, and policy documents, and a teacher survey. Major findings entailed that schools used available school data when developing policies, teachers were actively engaged, and pICTos was easy to use and simplified the process of crafting technology plans (Vanderlinde et al., 2010).

Understanding the cyclical process of technology integration planning requires participation in professional learning opportunities. Zhang and Brundrett (2010) stated that school leaders learned more effectively through job-embedded professional development that involved hands-on experience and collaboration with others. The specific type of professional development provides several learning opportunities for school administrators as well as builds teamwork among colleagues for exchange of ideas. Abdul Razzak (2013) verified this finding through her study of the Educational Leadership Program, a professional development initiative offered for school leaders on
technology adoption in Bahrain. She employed qualitative methods such as focus group discussions, premodule and postmodule reflections, and group interviews to evaluate the effectiveness of the program. Some of the advantages of this program were found to be job-embeddedness, its content, which relied on contemporary research and included topics such as organizational development, change management, leadership skills, and methods applied such as learning from experience, discourse, and reflection. The researcher stated that she could have unintentionally included her personal biases in the study since she was a module instructor in the particular program (Abdul Razzak, 2013).

Both studies confirmed the suggestions made by Desimone and Garet (2015) and Darling-Hammond et al. (2017) with reference to important characteristics of effective professional development.

Schools that have vision for educational technology and undertake a range of professional learning opportunities for both administrators and teachers are more successful in making useful applications of ICT in education. Machado and Chung (2015) examined principals’ role and effect in the technology integration process with 42 principals from four school districts in northern California. Analysis of both survey and interview data indicated that principals realized the importance of educational technology, acknowledged their own roles in this process, and found coaching a suitable method for increasing teachers’ competence to employ ICT in the classroom. Ninety-five percent of surveyed principals thought peer coaching/mentoring was a useful strategy for teachers’ professional development, and four of them reported that a similar system already existed in their schools (Machado & Chung, 2015). This resonates with prior
research (Abdul Razzak, 2013; Zhang & Brundrett, 2010) and supports key features of effective professional development (Darling-Hammond et al., 2017).

The research literature points to significant aspects of principals’ professional learning that help them lead the implementation of educational technology in schools with the goal of maximizing student learning. Teachers, however, are undoubtedly the main stakeholders and probably the most important change agents in ICT integration process; therefore, strengthening their capacity to better engage students in the learning activities, develop their higher-level critical thinking skills, and promote meaningful learning experiences with the help of ICT is worthwhile (Bransford et al., 2000; Fullan, 1993; Richardson, 2007).

**Professional Learning Opportunities for Teachers**

Professional learning initiatives aimed at teachers greatly influences the success of technology integration within teaching and learning to support student learning (Curwood, 2011; Kopcha, 2012; Lawless & Pellegrino, 2007; Murphy & Lebans, 2009). According to Mouza (2009) and Duran, Brunvand, Ellsworth, and Sendag (2012), effective professional development on the use of technology in education should be based on contemporary research. The *Eiffel* professional development program studied by Mouza (2009) consisted of workshops, school-site meetings, and in-class support. The program addressed teachers’ computer skills, included hands-on activities with use of subject-specific technology tools, fostered meaningful learning through group meetings and classroom practice, integrated classroom material to support teachers’ needs, engaged participants in the design and implementation of technology-aided lessons, provided support and feedback on classroom enactment, and encouraged
reflection. Mouza collected data from multiple sources such as interviews, classroom observations, artifacts, emails, and surveys. She used descriptive statistics and case study analytic techniques to analyze quantitative and qualitative data, respectively. Results showed lasting changes in teachers’ knowledge and skills for implementing technology-supported learning experiences for students as well as in their beliefs toward educational technology (Mouza, 2009). Likewise, the district-wide wiki professional development program evaluated by Duran et al. (2012) included connection to student learning, curriculum-specific applications, collegial learning, sufficient time, administrative support, adequate resources, built-in evaluation, and so on. Analysis of pre/post surveys, follow-up survey data, and content analysis of participant’s wiki pages exhibited improvements in participants’ knowledge, skills, and perceptions of readiness to use technology in the classroom as a result of the professional developed program (Duran et al., 2012). Thus, both studies reported that participation in research-based professional development increased teachers’ technology integration knowledge, built their capacity to plan and conduct technology-aided lessons, and cultivated continual teacher practice with ICT use. The professional development programs described in these studies were in line with a model of teacher growth (Clarke & Hollingsworth, 2002), principles of effective professional development (Desimone 2009, 2011; Desimone & Garet, 2015), and standards for professional learning (Learning Forward, 2011).

One of the preferred conditions for teachers’ professional learning is being job-embedded, which denotes “teacher learning that is grounded in day-to-day teaching practice and is designed to enhance teachers’ content-specific instructional practices with
the intent of improving student learning” (Croft, Coggshall, Dolan, Powers, & Killion, 2010, p. 2). A job-embedded professional development implemented in Canada did not only contribute to teachers’ use of ICT in the classroom but was also associated with cultural shifts in the schools (Murphy & Lebans, 2009). The model offered diverse technological tools and pedagogical expertise to underpin educators’ learning and growth, facilitated collaboration among teachers for developing digital learning resources, and inspired teachers to employ new approaches as well as ICT tools in instruction, which entailed some elements of effective professional development set forth by Darling-Hammond et al. (2017). A mixed-method, 3-year study of 20 middle school teachers conducted by Blanchard, LePrevost, Tolin, and Gutierrez (2016) also revealed that participation in the long-term, school-wide, technology-rich professional development was an effective strategy for overcoming teachers’ barriers of educational technology. A paired t test comparing preintervention and postintervention data for teaching beliefs and comfort with ICT analysis showed significant differences in both cases; teachers demonstrated more student-centered beliefs and more familiarity with instructional technologies after the professional development program. They took part in three week-long face-to-face workshops on designing student-centered inquiry-based learning activities with the help of various technologies followed by online synchronous sessions, demonstrative lessons conducted in actual classrooms, and peer feedback for improving these lessons to meet the curricula goals and make them more relevant for students. Blanchard et al. (2016) adopted Desimone’s (2009) model and considered all five features of high-quality professional learning.
Professional learning can shape teachers’ knowledge and skills and supply them with necessary competencies to incorporate technology into education when it focuses on instructional use of ICT, includes practical tasks, and responds to educators’ needs (Lawless & Pellegrino, 2007; Uslu & Bumen, 2012; Walker et al., 2012). Uslu and Bumen (2012) investigated the effects of the Intel Teach Program, a technology-mediated professional development initiative executed in Turkey, by comparing the preintervention and postintervention data. They found that the level of technology usage for developing and/or conducting the classroom activities considerably increased upon the completion of the Intel Teach Program, and the retention tests run after six weeks of the intervention verified this increase. In other words, the program had positive effects on teachers’ technology integration knowledge and skills. In addition to incorporating ICT into instruction, teachers also urged students to use technology to augment their learning outside of the classroom. Although the study presented interesting findings about the particular intervention program, it involved a limited number of participants and failed to include direct observations of teachers and/or the study of their lesson plans (Uslu & Bumen, 2012). Analogous results were reported by Walker et al. (2012) through a quasi-experimental study of technology-related teacher professional development opportunity executed in the U.S. Analysis of pre/post self-report data obtained via teacher survey \((n = 36)\) indicated an increase in teachers’ technology integration knowledge. Researchers designed both the professional development program and teacher questionnaire based on previous research. The program met all five requirements recommended by Desimone (2009) and gave attention to teachers’ diverse knowledge and skills. Survey items
addressed the categories of teacher knowledge introduced in the seminal work of Mishra and Koehler (2006).

Furthermore, findings from empirical studies provide evidence for PD achieving change in teachers’ self-efficacy toward teaching with ICT. Brinkerhoff (2006) assessed the effectiveness of a long-term professional development initiative, where technology was mainly treated as a tool to facilitate instruction and support student learning.

Analysis of quantitative data gathered from 25 teachers through the Computer Self-Efficacy Scale disclosed significant increase in teachers’ computer self-efficacy upon completion of the initiative. The success of this program might be due to its design, specifically incorporation of extended contact hours, practical tasks with the use of ICT, hands-on experience, connection to curriculum, varied instructional strategies, and reflection-on action. All these indicate that the author of the program took into account the critical elements of effective professional development (Desimone, 2009; Desimone & Garet, 2015).

The effects of a well-designed professional development program on technology self-efficacy was once more emphasized by DeSantis (2013). This sustained, collaborative, and scaffolded program aimed to advance teachers’ ICT self-efficacy as well as technological, pedagogical, and content knowledge, and, like the Brinkerhoff (2006) study, possessed all components of effective professional development found in literature (Darling-Hammond et al., 2017). The researcher administered the Interactive White Board Technology Self-Efficacy Survey to 41 fifth to eighth-grade teachers followed by semi-structured interviews with six randomly selected participants. DeSantis reported that both teachers’ technology self-efficacy and various categories of their
knowledge increased as a result of participation in this distinct program and that participants appreciated the combination of instruction, actual use of technology, collaboration, and on-demand mentor support.

One way of boosting teachers’ interest in technology integration is through support provided by more-experienced teachers and/or mentors. In a study conducted by Swan et al. (2002), mentors initially modeled the technology-enhanced lessons, directed teachers toward designing their own lessons embedded with ICT after a period of time, and then slowly faded the level of support once teachers showed confidence in this process. In a later study, Kopcha (2012) investigated the instructional practices of 18 elementary school teachers after participating in a lengthy professional development program through the technology integration survey, semi-structured interviews, and observations of technology-mediated lessons implemented by participants. Kopcha’s study revealed that teachers gained relevant knowledge and skills to make powerful use of educational technology because the core tenet of the professional development program was mentoring. It also confirmed the findings of previous research; teachers who received mentor support tended to use ICT more frequently to meet learning objectives and outcomes than those who did not work with a mentor (Swan & Dixon, 2006; Zhao & Bryant, 2006). Mentor-supported professional development models highlight mutual learning, collaboration, exchange of experiences between mentors and mentee teachers, and help teachers acquire applicable skills for incorporating technology into classroom activities (Swan & Dixon, 2006; Voogt & Knezek, 2008). Lim and Khine (2006) introduced a similar strategy, “a buddy-system” (p. 116), which referred to pairing an expert or tech-savvy teacher with a novice or less-experienced one to facilitate
technology integration in schools. Likewise, Phelps and Graham (2008) used the term “learning partners” (p. 128) when studying *Technology Together*, the school-based ICT-mediated teacher professional development in 16 Australian schools. This term was preferred because it denoted that no one was proficient in technology integration, so teachers learned and explored the topic together. The analysis of preintervention and postintervention survey data, as well as classroom observations, revealed significant improvements in educational uses of ICT (Phelps & Graham, 2008). Having access to experts or more-experienced teachers in a school and sharing both best practices and challenges in technology-enhanced lessons are vital for building teachers’ capacity and confidence in a professional development program (An & Reigeluth, 2012).

Another aspect of successful technology-enhanced professional learning is linking ICT skills with subject matter pedagogy. Peeraer and Van Petegem (2012) examined a professional development program promoting the educational uses of ICT implemented in Vietnam and compared the use of technology by teachers who participated in the particular program with those who did not. The program urged teachers to use ICT tools in connection with content and pedagogy, discuss how the selected tools could alter the existing teaching styles, and enrich student learning. Teachers developed and presented a plan of a technology-supported lesson and analyzed them together with colleagues, peers, and experts in educational technology. Analysis of data gathered through survey and focus group discussions showed that the teachers participating in the professional development program improved their skills to employ ICT in subject teaching and learning more than those who did not participate (Peeraer & Van Petegem, 2012). These findings aligned with the findings of an earlier study conducted by Crisan, Lerman, and
Winbourne (2007) in the United Kingdom. These researchers investigated content knowledge and pedagogy when mathematics teachers in three schools in the United Kingdom used technology. The cross-case analysis of the data collected from interviews, lesson observations, and written documents revealed that traditional teaching styles changed when teachers better comprehended the pedagogy of teaching subject matter with the help of technology. They moved from using ICT as a supplement to teaching a certain mathematics topic, to showing interest in experimenting with technology, and eventually to developing their own technology-based mathematics activities. These studies once more emphasize the importance of content focus, learning designs, coherence, collective participation, and other components of high-quality professional learning described earlier (Darling-Hammond et al., 2017; Desimone, 2009; Learning Forward, 2011).

The existing body of literature stresses the need for embedding subject teaching within the combination of pedagogy and ICT to achieve appreciable application of educational technology. Thus, and in view of the expectations of my main stakeholders with respect to content areas, reviewing best practices about the use of ICT in geography and history lessons will narrow my focus and contribute to the development of intended intervention.

**Use of Technology in Geography and History**

As mentioned above, my intervention will mainly concentrate on geography and history teachers, and for this purpose, this section discusses the literature on the use of technology in these content areas. Several researchers (e.g., Benimmas, Kerski, & Solis, 2011; Incekara, 2011; Schul, 2014; Stoddard, 2012) examined the use of various
technologies as instructional tools in these subject areas to enrich teaching practice and stimulate the growth of students’ knowledge and skills, yet the number of empirical studies is limited.

Google Earth, Geographic Information Systems (GIS), WebGIS, Global Positioning Systems (GPS) and other geographical technologies are quite popular across multiple studies. Benimmas et al. (2011) assessed the impact of My Community, Our Earth workshop on participants’ learning, the goal of which was to advance existing pedagogy prevalent in Arab nations through the use of geographical tools such as GIS or GPS and an interdisciplinary approach. It included active learning, inquiry-based pedagogy, collaborative learning, connection to actual issues such as natural hazards, water resources, and urbanization and applied a range of tools. A total of 20 teachers from seven Arab countries participated in this workshop. Preworkshop and postworkshop questionnaires administered to participants contained multiple choice and open-ended questions. Analysis of both quantitative and qualitative data and the results of the comparison between pre and postworkshop sessions revealed that participants considered themselves more competent to incorporate GIS, WebGIS, GPS or other technologies into lessons after the workshop. A year later, Boehm, Brysch, Mohan, and Backler (2012) discussed a new approach to teacher professional learning, namely video-based professional development to improve geography teachers’ aptitudes for creating meaningful learning experiences and furthering students’ understanding of geographical content. The program consisted of videos, explanations related to pedagogy and content, supplementary materials, and a facilitator’s guide. Videos were real lessons that portrayed how students interacted with technology to learn geographic concepts, which
tools they employed to demonstrate comprehension of content, and how their knowledge and skills were assessed. Eighteen teachers participating in this study were generally satisfied with the video-based professional development and Boehm et al. (2012) claimed that such technology-based professional development programs could “enhance and increase opportunities to offer and receive quality professional development in geography” (p. 49). Analogous practices were used during a workshop to support teachers to integrate GeoThentic, an online tool suitable for enhancing teaching and learning through real-world challenges (Doering, Koseoglu, Scharber, Henrickson, & Lanegran, 2014). The workshop combined geography content, geospatial technologies, and technology-infused instructional and assessment strategies. Convergent parallel design with pre/postworkshop surveys and observations were employed to evaluate the effectiveness of this professional development initiative. Paired t tests identified statistically significant changes in teachers’ technology knowledge, technological content knowledge, technological pedagogical knowledge as well as TPACK (Mishra & Koehler, 2006). Teachers also reported that using technology in geography education created opportunities for authentic learning and encouraged student engagement (Doering et al., 2014). Instructional scaffolding as a central element in professional development initiatives, described by both Boehm et al. (2012) and Doering et al. (2014) facilitated the progress of teachers’ content, pedagogical, and technological knowledge and skills. This, in turn, might be associated with a growth of students’ geographic inquiry, spatial thinking, and geographical thinking skills as reported by teachers (Doering et al., 2014).

Teaching geography content with practical instructional techniques and useful ICT tools for bolstering student learning is a challenge also faced by Slovak teachers.
Karolcik, Cipkova and Mazorova (2016) administered a survey to understand geography teachers’ experiences with digital tools after participating in a professional development program. Although Slovak teachers claimed that they used Google Earth, Map Editor, Marble Desktop Globe, EduPage E-Learning, and other tools for teaching topics in elementary and secondary schools, none of the teachers was observed in a real classroom setting. A major takeaway from the professional development program conducted in Slovakia was that utilization of digital tools created opportunities for student motivation and engagement, which reaffirmed earlier findings (DfES, 2003). Incorporating ICT into geography lessons may also alter educators’ viewpoints and perceptions of geography. The use of GIS as a learning tool, especially, changes the way geography was perceived for many years. Based on the analysis of curriculum documents, Incekara (2010) suggests countries such as Turkey, Azerbaijan, and Uzbekistan need to revisit their geography education and allow integration of modern content, new teaching strategies, and technological innovations.

Similarly, the role of ICT in history teaching and learning continues to grow substantially. A popular tool used in history classes is films, which, according to Stoddard (2012), stimulates student engagement and development of higher order thinking skills. He explored the role of films as a medium of instruction in two ninth-grade U.S. History classes by collecting data from teacher interviews, classroom observations, and class materials and films. The findings pointed out that implementing activities with professionally produced films were useful for developing students’ abstract knowledge, historical empathy, and thoughtful reflection (Stoddard, 2012). In another study, Hernandez-Ramos and De La Paz (2009) compared eighth-
grade students’ content knowledge in two middle schools; students in the intervention school underwent technology-mediated project-based learning experience, while those in the control group learned the same content but did not have group projects and did not employ ICT to create multimedia projects. The researchers used a pretest-posttest design in this quasi-experimental study and analyzed data obtained from knowledge tests, group projects, and attitude and opinion surveys using descriptive and inferential statistics (i.e., ANOVA) as well as thematic coding. Students at the intervention school worked in teams and used the mPower software because it was an easy and accessible tool for creating multimedia presentations. A combination of multimedia design in the form of mini-documentaries and content resulted in significant gains in students’ content knowledge and historical thinking skills. Students also demonstrated attitude change toward history in general and expressed willingness to learn more about the subject matter. Teachers recognized that ICT shaped the nature and quality of instruction in addition to motivating students (Hernandez-Ramos & De La Paz, 2009). Schul (2014) further explained that making documentaries helped to strengthen students’ conceptual understanding and historical reasoning by means of exploration and inquiry, as well as enliven their experiences with the study of history. He suggested several online tools (i.e., Digital Director’s Guild, National History Day, Civil War, and Digital Storytelling) for nurturing film pedagogy in history lessons (Schul, 2014). His findings supported prior work of Manfra and Coven (2011), who indicated that technology had an impact on improvement of students’ knowledge acquisition, higher-order thinking, and collaboration skills, and created opportunities for engaging students in “doing history” (p. 105). Manfra and Coven also noted that students could display their understanding and
explain historical phenomenon by drawing conceptual models with Magic Whiteboard Drawing, Groupboard, Inspiration or any other tool.

Another way to increase students’ historical understanding is through video games. An empirical study conducted by Watson, Mong, and Harris (2011) examined teachers’ and students’ experiences with *Making History*, an educational video game. They conducted classroom observations, focus group discussions with students, individual teacher interviews, and reviewed student assignments. Analysis of multiple sources of qualitative data disclosed that video games boosted student engagement, transformed teaching more toward a dynamic learner-centered environment, and prompted teacher facilitation skills. Students reported that they interacted with each other, discussed the game outside of class, and had fun playing the game. Video games can also be useful in realizing curriculum goals, but teachers need to identify how a certain game aligns with the content and how to use it during instruction (Maguth, List, & Wunderle, 2015). These authors studied the experience of a teacher who used the *Age of Empires II: The Age of Kings* video game in seventh grade history class. After playing the game, students were asked to write reflections that demonstrated learning about trade, war, government leaders, diplomacy, and so on. This meaningful experience fostered student thinking, application of diverse ideas, problem solving, inquiry, and reflection skills, which echoes with Howland et al. (2013) and Richardson (2007).

The present literature review once more emphasizes how technology can be employed in teaching social studies and offers suggestions for professional learning initiatives. One of the suggestions for professional learning of social studies teachers was put forward by Hammond and Manfra (2009). They proposed the giving-prompting-
making model for social studies instruction to explain the relationship between teachers’ pedagogical content knowledge and technology within TPACK (Mishra & Koehler, 2006). In this model, giving denotes direct instruction or transfer of knowledge, prompting means encouraging students to interact with the content via thoughtful questioning, and making implies constructing knowledge by product creation. The element of technology exists in all of these pedagogical modes aiming to augment teaching and learning. Hence, in order to gain acceptance, teacher professional learning programs should include content-specific information and create authentic environments for teachers to design innovative technology-enhanced practices (Dagen & Bean, 2014; Doering et al., 2014).

**Summary of Literature Review**

The intervention literature review stresses that professional learning opportunities are important when confronting the issues related to ICT uptake in education. Lawless and Pellegrino (2007) and Desimone (2009) point out that successful professional learning affects teacher’s knowledge, abilities, skills, and instructional behaviors, which can lead to changes in educator practice that ultimately influences student learning. Likewise, Darling-Hammond et al. (2017) and Desimone and Garet (2015) agree that effective professional development as structured professional learning should aim at improving educator effectiveness by changing teaching practice and bettering student learning. The design and implementation of quality professional learning programs requires an understanding of the elements or features of effective professional learning discussed in the sections above. Levin and Wadmany (2008) advise that “educational opportunities that facilitate collaboration with colleagues on authentic routine classroom
issues as well as personal and self-inquiry accompanied by mentorship” should follow the formal training focusing on preliminary ways to apply ICT into education (p. 259).

Meaningful integration of technology into teaching and learning necessitates tailored professional learning programs that address the intersection of technology, pedagogy, and content, while building teachers’ technological pedagogical content knowledge (Mishra & Koehler 2006) as manifested by concrete and measurable outcomes (Martin et al., 2014).

Having analyzed the literature on possible interventions and professional learning opportunities focusing on educational technology for teachers and school administrators, I adopted cognitive apprenticeship as a framework to guide the intervention (Collins et al., 1987). Cognitive apprenticeship-based professional learning is one of the best models to achieve effective use of technology in education (Nichol & Turner-Bisset, 2006; Tilley & Callison, 2007). Accordingly, the proposed intervention for my problem of practice in the context of Baku, Azerbaijan, was a cognitive apprenticeship-based professional development model intended for school administrators and teachers. The intervention supplied school administrators with relevant knowledge and skills for creating a shared vision on educational technology and developing school-based ICT integration plans. As recommended by Zhang and Brundrett (2013) and Abdul Razzak (2013), the particular program was job-embedded and allowed for hands-on and collaborative learning. At the same time, my hypothesis was that it would increase teachers’ technology integration knowledge and improve their level of self-efficacy toward the educational uses of ICT because it was based on contemporary research (Mouza, 2009), contained practical tasks with the use of technology (Brinkerhoff, 2006; Uslu & Bumen, 2012), and responded to
teachers needs identified during the needs assessment study (Walker et al., 2012). Technology-infused instructional strategies applied throughout the intervention derived from the giving-prompting-making model described by Hammond and Manfra (2009). This program also facilitated educators’ learning, increased their competence for incorporating technology through mentor support, and allowed them to apply new knowledge and skills to concrete, real-world situations (Browne & Ritchie, 1991; Collins et al., 1987; Nichol & Turner-Bisset, 2006). As mentoring is considering to be the core tenet of successful professional learning initiatives (Darling-Hammond et al., 2017; Kopcha, 2012), participating teachers received mentor support and the strategies suggested by Collins et al. (1987) guided how this support was provided. Furthermore, the proposed cognitive apprenticeship-based professional development had a subject matter focus (i.e., geography and history) in combination with pedagogy and technology. As established in the research literature, professional learning should embed content, pedagogy, and technology within the actual context of a regular classroom by hinting at a more specific type of professional learning for ICT integration (Crisan et al., 2007; Doering et al., 2014).
Chapter Four

Cognitive Apprenticeship-based Professional Development and Its Evaluation

Methodology

Azerbaijan, similar to many other developing countries, strives to meet the requirements of the 21st century education and equip students with critical thinking, collaboration, creativity skills through the promotion of effective integration of technology in schools to form a solid basis for future attainments, and eventually, turn them into the successful workforce for the 21st century (Greenhill & Petroff, 2010; P21, 2015). Empirical examination of factors associated with ICT adoption in our public schools revealed several barriers to technology adoption at the macro, meso, and micro levels. This intervention, a cognitive apprenticeship-based professional development (CAPD) program, was aimed at school administrators and teachers and intended to mitigate some of these barriers and to support the application of technology into the classroom in Baku schools. Intervention literature manifested that professional learning opportunities centered on cognitive apprenticeship were effective interventions to achieve meaningful use of technology in education (Nichol & Turner-Bisset, 2006; Tilley & Callison, 2007).

Purpose of Study

The purpose of this study was to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ aptitudes to implement educational technology that could potentially boost student learning. For this purpose, the invention focused on a) school administrators’ knowledge and skills necessary for creating a vision of educational technology and preparing ICT integration plan; and b) teachers’
technology integration knowledge as well as their self-efficacy toward ICT. More distally, these experiences were hypothesized to lead to the meaningful use of technology in the classroom and ultimately have an effect on student achievement (Desimone, 2009).

The research questions included both process and outcome questions.

**Process Research Questions**

RQ1: What was the delivered CAPD and to what degree was it implemented with fidelity?

RQ2: What were participants’ experiences related to participation in CAPD?

**Outcome Research Questions**

RQ3: What did school administrators report about their vision relative to educational technology and knowledge about an ICT integration plan after participating in CAPD?

RQ4: Did CAPD improve teachers’ technology integration knowledge and self-efficacy toward educational technology?

RQ5: What were teachers’ experiences related to the use of technology in the classroom after participating in CAPD?

**Research Design**

The study employed a quasi-experimental mixed methods design to understand whether the intervention might be associated with any changes in teachers’ technology integration knowledge and self-efficacy toward educational technology. Shadish, Cook, and Campbell (2002) define quasi-experiment as “an experiment in which units are not assigned to conditions randomly” (p. 12). To avoid the spillover effects between the treatment and control groups discussed by some researchers (e.g., Kelcey & Phelps,
2013; Stuart, 2007), the study involved one group of participants and the dependent variable was measured before and after the treatment. I collected data concurrently using both quantitative and qualitative data that allowed for triangulation (Creswell & Plano Clark, 2011).

The logic model (see Appendix L) that guided this intervention depicts program inputs, components such as activities and participation, and expected short, medium, and long-term outcomes. The causal model illustrates the relationship between variables and is included in Appendix M. The section below discusses process and outcome evaluation plans to understand how process and outcomes of the CAPD program were assessed.

**Process Evaluation**

Process evaluation is a widely used form of evaluation that examines how well a program is operating (Rossi, Lipsey, & Freeman, 2004). It focuses on participants’ voices and/or experiences within a program, fidelity of implementation, and strengths and weaknesses of a program. Fidelity of implementation generally refers to the extent to which an intervention program is implemented in comparison with the original program design (Dusenbury, Brannigan, Falco, & Hansen, 2003; Holliday, 2014; O’Donnell, 2008). There are various terms used in the literature to denote fidelity of implementation including treatment integrity, treatment fidelity, and intervention integrity (Schulte, Easton, & Parker, 2008). A more comprehensive definition of fidelity of implementation identified in the literature suggests considering (a) adherence to the program model, (b) exposure, dosage, or duration of implementation referring to the amount of treatment delivered, (c) quality of program delivery – whether implementers performed the program activities in the expected manner, (d) participant responsiveness – how well
participants participated in the program, the extent to which they were engaged, (e)
participant differentiation – whether the treatment condition differed from the control condition as it was initially planned (Dusenbury et al., 2003; Nelson, Cordray, Hulleman, Darrow, & Sommer, 2012; Schulte et al., 2008).

Three (i.e., adherence, dosage, and quality of delivery) of these five dimensions of treatment integrity were important for measuring fidelity of implementation in the CAPD program. Obtaining participants’ feedback about the core elements of the program allowed me to determine whether I adhered to the original program design. Because the dosage of the implementation was highly important, I conducted postworkshop survey with teachers and focus group discussions with both school administrators and teachers after the intervention. I worked directly with the school administrators and facilitated the workshop for teachers focusing on educational technology together with the invited experts. Considering the fact that these experts delivered mentoring targeted at teachers, the quality of program delivery was highly significant in the CAPD program. Consequently, I conducted focus group discussions to ascertain what participants learned from mentors, which topics they covered, and their perceptions about the effectiveness of mentors. These discussions also helped me gather information about participants’ insights of the intervention, most and least beneficial aspects of, and suggestions for improving the CAPD program.

Outcome Evaluation

Outcome evaluation is a form of evaluation that assesses the effectiveness of a program by measuring the changes in the outcomes that the program is to address (Rossi et al., 2004). In this study, the independent variable is the intervention—the CAPD
program. Student achievement (i.e., summative assessment results) is the distal outcome of the intervention and is, therefore, the dependent variable. However, the particular study did not measure the effects of the intervention on student achievement; instead, it looked at the mediating variables.

A mediating variable, also called an intervening variable, is “an attribute or characteristic that ‘stands between’ the independent and dependent variables and exercises an influence on the dependent variable apart from the independent variable” (Creswell, 2012, p. 118). In other words, mediating variables explain the relationship between independent and dependent variables. In this study, the mediating variables or proximal outcomes consisted of vision about educational technology, knowledge about ICT integration plan, technology integration knowledge, self-efficacy toward educational technology, use of educational technology in the classroom. The study employed both quantitative and qualitative instruments to measure these variables as described below.

**Method**

This section provides information about participants, measures, and procedure. The latter includes a description of the CAPD program and techniques applied to collect and analyze data.

**Participants**

I implemented the intervention in four public schools located in Baku. These same schools took part in the needs assessment study. A total of 24 individuals participated in this study, including two school administrators, a principal, a vice principal, and four general secondary grade (i.e., five to nine) teachers from each school. As stated earlier, my intervention targeted geography and history teachers and only
teachers of these subject areas (i.e., two geography and two history teachers per school) benefited from the program. Expected short and intermediate-term outcomes were then observed for both school administrators and teachers.

**Measures**

This section includes a discussion of both process and outcome evaluation measures. The research matrix (see Appendix N) offers detailed information about each research question, construct, measure, specifics about data collection and analysis processes. To evaluate the implementation of the CAPD program, I collected data using postworkshop survey and focus group interview protocols. Then, the same focus group interview protocols, plus two questionnaires, and an observation protocol were applied to measure any changes in outcomes. Moreover, I performed document analysis to evaluate the ICT integration plans prepared during the CAPD program.

**Postworkshop survey.** Studies conducted by DeSantis (2013) and Mouza (2009) informed me while developing the postworkshop survey (see Appendix O). The instrument includes 18 Likert items to collect data on adherence, dosage, quality of instruction, and teachers’ perceptions of the workshop. For instance, teachers were queried about how strongly they agreed or disagreed that the workshop was useful for effective integration of ICT into teaching and learning, or that the workshop facilitators were knowledgeable and experienced, or that all sessions of the workshop contributed to their existing teaching practice. Participants indicated their level of agreement with each statement on a scale from (1) strongly disagree to (5) strongly agree.

**Focus group interview protocol for school administrators.** Studies conducted by DeSantis (2013) and Kopcha (2012) contributed to the development of this instrument
The purpose of the focus group was to understand how the intervention components targeting school administrators were implemented and how they influenced administrators’ vision about educational technology and knowledge about ICT integration plan. Some of the items for measuring process indicators include (1) “Please comment on the topics covered, content, duration/total hours of the CAPD program.” (2) “Was the CAPD program implemented as planned? What parts did you find the most and the least useful?” (3) “Please share your thoughts about the facilitation process. Was the facilitator helpful throughout the process? If so, how was the facilitator helpful? If not, what could the facilitator do to be more helpful?” (4) “Do you have any suggestions for improving the CAPD program? Please explain.”

The focus group interview protocol for school administrators also measured two outcome variables: vision relative to educational technology and knowledge about ICT integration plan. A school technology vision should be a clear, succinct, and measurable and should encourage a school culture that adopts ICT for teaching and learning (Chang, 2012; Hew & Brush, 2007; Tondeur et al., 2008). Bennett and Everhart (2003) claim that vision statements are “compelling stories that describe how students will be using the technology and how teachers and other staff will be using it for data-driven decision making, increased productivity and planning” (p. 22). Sample questions about school technology vision are (1) “In your own words, please describe what a shared vision about educational technology means to you. What are the benefits of creating a shared school vision for ICT integration?” (2) “Please share your school’s vision about educational technology with us.”
A school-based ICT integration plan or ICT policy plan refers to “a document that describes technical and infrastructure specifications, but particularly describes the learning objectives for ICT use as well as strategies of its implementation (including professional development)” (Vanderlinde, Dexter, & van Braak, 2012, p. 507). I adopted some interview questions from Vanderlinde, Dexter, and van Braak (2012) upon receiving their permission. Some of the questions to measure school administrators’ knowledge about ICT integration plans are (1) “In your own words, please describe what an ICT integration plan means to you. What are the advantages and disadvantages of having a school-based ICT integration plan?” (2) “Following this professional development, please provide some info about the content of your school’s ICT integration plan.”

**Focus group interview protocol for teachers.** Multiple studies (e.g., DeSantis, 2013; Kopcha, 2012; Mouza, 2009) guided me through the creation of this instrument (see Appendix Q). The purpose of this focus group was to evaluate the process of intervention components targeting teachers and understand their experiences related to the use of ICT in the classroom after participating in the CAPD program. For instance, it includes items such as (1) “Please comment on the topics covered, workshop, duration/total hours of the CAPD program. Did it meet your expectations related to educational technology implementation?” (2) “Please share your thoughts about the workshop facilitators as well as mentors. Do you think they supported you throughout the technology integration process? Please elaborate.” (3) “What issues did mentors help you address? What could they do to be more helpful?” for measuring process indicators.
I adopted some of the questions from Mouza (2009) and developed others myself to match the research questions. Sample items to measure outcome indicators are (1) “Do you think your technology integration knowledge has increased after participating in the CAPD program?” (2) “Do you feel confident in your ability to utilize ICT in your lessons today? Why or why not?” (3) “Can you give some examples of how you integrate technology in your teaching to support student learning and address student understanding of content standards in geography and history?”

My doctoral advisor and executive sponsor reviewed both protocols to ensure clarity and improve content validity (Denzin & Lincoln, 2005).

**Document analysis tool.** An evaluation of the final ICT integration plans prepared during the CAPD program provides evidence of school administrators’ knowledge about such plans. I created a spreadsheet based heavily on the content of the ICT policy plans provided by Vanderlinde, Dexter, and van Braak (2012) to record the explicit knowledge visible on the final plans (see Appendix R). Consistent with Vanderlinde, Dexter, and van Braak (2012), some of the content elements of such plans contain setting a clear vision about ICT in education, describing ICT-enhanced activities, technology-focused professional learning, and technical and pedagogical support for teachers. The doctoral advisor supervising this study and my executive sponsor reviewed this spreadsheet to ensure credibility.

**Technology integration knowledge survey.** Many researchers (e.g., Hew & Brush, 2007; Lawless & Pellegrino, 2007; Mishra & Koehler, 2006) talk about increasing teachers’ knowledge and skills of technology as a teaching and learning tool, and of technology-mediated instruction for enabling them to make meaningful use of ICT in
education. In this study, I adopted Dockstader’s (1999) definition of technology integration:

Technology integration is using computers effectively and efficiently in the general content areas to allow students to learn how to apply computer skills in meaningful ways. Discrete computer skills take on new meaning when they are integrated within the curriculum. Integration is incorporating technology in a manner that enhances student learning. Technology integration is using software supported by the business world for real-world applications so students learn to use computers flexibly, purposefully and creatively. Technology integration is having the curriculum drive technology usage, not having technology drive the curriculum. Finally, technology integration is organizing the goals of curriculum and technology into a coordinated, harmonious whole. (p. 73)

Teacher technology integration knowledge was measured quantitatively using the technology integration knowledge survey that includes modified versions of items used by Walker et al. (2012), DeSantis (2013), Mouza (2009), and Uslu and Bumen (2012). This instrument (see Appendix S) consists of 17 Likert scale items corresponding to the technological pedagogical content knowledge explained by Mishra and Koehler (2006) and response options range from (1) strongly disagree to (5) strongly agree. Sample items include (1) “I can troubleshoot technical problems associated with hardware.” (2) “I can use a wide range of teaching approaches with ICT.” (3) “I know how to enhance my instruction with the help of ICT.” (4) “I know how to integrate ICT into my teaching to address content standards.” (5) “I can select appropriate content-specific technological
tools to support teaching and learning.” (6) “I can employ technology to promote students’ higher-order thinking skills.”

**Self-efficacy for educational technology survey.** Numerous studies offer empirical evidence that participation in and scaffolded professional learning programs increase teachers’ technology self-efficacy, which in turn facilitates their adoption of ICT for educational purposes (Brinkerhoff, 2006; DeSantis, 2013). I measured teacher self-efficacy toward educational technology using an adapted version of Computer Technology Integration Survey (see Appendix T) developed by Wang, Ertmer, and Newby (2004). I changed several items to read (1) “I feel confident that I have the skills necessary to use technology for instruction.” (2) “I feel confident that I can involve my students to participate in technology-enhanced activities.” (3) “I feel confident about keeping curriculum goals and technology uses in mind when designing my lessons.” and so on. Four items of the original survey were not included in the adapted version as they were irrelevant. This instrument consists of 17 items, and participants responded to each item on a five-point Likert scale (from 1-Strongly disagree to 5-Strongly agree).

My dissertation supervisor and executive sponsor reviewed these two surveys plus the postworkshop survey and ascertained content validity of these measures. I piloted these three instruments among 35 teachers of Baku public schools to check their reliability and ensure the accuracy of survey items. All three instruments had acceptable reliability: postworkshop survey ($\alpha = .7$); technology integration knowledge survey ($\alpha = .74$); and self-efficacy for educational technology survey ($\alpha = .71$).

**Observation protocol.** Maddux and Johnson (2005) distinguish two types of ICT applications that will be foci in the present study. Type I applications use
technology to make the traditional teaching and learning more convenient, whereas Type II applications employ ICT creatively to produce new or better forms of teaching and learning and thus, significantly contribute to education (Maddux & Johnson, 2005). Mills and Tincher’s (2003) explanation of ICT use in the classroom is as follows “applying technology across the curriculum, applying technology to problem solving and decision making in authentic learning environments, and applying technology to facilitate collaboration and cooperation among learners” (p. 382).

In this study, the use of technology in the classroom was evaluated through classroom observations and focus group discussions. I employed a modified version of the Technology Observation Checklist created by Wang, Hsu, Reeves, and Coster (2014) during observations. The authors reported that the original instrument had an inter-rater reliability of 0.9. The observation protocol distinguished technology implemented during the lesson, classroom organization, explanation of teacher and student behavior, and use of technology to support student learning (see Appendix U).

**Procedure**

This section contains a full description of the participant recruitment, intervention, and steps taken during the data collection and analysis processes.

**Participant recruitment.** The intervention targeted the same four schools that participated in the needs assessment study. For this reason, participants were selected using non-probability convenience sampling. Two school administrators, a principal and a vice principal, and four teachers (i.e., two geography and two history teachers) from each school were invited to take part in this study. I sent potential participants an email
solicitation (see Appendices V & W) and invited them to a virtual meeting. Participants had five days for responding and expressing interest in participating in the CAPD program via email. The written informed consent forms were emailed to participants using the recruitment email (see Appendices X and Y); they had five days to read these forms. The forms were in Azerbaijani so that participants could read and understand the information about the research study. Then I held the virtual information session using Microsoft Teams platform and explained the CAPD program as well as consent forms during this meeting. Participants were asked to read the written informed consent form, print, and provide their name, signature, and the date. Due to COVID-19, the participants left the signed written informed consent forms in the school and I collected them.

**Intervention.** I designed and developed the CAPD program, which addresses the factors that emerged as important in my needs assessment study. To achieve long-lasting effects, the program utilized all six strategies suggested by Collins et al. (1987) in relation to expert’s actions. The aim was to have two groups of participants, school administrators and teachers; hence, the components targeting each group differed. Two experts on educational technology who teach geography and history were recruited to serve as mentors. These experts were trained as mentors by ITE and worked in numerous projects to support teachers with the application of technology into teaching and learning for several years (I. Tagiyeva, personal communication, January 9, 2020).

**Components targeting school administrators.** This part of the program focused on a school vision on educational technology and school-wide ICT integration plan. I first organized an introductory meeting with all administrators and explained this component of the intervention. The school administrator component of the CAPD program lasted 20
hours; the program timeline can be found in Appendix Z. Starting April 2021 I held group meetings and school-based consultations. The duration of each group meeting was two hours, while school meetings lasted an hour. All eight school administrators attended group meetings. The content of these meetings and the general overview of the school administrator component are provided in Appendix AA and AB, respectively. We first talked about a shared vision about educational technology, what it was, and why it was important in the implementation of ICT integration. Next, I explained what ICT integration plan was and why having such a plan was vital for boosting the level of technology use in the school (Gulbahar, 2007; Vanderlinde, van Braak, & Dexter, 2012). There was one consultation per school and both a principal and vice principal attended this meeting to discuss their initial views about the vision and ICT integration plans. I then described the content of and strategies for developing comprehensive ICT policy plans. Zhang and Brundrett (2010) claim that school leaders learn better when they receive practical advice and interact with the new content within day-to-day practices instead of formal courses. Therefore, I provided necessary support and scaffolding through the development of initial school-based ICT integration plans and they reflected on concepts learned. Both group meetings and school-based consultations were implemented via Microsoft Teams platform. Considering the literature reviewed in Chapter Three, I presented successful international examples of school-based ICT integration plans. Based on knowledge gained during the meetings, consultations received, as well as international best practices, school administrators finalized their own school-based ICT integration plans. They presented their plans during the last group meeting, which was the culmination of this part of the CAPD program.
**Components targeting teachers.** This component of the intervention concentrated on teachers’ technology integration knowledge, self-efficacy toward educational technology, and meaningful classroom experiences with the use of ICT to advance student learning. The duration of this component of CAPD was 40 hours; a detailed timeline is presented in Appendix Z. First, teachers attended a 20-hour virtual workshop on the educational uses of ICT with the adoption of a problem-based approach to increase teachers’ knowledge about possible uses of technology in geography and history classes to support student learning. This workshop incorporated curriculum-based, subject-specific, technology-rich learning activities as illustrated in Appendix AC-AF. I facilitated it together with the recruited mentors. The next phase involved 20 hours of mentoring implemented during March-May 2021. Mentors held five group meetings that lasted two hours each and 10 one-hour long individual meetings. Previous studies point out that mentoring emphasizes collaborative learning, mutual support, and exchange of ideas between mentors and mentee teachers, which are essential for assisting teachers in using technology in meaningful ways (Zhao & Bryant, 2006). Mentors conducted model lessons for a group of students by combining subject matter content, pedagogy, and ICT to help teachers understand the benefits of technology in subject teaching (Al Mulhim, 2014; Crisan et al., 2007). With the assistance received from mentors, the participant teachers designed and implemented technology-enhanced instruction. Then, they discussed these lessons with mentors and peers, made necessary modifications based on feedback, and organized new lessons with the use of technology. I observed all of these lessons.
**Data Collection.** Once the Johns Hopkins Homewood Institutional Review Board (HIRB) approved all instruments, I translated them into Azerbaijani and collected quantitative and qualitative data concurrently. The following sections outline the specific procedures for both quantitative and qualitative measures. Observation is discussed separately as it involved gathering mixed data.

**Quantitative measures.** I administered three online surveys to teachers through SurveyMonkey.com and each survey took them about 15-20 minutes to complete. The link to the postworkshop survey was sent to teachers on the last day of the workshop and they had three days to complete it. The other two online surveys—technology integration knowledge survey and self-efficacy for educational technology survey were administered to teachers before and after the intervention. In other words, teachers were required to submit knowledge and efficacy surveys right after the introductory meeting, at least a day before the start of the workshop, and within a week upon the completion of mentoring phase.

**Qualitative measures.** Focus group interviews with both school administrators and teachers were semi-structured to allow participants the opportunity to express their opinions freely. These interviews were held via Microsoft Teams platform after the intervention, which was the last week of May 2021. I organized one discussion with school administrators since only eight of them took part in this study and two discussions with teachers, eight teachers per discussion group. With participants’ permission, I audio recorded the interviews as well as took notes. The discussions lasted 60 to 90 minutes.

I collected schools’ ICT integration plans prepared during the CAPD program at the end of intervention and analyzed these documents in early June 2021. As stated
above, I used guidelines offered by Vanderlinde, Dexter, and van Braak (2012) during this process.

**Observation.** Each participating teacher was observed twice – in the middle and at the end of intervention. According to the MoE guidelines issued during COVID-19 (MoE, 2020b), online lessons last 30 minutes, thus each observation was equal to 30 minutes. Both quantitative and qualitative data were gathered during observations in accordance with the observation protocol instrument. To understand how and why ICT was employed in these lessons and whether the implementation of educational technology supported student learning, I took detailed notes of teacher behavior, student behavior, as well as technology use. Later, I compiled these notes and sent to teachers for their approval as my understanding of the purpose of ICT use might have differed from their understandings. As a result, I obtained a description of each lesson with the indication of purpose of educational technology. It allowed me to determine whether usage of ICT helped to develop and/or assess subject-specific content knowledge, promote critical thinking skills, reinforce student learning, etc.

**Data Analysis.** Quantitative and qualitative data were analyzed separately and merged for interpretation (Creswell & Plano Clark, 2011). Once the data were analyzed, I translated everything to English to represent the results of the analysis. To ensure trustworthiness of the data I applied back translation. I then assigned codes to each school and each research participant to ensure anonymity.

**Quantitative data sources.** To prepare the data for analysis, I first coded the data by assigning numeric values for each response, entered all quantitative data into SPSS software package (version 25), and cleaned any data errors from the database. Then,
descriptive statistics including frequencies, means, and standard deviations were computed for items on all surveys. I conducted descriptive analyses and checked for trends and distributions. Next, Cronbach’s alpha estimates were calculated to assess the internal consistency of each measure. I performed a t test for examining the preintervention and postintervention differences on teachers’ technology integration knowledge and their self-efficacy for educational technology. Finally, I represented results in statements, tables, and figures, and triangulated quantitative results with the qualitative ones to explain how the results answered the research questions.

**Qualitative data sources.** I first organized documents, transcribed text, and entered all qualitative data into Dedoose (Version 6.1.18). Then I read through the data and wrote memos to explore them. I created initials codes, assigned labels to codes, identified patterns within codes, and grouped the codes into themes. Next, I organized the data per research question, reread the data, and checked for emergence of new codes and reexamination of existing ones. After reading the data one more time, I combined codes into recurring themes. To ensure trustworthiness, I applied member-checking and triangulation of the data drawn from several sources (Lincoln & Guba, 1985; Shenton, 2004). I sent all transcripts to participants and asked for their feedback; they had an opportunity to correct any misleading or wrong interpretations. Data obtained through focus group interviews were triangulated with those from document analysis and lesson observations. Additionally, qualitative results were triangulated with the quantitative ones before assessing how the research questions were answered.
Researcher Subjectivity

A statement of subjectivity is imperative to understand how researcher’s experiences, beliefs, and predispositions may affect his/her research work (Given, 2008). My educational and professional background has strongly influenced the development and design of the CAPD program and it had an effect on the implementation as well; but these factors might have influenced data collection and analysis. Therefore, I openly discuss any potential biases in this section.

Currently, I am the Deputy Director at the Institute of Education of the Republic of Azerbaijan, which is responsible for the development of content and evaluation standards at all levels of education, conducting national and international assessment studies, implementing educational innovations, and doing research on contemporary educational issues. I oversee the operations of several departments that focus on general education. Although I do not have any direct relationship with the target schools, the Institute of Education is a subordinate organization of MoE and my administrative position might have influenced school administrators and their attitudes toward and participation in this study. This, in its turn, might have had an impact on teachers and their engagement in my research project.

In addition, as an ex-employee of two organizations that are primarily involved in bolstering ICT uptake within the education system of Azerbaijan, I am professionally interested in the results of this study. Having advanced my competencies in educational technology and related professional learning initiatives through the Doctor of Education program, I hoped the CAPD program would be effective and add value to the knowledge base and experiences of participants.
Chapter Five

Findings and Discussion

This study aimed to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ knowledge and skills to implement educational technology that could potentially enhance student learning. This chapter includes reliability estimates for quantitative measures, a brief discussion of the implementation process of the CAPD program, and the results of the process and outcome evaluation of the intervention. The results are organized per research question drawing on multiple sources of data. The chapter ends with limitations of the study and implications for future research and policy.

Reliability Estimates

I administered three surveys to teachers: postworkshop survey, technology integration knowledge survey, and self-efficacy for educational technology survey. The last two surveys were employed before and after the intervention, and reliability estimates ranged from 0.72 to 0.97. The postworkshop survey (see Appendix O) included 18 Likert items and had high reliability ($\alpha = .92$). Table 5.1 presents the reliability estimates of all three surveys.
As shown in Table 5.1, both technology integration knowledge survey and self-efficacy for educational technology surveys had relatively lower reliability during pretest but higher reliability during the posttest.

**Implementation Process of the CAPD Program**

The CAPD program was implemented exactly as described in Chapter Four; however, a few changes were necessary from proposal to dissertation study. I initially proposed to organize 10 meetings with the school administrators (i.e., five group meetings and five school-based consultations) with the duration of two hours each. They asked me to make minor changes to this plan during the introductory meeting held in late March 2021. Per their request, I conducted 12 meetings consisting of eight two-hour long group meetings and four one-hour long school meetings. School administrators learned how to develop their own school-based ICT integration plans with the help of information provided in these meetings, discussions among colleagues and subordinates, examples of technology integration plans from international schools, and practical advice received during school-based consultations. These strategies were consistent with those
suggested by Collins et al. (1987), Zhang and Brundrett (2010), and Abdul Razzak (2013).

Similar changes were made to the component targeting teachers, especially with reference to a virtual workshop that focused on the educational use of technology in geography and history classes. At first, I suggested delivering this 20-hour long workshop during one week consisting of four hours a day, Monday through Friday. When teachers did not want to allocate so many hours a day due to their family responsibilities outside of school hours, we discussed other options and agreed upon a two-week virtual workshop. Thus, I distributed the workshop content to eight sessions instead of five as originally planned and conducted it four days a week for two and a half hours each day. With this minor alteration, we completed the virtual workshop by March 13, 2021. No changes were made to the mentoring part of the CAPD program. Each teacher received 20 hours of subject-specific mentoring support. Both mentors demonstrated model lessons, organized individual and group meetings, observed teachers’ lessons, and provided necessary guidance and support for using technology to augment student learning. The level of scaffolding gradually faded out once mentees started to transfer their knowledge and skills to concrete lessons and create meaningful technology-mediated learning experiences. We followed the recommendations of several scientists scrutinized in Chapter Three (e.g., Collins et al., 1987; Nichol & Turner-Bisset, 2006; Zhao & Bryant, 2006) throughout the implementation of CAPD. For instance, the intervention incorporated the six strategies (i.e., modeling, coaching, scaffolding, articulation, reflection, and exploration) of cognitive apprenticeship mentioned by Collins
et al. (1987) and expert support was provided by more experienced teachers—mentors as suggested by Nichol and Turner-Bisset (2006) and Zhao and Bryant (2006).

COVID-19 influenced the original design of my intervention, the teacher component, as well as the evaluation study. I initially planned to deliver a face-to-face workshop and implement mentoring in a blended mode. Then, I wanted to observe lessons conducted in a face-to-face learning environment and hold face-to-face focus group discussions. COVID-19 restrictions on human movement and physical interactions necessitated a revision to this component of CAPD. Consequently, both the workshop and mentoring were implemented virtually, and online lessons were observed to understand teachers’ use of technology in their classroom. I also organized virtual focus group discussions with teachers using Microsoft Teams platform. Considering school administrators’ time limitations, I originally planned to hold virtual meetings with them followed by online focus group discussion; thus, the pandemic did not have an impact on the implementation of this component.

**Fidelity of Implementation**

The research questions related to fidelity of implementation included (1) What was the delivered CAPD and to what degree was it implemented with fidelity? and (2) What were participants’ experiences related to participation in CAPD? The findings obtained from both quantitative and qualitative data for each of these research questions are discussed below.

**Implementation Fidelity (RQ 1)**

Three dimensions of treatment integrity considered for assessing fidelity of implementation in the CAPD program were adherence, dosage, and quality of instruction
(see Appendix N). I employed several instruments to answer the first research question and understand whether I adhered to the original program design. In general, participating teachers ($n = 16$) and school administrators ($n = 8$) reported positive feedback about the implementation of the CAPD program. Ninety-four percent of teachers ($n = 15$ out of 16) agreed or strongly agreed that the workshop was implemented as planned and all sessions were conducted (see Table 5.2). They reconfirmed this during the focus group discussions and referred not only to the virtual workshop but also to mentoring. One history teacher said, “You presented an overview of the CAPD program during the introductory meeting and informed us of its elements. So, we knew what to expect. We first participated in the workshop, then received mentoring support” (Teacher 10, Focus group discussion). Another teacher named the topics covered during the workshop and thanked us for creating a collaborative learning environment through the mentor who taught geography and had prior experience with the implementation of educational technology. When queried about the duration of the workshop, 94% of respondents ($n = 15$ out of 16) said that it lasted 20 hours. Several teachers verified this in the focus group discussions and stated that the entire professional learning program was 40 hours, implemented during March-May 2021.
Table 5.2

Frequency of Teacher Reporting about the Degree of CAPD Implementation with Fidelity (n = 16)

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Disagree / Disagree</th>
<th>Neutral</th>
<th>Strongly Agree / Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>1. The workshop was conducted as planned.</td>
<td>0 (0)</td>
<td>1 (0.06)</td>
<td>15 (0.94)</td>
</tr>
<tr>
<td>2. All sessions of the workshop were implemented.</td>
<td>0 (0)</td>
<td>1 (0.06)</td>
<td>15 (0.94)</td>
</tr>
<tr>
<td>3. In total, the workshop lasted 20 hours.</td>
<td>0 (0)</td>
<td>1 (0.06)</td>
<td>15 (0.94)</td>
</tr>
<tr>
<td>4. Overall, I liked how facilitators conducted the workshop.</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>16 (1.00)</td>
</tr>
<tr>
<td>5. Facilitators were knowledgeable and experienced in this area.</td>
<td>0 (0)</td>
<td>1 (0.06)</td>
<td>15 (0.94)</td>
</tr>
<tr>
<td>6. Overall, the workshop was of good quality.</td>
<td>0 (0)</td>
<td>1 (0.06)</td>
<td>15 (0.94)</td>
</tr>
</tbody>
</table>

Similar questions were asked of school administrators during the focus group discussion. They repeatedly said their component of the program lasted 20 hours and was implemented as intended. One of them added, “You sent calendar invitations for every single meeting, we participated in eight group and four school meetings. We discussed topics that were absolutely new to us and jointly learned how to prepare an ICT integration plan for our schools” (School administrator 3, Focus group discussion). All school administrators (n = 8) expressed gratitude for quality delivery, deep knowledge, and high professionalism of the facilitator. “We are happy to have such professionals in our country. It is admirable that people like you return to Azerbaijan and contribute to the development of our education system. Thank you for guiding us, raising thought-
provoking questions, and challenging us” (School administrator 6, Focus group discussion). Another principal noted,

At first, I did not expect that this program would advance my knowledge and professional practice, but you completely changed it. I have never heard of a school vision for educational technology or an ICT integration plan before the CAPD program, so you made a significant contribution to my personal and professional development. Thank you for making us think and changing our thoughts. (School administrator 8, Focus group discussion)

Analogous thoughts were prevalent among teachers as well. All of them (n = 16) liked how the facilitators conducted the workshop (see Table 5.2) and enjoyed the mentorship. Ninety-four percent of teachers (n = 15 out of 16) agreed or strongly agreed that facilitators were knowledgeable and experienced in the implementation of educational technology. The same percent of them considered that generally, the workshop was of good quality. They echoed it during the focus group discussions and elaborated on mentor support received throughout the CAPD program.

I am glad that you invited these two experts to this project. We very rarely get an opportunity to work with an experienced colleague who teaches the same subject matter. My mentor gave numerous examples from history lessons, assisted me when needed, responded to all of my questions, be it related to content, pedagogy, or technology. This was, indeed, very useful. (Teacher 11, Focus group discussion)

One geography teacher expressed,
We learned a lot from both facilitators/mentors. The workshop was full of practical activities and various ICT tools and connected to geography curriculum. I incorporated technology into my lessons, discussed these lessons with the mentor, and improved my knowledge and skills with her assistance. I do not think I could have been so successful if I did this on my own. (Teacher 4, Focus group discussion)

These findings resonate with prior research by Crisan et al. (2007), and Peeraer and Van Petegem (2012), who report that a combination of technology with subject matter pedagogy is significant for professional learning focusing on ICT integration. These results also indicate that subject-specific technology use increase when teachers are guided through group meetings and classroom practice, which is in alignment with Mouza (2009).

**Participants’ Experiences in the CAPD Program (RQ 2)**

Analysis of data collected from the postworkshop survey and focus group discussions with both target groups revealed participants’ perceptions of the intervention, the most and least useful aspects of, and suggestions for improving CAPD. Eighty-one percent of teachers \((n = 13 \text{ out of } 16)\) found the workshop to be useful for effective integration of ICT into teaching and learning (see Table 5.3). Seventy-five percent \((n = 12 \text{ out of } 16)\) agreed or strongly agreed that all sessions of the workshop contributed to their existing teaching practice. The remaining prompts \((i.e., 7-15)\) shown in Table 5.3 are associated with the workshop sessions, thus they point out the participants’ insights of the workshop along with adherence to its original design. According to survey results, teachers understood the relationship between the 21st century skills and educational
technology \((n = 12 \text{ out of } 16; 75\%)\), learned that ICT could promote student learning \((n = 13 \text{ out of } 16; 81\%)\), and could name at least three ways of integrating technology to develop students’ creativity and geographical inquiry/historical thinking skills \((n = 13 \text{ out of } 16; 81\%)\) after the workshop. More than half of them \((n = 11 \text{ out of } 16; 69\%)\) agreed or strongly agreed that in consequence of the virtual workshop, they could identify major characteristics of meaningful learning with ICT; knew new ICT tools suitable for teaching geography/history; could detect strategies for applying ICT into teaching and learning to meet curricular goals; and could plan a lesson using subject-specific technology tools. These results are in line with the findings reported by Benimmas et al. (2011), Duran et al. (2012), and Uslu and Bumen (2012) and once again affirm that the workshop was conducted as planned and all sessions were implemented (see Appendix AC).

Table 5.3

*Frequency of Teacher Reporting about Their Experiences related to Participation in Workshop*\(^2\)

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Strongly Disagree / Disagree (n (%))</th>
<th>Neutral (n (%))</th>
<th>Strongly Agree / Agree (n (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. The workshop was useful for effectively integrating technology into teaching and learning.</td>
<td>0 (0)</td>
<td>3 (0.19)</td>
<td>13 (0.81)</td>
</tr>
<tr>
<td>8. All sessions of the workshop contributed to my existing teaching practice.</td>
<td>1 (0.06)</td>
<td>3 (0.19)</td>
<td>12 (0.75)</td>
</tr>
<tr>
<td>9. I now understood the relationship between the</td>
<td>1 (0.06)</td>
<td>3 (0.19)</td>
<td>12 (0.75)</td>
</tr>
</tbody>
</table>

\(^2\) This table presents data obtained from the same postworkshop survey. Therefore, the number of prompts continues from previous table (i.e., 5.2).
21st century skills and educational technology.

<table>
<thead>
<tr>
<th></th>
<th>10. I now know that technology can foster student learning.</th>
<th>1 (0.06)</th>
<th>2 (0.13)</th>
<th>13 (0.81)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11. I can now identify major characteristics of meaningful learning with technology.</td>
<td>1 (0.06)</td>
<td>4 (0.25)</td>
<td>11 (0.69)</td>
</tr>
<tr>
<td></td>
<td>12. I now know new ICT tools appropriate for teaching geography / history.</td>
<td>1 (0.06)</td>
<td>4 (0.25)</td>
<td>11 (0.69)</td>
</tr>
<tr>
<td></td>
<td>13. I can now pinpoint strategies for incorporating technology into teaching and learning to meet curricula goals.</td>
<td>1 (0.06)</td>
<td>4 (0.25)</td>
<td>11 (0.69)</td>
</tr>
<tr>
<td></td>
<td>14. I can now name at least three ways for implementing educational technology to cultivate students’ creativity and geographical inquiry/historical thinking skills.</td>
<td>1 (0.06)</td>
<td>2 (0.13)</td>
<td>13 (0.81)</td>
</tr>
<tr>
<td></td>
<td>15. I can now develop a lesson plan using subject-specific ICT tools.</td>
<td>1 (0.06)</td>
<td>4 (0.25)</td>
<td>11 (0.69)</td>
</tr>
</tbody>
</table>

During focus group discussions, 88% of teachers \( (n = 14 \text{ out of } 16) \) considered mentoring and individual meetings as part of mentoring very beneficial as they focused on the individual teachers’ needs. “My ICT skills are not perfect and I thought the mentor would not want to work with me. On the contrary, she was very supportive, had a lot of patience, and continuously encouraged me” (Teacher 9, Focus group discussion).

Another teacher said,

This is the first time I attended a professional learning program structured this way. I participated in many short-period trainings in the past but never worked
with the mentor before. I guess this is the reason why this program is so valuable.

(Teacher 16, Focus group discussion)

This underpins the findings of Swan and Dixon (2006), Zhao and Bryant (2006), and Kopcha (2012), who report that mentoring or mentor support is the core tenet of technology-enhanced professional learning opportunities. Moreover, each teacher asserted that working with a mentor who had the same background in terms of content area made this program unique. School administrators also reiterated this for several reasons. First, they unanimously agreed that although the needs assessment study (see Chapter Two) was conducted in 2016, our public schools still lacked knowledge and/or information about a school vision or an ICT integration plan. Hence, CAPD was the only program implemented in Baku, Azerbaijan that built administrators’ capacity in these directions. Second, school-based consultations were “highly valuable” (School administrator 1, Focus group discussion) given that during these meetings administrators received specific guidance for the preparation of ICT integration plans tailored to the individual school’s needs and requirements.

Even though no participant mentioned any least beneficial aspects of the intervention, they put forward several noteworthy ideas for improving CAPD. Two of the administrators expressed a need for adding information about school mission, strategic plan, action plan, and other similar tools for management to the content of relevant CAPD component. One principal said, “We hear these fancy words from relatives or acquaintances working in different sectors but do not understand their meanings. Therefore, I think it will be valuable if you could enrich the program content by attending to these issues” (School administrator 5, Focus group discussion). Another agreed and
brought up “outcome indicators”, a term used by her son when talking about action plans (School administrator 1, Focus group discussion). Evidently, some principals or vice principals wanted to acquire professional competence regarding school or organization management, and they required more profound information. Teachers’ suggestions for further advancing the CAPD program included a) executing this program in a hybrid format because application of technology in a face-to-face learning environment might be more challenging; b) considering the use of pertinent mobile apps; and c) adding ICT tools for formative assessment.

In conclusion, all school administrators ($n = 8$) and 14 teachers declared that they would prefer having more professional learning opportunities structured this way. Participants reported that practical tasks related to real classroom teaching were crucial, working in small groups was effective, individual meetings were constructive, and application of technology in combination of content and pedagogy was stimulating and challenging at the same time. These echo earlier studies Uslu and Bumen (2012), Mouza (2009), Lim and Khine (2006), and Peeraer and Van Petegem (2012). One geography teacher uttered,

This professional learning program became a turning point in my career as a teacher. I learned how to identify and exploit ICT tools corresponding to the lesson objectives. I discovered that with right or meaningful use of technology I could not only motivate and attract students but also boost their learning. I am happy to be part of this very interesting program. (Teacher 5, Focus group discussion)
Process Evaluation Summary

The intervention was implemented as planned, I adhered to the original program design, and the dosage of each CAPD component remained unchanged. Generally, participants enjoyed this professional learning opportunity and found it quite useful. Because schools did not possess a school vision and/or an ICT integration plan before joining the CAPD program, administrators emphasized the importance of each meeting and each topic. The facilitator was goal-oriented and provided necessary support to principals and vice principals; together, they learned how to create a school vision and develop a technology integration plan considering each school's characteristics and needs. School-based consultations were especially beneficial as administrators could focus on their products and make essential improvements.

Teachers attended the 20-hour virtual workshop followed by 20 hours of mentoring support. They learned how to incorporate technology to advance student learning, became acquainted with several subject-specific ICT tools, and developed technology-mediated lessons in connection with curricula goals. Participants indicated that mentoring was one of the most beneficial aspects of CAPD. Another uniqueness of this program was involving mentors, who taught the same subject matters as teachers and who had implemented educational technology in their own lessons for many years. Teachers were very appreciative of the one-on-one meetings held in the context of mentoring as these meetings concentrated on individual professional needs and stimulated personal development. Even though school administrators or teachers did not point at any weaknesses of CAPD, they offered remarkable suggestions for improving this program as described above.
My anecdotal observations showed that school administrators \((n = 8)\) had inadequate knowledge about the general management of an educational institution, in this case, a public school. They were not novice principals or vice principals; in fact, I interviewed five of them during the needs assessment study in 2016. Most of them demonstrated minimal information about the basic principles of school management. For instance, school administrators had seen annual action plans sent by upper organizations but never developed one and even struggled to construe such plans. Likewise, they expressed a need for better information technology infrastructure and more equipment for schools, yet were unaware of the procedure for requesting it from the MoE. School leaders also possessed limited big picture thinking abilities and focused on trivial details, which might hinder their professional growth.

The difficulties faced by teachers varied in nature. All of them were experienced geography or history teachers in public schools but they seemed to be unfamiliar with the geography or history subject curriculum despite regular teaching. They demonstrated difficulties in not only understanding standards and/or learning outcomes described in curricula but also in assessment of and for learning. Additionally, they exhibited limited knowledge with reference to instructional strategies, specifically in an online learning environment. Regardless of lesson objectives, most teachers faced challenges in determining appropriate pedagogical approaches for effectively teaching geographical or historical content. Their perceptions of inquiry-based instruction or geographical inquiry and of historical reasoning very much differed from mine. All these once again highlight the importance of primary forms of knowledge plus TPACK as described by Mishra and Koehler (2006).
Outcome Evaluation

To measure the effects of the CAPD program on outcomes, I looked at the mediating variables—vision relative to educational technology, knowledge about ICT integration plan, technology integration knowledge, self-efficacy toward educational technology, use of ICT in the classroom (see Appendix M). In this section, I describe the teachers’ classroom experiences concerning the use of technology in both geography and history lessons by adopting a distinct approach to each of these cases to avoid redundancy. In other words, in the description, I illustrate the actual lessons only minimally since the pedagogical use of ICT in these lessons were alike. Both quantitative and qualitative instruments were employed to measure any changes on proximal outcomes. The findings are reported per research question below.

Vision about Educational Technology and Knowledge about ICT Integration Plan (RQ 3)

As indicated in Chapter Two, public schools in Azerbaijan did not possess a vision for educational technology and administrators had no knowledge about an ICT integration plan. For this reason, one of the CAPD components targeted school administrators. Focus group discussion and document analysis of the final ICT integration plans prepared during CAPD revealed the administrators’ learning after participating in the intervention. All administrators ($n = 8$) stated that this program entirely changed their thinking about technology application.

I realized that we had very narrow view on this matter. During our meetings, you talked about the importance of educational technology, its connection to 21st century learning, job market requirements, a shared vision, plans and policies for
employing technology meaningfully within schools. I recognized this as a systemic approach; we cannot achieve effective implementation of educational technology if we expect this just of teachers and students. In this regard, this program has broadened my mindset, my thinking. (School administrator 7, Focus group discussion)

Another administrator added, “You definitely pushed us to think differently on this issue. It was very mind-opening” (School administrator 4, Focus group discussion). Six of the administrators asserted that a shared vision for educational technology meant a unified approach to them and the biggest benefits of having such vision was uniting school staff around common goal. “A unified approach is vital. Now that we have defined our aims and objectives, we will work in this direction” (School administrator 1, Focus group discussion). All four schools created a vision for educational technology and administrators happily shared them during the discussion. “To be a school that engages students in stimulating technology-rich activities and cultivates their abilities to think critically, create, overcome hardships, and apply ICT” (School administrator 8, Focus group discussion). These results were in line with the findings obtained from the document analysis tool (see Appendix R). As presented in Table 5.4, all four schools included visions for technology in education in their ICT integration plans.
Table 5.4

Evaluation of School-Based ICT Integration Plans Prepared During CAPD: First Section

<table>
<thead>
<tr>
<th>№</th>
<th>Content</th>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting direction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1. General vision on education</td>
<td>A description of school’s vision on education as well as teaching and learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2. Vision on ICT in education</td>
<td>A general description of the place for ICT in teaching and learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3. Description of ICT enriched activities</td>
<td>A detailed overview of the ICT activities schools want to organize with their students in different classrooms or teaching grades</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After the professional learning opportunity, the administrators were able to clearly describe how technology could be used to enhance teaching and learning. They mentioned several advantages of having such a plan and the most prominent one was:

It is a roadmap for incorporating ICT into classroom more purposefully so our students enjoy learning, become skillful, knowledgeable, and prepared for independent life. It is also a guide for administrators and teachers as the plan puts forward distinct steps for the implementation of educational technology. (School administrator 3, Focus group discussion)

Administrators were quite active once they were asked to provide information about the content of their plans. Most of them agreed that the plan should portray existing equipment, include a section about technology coordinators and professional learning of staff, describe ICT-rich activities to be implemented with students, and contain
information pertaining to evaluation of ICT integration. The descriptive information obtained from document analysis affirms these responses of administrators (see Table 5.5). These findings resonate with earlier studies (Chang, 2012; Gulbahar, 2007; Vanderlinde, Dexter, & van Braak, 2012). All three studies emphasize inclusion of school vision for educational technology, hardware and software specification, in-service training, role of ICT coordinators, and various activities. Additionally, Gulbahar (2007) and Chang (2012) recommend the importance of school-wide evaluation of technology application. Three of the administrators added that schools should also consider promotional events to draw attention to the effective use of technology across grades and subjects.

Some teachers or parents may resist the use of ICT in teaching and learning, so we need to organize regular events to accentuate the significance of developing meaningful learning experiences with the help of technology. Therefore, we included such a section in our plan. (School administrator 1, Focus group discussion)

Another administrator developed this idea further, “Yes, definitely. I think we should also organize stimulating activities in our schools. Such activities will motivate our teachers once they witness that their hard work and efforts to incorporate technology effectively are recognized and appreciated” (School administrator 4, Focus group discussion). None of the studies reviewed in either Chapter One or Chapter Three discussed promotional events or stimulating activities as parts of ICT integration plans. Furthermore, one administrator said,
We should not forget about libraries. ICT integration should also entail development of school libraries. Students do not learn just in the classrooms. By organizing diverse technology-rich activities in our libraries we can improve the current state of libraries, invite more students to use its services as well as facilitate the implementation of education technology. (School administrator 5, Focus group discussion)

This finding, also, was not found in previous studies reviewed.

Although I explained the content of school-based ICT integration plans during the CAPD program, administrators developed their plans considering schools’ current technology infrastructure and needs. In three cases, plans did not include external ICT training activities and ICT code of behavior; whereas ICT budget plan was omitted in all four cases (see Table 5.5). These omissions might be due to the nature of our education system; public schools lack their own budgets and, therefore, may encounter obstacles in planning external professional learning initiatives for technology integration. With respect to ICT code of behavior, administrators might expect to receive it from upper organizations because the central governing body usually provides many guidelines or manuals of similar kind.
Table 5.5

**Evaluation of School-Based ICT Integration Plans Prepared During CAPD: Remaining Sections**

<table>
<thead>
<tr>
<th>№</th>
<th>Content</th>
<th>Description</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Developing people</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>ICT professional development</td>
<td>ICT professional development activities organized within the school</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for teachers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>External ICT training activities</td>
<td>Description of training courses for teachers will attend externally</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.3</td>
<td>ICT support for teachers</td>
<td>ICT support (technical and educational) for teachers</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Developing organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Description of hardware</td>
<td>Description of in-house hardware</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.2</td>
<td>Description of software</td>
<td>Description of in-house software</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.3</td>
<td>Safe use of the Internet</td>
<td>Guidelines concerning the safe use of the Internet</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.4</td>
<td>School website</td>
<td>Description of the role of the school’s website</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.5</td>
<td>Collaboration with organizations</td>
<td>Collaboration with other organizations</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3.6</td>
<td>ICT budget plan</td>
<td>The school’s ICT budget plan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.7</td>
<td>ICT code of behavior</td>
<td>An ICT code of behavior for teachers and students</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

Analysis of schools’ ICT integration plans also revealed that administrators were attentive during CAPD and heeded my advice. As is evident from Tables 5.4 and 5.5, the
plans prepared by them during this program were aligned with those found in the literature (e.g., Vanderlinde, Dexter, & van Braak, 2012). In addition, all four plans also incorporated several other sections such as activities for/with students, training of relevant stakeholders (i.e., parents and non-teaching staff), and assessment of ICT competency. Studies scrutinized in previous chapters did not touch on any of them as content of the schools’ technology integration plans (e.g., Gulbahar, 2007; Vanderlinde, Dexter, & van Braak, 2012).

**Technology Integration Knowledge and Self-Efficacy for Educational Technology (RQ 4)**

To determine whether teachers report any changes in their technology integration knowledge as well as self-efficacy toward educational technology with participation in the CAPD program, I compared preintervention and postintervention scores from both surveys (see Table 5.6). Teachers’ technology integration knowledge scores were significantly higher after participating in the CAPD program ($M = 4.09, SD = 0.54$) than before it ($M = 2.57, SD = 0.42; t = -7.98, p = 0.000$). Equally, a paired sample $t$ test revealed statistically significant difference between teachers’ self-reported preintervention ($M = 2.61, SD = 0.42$) and postintervention self-efficacy scores ($M = 4.01, SD = 0.42; t = -8.07, p = 0.000$). These findings suggest that the CAPD program was successful in improving teachers’ technology integration knowledge as well as their self-efficacy toward educational technology. As delineated by earlier research, such results are achievable when professional learning initiatives contain a variety of practical activities, combine content, pedagogy, and technology, focus on instructional uses of ICT, and support participants through more-experienced teachers (e.g., Brinkerhoff,
2006; DeSantis, 2013; Uslu & Bumen, 2012; Walker et al., 2012), which were all components of the CAPD program.

Table 5.6

*Intervention Pretest, Posttest, and Paired Sample t Test Results*

<table>
<thead>
<tr>
<th>Scale</th>
<th>Pretest $n = 16$</th>
<th>Posttest $n = 16$</th>
<th>Paired Sample $t$ test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Technology integration knowledge survey</td>
<td>2.57</td>
<td>0.42</td>
<td>4.09</td>
</tr>
<tr>
<td>Self-efficacy for educational technology survey</td>
<td>2.61</td>
<td>0.42</td>
<td>4.01</td>
</tr>
</tbody>
</table>

Although initially not planned, I was interested in discovering the relationship between technology integration knowledge and self-efficacy for educational technology; hence, I calculated Pearson Correlations to examine the association between these variables. As depicted in Table 5.7, the preintervention relationship between knowledge and efficacy was negative, weak, and not significantly different from zero ($r = -0.040$). Nevertheless, there was a positive, strong, and statistically significant postintervention relationship ($r = 0.835$), which signifies that increases in teachers’ technology integration knowledge were associated with increases in self-efficacy toward educational technology. This finding corroborates the results of Bauer and Kenton (2005), who also reported a relationship between knowledge and self-efficacy while applying technology to teaching and learning.
### Table 5.7

*Pretest and Posttest Correlation Results (n = 16)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-technology integration knowledge</td>
<td>2.57</td>
<td>0.42</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Pre-self-efficacy for educational technology</td>
<td>2.61</td>
<td>0.42</td>
<td>-0.04</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Post-technology integration knowledge</td>
<td>4.09</td>
<td>0.54</td>
<td>-0.25</td>
<td>-0.29</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4. Post-self-efficacy for educational technology</td>
<td>4.01</td>
<td>0.42</td>
<td>-0.001</td>
<td>-0.38</td>
<td>0.84**</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note: **. Correlation is significant at the 0.01 level (two-tailed).*

Qualitative data gathered from focus group discussions validated the significant growth in self-assessed knowledge and self-efficacy scores from preintervention to postintervention. All teachers (n = 16) claimed that the CAPD program positively influenced the way they applied ICT in the classroom. Eight of them stated that mentoring had more effect on their teaching practice in terms of educational technology than the workshop and/or learning from colleagues, while the rest asserted that the program was effective and successful as a whole.

I consider workshop as an introduction; we received new information, exchanged ideas, reviewed some tools, developed lesson plans, etc. Next, in the practical side of this program, we conducted lessons, tried to put our new knowledge and skills into action. Mentors observed these lessons and we had comprehensive discussions about each of them. In our group meetings, we learned from both
mentors and colleagues, in one-on-one meetings we reflected a lot and tried to explore ways to improve our use of technology. Then, we went back to our classes and implemented much better technology-mediated lessons. Therefore, this program with all its components and elements was a success. (Teacher 14, Focus group discussion)

Another teacher added,

Reflecting on our lessons, analyzing our instructional strategies and use of ICT, considering student activities, and having an open conversation about how and if we fostered student learning via these lessons shaped both my thinking of and my teaching with technology. (Teacher 15, Focus group discussion)

Thirteen teachers indicated that the CAPD program increased their technology integration knowledge, while the remaining three said there was still much to learn. These findings are consistent with those of Doering et al. (2014), who revealed an increase in teachers’ technology knowledge owing to a workshop that combined subject content, subject related ICT tools, and technology-mediated instruction.

The same 13 teachers also expressed confidence in their abilities to utilize ICT in lessons. “My confidence level has increased as I learned new and better ways of integrating technology into teaching and learning” (Teacher 3, Focus group discussion). Several teachers \( (n = 3 \text{ out of 16}) \) agreed with this statement but uttered they would feel more confident with time. One geography teacher asserted,

After using a range of ICT tools in my lessons I feel quite confident in my skills. However, I also understand that I need to advance my competency for achieving
sustained results. The most important thing is that I believe in myself and in my abilities. I know I can do this. (Teacher 5, Focus group discussion)

Quite interestingly, all 16 teachers thought that collaboration with mentors who taught the same content areas and discovering the potential of and utilizing subject-specific ICT tools in classes under mentors’ guidance strongly influenced teachers’ confidence in their abilities to implement educational technology. This confirms DeSantis’ (2013) findings and demonstrates that cognitive apprenticeship is, indeed, an effective an approach to professional learning, which verifies the works of several researchers (e.g., Bell et al., 2013; Glazer et al., 2009; Saigal, 2012).

**Teachers’ Experiences related to the Use of Technology in the Classroom (RQ 5)**

To understand whether teachers’ use of ICT in the classroom has changed owing to participation in the CAPD program, I observed 32 online lessons and queried about teachers’ experiences pertaining to implementation of educational technology during focus group discussions. As indicated in Chapter Four, I focused on general secondary grade (i.e., five to nine) geography and history teachers and observed each teacher twice, during and after the intervention. Table 5.8 presents the number of lessons observed per subjects and grade levels. Geography is taught from grade six (Institute of Education, 2013), thus the observed lessons are comprised of those taught in sixth to ninth grades.
Table 5.8

Number of Lessons Observed During and After the Intervention

| Grades | Geography | | | History | | |
|--------|----------|---|---|----------|---|
|        | During   | After | During | After | |
| Fifth  | 0        | 0     | 2      | 1     | |
| Sixth  | 3        | 2     | 2      | 2     | |
| Seventh| 2        | 2     | 2      | 2     | |
| Eighth | 2        | 2     | 1      | 2     | |
| Ninth  | 1        | 2     | 1      | 1     | |
| Total  | 8        | 8     | 8      | 8     | |

Analysis of the observation data revealed some changes in teachers’ practices and classroom organization. They made more use of pair or group work in virtual classrooms at the end of CAPD (see Table 5.9). Direct instruction or teacher lecture as well as whole class discussion were predominant instructional strategies during these lessons. They typically explained new topics using direct instruction and summarized lessons, reviewed students’ assignments, and/or outcomes of pair or group work by means of whole class discussion. Other preferred strategies included compare and contrast, concept formation, and questioning. I did not observe inquiry, role-play, simulations, project-based learning, or alternative pedagogical approaches for enhancing higher-order thinking skills.
Table 5.9

*Classroom Organization in Lessons Observed During and After the Intervention*

<table>
<thead>
<tr>
<th>Classroom organization</th>
<th>Subjects</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Geography</td>
<td>History</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>During</td>
<td>After</td>
<td>During</td>
<td>After</td>
<td></td>
</tr>
<tr>
<td>Teacher lecture</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Individual work</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Pair work</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Small group work</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Whole class discussion</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Due to COVID-19, all lessons were conducted online via Microsoft Teams platform. A wide array of ICT tools were utilized in the lessons (see Table 5.10), some of which contained software introduced during the workshop such as Google Earth, WorldWide Telescope, Padlet, Sutori, GeaCron (see Appendix AE). Both geography and history teachers increased the number and diversity of software usage in lessons toward the end of the intervention (see Table 5.10). This was validated in focus group discussions.

We reviewed many ICT tools during the workshop but employing them in our lessons required time. With mentor guidance and experience, I felt more comfortable in using such tools in my classes. For instance, last week I used Padlet again and my students loved it. (Teacher 2, Focus group discussion)

One history teacher said,

I realized that my students enjoyed technology-rich lessons, so I decided to use ICT more frequently. They created wonderful videos at the end of the academic
year. I will further advance my skills in this direction during summer and my students will experience a completely new teacher in the fall. (Teacher 10, Focus group discussion)

These findings resonate with Benimmas et al. (2011) and Karolcik et al. (2016). In both studies, teachers claimed to be more competent with technology and used diverse ICT tools after participating in the workshops.

Table 5.10

Use of ICT Tools in Lessons Observed During and After the Intervention

<table>
<thead>
<tr>
<th>ICT Tools</th>
<th>Geography</th>
<th></th>
<th></th>
<th>History</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During</td>
<td>After</td>
<td>During</td>
<td>After</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsoft Office programs</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web search</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YouTube</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online Maps and Telescope</td>
<td></td>
<td>6</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video creators</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Padlet</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LearningApps.org</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other online tools</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>28</td>
<td>12</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Teachers implemented varied instructional strategies and learning activities during online lessons. Appendices AG and AH reflect how an assortment of ICT tools enriched teaching and learning experiences in geography and history lessons. Students demonstrated comprehension of geographical content by means of Padlet, Animoto, or Google Maps in one during- and three after-intervention lessons (see Appendix AG). For example, after learning about time zones, sixth graders had to solve practical problems
and calculate the difference between several time zones using Google Maps. These problems required an understanding of the lines of longitude, the prime meridian, as well as the International Date Line. Teachers incorporated a range of ICT tools (e.g., LearningApps.org, Quizizz, JeopardyLabs, Crossword Labs) to check for student understanding or assess their learning, specifically geographical knowledge and skills in seven out of eight after-intervention lessons in comparison to one mid-intervention lesson. Pedagogical use of WorldWide Telescope, Padlet, Google Earth, and Google Map also supported the development of students’ geographical thinking and critical thinking skills in four after-intervention lessons. One teacher noted,

This program made us approach technology from a different angle and unveiled its potential for teaching and learning. In the past, my students rarely understood the Solar System and liked reading or learning about it. However, a week ago, we travelled from planet to planet via WorldWide Telescope and students easily grasped the abstract information because of visualization. This technology assisted me to further students’ understanding of geographical content. (Teacher 7, Focus group discussion)

This confirms the findings of Boehm et al. (2012). Although the CAPD program is not a video-based program as described by Boehm et al. (2012), the instructional scaffolding applied throughout both professional learning opportunities is their common element. In each of these programs, teachers learned how to employ ICT to explain geographical concepts, advance students’ comprehension of geographical content, and/or assess their geographical knowledge and skills.
The purpose of technology application evolved in the geography lessons implemented toward the end of the intervention (see Appendix AG). For example, teachers initially showed YouTube videos to stimulate student engagement, but then the same tool served as a supplementary teaching aid to advance students’ understanding of geographical content and reinforce their learning. Likewise, teachers first employed LearningApps.org as a tool to reinforce student learning, then they discovered its other functions and utilized it for checking student understanding as well as assessing their geographical knowledge and skills. Thirteen out of 16 teachers highlighted that they tended to accept a particular tool and determine other ways of its application to augment teaching once they detected how useful and effective it could be in the actual lessons. One teacher shared her experience,

I have heard of Google Maps before participating in this program but never considered using it in my lessons. Our mentor explained and showed how practical this tool could be and I decided to try it. My students, the seventh and eighth graders, easily used Google Maps and completed group works on time. They were actively engaged in discussion, studied geographical interconnections, and displayed a holistic sense of the subject. I realized that technology might indeed boost students’ geographical thinking; now that I am confident I will use it. (Teacher 6, Focus group discussion)

This underpins that implementation of educational technology may not only change teaching practices (Levin & Wadmany, 2005) but also influence teachers’ self-efficacy toward pedagogical used of ICT (Bauer & Kenton, 2005).
Analogous experiences were prevalent in history classes as well. Most history teachers benefitted from the same ICT tools for similar purposes, but they added some new ones such as PowToon, Wordwall, and GeaCron (see Appendix AH). Students used both Animoto and PowToon to exhibit understanding of historical content, while in geography lessons they created videos with Animoto only. GeaCron and WorldWide Telescope may further teaching and learning of historical and geographical concepts respectively, this might be the reason why history teachers made use of the former and geography teachers of the latter one in online lessons. As is evident from Appendices AG and AH, Padlet and LearningApps.org were frequently used resources of history teachers akin to their geography colleagues. Application of Padlet served several purposes. Both history and geography teachers used it twice (i.e., once in mid- and once in after-intervention lessons) to activate prior knowledge. For instance, before explaining the new topic of Earth’s rotation around its own axis to students in grade seven, a geography teacher posed questions about the day and night cycle on Padlet. Students had 10 minutes to complete this task individually. The day and night cycle was taught in grade six, thus the teacher activated students’ prior knowledge related to the topic and addressed any misconceptions. In addition, this tool aided teachers to promote students’ historical and geographical thinking plus critical thinking skills. Students also seemed to benefit from using Padlet; they referred to it several times to display comprehension of historical or geographical content. A history teacher explained the end-of-unit assignment about the Russian colonial policy in Azerbaijan to students. Students had to work in pairs and were free to use any ICT tool for completing the assignment. Eight out of 12 pairs chose to perform this task on Padlet and they demonstrated their understanding of the topic by
providing information, evidence, and related visuals. Students seemed to enjoy this assignment as well as the technological functions of Padlet. According to Hernandez-Ramos and De La Paz (2009), the application of technology in history classes affects students’ attitudes toward the subject and students gain an understanding of and demonstrate historical content knowledge via ICT.

Comparably, LearningApps.org was practical for reinforcing student learning, fostering students’ critical thinking skills, and assessing their historical or geographical knowledge. For example, a history teacher developed and conducted Who Wants to Be a Millionaire game for students in grade eight using this tool. The game was on the topic of the Treaty of Turkmenchay and asked questions with different difficulty levels. Some questions demanded logical and critical thinking, others helped to strengthen the mastery of the topic. This learning experience was meaningful with the use of technology. Numerous technologies were employed to check for students’ understanding and/or evaluate their learning in both lessons on top of LearningApps.org. These included Wordwall, GeaCron, Crossword Labs, JeopardyLabs, and Quizizz. This was verified during focus group discussions. One teacher uttered,

Using diverse tools to assess students’ historical knowledge was more comfortable than doing it orally. I could obtain information per student in the case of individual tasks. What I liked the most was provision of instant feedback; students could see their results immediately and we allocated more time for reviewing questions and answers as well as reflecting on their mistakes. (Teacher 12, Focus group discussion)
This is in line with the findings of Doering et al. (2014), who reported that infusion of technology might alter assessment strategies and techniques carried out by teachers.

The purposes for which the history teachers used ICT during and after the intervention were similar to those of geography lessons. For instance, one teacher explained a new topic using PowerPoint presentation in the beginning of a mid-intervention lesson, she then asked students to read relevant passages from the textbook and posed questions about the new material. She encouraged them to do a web search to learn related historical concepts. Students presented oral answers to these questions, followed by her corrections, additions when necessary, and a summary of the lesson. The same teacher conducted a more interactive lesson and attempted to create technology-mediated meaningful learning experiences after the CAPD program. She started the lesson by questioning to interest students in the topic ahead (i.e., Crusades), divided them into four groups, and demonstrated tasks of each group on Padlet. Tasks required recall of previously learned material, brainstorming, analysis, and construction of new knowledge; therefore, students were engaged in discourse and remained focused. In this particular lesson, tasks posted on this software bolstered students’ historical thinking, which is in alignment with the results of Stoddard (2012). Next, students completed and presented their group work results and demonstrated understanding of historical content on Padlet. The teacher ended the lesson with a general discussion on LearningApps.org, assessed students’ historical knowledge, and reinforced their learning.

These were compatible to the experiences teachers shared during the focus group discussion. One of them stated,
Recently, I gave my students a homework to reflect on Second Karabakh War. They had to use a variety of internet resources because it took place in 2020 and our textbooks did not contain information about this armed conflict. I expected that my students, eighth graders, would prepare PowerPoint presentations. I was amazed with the results! One group created a video, another one made a timeline, a third group developed a diagram, a fourth one designed a crossword puzzle, etc. Students employed PowToon, Visme, Wordwall, Crossword Labs, and other tools. What I learned from this lesson was that we should not limit ourselves, because our students do not. We should further our ICT competence and create interesting learning opportunities for our students. Thank you for encouraging, assisting, and supporting me through this process. (Teacher 16, Focus group discussion)

Both lesson observations, particularly those implemented after the intervention, and experiences shared in focus group discussions were an indication of the positive effects of the CAPD program.

Nevertheless, I did not observe any lesson where teachers attempted to cultivate students’ geographic inquiry, spatial thinking, historical reasoning, or higher-order thinking skills although they claimed to do so in the focus group discussions. They perceived that these skills could be formed just by posing questions and having students answer them. Apparently, teachers had limited pedagogical knowledge about instructional strategies effective for teaching social studies. In some cases, teachers also demonstrated outdated content knowledge. For example, geography teachers were unfamiliar with GIS or GPS, which might be a consequence of the outdated curriculum.
As indicated in Chapter One, standards-based subject curricula were developed during 2003-2008 in Azerbaijan (MoE, n.d.-a) and our current geography curriculum lacks information about GIS or GPS (Institute of Education, 2013). This once again substantiates Incekara’s (2010) recommendations for revisiting geography education.

**Outcome Evaluation Summary**

Schools involved in the study had neither a vision for educational technology nor an ICT integration plan. Participation in the CAPD program helped school administrators develop a vision relative to pedagogical use of ICT. Each school articulated their visions in their ICT integration plans prepared during the intervention. Six out of eight administrators agreed that having a vision for education technology was equal to having a unified approach across the school. Analysis of the ICT integration plans crafted during the CAPD program showed that the intervention was effective at increasing school leaders’ knowledge as intended. With these plans, principals and vice principals determined their objectives for technology integration and scrutinized ICT infrastructure of the school, teachers’ professional learning concentrated on pedagogical use of ICT, and training of students and other pertinent stakeholders. The ICT integration plans of target schools met most of the requirements set forth by Vanderlinde, Dexter, and van Braak (2012). The differences entailed: a) none of the schools planned for its ICT budget due to the centralized management of public-school funding; b) only one school considered external training activities for teachers on educational use of technology; and c) only one school outlined the ICT code of behavior. Nonetheless, in contrast to the literature (Gulbahar, 2007; Vanderlinde, Dexter, & van Braak, 2012), the plans prepared during the intervention encompassed a few other sections such as promotional events,
stimulating activities aimed at teachers, training of students and interested parties, as well as assessment of teachers’ and students’ ICT competency.

Moreover, the school administrators considered having ICT integration plans advantageous as they manifested their schools’ approach for technology application. The principals and vice principals had never prepared such plans before, which might be a trace of the Soviet management system. All regulations, guidelines, or plans were provided from the top during the Soviet Union and school leaders and/or teachers just played the role of an implementer. However, understanding the benefit of having an ICT integration plan allowed them to see it in a different way. This means the historical context of Azerbaijan may constrain the school administrators’ leadership toward implementation of educational technology. Yet, tailored professional learning programs have the potential to develop school leaders’ competencies for becoming better achievers and preparing them to embrace innovations.

The other two findings include significant increases in teachers’ technology integration knowledge and self-efficacy toward educational technology. Comparison of preintervention and postintervention knowledge scores indicated that the CAPD program improved teachers’ knowledge for meaningful application of ICT within teaching and learning. Thirteen teachers expressed that the intervention enhanced their knowledge and skills related to technology integration. Uslu and Bumen (2012) also reported positive effects of a six-week long intervention on teachers’ technology integration knowledge as well as their level of technology use in the classroom. Most teachers claimed that collaboration with mentors had positive effects on and changed their existing instructional practices because mentors tailored their activities to the needs and potential
of participating teachers and guided them like “a beacon” (Teacher 7, Focus group discussion). Equally, teachers’ self-efficacy toward instructing with technology significantly improved because of this intervention. Thirteen teachers said their confidence level increased after participating in the CAPD program and they now believed in their capacity and abilities to incorporate ICT in the classroom, which resonates with Brinkerhoff (2006) and DeSantis (2013). These authors found an increase in teachers’ technology self-efficacy after participating in professional learning opportunities. Both programs were well-designed, used ICT as a tool to facilitate instruction, had connections to content, and included thorough reflections. Moreover, the relationship between these two variables—technology integration knowledge and self-efficacy toward educational technology—postintervention was positive, significant, and strong. In other words, teachers’ knowledge about pedagogical use of ICT is associated with their belief or confidence level in their abilities to implement this innovation.

Improved knowledge and efficacy was associated with the meaningful use of ICT in online lessons, as reported in the literature (Bauer & Kenton, 2005). Analysis of observation data showed numerous applications of ICT tools in both geography and history lessons. In mid-intervention lessons, teachers mainly incorporated technology for activating prior knowledge or presenting new topics, whereas toward the end of CAPD, they advanced their teaching practice and utilized these tools to deepen students’ geographical or historical content knowledge, to promote their geographical or historical thinking as well as critical thinking skills and assessed and reinforced their learning. These findings align with earlier studies (e.g., Boehm et al., 2012; Hernandez-Ramos & De La Paz, 2009). This implies that CAPD was successful and achieved short and
medium-term outcomes (see Appendix L). Yet, teachers exhibited limited pedagogical knowledge with respect to effective instructional strategies in social studies classroom and outdated content knowledge, particularly in the case of geography. Perhaps, this is why teachers encountered difficulties fostering students’ higher-order thinking skills, bolstering historical reasoning through exploration and inquiry, or engaging them in geographical inquiry.

**Limitations**

Several limitations to this study include sample size, research site, intervention duration (i.e., the school administrator component), and intervention delivery mode. Only 24 participants, eight school administrators and 16 teachers took part in the study. Typically, schools have two administrators (i.e., a principal and a vice principal), and not more than three geography and three history teachers in public schools in Azerbaijan. Consequently, 24 participants were expected. With only four participating schools, such a small size may limit the generalizability of the findings. A much larger sample of school administrators as well as additional geography and history teachers from more public schools might reveal more information about the benefits of the CAPD program.

As mentioned in Chapter One, the context of my professional practice is Azerbaijan and the research was conducted in Baku, the capital city. Public schools in Baku generally receive more attention from the government, and all innovative projects are first implemented here. The information technology infrastructure may also be better in these schools than those located in regions outside of the city. Accordingly, implementing my intervention in more than four public schools representing various parts
of Azerbaijan might result in different findings relative to its effectiveness in terms of supporting teachers to integrate ICT within their classroom instruction.

My intervention had two components. The school administrator component lasted 20 hours, and the teacher component was 40 hours. Desimone (2009, 2011) suggests having at least 20 hours of contact time in professional learning programs, but this is the recommended minimum. As findings from the analysis of qualitative data indicate, school administrators were mostly unaware of the basic principles of school management and had no previous experience in development of documents such as an action plan. I could have expanded the content of the intervention component if time allowed. Even though ICT integration plans prepared during the CAPD program corresponded to those reported by Gulbahar (2007) and Vanderlinde, Dexter, and van Braak (2012), possessing comprehensive content knowledge on the topic might have facilitated the process. Insufficient knowledge and experience about essentials of school management may also entail extra support in execution of these ICT integration plans.

Finally, due to COVID-19, I had to implement the CAPD program entirely online. All components of the intervention as well as lessons observed by me were conducted via Microsoft Teams platform. Other delivery modes of the intervention (i.e., face-to-face or blended) might result in different outcomes. Additionally, recognizing that I conducted my needs assessment study in 2016, I wanted to observe whether sufficient equipment and necessary infrastructure were available in the classrooms during the intervention, but online delivery made it impossible. I acquired no additional information about the current technology infrastructure of the target schools. A few teachers questioned the possibility of ICT integration in face-to-face learning environments during the focus group.
discussions. One of them asserted, “We applied knowledge and skills gained through this program to online lessons. I wonder if I will be able to implement technology-mediated lessons once we shift to full-time face-to-face environment because our classrooms lack ICT equipment” (Teacher 8, Focus group discussion). Another one also noted, “I will attempt to demonstrate a successful performance by putting into practice what I have learned in this professional learning opportunity. I just hope my school will have better ICT infrastructure next academic year” (Teacher 13, Focus group discussion). If limited access to technology continues to be an issue in target public schools, then sustaining the effects of the CAPD program on teachers’ technology integration knowledge and self-efficacy toward educational technology will be a challenge.

**Implications for Future Research, Policy, and Practice**

This section describes implications for future research, policy, and practice. The latter subsection mainly focuses on recommendations for professional learning providers, whereas the policy subsection suggests implications for both Azerbaijan and centralized education systems similar to Azerbaijan.

**Implications for Future Research**

Future studies, especially those carried out in Azerbaijan, should concentrate on other cities and/or regions, not just the capital city to obtain thorough information. Public schools in different parts of the country with a larger sample size may yield more representative results for the country. Determining participants’ prerequisite knowledge and skills before designing technology-focused professional learning programs seems to be vital. Anecdotally, the school administrators participating in this study had insufficient knowledge and skills related to fundamentals of school management, therefore adding
appropriate elements to the intervention and increasing the number of contact hours may further enhance their knowledge and skills. To assess any changes in administrators’ knowledge and skills and ensure triangulation, collecting quantitative data in addition to the qualitative data may strengthen the research design.

Addressing the effects of the CAPD program implemented in other contexts, locations, and/or cultures and investigating the phenomenon from different angles may contribute to the existing scientific knowledge. In these cases, the program may be delivered either in a face-to-face or blended environment and examine if delivery mode may have an influence on teachers’ self-reported preintervention and postintervention technology integration knowledge and self-efficacy toward educational technology scores. Furthermore, employing a randomized field experiment with the pretest-posttest control group design may strengthen the results by generating valid causal inferences in many ways as described by Shadish et al. (2002).

**Implications for Policy**

The findings of this study offer meso- and macro-level considerations that have the potential to influence existing education systems, especially in countries like Azerbaijan. These suggestions go beyond professional learning and/or implementation of educational technology:

1. Policies pertaining to educators’ professional learning should be revised to include standards and/or features of high-quality professional learning suggested by Learning Forward (2011) and Desimone and Garet (2015). For instance, school-based professional learning gives rise to meaningful
learning, reflective practice, and continuous improvement (Martin et al., 2014).

2. Centralized education systems like Azerbaijan should start implementation of policies concerning evaluation of the effectiveness of professional learning initiatives and detect how, if at all, these initiatives affect student learning.

3. To be compatible with most of the developed counties, Azerbaijan and/or similar education systems should revise geography (Incekara, 2010) and history curricula to cultivate students’ creativity, geographical inquiry, spatial thinking, and historical reasoning skills. The revised curricula should also include GIS or GPS or other germane technologies that strongly influence the subject matter content.

4. Countries should set clear requirements for the school leading and teaching positions through the development of professional standards for both target groups. These documents should reflect standards in several domains essential for managing a school and for teaching. They should also establish standards for educational use of technology. Upon approval of these documents, Azerbaijan and/or other centralized education systems should apply these standards to teacher/administrator education, recruitment, professional learning, and certification of educators and school leaders.

5. To understand the country’s position with reference to teaching and learning in the international arena, Azerbaijan or a centralized education
system may consider participation in the Teaching and Learning International Survey. It addresses several themes such as school leadership, teachers’ instructional and professional practices, teacher education and development, teacher self-efficacy, implementation of innovations, etc. (Organisation for Economic Co-operation and Development, n.d.).

6. To promote the use of ICT among students, Azerbaijan or a similar centralized education system should participate in the International Computer and Information Literacy Study. It allows the countries to make informed decisions about students’ development of 21st century information and technology competency skills (International Association for the Evaluation of Educational Achievement, n.d.).

7. Finally, if centralized education systems continue to invest in technology infrastructure and expect the implementation of the educational technology, then they should apply mechanisms for monitoring the use of ICT in schools that generate meaningful learning (Howland et al., 2013). This can be administered separately or as part of school evaluations.

Implications for Practice
The study manifested meaningful results that can be applied to diverse professional learning programs designed for either school administrators or teachers. These findings help to better understand the usage of ICT for educational purposes in Azerbaijan. In other words, although limited in sample size, educators in my country improved their understanding of how to implement educational technology to support
student learning. Nonetheless, to achieve meaningful use of ICT in teaching and learning, Azerbaijan and/or centralized education systems similar to Azerbaijan should consider the following recommendations:

1. This study provides evidence for the effectiveness of the cognitive apprenticeship model for achieving transfer of learning, as discussed by Brown et al. (1989). Consequently, professional learning providers should consider their approaches to professional learning and develop programs based on cognitive apprenticeship model to stimulate learning in context with the help of an expert, especially for boosting meaningful technology integration (Bell et al., 2013).

2. Although current policies do not require that professional learning providers assess the effectiveness of professional learning initiatives, they should still start conducting evaluation research at least at the pilot level. If professional learning opportunities do not result in changes in student learning outcomes in the long-term, then the investments allocated into these programs become inefficient.

3. School administrators should attend more research-based professional learning opportunities, where the content of these programs builds on the elements of school management and the duration is more than 20 hours. Programs concentrating on meaningful technology integration should contain a school administrator component to enable them to lead the ICT integration process (Mwawasi, 2014).
4. Professional learning providers should diagnose and enhance teachers’ content knowledge and pedagogical knowledge before introducing any programs related to the implementation of innovations. Technology-focused professional learning opportunities should build around TPACK as a conceptual framework (Hammond & Manfra, 2009; Mishra & Koehler, 2006).

5. Professional learning providers should organize and implement professional learning initiatives only in schools that have proper ICT infrastructure. As minimal or no access to technology continues to be an issue in most schools, neither administrators nor teachers can put into practice the knowledge and skills earned through these programs.

My current role at the Institute of Education, which serves as a brain center not just for MoE but also for the entire education system in Azerbaijan allows me to act on most of these recommendations.
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Shin, W. S., Han, I., & Kim, I. (2014). Teachers’ technology use and the change of their pedagogical beliefs in Korean educational context. *International Education Studies, 7*(8), 11–22.


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Appendix A

Teacher ICT in Education Questionnaire

Thank you for agreeing to participate in the “Factors Associated with Implementation of Educational Technology” research study. The research study focuses on barriers to technology integration in public schools of Azerbaijan.

This questionnaire seeks information about your experience using ICT for educational purposes and some background information. Answering this questionnaire should require no more than 20-25 minutes. Most of the questions could be answered just by checking in the appropriate box. All responses are anonymized and treated in the strict confidence; no individual or school will be identifiable in the research paper or in resulting publications.

Thank you very much for your time and effort you put in responding to this questionnaire.

| Date |  |
| Teacher code |  |
| School code |  |

### Professional background information

1. *What subject(s) do you teach? Please tick all that apply:*

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Biology</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Azerbaijani language</th>
<th>Physics</th>
<th>Geography</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Russian language</th>
<th>Chemistry</th>
<th>Other (please specify below)</th>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>English</th>
<th>Other foreign language</th>
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</tbody>
</table>

2. *Do you use ICT in your lessons?*

<table>
<thead>
<tr>
<th>Yes (if yes, continue)</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. How often do you use technology in your lessons?  
   - Every lesson or almost every day  
   - At least once a week  
   - Several times a month  
   - Once or twice a month  
   - Never or almost never

4. How many years in total have you been using ICT for educational purposes?  
   - < 1 year  
   - 1-3 years  
   - 4-6 years  
   - > 6 years

<table>
<thead>
<tr>
<th>Use of educational technology</th>
</tr>
</thead>
</table>
| 5. Does your school have a vision on educational technology?  
   - Yes  
   - No |
| 6. Is there an ICT integration strategy or plan in your school?  
   - Yes  
   - No |
| 7. Has the school provided you with a computer?  
   - Yes  
   - No |
| 8. Are the classrooms where you teach lessons equipped with computer technology?  
   - Yes  
   - No |
| 9. How do you use technology for teaching and learning purposes?  
   - |
| 10. What factors affect your use of technology for educational purposes?  
   - |
| 11. Have you participated in any training(s) on the educational use of technology?  
   - Yes  
   - No |
| 12. Was this training / were these trainings compulsory?  
   - Yes  
   - No |

To what extent do you agree or disagree with the following statements?  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Strongly agree</th>
</tr>
</thead>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>13. Overall, the training(s) received on educational technology were of good quality.</td>
<td></td>
</tr>
<tr>
<td>14. Trainings received were useful for effectively integrating technology into teaching and learning.</td>
<td></td>
</tr>
<tr>
<td>15. Trainings received were enough for effectively integrating technology into teaching and learning.</td>
<td></td>
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<tr>
<td>ICT use in teaching and learning positively affects:</td>
<td></td>
</tr>
<tr>
<td>- Student engagement (16)</td>
<td></td>
</tr>
<tr>
<td>- Student achievement (17)</td>
<td></td>
</tr>
<tr>
<td>- Student creativity (18)</td>
<td></td>
</tr>
<tr>
<td>- Students’ higher order thinking skills (19)</td>
<td></td>
</tr>
<tr>
<td>- Realization of learning outcomes (20)</td>
<td></td>
</tr>
<tr>
<td>- Acquisition of content knowledge (21)</td>
<td></td>
</tr>
<tr>
<td>- Change in teaching practices (22)</td>
<td></td>
</tr>
<tr>
<td>23. ICT use in education is essential for preparing students to live and work in the 21st century.</td>
<td></td>
</tr>
<tr>
<td>I use ICT mostly:</td>
<td></td>
</tr>
<tr>
<td>- To search for information (24)</td>
<td></td>
</tr>
<tr>
<td>- To make presentations (25)</td>
<td></td>
</tr>
<tr>
<td>- To have students work in a collaborative way (26)</td>
<td></td>
</tr>
<tr>
<td>- To conduct an assessment (27)</td>
<td></td>
</tr>
<tr>
<td>- To prepare tasks and exercises for students (28)</td>
<td></td>
</tr>
<tr>
<td>- To prepare educational materials (29)</td>
<td></td>
</tr>
<tr>
<td>- To provide feedback on students’ learning (30)</td>
<td></td>
</tr>
<tr>
<td>- To seek professional development opportunities (31)</td>
<td></td>
</tr>
<tr>
<td>Personal background information</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Gender (32)</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
</tr>
<tr>
<td><strong>Age (33)</strong></td>
<td></td>
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<tr>
<td>≤ 25</td>
<td></td>
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<tr>
<td>26-35</td>
<td></td>
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<td>36-45</td>
<td></td>
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<tr>
<td>46-55</td>
<td></td>
</tr>
<tr>
<td>55-65</td>
<td></td>
</tr>
<tr>
<td><strong>Years of teaching experience (34)</strong></td>
<td></td>
</tr>
<tr>
<td>Less than 3 years</td>
<td></td>
</tr>
<tr>
<td>3-5 years</td>
<td></td>
</tr>
<tr>
<td>6-10 years</td>
<td></td>
</tr>
<tr>
<td>11-20 years</td>
<td></td>
</tr>
<tr>
<td>21 years of more</td>
<td></td>
</tr>
<tr>
<td><strong>How often do you use computers in your daily life? (35)</strong></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>Almost monthly</td>
<td></td>
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<tr>
<td>A few times a year</td>
<td></td>
</tr>
<tr>
<td>Never or almost never</td>
<td></td>
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</tbody>
</table>

Thank you for completing this questionnaire!
Appendix B

Interview Protocol

Questions to Key Stakeholders

Welcome note:

I introduced myself and thanked the key stakeholder for agreeing to participate in the “Factors Associated with Implementation of Educational Technology” research study. I provided brief information about the study and explained the need for this interview.

1. What do you think of educational technology?
2. Do you know whether the importance of educational technology is properly communicated?
3. What is role of communication in terms of educational technology in a school culture?
4. Do target schools have a shared vision on educational technology?
5. Do target schools have a school policy or plan on ICT integration?
6. How does professional development influence the use of ICT in teaching and learning?
7. Do you agree that the existing professional development opportunities are adequate for achieving effective use of ICT in education?
8. What factors affect the integration of technology into teaching and learning?
9. Have you discussed the use of technology with teachers and/or school administrators in target schools?
10. Would you please describe how technology is being integrated into teaching and learning?
11. Do you believe that integration of ICT into education enhances children’s skills and competences? Please explain.
12. Have you received any feedback from either parents or students on the educational uses of technology so far? If yes, what kind?
13. Please share any other thoughts you may have on this topic.
Appendix C

Interview Protocol

Questions to School Administrators

Welcome note:

I introduced myself and thanked the school administrator for agreeing to participate in the “Factors Associated with Implementation of Educational Technology” research study. I provided brief information about the study and explained the need for this interview.

1. What do you think of educational technology?
3. Does your school have computer technology (equipment) and access to the Internet?
4. Do you communicate the importance of educational technology in school? If yes, how?
5. Does your school have a vision on educational technology?
6. Is there a policy or ICT integration plan in this school?
7. What can you say about the teachers’ professional development on educational technology?
8. Do you think that current professional development opportunities are adequate for achieving effective use of ICT in education?
9. In your opinion, what factors affect teachers’ use of technology in education?
10. Can you please describe how technology is used for educational purposes here?
11. In your opinion, how does educational use of technology affect students?
12. Have you received any feedback from students and parents about the use of technology in classrooms? If yes, please explain.
13. Please share any other thoughts you may have on this topic.
Appendix D

Focus Group Discussion Protocol

Questions to Students

Welcome note:
I introduced myself and thanked students for agreeing to participate in the “Factors Associated with Implementation of Educational Technology” research study. I provided brief information about the study and explained the need for this discussion.

1. Do you use computers (or any portable device) at home? If yes, please explain the purposes of computer usage.

2. How often do you use Internet and why?

3. What do you think of the use of technology for educational purposes? Please explain.

4. Do your teachers use ICT during lessons? If yes, can you describe how technology is being integrated into teaching and learning?

5. What can you say about the ICT integration across various subjects?

6. Which lessons do you like more: the ones with the use of ICT or without? Why?

7. Can you describe the learning activities with the use of technology that you enjoy the most?

8. Does integration of ICT into education enhance your skills and competences? If yes, please elaborate.

9. Would you want to use computers at schools in the future?

10. Please share any other thoughts you may have on this topic.
Appendix E

Focus Group Discussion Protocol

Questions to Parents

Welcome note:
I introduced myself and thanked parents for agreeing to participate in the “Factors Associated with Implementation of Educational Technology” research study. I provided brief information about the study and explained the need for this discussion.

1. Do you allow your child (children) to use computers (or any portable device) at home? If yes, please explain the purposes of computer usage.
2. Do you allow your child (children) to use Internet at home? If yes, please explain the purposes of Internet usage.
3. What do you think of the use of technology for educational purposes? Please explain.
4. Do you know if your child’s (children’s) teachers use ICT during lessons?
5. If yes, could you please describe how technology is being integrated into teaching and learning?
6. Which lessons do you think your child (children) like more: the ones with ICT use or without?
7. Do you have any concerns about your children’s use of computers at schools?
8. Does integration of ICT into education enhance your child’s (children’s) skills and competences? If yes, please elaborate.
9. Would you want your children to use computers at schools in the future?
10. Please share any other thoughts you may have on this topic.
Appendix F

Observation Log

Teacher: ____________________________
School: ____________________________

Grade/Class: _______  Data Observed: _____________
Observer: __________________________

Subject: ____________________________

Lesson topic & intended purpose
For example: introducing new concepts, putting knowledge into practice, repeating concepts, processes, or procedures, developing core ideas and/or conceptual understanding, real-life connections, assessment of student learning.

Instructional strategies

Learning activities
For example: teacher presentations, student presentations, discussions, inquiry, group/pair assignments, role play, debate, simulation.

Use of technology
For example: to develop/strengthen conceptual understanding, learn or practice a skill, collect data, create a presentation, complete a task, conduct assessment.

Assessment techniques
For example: homework, questioning for understanding, test, quiz, project, minute paper, portfolio, peer review, feedback, self-assessment, reflection.

Comments on student behaviour
For example: uses technology to demonstrate learning, monitors own learning, provides feedback and support to other students.
Appendix G

Protocol Number:

Key Stakeholder Participant Code: ________ Instructor Participant Code: __________

Johns Hopkins University
Homewood Institutional Review Board

Key Stakeholder Informed Consent

Title: Factors Associated with Implementation of Educational Technology
Location: Baku, Azerbaijan
Principal Investigator: Chadia Abras, Johns Hopkins University
Date: March 16, 2016

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to identify factors that affect the implementation of educational technology in public schools of Azerbaijan.

The study will be conducted in 4 schools selected from the list provided by the Ministry of Education. The research participants will involve 8 school administrators, over 100 teachers, 32 students, and a maximum of 16 parents. In addition, classroom observations and interviews with several key stakeholders will be conducted.

PROCEDURES:
You will be asked to participate in an audio taped interview to help us learn your perspective about the use of technology in education. The interview may last from 30 to 45 minutes.

RISKS/DISCOMFORTS:
There are no anticipated risks to you.

BENEFITS:
Potential benefits are an increased understanding of how and for what purposes educational technology is integrated in the classroom activities. It is generally believed that the educational use of information and communication technologies boost student learning.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your participation in this study is entirely voluntary. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.
You can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

**CONFIDENTIALITY:**

Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the JHU Homewood Institutional Review Board (HIRB) and officials from government agencies such as the Office for Human Research Protections. All of these people are required to keep your identity confidential. Records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All audio tapes and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all participants.

Audio data of the interviews may be transcribed by an outside agent (transcriptionist), who will de-identify all transcripts by deleting all names from the transcript and only a participant number or pseudonym will be included on these transcripts.

All research data including audio tapes will be kept in a locked office. Electronic data will be stored on the PI’s computer, which is password protected. Any original tapes or electronic files will be erased and paper documents shredded, ten years after collection.

Only group data will be included in publication; no individual achievement data will ever be published.

**COMPENSATION:**

You will not receive any payment or other compensation for participating in this study.

**IF YOU HAVE QUESTIONS OR CONCERNS:**

You can ask questions about this research study at any time during the study by contacting Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the JHU HIRB at (+1410) 516-6580.

**SIGNATURES**

**WHAT YOUR SIGNATURE MEANS:**
Your signature below means that you understand the information in this consent form and agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

Key stakeholder’s Name

Key stakeholder’s Signature
Date

Signature of Person Obtaining Consent
Date
(Investigator or HIRB-Approved Designee)
Appendix H

Protocol Number:

School Administrator Participant Code: ___________ Instructor Participant Code: ___________

Johns Hopkins University
Homewood Institutional Review Board

School Administrator Informed Consent

<table>
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<th>Title:</th>
<th>Factors Associated with Implementation of Educational Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Baku, Azerbaijan</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Chadia Abras, Johns Hopkins University</td>
</tr>
<tr>
<td>Date:</td>
<td>March 16, 2016</td>
</tr>
</tbody>
</table>

PURPOSE OF RESEARCH STUDY:

The purpose of this research study is to identify factors that affect the implementation of educational technology in public schools of Azerbaijan.

The study will involve 8 school administrators, over 100 teachers, 32 students, and a maximum of 16 parents. In addition, classroom observations and interviews with several key stakeholders will be conducted.

PROCEDURES:

If selected, your school will be included in the study. You will be interviewed about the use of ICT in education, which may last from 30 to 45 minutes. Four teachers working in your school will be observed and later interviewed to better understand the classroom observation. Eight students from the observed lessons, and four parents of the observed students will be randomly selected to participate in the focus group discussions.

RISKS/DISCOMFORTS:

There are no anticipated risks to you.

BENEFITS:

Potential benefits are an increased understanding of how and for what purposes ICT is integrated in the classroom activities. It is generally believed that the educational use of ICT boost student learning.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:

Your participation in this study is entirely voluntary. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.
You can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

CONFIDENTIALITY:
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the JHU Homewood Institutional Review Board (HIRB) and officials from government agencies such as the Office for Human Research Protections. All of these people are required to keep your identity confidential. Records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All audio tapes and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all participants.

Audio data of the interviews may be transcribed by an outside agent (transcriptionist), who will de-identify all transcripts by deleting all names from the transcript and only a participant number or pseudonym will be included on these transcripts.

All research data including paper surveys will be kept in a locked office. Electronic data will be stored on the PI’s computer, which is password protected. Any original tapes or electronic files will be erased and paper documents shredded, ten years after collection.

Only group data will be included in publication; no individual achievement data will ever be published.

COMPENSATION:
You will not receive any payment or other compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:
You can ask questions about this research study at any time during the study by contacting Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the JHU HIRB at (+1410) 516-6580.

SIGNATURES
WHAT YOUR SIGNATURE MEANS:
Your signature below means that you understand the information in this consent form and agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

______________________________  ______________________________
School administrator’s Name         School administrator’s Signature

______________________________
Date

______________________________  ______________________________
Signature of Person Obtaining Consent    Date
(Investigator or HIRB-Approved Designee)
Appendix I

Protocol Number:

Teacher Participant Code: ______________  Instructor Participant Code: _____________

Johns Hopkins University
Homewood Institutional Review Board

Teacher Informed Consent

<table>
<thead>
<tr>
<th>Title:</th>
<th>Factors Associated with Implementation of Educational Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Baku, Azerbaijan</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Chadia Abras, Johns Hopkins University</td>
</tr>
<tr>
<td>Date:</td>
<td>March 16, 2016</td>
</tr>
</tbody>
</table>

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to identify factors that affect the implementation of educational technology in public schools of Azerbaijan.

The study will involve 8 school administrators, over 100 teachers, 32 students, and a maximum of 16 parents. In addition, classroom observations and interviews with several key stakeholders will be conducted.

PROCEDURES:
If selected, your lessons will be observed and videotaped. The observation will last 45 minutes, but at least 2-3 observations will be conducted.

RISKS/DISCOMFORTS:
There are no anticipated risks to you.

BENEFITS:
Potential benefits are an increased understanding of how and for what purposes educational technology is integrated in the classroom activities. It is generally believed that the educational use of information and communication technologies boost student learning.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your participation in this study is entirely voluntary. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.
You can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabayev1@jhu.edu.

CONFIDENTIALITY:

Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the JHU Homewood Institutional Review Board (HIRB) and officials from government agencies such as the Office for Human Research Protections. All of these people are required to keep your identity confidential. Records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All videotapes and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all participants.

Video data of interview may be transcribed by an outside agent (transcriptionist), who will de-identify all transcripts by deleting all names from the transcript and only a participant number or pseudonym will be included on these transcripts.

All research data including interview notes and videotapes will be kept in a locked office. Electronic data will be stored on the PI’s computer, which is password protected. Any original tapes or electronic files will be erased and paper documents shredded, ten years after collection.

Only group data will be included in publication; no individual achievement data will ever be published.

COMPENSATION:

You will not receive any payment or other compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:

You can ask questions about this research study at any time during the study by contacting Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabayev1@jhu.edu.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the JHU HIRB at (+1410) 516-6580.

SIGNATURES

WHAT YOUR SIGNATURE MEANS:
Your signature below means that you understand the information in this consent form and agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

____________________________________
Teacher’s Name

____________________________________
Teacher’s Signature
Date

____________________________________
Signature of Person Obtaining Consent
Date
(Investigator or HIRB-Approved Designee)
Appendix J

Protocol Number:

Student Participant Code: _____________  Instructor Participant Code: _____________

Johns Hopkins University
Homewood Institutional Review Board

Student Assent and Parental Informed Consent

Title: Factors Associated with Implementation of Educational Technology
Location: Baku, Azerbaijan
Principal Investigator: Chadia Abras, Johns Hopkins University
Date: March 16, 2016

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to identify factors that affect the implementation of educational technology in public schools of Azerbaijan.

It is anticipated that 8 school administrators, over 100 teachers, 32 students, and a maximum of 16 parents will participate in the study. In addition, classroom observations and interviews with several key stakeholders will be conducted.

PROCEDURES:
There will be several components for this study:

1. Your child’s classroom interactions will be observed and videotaped.
2. Your child may be asked to participate in a videotaped focus group discussion.

Time required: The class observation will last 45 minutes, but at least 2-3 classroom observations will be conducted. If selected, your child will be asked to participate in a 30 to 45-minute-long focus group discussion.

RISKS/DISCOMFORTS:
There are no anticipated risks to your child.

BENEFITS:
Potential benefits are an increased understanding of how and for what purposes educational technology is integrated in the classroom activities. It is generally believed that the educational use of information and communication technologies boost student learning.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your child’s participation in this study is entirely voluntary. You choose whether to allow your child to participate, and your child will indicate below whether he or she agrees to take part in the study. If you decide not to allow your child to participate, or your child chooses not to participate, there are no penalties, and neither you nor your child will lose any benefits to which you would otherwise be entitled.

You or your child can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw your child from the study, or your child wants to stop participating, please contact Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

**CONFIDENTIALITY:**

Any study records that identify your child will be kept confidential to the extent possible by law. The records from your child’s participation may be reviewed by people responsible for making sure that research is done properly, including members of the JHU Homewood Institutional Review Board (HIRB) and officials from government agencies such as the Office for Human Research Protections. All of these people are required to keep your identity and the identity of your child confidential. Records that identify you or your child will be available only to people working on the study, unless you give permission for other people to see the records.

All videotapes and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all participants.

Video data of the classroom interactions, as well as focus group discussions may be transcribed by an outside agent (transcriptionist), who will de-identify all transcripts by deleting all names from the transcript and only a participant number or pseudonym will be included on these transcripts.

All research data including discussion notes and videotapes will be kept in a locked office. Electronic data will be stored on the PI’s computer, which is password protected. Any original tapes or electronic files will be erased and paper documents shredded, ten years after collection.

Only group data will be included in publication; no individual achievement data will ever be published.

**COMPENSATION:**

Your child will not receive any payment or other compensation for participating in this study. We will provide drinks and beverages during the focus group discussions.

**IF YOU HAVE QUESTIONS OR CONCERNS:**

You and your child can ask questions about this research study at any time during the study by contacting Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.
If you or your child have questions about your child’s rights as a research participant or feel that your child has not been treated fairly, please call the JHU HIRB at (+1410) 516-6580.

SIGNATURES

WHAT YOUR SIGNATURE MEANS:

Your signature below means that you understand the information in this consent form and agree to allow your child to participate in the study. By signing this consent form, you and your child have not waived any legal rights your child otherwise would have as a participant in a research study.

________________________________________________
Child’s Name

________________________________________________
Child’s Signature
Date

________________________________________________
Signature of Parent or Legal Guardian
Date

________________________________________________
Signature of Person Obtaining Consent
Date
(Investigator or HIRB-Approved Designee)
Appendix K

Protocol Number:

Parent Participant Code: ______________
Instructor Participant Code: ______________

Johns Hopkins University
Homewood Institutional Review Board

Parent Informed Consent

<table>
<thead>
<tr>
<th>Title:</th>
<th>Factors Associated with Implementation of Educational Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Baku, Azerbaijan</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Chadia Abras, Johns Hopkins University</td>
</tr>
<tr>
<td>Date:</td>
<td>March 16, 2016</td>
</tr>
</tbody>
</table>

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to identify factors that affect the implementation of educational technology in public schools of Azerbaijan.

The study will involve 8 school administrators, over 100 teachers, 32 students, and a maximum of 16 parents. In addition, classroom observations and interviews with several key stakeholders will be conducted.

PROCEDURES:
If selected, you will be asked to participate in a videotaped focus group discussion to learn parents’ perspective on the use of technology in education. The discussion may last from 30 to 45 minutes.

RISKS/DISCOMFORTS:
There are no anticipated risks to you.

BENEFITS:
Potential benefits are an increased understanding of how and for what purposes educational technology is integrated in the classroom activities. It is generally believed that the educational use of information and communication technologies boost student learning.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your participation in this study is entirely voluntary. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.
You can stop participation in the study at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

CONFIDENTIALITY:
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the JHU Homewood Institutional Review Board (HIRB) and officials from government agencies such as the Office for Human Research Protections. All of these people are required to keep your identity confidential. Records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All videotapes and measures will be examined by the Principal Investigator and research affiliates only (including those entities described above). No identifiable information will be included in any reports of the research published or provided to school administration. A participant number will be assigned to all participants.

Video data of the focus group discussion may be transcribed by an outside agent (transcriptionist), who will de-identify all transcripts by deleting all names from the transcript and only a participant number or pseudonym will be included on these transcripts.

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Only group data will be included in publication; no individual achievement data will ever be published.

COMPENSATION:
You will not receive any payment or other compensation for participating in this study. We will provide drinks and beverages during the focus group discussions.

IF YOU HAVE QUESTIONS OR CONCERNS:
You can ask questions about this research study at any time during the study by contacting Ulkar Babayeva via phone or email: (+994) 50-6410579, ubabaye1@jhu.edu.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the JHU HIRB at (+1410) 516-6580.

SIGNATURES
WHAT YOUR SIGNATURE MEANS:
Your signature below means that you understand the information in this consent form and agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

Parent’s Name

Parent’s Signature
Date

Signature of Person Obtaining Consent
Date
(Investigator or HIRB-Approved Designee)
## Appendix L

### Logic Model

**Program:** Cognitive Apprenticeship-Based Professional Development  
**Situation:** Baku, Azerbaijan

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
<th>Participation</th>
</tr>
</thead>
</table>
| Time   | 20-hour long professional development  
Twelve meetings (8 group and 4 school meetings) during April – May 2021  
Successful international examples of school-based ICT integration plans  
 Necessary support and scaffolding for developing ICT integration plans  
Development of ICT integration plans (one plan per school)  
40-hour long professional development  
20-hour virtual workshop on educational uses of ICT with the adoption of a problem-based approach and incorporation of curriculum-based, subject-specific, technology-rich learning activities  
20-hour mentoring during March-May 2021  
Model lessons to a group of students (expert practice)  
Assistance and support for design and implementation of technology-enhanced instruction  
Technology-supported lessons (two lesson plans per teacher) | Eight school administrators in total – two, a principal and a vice principal, from each school  
Sixteen teachers – four (two geography and two history teachers) per school | |

<table>
<thead>
<tr>
<th>Short</th>
<th>Medium</th>
<th>Long</th>
</tr>
</thead>
</table>
| Articulated vision about educational technology by school administrators  
Increased school administrators’ knowledge about ICT integration plan  
Increased teachers’ technology integration knowledge  
Increased teachers’ self-efficacy toward educational technology | Increased use of technology in the classroom | Increased summative assessment results of students |

### Assumptions
- Professional development time is enough to increase the meaningful use of educational technology in the classroom.
- School administrators have not yet received any professional development focusing on creating a vision on educational technology and the ICT integration plan.
- Teachers have not yet participated in a professional development program structured this way.

### External Factors
- COVID-19
- Changes in leadership positions of main stakeholder organizations
- Low of government support
- Changes in school leadership
- Low level of teacher participation due to family responsibilities outside of school hours
Appendix M

Causal Model

IV: Cognitive Apprenticeship-based Professional Development

School administrators

Teachers

Knowledge about ICT integration plan (mediating variable)

Vision on educational technology (mediating variable)

Use of technology in the classroom (mediating variable)

Technology integration knowledge (mediating variable)

Self-efficacy toward educational technology (mediating variable)

DV: Students' summative assessment results
## Appendix N

### Research Matrix

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Constructs</th>
<th>Instruments/Measures</th>
<th>Data Source(s)</th>
<th>Timing/Frequency</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What was the delivered CAPD and to what degree was it implemented with fidelity?</td>
<td>Adherence</td>
<td>Post-workshop survey Focus group interview protocol for school administrators Focus group interview protocol for teachers</td>
<td>School administrators, teachers</td>
<td>1x – after the workshop 1x - at the end of CAPD 1x - at the end of CAPD</td>
<td>Descriptive statistics Emergent coding</td>
</tr>
<tr>
<td></td>
<td>Dosage</td>
<td>Post-workshop survey Focus group interview protocol for school administrators Focus group interview protocol for teachers</td>
<td>School administrators, teachers</td>
<td>1x – after the workshop 1x - at the end of CAPD 1x - at the end of CAPD</td>
<td>Descriptive statistics Emergent coding</td>
</tr>
<tr>
<td></td>
<td>Quality of instruction</td>
<td>Post-workshop survey Focus group interview protocol for school administrators Focus group interview protocol for teachers</td>
<td>School administrators, teachers</td>
<td>1x – after the workshop 1x - at the end of CAPD 1x - at the end of CAPD</td>
<td>Descriptive statistics Emergent coding</td>
</tr>
<tr>
<td>2. What were participants’ experiences related to participation in CAPD?</td>
<td>Participants’ perceptions of the intervention Most and least beneficial aspects of CAPD Suggestions for improving CAPD</td>
<td>Post-workshop survey Focus group interview protocol for school administrators Focus group interview protocol for teachers</td>
<td>School administrators, teachers</td>
<td>1x – after the workshop 1x - at the end of CAPD 1x - at the end of CAPD</td>
<td>Descriptive statistics Emergent coding</td>
</tr>
<tr>
<td>3. What did school administrators report about their vision relative to educational technology and knowledge about an ICT integration plan after participating in CAPD?</td>
<td>Vision relative to educational technology Knowledge about ICT integration plan</td>
<td>Focus group interview protocol for school administrators Document analysis (i.e., an evaluation of the final ICT integration plans prepared during CAPD)</td>
<td>School administrators</td>
<td>1x – at the end of CAPD</td>
<td>Emergent coding</td>
</tr>
<tr>
<td>4. Did CAPD improve teachers’ technology integration knowledge and self-efficacy toward educational technology?</td>
<td>Technology integration knowledge Self-efficacy toward educational technology</td>
<td>Technology integration knowledge survey Self-efficacy for educational technology survey</td>
<td>Teachers</td>
<td>2x – before and after CAPD</td>
<td>Descriptive statistics T-test</td>
</tr>
<tr>
<td>5. What were teachers’ experiences related to the use of technology in the classroom after participating in CAPD?</td>
<td>Use of technology in the classroom</td>
<td>Observation protocol Focus group interview protocol for teachers</td>
<td>Teachers</td>
<td>2x – during and at the end of CAPD</td>
<td>Emergent coding</td>
</tr>
</tbody>
</table>
Appendix O

Postworkshop Survey

Dear teachers,

Thank you for participating in the Educational Technology in Geography and History Classes workshop within the Cognitive Apprenticeship-based Professional Development program. Please complete this form to help me understand your perceptions of the workshop. Please circle one response to indicate the extent to which you agree or disagree with each statement.

<table>
<thead>
<tr>
<th>To what extent do you agree or disagree with the following statements?</th>
<th>Strongly disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The workshop was conducted as planned.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. All sessions of the workshop were implemented.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. In total, the workshop lasted 20 hours.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. Overall, I liked how facilitator(s) conducted the workshop.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. Facilitator(s) was(were) knowledgeable and experienced in this area.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. Overall, the workshop was of good quality.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7. The workshop was useful for effectively integrating technology into teaching and learning.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8. All sessions of the workshop contributed to my existing teaching practice.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>9. I now understood the relationship between the 21st century skills and educational technology.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>10. I now know that technology can foster student learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I can now identify major characteristics of meaningful learning with technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I now know new ICT tools appropriate for teaching geography/history.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I can now pinpoint strategies for incorporating technology into teaching and learning to meet curricula goals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. I can now name at least three ways for implementing educational technology to cultivate students’ creativity and geographical inquiry/ historical thinking skills.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I can now develop a lesson plan using subject-specific ICT tools.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I now feel confident with my ability to learn about educational technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. I still need support with integrating ICT into my instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. I would prefer having similar workshops on a regular basis.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for completing this survey!
Appendix P

Focus Group Interview Protocol

Questions to School Administrators

Welcome note:
I thanked school administrators for agreeing to participate in the Cognitive Apprenticeship-based Professional Development program as well as its evaluation study. I provided brief information about the evaluation study and explained the need for this discussion.

Process Evaluation

1. Please comment on the topics covered, content, duration/total hours of the CAPD program.
2. Was the CAPD program implemented as planned? What parts did you find the most and the least useful?
3. Please share your thoughts about the facilitation process. Was the facilitator helpful throughout the process? If so, how was the facilitator helpful? If not, what could the facilitator do to be more helpful?
4. Do you have any suggestions for improving the CAPD program? Please explain.
5. Would you prefer having more professional development programs structured this way? Why or why not?

Outcome Evaluation

6. In what ways did the CAPD program influence you thinking about technology integration?
7. In your own words, please describe what a shared vision about educational technology means to you. What are the benefits of creating a shared school vision for ICT integration?
8. Please share your school’s vision about educational technology with us.
9. In your own words, please describe what an ICT integration plan means to you. What are the advantages and disadvantages of having a school-based ICT integration plan?
10. Following this professional development, please provide some info about the content of your school’s ICT integration plan.
11. Please share any other thoughts you may have on this topic.
Appendix Q

Focus Group Interview Protocol

Questions to Teachers

Welcome note:
I thanked teachers for agreeing to participate in the Cognitive Apprenticeship-based Professional Development program as well as its evaluation study. I provided brief information about the evaluation study and explained the need for this discussion.

Process Evaluation

1. Please comment on the topics covered, workshop, duration/total hours of the CAPD program. Did it meet your expectations related to educational technology implementation?

2. Was the CAPD program implemented as planned? Which elements of the program did you find the most and the least useful?

3. Please share your thoughts about the workshop facilitators as well as mentors. Do you think they supported you throughout the technology integration process? Please elaborate.

4. What issues did mentors help you address? What could they do to be more helpful?

5. Do you have any suggestions for improving the workshop/CAPD program? Please explain.

6. Would you prefer having more professional development programs structured this way? Why or why not?

Outcome Evaluation

7. How did the CAPD program, including workshop and mentoring as well as learning from other teachers influence the way you integrate technology into your instruction?

8. Do you think your technology integration knowledge has increased after participating in the CAPD program?

9. Do you feel confident in your ability to utilize ICT in your lessons today? Why or why not?
10. Can you give some examples of how you integrate technology in your teaching to support student learning and address student understanding of content standards in geography or history?

11. Please share any other thoughts you may have on this topic.
## Appendix R

### Document Analysis Tool

**Evaluation of school-based ICT integration plans prepared during CAPD**

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Description</th>
<th>School W</th>
<th>School X</th>
<th>School Y</th>
<th>School Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting direction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1. General vision on education</td>
<td>A description of school’s vision on education as well as teaching and learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2. Vision on ICT in education</td>
<td>A general description of the place for ICT in teaching and learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.3. Description of ICT enriched activities</td>
<td>A detailed overview of the ICT activities schools want to organize with their students in different classrooms or teaching grades</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Developing people</td>
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<tr>
<td></td>
<td>2.1. ICT professional development</td>
<td>ICT professional development activities organized within the school for teachers</td>
<td></td>
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<tr>
<td></td>
<td>2.2. External ICT training activities</td>
<td>Description of training courses teachers will attend externally</td>
<td></td>
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<tr>
<td></td>
<td>2.3. ICT support for teachers</td>
<td>ICT support (technical and educational) for teachers</td>
<td></td>
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<tr>
<td>3</td>
<td>Developing organization</td>
<td></td>
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<tr>
<td></td>
<td>3.1. Description of hardware</td>
<td>Description of in-house hardware</td>
<td></td>
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<tr>
<td></td>
<td>3.2. Description of software</td>
<td>Description of in-house software</td>
<td></td>
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<tr>
<td></td>
<td>3.3. Safe use of the Internet</td>
<td>Guidelines concerning the safe use of the Internet</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>3.4. School website</td>
<td>Description of the role of the school’s website</td>
<td></td>
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<tr>
<td></td>
<td>3.5. Collaboration with organizations</td>
<td>Collaboration with other organizations</td>
<td></td>
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<tr>
<td></td>
<td>3.6. ICT budget plan</td>
<td>The school’s ICT budget plan</td>
<td></td>
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<tr>
<td></td>
<td>3.7. ICT code of behavior</td>
<td>An ICT code of behavior for teachers and students</td>
<td></td>
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</tr>
</tbody>
</table>

*Note: Codes are assigned to 4 schools participating in the CAPD program.*
Appendix S

**Technology Integration Knowledge Survey**

*Teachers*

Please indicate the extent to which you agree or disagree with each of the statements below.
SD = Strongly Disagree, D = Disagree, NA/ND = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree

<table>
<thead>
<tr>
<th>Items</th>
<th>SD</th>
<th>D</th>
<th>NA/ND</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I know how to use various technologies.</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2. I am comfortable using ICT in the classroom.</td>
<td></td>
<td></td>
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<tr>
<td>3. I can troubleshoot technical problems associated with hardware.</td>
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<tr>
<td>4. I can use a wide range of teaching approaches with ICT.</td>
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<tr>
<td>5. I have the skills to develop technology-mediated learning activities.</td>
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<tr>
<td>6. I know how to enhance my instruction with the help of ICT.</td>
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<tr>
<td>7. I know how to integrate ICT into my teaching to address content standards.</td>
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<tr>
<td>8. I know how to utilize ICT tools to meet lesson objectives.</td>
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<tr>
<td>9. I can select appropriate content-specific technological tools to support teaching and learning.</td>
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<tr>
<td>10. I can find relevant e-resources to supplement my instruction.</td>
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<tr>
<td>11. I can combine the subject content, technology, and teaching approaches/strategies in the classroom.</td>
<td></td>
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<tr>
<td>12. I know how to integrate technology into my instruction to maximize student learning.</td>
<td></td>
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<tr>
<td>13. I can incorporate ICT into my lessons to boost student creativity.</td>
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<tr>
<td>14. I can use technology in the classroom to foster student collaboration.</td>
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<tr>
<td>15. I know how to utilize ICT promote student-centered learning.</td>
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<tr>
<td>16. I know how to use ICT to facilitate students’ problem-solving skills.</td>
<td></td>
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<tr>
<td>17. I can employ technology to promote students’ higher-order thinking skills.</td>
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</tbody>
</table>
Appendix T

Self-Efficacy for Educational Technology Survey

*Teachers*

Adapted version of Computer Technology Integration Survey developed by Wang et al. (2004)

The purpose of this survey is to determine how you feel about integrating technology into classroom teaching. Please indicate the extent to which you agree or disagree with each of the statements below.

SD = Strongly Disagree, D = Disagree, NA/ND = Neither Agree nor Disagree, A = Agree, SA = Strongly Agree

<table>
<thead>
<tr>
<th>Items</th>
<th>SD</th>
<th>D</th>
<th>NA/ND</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel confident that I understand capabilities of ICT well enough to maximize them in my classroom.</td>
<td></td>
<td></td>
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<tr>
<td>2. I feel confident that I have the skills necessary to use technology for instruction.</td>
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<tr>
<td>3. I feel confident that I can successfully teach relevant subject content with appropriate use of technology.</td>
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<tr>
<td>4. I feel confident in my ability to evaluate software for teaching and learning.</td>
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<tr>
<td>5. I feel confident I can help students when they have difficulty with technology.</td>
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<tr>
<td>6. I feel confident I can effectively monitor students’ technology use for learning in my classroom.</td>
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<tr>
<td>7. I feel confident that I can involve my students to participate in technology-enhanced activities.</td>
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<tr>
<td>8. I feel confident I can consistently use educational technology in effective ways.</td>
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<tr>
<td>9. I feel confident I can provide individual feedback to students during technology use.</td>
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<tr>
<td>10. I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.</td>
<td></td>
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<tr>
<td>11. I feel confident about selecting appropriate ICT tool for instruction based on curriculum standards.</td>
<td></td>
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<tr>
<td>12. I feel confident about assigning technology-enhanced activities.</td>
<td></td>
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<tr>
<td>13. I feel confident about keeping curriculum goals and technology uses in mind when designing my lessons.</td>
<td></td>
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<tr>
<td>14. I feel confident that I will be comfortable using technology in my teaching.</td>
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<tr>
<td>15</td>
<td>I feel confident that, as time goes by, my ability to address student learning with the use of technology will improve.</td>
<td></td>
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<tr>
<td>16</td>
<td>I feel confident that I can develop creative ways to teach effectively with technology.</td>
<td></td>
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<tr>
<td>17</td>
<td>I feel confident that I can carry out technology-enhanced lessons even when I am opposed by skeptical colleagues.</td>
<td></td>
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</tbody>
</table>
## Appendix U

### Observation Protocol

Modified version of Technology Observation Checklist created by Wang et al. (2014)

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>School:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade/class:</td>
<td>Observer:</td>
</tr>
<tr>
<td>Subject:</td>
<td>Date of observation:</td>
</tr>
<tr>
<td><strong>Topic:</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Hardware used in this lesson</strong></th>
<th><strong>Software used in this lesson</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Teacher computer</td>
<td>☐ Word processor</td>
</tr>
<tr>
<td>☐ Computers for students</td>
<td>☐ Spreadsheet</td>
</tr>
<tr>
<td>☐ Projector</td>
<td>☐ Presentation</td>
</tr>
<tr>
<td>☐ Smartboard</td>
<td>☐ Drawing</td>
</tr>
<tr>
<td>☐ Other</td>
<td>☐ Web search</td>
</tr>
<tr>
<td></td>
<td>☐ YouTube</td>
</tr>
<tr>
<td></td>
<td>☐ Maps (explain) ________________</td>
</tr>
<tr>
<td></td>
<td>☐ GIS/GPS</td>
</tr>
<tr>
<td></td>
<td>☐ Movie (explain) _______________</td>
</tr>
<tr>
<td></td>
<td>☐ Simulation</td>
</tr>
<tr>
<td></td>
<td>☐ Other _________________________</td>
</tr>
</tbody>
</table>
### Classroom organization

- ☐ Teacher lecture
- ☐ Individual work
- ☐ Pair work
- ☐ Small group
- ☐ Whole class discussion
- ☐ Other ______________________________

### Other notes (e.g., instructional strategies, learning activities, other resources used)

---

### Teacher behavior:

Preparation for the class, use of technology, engagement of students

---

### Student behavior:

Active engagement, collaboration, use of technology, product development

---

### Technology use:

Support of student learning (subject-specific content, problem solving and/or critical thinking skills, higher order thinking skills, etc.)
Appendix V

Recruitment Script sent via Email

School Administrators

Dear school administrators,

With this email, I invite you to participate in the Cognitive Apprenticeship-based Professional Development (CAPD) program that focuses on the use of educational technology through the creation of meaningful learning experiences. I would like to thank and congratulate you for being pioneers!

This study will be conducted as part of the researcher's doctoral degree. The purpose of the study is to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ implementation of educational technology that can potentially boost student learning.

Please be aware that your participation is completely voluntary. You will be provided with a consent form to sign if you agree to participate in the study. Your participation in this study includes completing the following activities and measures:

1. Eight group meetings (each meeting equals 2 hours),
2. Four school-based consultations (each meeting will last 1 hour),
3. Focus group discussion (at the end of the CAPD program for 60 to 90 minutes),
4. Submit school-based ICT integration plans prepared during the CAPD program for analysis.

If you do not want to participate in the study, your enrollment and participation in the CAPD program will not be affected. You have five days to respond to this email and express your interesting in participating in the CAPD program.

To discuss the details of the CAPD program, I will hold a virtual meeting next week and explain the study as well as the written informed consent forms in detail.

You can ask questions about this research at any time by emailing me ubabayel@jhu.edu or by calling at (+994) 50 6410579.

All your efforts are highly appreciated!

Best regards,
Ulkar Babayeva
Doctoral candidate
Johns Hopkins University
Appendix W

Recruitment Script sent via Email

Teachers

Dear teachers,

With this email, I invite you to participate in the Cognitive Apprenticeship-based Professional Development (CAPD) program that focuses on the use of educational technology through the creation of meaningful learning experiences. I would like to thank and congratulate you for being pioneers!

This study will be conducted as part of the researcher's doctoral degree. The purpose of the study is to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ implementation of educational technology that can potentially boost student learning.

Please be aware that your participation is completely voluntary. You will be provided with a consent form to sign if you agree to participate in the study. Your participation in this study includes completing the following activities and measures:

1. 20-hour virtual workshop on the educational uses of ICT,
2. 20 hours of mentoring support,
3. Technology Integration Knowledge survey (prior to and following the CAPD program for 15-20 minutes)
4. Self-Efficacy for Educational Technology survey (prior to and following the CAPD program for 15-20 minutes)
5. Postworkshop Survey (right after the workshop for 15-20 minutes)
6. Focus group discussion (at the end of the CAPD program for 60 to 90 minutes)
7. Two lesson observations (in the middle and at the end of the CAPD program for 30 minutes each)

If you do not want to participate in the study, your enrollment and participation in the CAPD program will not be affected. You have five days to respond to this email and express your interesting in participating in the CAPD program.

To discuss the details of the CAPD program, I will hold a virtual meeting next week and explain the study as well as the written informed consent forms in detail.

You can ask questions about this research at any time by emailing me ubabayel@jhu.edu or by calling at (+994) 50 6410579.

All your efforts are highly appreciated!

Best regards,
Ulkar Babayeva
Doctoral candidate
Johns Hopkins University
JOHNS HOPKINS UNIVERSITY
HOMEWOOD INSTITUTIONAL REVIEW BOARD (HIRB)

RESEARCH PARTICIPANT INFORMED CONSENT FORM
School Administrator

Study Title: Cognitive Apprenticeship-based Professional Development and Its Evaluation

Application No.: HIRB00012593

Principal Investigator: Stephen Pape, Professor, Johns Hopkins University School of Education 2800 N Charles St., Baltimore, MD 21218, stephen.pape@jhu.edu, (410) 516-7953

You are being asked to join a research study. Participation in this study is voluntary. Even if you decide to join now, you can change your mind later.

1. Research Summary (Key Information):
   The information in this section is intended to be an introduction to the study only. Complete details of the study are listed in the sections below. If you are considering participation in the study, the entire document should be discussed with you before you make your final decision. You can ask questions about the study now and at any time in the future.

   The cognitive apprenticeship-based professional development (CAPD) program is aimed to support school administrators and teachers to mitigate barriers related to the implementation of educational technology and support the application of information and communication technologies (ICT) into teaching and learning in Baku public schools. The purpose of this study is to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ implementation of educational technology that can potentially boost student learning. This study is being conducted as part of the student researcher’s dissertation research study.

   Participants will be school administrators and teachers recruited from four public schools located in Baku, Azerbaijan. Through this program, school administrators will create a school vision on educational technology and develop a school-wide ICT integration plan. Teachers will attend a 20-hour virtual workshop on the educational uses of ICT and receive 20 hours of mentoring support. The program aims to increase teachers’ technology integration knowledge, self-efficacy toward educational technology implementation, and meaningful classroom implementation of ICT to advance student learning.

   No risk is expected from participation in this study.

2. Why is this research being done?
   This research is being done to inform educators, educational institutions, and policymakers in the design and implementation of policies focusing on meaningful use of ICT in teaching and learning in Azerbaijan. Additionally, the results will inform the education community related to high-quality and
Effective professional development opportunities related to technology implementation for teachers and school administrators. Another long-term goal of this study is to inform national policies focusing on the use of technology in teaching and learning.

We anticipate that a maximum of eight school administrators and 24 teachers will take part in this study.

3. What will happen if you join this study?
If you agree to be in this study, we will ask you to attend the CAPD program focusing on educational technology.

The focus of the school administrator component of the CAPD program will be a school vision on educational technology and school-wide ICT integration plan. The school administrator component of the CAPD program will last 20 hours; five group meetings and five school-based consultations. The duration of each meeting will be two hours. At the end of the program, school administrators will participate in an online focus group discussion, which will last 60 to 90 minutes.

We will also analyze the school-based ICT integration plans prepared by school administrators during the CAPD program.

If you do not want to participate in the study, your enrollment and participation in the CAPD program will not be affected.

Audio/Video recordings:
As part of this research, we are requesting your permission to create and use audio/video recordings of focus group discussions. Any recordings or images from recordings will not be used for advertising or non-study related purposes.

You should know that:
- You may request that the audio recording or video recording be stopped at any time.
- If you agree to allow the audio recording and video recording and then change your mind, you may ask us to destroy that imaging/recording. If the imaging/recording has had all identifiers removed, we may not be able to do this.
- We will only use these recordings for the purposes of this research.

Please indicate your decision below by checking the appropriate statement:

______ I agree to allow the study to make and use photographs/video recordings/audio recordings of me (or the participant I represent) for the purpose of this study.

______ I do not agree to allow the study team to make and use photographs/video recordings/audio recordings of me (or the participant I represent) for the purpose of this study.

Participant Signature
(or Legally Authorized Representative Signature, if applicable)

Date

How long will you be in the study?
You will be in this study for a total of two months.
4. **What are the risks or discomforts of the study?**
The risks associated with participation in this study are no greater than those encountered in daily life (i.e., time management, workload, multiple tasking).

5. **Are there benefits to being in the study?**
The CAPID program aims to increase the knowledge and skills related to the implementation of educational technology, which may lead to changes in your classroom practices. Participants will have an opportunity to be a part of the research-based intervention program that focuses on meaningful use of ICT in teaching and learning.

This study may benefit society if the results lead to a better understanding and usage of technology for educational purposes in the context of public schools in Azerbaijan. In other words, educators in Azerbaijan and society in general, will know how to effectively implement educational technology to support student learning. It may inform the policymakers to implement policies focusing on meaningful use of ICT in education including provision of high-quality and effective professional development opportunities for teachers and school administrators.

6. **What are your options if you do not want to be in the study?**
Your participation in this study is entirely voluntary. You choose whether to participate. Any potential benefits to you may be available through other means.

If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

7. **Will it cost you anything to be in this study?**
No.

8. **Will you be paid if you join this study?**
No.

9. **Can you leave the study early?**
   - You can agree to be in the study now and change your mind later, without any penalty or loss of benefits.
   - If you wish to stop, please tell us right away.
   - If you want to withdraw from the study, please contact Ulkar Babayeva at ubabayeva1@jhu.edu or (+994) 50 6410579.

10. **How will the confidentiality of your data be protected?**
    Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

    Any personally identifiable information will be anonymized through the use of a coding system in which each participant is given a pseudonym (e.g., School administrator 1). The key for this code will be
kept in a password-protected file on a password-protected laptop. Only the Primary Investigator and student investigator will have access to this key. The key will be permanently deleted following the study and after the dissertation is written.

11. What other things should you know about this research study?

What is the Institutional Review Board (IRB) and how does it protect you?
This study has been reviewed by an Institutional Review Board (IRB), a group of people that reviews human research studies. The IRB can help you if you have questions about your rights as a research participant or if you have other questions, concerns or complaints about this research study. You may contact the IRB at 410-516-6580 or irb@jhu.edu.

What should you do if you have questions about the study?
Call the principal investigator, Dr. Stephen Pape at (410) 516-7953. If you wish, you may contact the principal investigator by letter. The address is on page one of this consent form. If you cannot reach the principal investigator or wish to talk to someone else, call the IRB office at 410-516-5680.

You can ask questions about this research study now or at any time during the study, by talking to the researcher(s) working with you or by calling Ulkar Babayeva, student investigator at (+994) 50 6410579.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

12. What does your signature on this consent form mean?
Your signature on this form means that: You understand the information given to you in this form, you accept the provisions in the form, and you agree to join the study. You will not give up any legal rights by signing this consent form.

WE WILL GIVE YOU A COPY OF THIS SIGNED AND DATED CONSENT FORM

<table>
<thead>
<tr>
<th>Signature of Participant</th>
<th>(Print Name)</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of Person Obtaining Consent</td>
<td>(Print Name)</td>
<td>Date/Time</td>
</tr>
</tbody>
</table>

NOTE: A COPY OF THE SIGNED, DATED CONSENT FORM MUST BE KEPT BY THE PRINCIPAL INVESTIGATOR; A COPY MUST BE GIVEN TO THE PARTICIPANT.
Appendix Y

Date:
Principal Investigator: Stephen Pape
Application No.: HIRB00012593

JOHNS HOPKINS UNIVERSITY
HOMEWOOD INSTITUTIONAL REVIEW BOARD (HIRB)

RESEARCH PARTICIPANT INFORMED CONSENT FORM
Teacher

Study Title: Cognitive Apprenticeship-based Professional Development and Its Evaluation
Application No.: HIRB00012593
Principal Investigator: Stephen Pape, Professor, Johns Hopkins University School of Education 2800 N Charles St., Baltimore, MD 21218, stephen.pape@jhu.edu, (410) 516-7953

You are being asked to join a research study. Participation in this study is voluntary. Even if you decide to join now, you can change your mind later.

1. Research Summary (Key Information):
The information in this section is intended to be an introduction to the study only. Complete details of the study are listed in the sections below. If you are considering participation in the study, the entire document should be discussed with you before you make your final decision. You can ask questions about the study now and at any time in the future.

The cognitive apprenticeship-based professional development (CAPD) program is aimed to support school administrators and teachers to mitigate barriers related to the implementation of educational technology and support the application of information and communication technologies (ICT) into teaching and learning in Baku public schools. The purpose of this study is to assess the effectiveness of the CAPD program to improve school administrators’ and teachers’ implementation of educational technology that can potentially boost student learning. This study is being conducted as part of the student researcher’s dissertation research study.

Participants will be school administrators and teachers recruited from four public schools located in Baku, Azerbaijan. Through this program, school administrators will create a school vision on educational technology and develop a school-wide ICT integration plan. Teachers will attend a 20-hour virtual workshop on the educational uses of ICT and receive 20 hours of mentoring support. The program aims to increase teachers’ technology integration knowledge, self-efficacy toward educational technology implementation, and meaningful classroom implementation of ICT to advance student learning.

No risk is expected from participation in this study.

2. Why is this research being done?
This research is being done to inform educators, educational institutions, and policymakers in the design and implementation of policies focusing on meaningful use of ICT in teaching and learning in Azerbaijan. Additionally, the results will inform the education community related to high-quality and
effective professional development opportunities related to technology implementation for teachers and school administrators. Another long-term goal of this study is to inform national policies focusing on the use of technology in teaching and learning.

We anticipate that a maximum of eight school administrators and 24 teachers will take part in this study.

3. **What will happen if you join this study?**

If you agree to be in this study, we will ask you to attend the CAPD program focusing on educational technology.

The teacher component of the CAPD program will concentrate on teachers’ technology integration knowledge, self-efficacy toward educational technology, and meaningful classroom experiences with the use of ICT to advance student learning. The duration of this component of the CAPD will be 40 hours; a 20-hour virtual workshop on the educational uses of ICT and 20 hours of mentoring.

If you agree to be in this study, we will ask you to complete a Technology Integration Knowledge survey and a Self-Efficacy for Educational Technology survey prior to and following the professional learning opportunity, plus a Post-Workshop Survey right after the workshop. The surveys will take between 45 and 60 minutes in total. Finally, you will be asked to participate in an online focus group discussion for 60 to 90 minutes at the end of the CAPD program.

Additionally, you will be virtually observed twice – in the middle and at the end of intervention. Since the online lessons last 30 minutes in Azerbaijan, each observation will be equal to 30 minutes.

If you do not want to participate in the study, your enrollment and participation in the CAPD program will not be affected.

**Audio/Video recordings:**

As part of this research, we are requesting your permission to create and use audio/video recordings of focus group discussions. Any recordings or images from recordings will not be used for advertising or non-study related purposes.

You should know that:
- You may request that the audio recording or video recording be stopped at any time.
- If you agree to allow the audio recording and video recording and then change your mind, you may ask us to destroy that imaging/recording. If the imaging/recording has had all identifiers removed, we may not be able to do this.
- We will only use these recordings for the purposes of this research.

Please indicate your decision below by checking the appropriate statement:

- [ ] I agree to allow the study to make and use photographs/video recordings/audio recordings of me (or the participant I represent) for the purpose of this study.
- [ ] I do not agree to allow the study team to make and use photographs/video recordings/audio recordings of me (or the participant I represent) for the purpose of this study.

Participant Signature (or Legally Authorized Representative Signature, if applicable) 

Date 

Informed Consent Form January 2019
How long will you be in the study?
You will be in this study for a total of two months.

4. What are the risks or discomforts of the study?
The risks associated with participation in this study are no greater than those encountered in daily life (i.e., time management, workload, multiple tasking).

5. Are there benefits to being in the study?
The CAPD program aims to increase the knowledge and skills related to the implementation of educational technology, which may lead to changes in your classroom practices. Participants will have an opportunity to be a part of the research-based intervention program that focuses on meaningful use of ICT in teaching and learning.

This study may benefit society if the results lead to a better understanding and usage of technology for educational purposes in the context of public schools in Azerbaijan. In other words, educators in Azerbaijan and society in general, will know how to effectively implement educational technology to support student learning. It may inform the policymakers to implement policies focusing on meaningful use of ICT in education including provision of high-quality and effective professional development opportunities for teachers and school administrators.

6. What are your options if you do not want to be in the study?
Your participation in this study is entirely voluntary. You choose whether to participate. Any potential benefits to you may be available through other means.

If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled.

7. Will it cost you anything to be in this study?
No.

8. Will you be paid if you join this study?
No.

9. Can you leave the study early?
- You can agree to be in the study now and change your mind later, without any penalty or loss of benefits.
- If you wish to stop, please tell us right away.
- If you want to withdraw from the study, please contact Ulkar Babayeva at ulnbaye1@jhu.edu or (+994) 30 6410579.

10. How will the confidentiality of your data be protected?
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (All of these people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.
Any personally identifiable information will be anonymized through the use of a coding systems in which each participant is given a pseudonym (e.g., Teacher 1). The key for this code will be kept in a password-protected file on a password-protected laptop. Only the Primary Investigator and student investigator will have access to this key. The key will be permanently deleted following the study and after the dissertation is written.

11. What other things should you know about this research study?

What is the Institutional Review Board (IRB) and how does it protect you?
This study has been reviewed by an Institutional Review Board (IRB), a group of people that reviews human research studies. The IRB can help you if you have questions about your rights as a research participant or if you have other questions, concerns or complaints about this research study. You may contact the IRB at 410-516-6580 or irb@jhu.edu.

What should you do if you have questions about the study?
Call the principal investigator, Dr. Stephen Pape at (410) 516-7953. If you wish, you may contact the principal investigator by letter. The address is on page one of this consent form. If you cannot reach the principal investigator or wish to talk to someone else, call the IRB office at 410-516-5680.

You can ask questions about this research study now or at any time during the study, by talking to the researcher(s) working with you or by calling Ulkvar Babayeva, student investigator at (+994) 50 6410579.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

12. What does your signature on this consent form mean?
Your signature on this form means that: You understand the information given to you in this form, you accept the provisions in the form, and you agree to join the study. You will not give up any legal rights by signing this consent form.

WE WILL GIVE YOU A COPY OF THIS SIGNED AND DATED CONSENT FORM

<table>
<thead>
<tr>
<th>Signature of Participant</th>
<th>(Print Name)</th>
<th>Date/Time</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signature of Person Obtaining Consent</th>
<th>(Print Name)</th>
<th>Date/Time</th>
</tr>
</thead>
</table>

NOTE: A COPY OF THE SIGNED, DATED CONSENT FORM MUST BE KEPT BY THE PRINCIPAL INVESTIGATOR; A COPY MUST BE GIVEN TO THE PARTICIPANT.
Appendix Z

Cognitive Apprenticeship-based Professional Development

Program Timeline

<table>
<thead>
<tr>
<th>№</th>
<th>Activity</th>
<th>March</th>
<th>April</th>
<th>May</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>I week</td>
<td>II week</td>
<td>III week</td>
</tr>
<tr>
<td>1</td>
<td>Introductory meeting</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Meetings</td>
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Components targeting school administrators

<table>
<thead>
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<th>№</th>
<th>Activity</th>
<th>March</th>
<th>April</th>
<th>May</th>
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</thead>
<tbody>
<tr>
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<td>Introductory meeting</td>
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</tr>
<tr>
<td>2</td>
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<td>1 group meeting</td>
<td>1 group meeting</td>
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Components targeting teachers

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<thead>
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<th>Activity</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introductory meeting</td>
<td>2 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Workshop</td>
<td>4 sessions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Mentoring</td>
<td>1 ind meeting</td>
<td>1 g+1 ind meeting</td>
<td>1 ind meeting</td>
</tr>
</tbody>
</table>

Note: Introductory meetings are not part of CAPD program. This is a necessary activity prior to the implementation of the intervention.

g = group
s = school
ind = individual
Appendix AA

Cognitive Apprenticeship-based Professional Development

School Administrator Component

<table>
<thead>
<tr>
<th>No</th>
<th>Months</th>
<th>Weeks</th>
<th>Meetings</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>April</td>
<td>I week</td>
<td>1 group meeting</td>
<td>A shared vision about educational technology and its importance in the implementation of this innovation</td>
</tr>
<tr>
<td>2</td>
<td>April</td>
<td>II week</td>
<td>1 group meeting</td>
<td>Discussion of a school vision about education technology</td>
</tr>
<tr>
<td>3</td>
<td>April</td>
<td>III week</td>
<td>1 g + 1 s meeting</td>
<td>Development of a school vision about education technology</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>IV week</td>
<td>1 g + 1 s meeting</td>
<td>ICT integration plan and its significance for boosting the level of technology use in schools</td>
</tr>
<tr>
<td>5</td>
<td>April</td>
<td>V week</td>
<td>1 g + 1 s meeting</td>
<td>Discussion of initial ideas for an ICT integration plan per school</td>
</tr>
<tr>
<td>6</td>
<td>May</td>
<td>I week</td>
<td>1 g + 1 s meeting</td>
<td>Description of the content of and strategies for crafting comprehensive ICT integration plans Development of an outline for an ICT integration plan per school</td>
</tr>
<tr>
<td>7</td>
<td>May</td>
<td>II week</td>
<td>1 group meeting</td>
<td>Presentation of successful international examples of school-based ICT integration plans Scaffolding through the development of school-based ICT integration plans and reflection-on action</td>
</tr>
<tr>
<td>8</td>
<td>May</td>
<td>III week</td>
<td>1 group meeting</td>
<td>Finalization of school-based ICT integration plans Presentation of final ICT integration plans prepared during this component of the CAPD program</td>
</tr>
</tbody>
</table>

**Note:** School administrators will come to school meetings with ideas, initial drafts, or sketches to work on during the school-based consultations.

\[g = \text{group} \]
\[s = \text{school}\]
Appendix AB

School Administrator Component Overview

Outline

- Overview
- Context
- Goal
- Learning objectives
- School vision
- ICT Integration plan
- Strategies

Overview

- Participants
- Meetings
- Dates
- Delivery
Content

1. Understanding CT Integration Plan
2. Evaluation of the Impact of CT Integration Plan
3. Incorporation of CT Integration Plan
4. Implementation of CT Integration Plan
5. Evaluation of the Outcome of CT Integration Plan
6. Changing the CT Integration Plan
7. Incorporation of CT Integration Plan
8. Implementation of CT Integration Plan
9. Evaluation of the Outcome of CT Integration Plan
10. Changing the CT Integration Plan

Goal

To form school administrators’ understanding of what about educational technology and increase their knowledge about CT integration plans.

Learning Objectives

- Students will be able to analyze the impact of CT integration plan on classroom learning.
- Students will be able to evaluate the effectiveness of CT integration plan.
- Students will be able to implement CT integration plan in their classroom.
- Students will be able to change their CT integration plan.
- Students will be able to incorporate CT integration plan in their daily teaching.
- Students will be able to evaluate the outcome of CT integration plan.
Appendix AC

Educational Technology in Geography and History Classes

Teacher Workshop Agenda

*Workshop duration was 20 hours. It was held for two weeks; each session lasted 2.5 hours.*

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Topic &amp; Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session 1</strong>  &lt;br&gt; Week 1</td>
<td>21st Century Skills and Educational Technology  &lt;br&gt; • Participants will demonstrate knowledge of the 21st century skills.  &lt;br&gt; • Participants will recognize the benefits of educational technology in teaching and learning.</td>
</tr>
<tr>
<td><strong>Session 2</strong>  &lt;br&gt; Week 1</td>
<td>Educational Technology and Student Learning  &lt;br&gt; • Participants will explain how technology can foster student learning.</td>
</tr>
<tr>
<td><strong>Session 3</strong>  &lt;br&gt; Week 1</td>
<td>Educational Technology and Student Learning  &lt;br&gt; • Participants will identify major characteristics of meaningful learning with technology.</td>
</tr>
<tr>
<td><strong>Session 4</strong>  &lt;br&gt; Week 1</td>
<td>ICT tools in Geography and History  &lt;br&gt; • Given the specific content, participants will detect strategies for incorporating ICT tools into teaching and learning to meet curricula goals.</td>
</tr>
<tr>
<td><strong>Session 5</strong>  &lt;br&gt; Week 2</td>
<td>ICT tools in Geography and History  &lt;br&gt; • Participants will identify at least three ways for implementing educational technology to cultivate students’ creativity, geographical inquiry, and historical thinking skills.</td>
</tr>
<tr>
<td><strong>Session 6</strong>  &lt;br&gt; Week 2</td>
<td>Planning Technology-mediated Lessons  &lt;br&gt; • Given the specific content, participants will develop a lesson plan with the use of ICT tools.</td>
</tr>
<tr>
<td><strong>Session 7</strong>  &lt;br&gt; Week 2</td>
<td>Planning Technology-mediated Lessons  &lt;br&gt; • Given the developed lesson plans, participants will determine whether the particular use of technology would be adequate for increasing student learning.</td>
</tr>
<tr>
<td><strong>Session 8</strong>  &lt;br&gt; Week 2</td>
<td>Review and Reflection  &lt;br&gt; • Participants will make necessary improvements to these lesson plans and explain how these lessons may enhance student learning and help them realize learning outcomes.</td>
</tr>
</tbody>
</table>
Appendix AD

Workshop Overview

Outline

- Overview
- Content
- Goal
- Learning objectives
- Instructional sequence
- Strategies
- Instructional media

Overview

- Participants: Geography and history teachers (a total of 16)
- Dates: 01-13 March, 2021
- Duration: 20 hours
- Delivery mode: Online
- Facilitators: Me and the recruited mentors
- Location: Baku, Azerbaijan
Content

Sessions

21st century skills and educational technology
Educational technology and student learning
ICT tools in geography and history
Planning technology-mediated lessons
Review and reflection

Goal
To increase teachers' technology integration knowledge and skills about possible uses of technology in geography and history classes to increase student learning

The workshop will incorporate curriculum-based, subject specific, technology-rich learning activities to achieve the learning objectives.

Learning Objectives

- Participants will demonstrate knowledge of the 21st century skills.
- Participants will recognize the benefits of educational technology in teaching and learning.
- Participants will explain how technology can foster student learning.
- Participants will identify major characteristics of meaningful learning with technology.
- Participants will create a lesson plan with the use of ICT tools.
- Participants will determine whether the particular use of technology will maximize the meaningful learning experiences.
- Participants will consider how ICT tools may enhance student learning and help them realize learning outcomes.
Instructional Sequence

Strategies

Instructional Strategies
- Direct instruction
- Group discussions
- Collaborative learning
- Hands-on learning
- Think-Pair-Share
- Critical friends

Assessment Strategies
- Minute point papers
- Opinion polls
- Rubrics
- Think-Pair-Share
- Observations

Instructional Media
- Microsoft Teams platform
- Several computers or other devices connected to the Internet
- Various content-appropriate tools such as Animoto, Google Earth, Google Map, Capsles, Gapminder, etc.
Appendix AE

Workshop: Session 4 Presentation

ICT TOOLS IN GEOGRAPHY AND HISTORY

SESSION 4

SESSION’S OBJECTIVES (4)

» Participants will review ICT tools in geography and history classes.
» Given the specific content, participants will detect strategies for incorporating ICT tools into teaching and learning to meet curricula goals.
SUBJECT-SPECIFIC ICT tools

Review these tools in 4 groups and explain how, if at all, they can be useful in the classroom.

30 minutes

8 Geography teachers = 2 groups
8 History teachers = 2 groups

TOOLS

Google Earth
WorldWide
Telescope
European Space
Agency
Google Maps
AirPano
Tagxedo
Kahoot

Padlet
GeaCron
Animoto
Freeciv
Scribble Maps
Sutori
SmartDraw
Glogster

Participants may suggest other tools.
DISCUSSION

How can these tools be used during lessons?
Can they help enhance student learning?

30 minutes

STRATEGIES FOR INCORPORATING TECHNOLOGY

In groups
Discuss and detect strategies for incorporating these technologies into teaching and learning to meet curricula goals.

Subject curricula
Geography - https://bit.ly/3gk1HBq

Assessment
Can these tools be used for assessment? How?

1 hour

Duration = 1 hour
Each group (4 groups in total) concentrates at least on one grade, one content domain/standard (per subject). For instance,

Geography grade 7, content domain nature, standard “Explains the mutual relationship between the internal components of the biosphere” – How can we implement educational technology to realize this outcome?

History grade 8, content domain culture, standard “Evaluates/assesses cultures and civilizations” – How can we use ICT to realize this outcome?
RESULTS (strategies)
Presentation of results = 5 minutes
Peer feedback = 10 minutes

30 minutes

Each group presents results in 5 minutes (4*5 = 20 minutes) and then provides feedback to other groups' strategies (10 minutes in total)
Appendix AF

Workshop: Session 5 Presentation

ICT Tools in Geography and History

Session 5

Session’s Objectives (5)

- Participants will identify at least three ways for implementing educational technology to cultivate students’ creativity, geographical inquiry, and historical thinking skills.
ICT INTEGRATION

Demonstrating several ways for integrating ICT into teaching and learning to develop students’ subject-related skills.
Discussion

30 minutes

Demonstration of sample lessons (videos)
Facilitation of a discussion around this topic

THREE WAYS

In groups, identify at least three ways for implementing educational technology to cultivate students’ creativity, geographical inquiry, and historical thinking skills.

1 hour 15 minutes

Participants are free to choose any topic.
For this task, participants work in 4 groups. There are 2 geography and 2 history teachers in one group.
RESULTS (three ways)

Presentation of results = 5 minutes
Peer feedback = 10 minutes

30 minutes

Each group presents results in 5 minutes \((4 \times 5 = 20\text{ minutes})\) and then provides feedback to other groups’ strategies \((10\text{ minutes in total})\)

REFLECTION

What did you learn in these sessions?
Can ICT tools be useful to enhance student learning and meet curricula goals?
Any connection between 21st century skills and your subject areas?

15 minutes
THANKS!

Any questions?

Next session

◇ You will develop lesson plans with the use of subject-specific ICT tools.
Appendix AG

Geography Lesson Observation Results: ICT Tools, Classroom Organization, and Purpose of Educational Technology

<table>
<thead>
<tr>
<th>ICT Tools</th>
<th>During</th>
<th></th>
<th>After</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>when</td>
<td>purpose</td>
<td>$n$</td>
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<tr>
<td>Word</td>
<td>1</td>
<td>Whole class discussion</td>
<td>To demonstrate tasks/questions</td>
<td>-</td>
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<tr>
<td>PowerPoint</td>
<td>1</td>
<td>Teacher lecture</td>
<td>To present new topic &amp; To teach geographical content</td>
<td>2</td>
</tr>
<tr>
<td>Web search</td>
<td>1</td>
<td>Small group work</td>
<td>To learn geographical concepts</td>
<td>1</td>
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<tr>
<td>YouTube</td>
<td>1</td>
<td>Teacher lecture</td>
<td>To engage students &amp; To promote students’ geographical thinking skills</td>
<td>2</td>
</tr>
<tr>
<td>Google Earth</td>
<td>-</td>
<td></td>
<td>Teacher lecture &amp; Small group work</td>
<td>2</td>
</tr>
<tr>
<td>Tool</td>
<td>Task</td>
<td>Activity Type</td>
<td>Objectives</td>
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<td>----------------------</td>
<td>------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Google Maps</td>
<td>1</td>
<td>Individual work</td>
<td>To demonstrate students’ understanding of geographical content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Whole class discussion &amp; Small group work</td>
<td>To reinforce students’ learning &amp; To promote students’ geographical thinking skills</td>
<td></td>
</tr>
<tr>
<td>WorldWide Telescope</td>
<td>-</td>
<td>Teacher lecture &amp; Whole class discussion</td>
<td>To advance students’ understanding of geographical content &amp; To develop students’ geographical thinking and critical thinking skills</td>
<td></td>
</tr>
<tr>
<td>Padlet</td>
<td>1</td>
<td>Individual work</td>
<td>To activate prior knowledge &amp; To demonstrate students’ comprehension of geographical content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Whole class discussion &amp; Pair work</td>
<td>To develop students’ geographical thinking and critical thinking skills &amp; To demonstrate students’ comprehension of geographical content</td>
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<tr>
<td>App</td>
<td>Task</td>
<td>Purpose</td>
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<tr>
<td>LearningApps.org</td>
<td>Whole class discussion</td>
<td>To reinforce student learning &amp; Whole class discussion To check for student understanding &amp; To assess students’ geographical knowledge and skills</td>
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<td>Quizizz</td>
<td>Individual work</td>
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<td>Canva</td>
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<td>To teach geographical content</td>
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<td>Sutori</td>
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<td>To assess students’ geographical knowledge</td>
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Appendix AH

History Lesson Observation Results: ICT Tools, Classroom Organization, and Purpose of Educational Technology

<table>
<thead>
<tr>
<th>ICT Tools</th>
<th>During</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>when</td>
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<tr>
<td>PowerPoint</td>
<td>1 Teacher lecture</td>
<td>To present new topic</td>
</tr>
<tr>
<td>Web search</td>
<td>1 Whole class discussion</td>
<td>To learn historical concepts</td>
</tr>
<tr>
<td>YouTube</td>
<td>2 Teacher lecture</td>
<td>To activate prior knowledge &amp; To reinforce learning</td>
</tr>
<tr>
<td>Google Earth</td>
<td>1 Teacher lecture</td>
<td>To teach historical content</td>
</tr>
<tr>
<td>Google Maps</td>
<td>2 Teacher lecture &amp; Individual work</td>
<td>To teach historical content &amp; To demonstrate students’ comprehension of historical content</td>
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<td>PowToon</td>
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<tr>
<td>Tool</td>
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<td>Whole class discussion &amp; Individual work</td>
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<td></td>
<td></td>
<td>Small group work &amp; Whole class discussion &amp; Pair work</td>
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<tr>
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<td>Whole class discussion</td>
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<td>Whole class discussion</td>
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<td>Wordwall</td>
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<td>Whole class discussion &amp; Pair work</td>
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<tr>
<td>Animoto</td>
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<td>Small group work</td>
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<tr>
<td>GeaCron</td>
<td>-</td>
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<tr>
<td>Activity</td>
<td>Frequency</td>
<td>Method</td>
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<td>Sutori</td>
<td>1</td>
<td>Teacher lecture</td>
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<tr>
<td>JeopardyLabs</td>
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<td>Whole class discussion</td>
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<tr>
<td>Crossword Labs</td>
<td>1</td>
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| **Total**         | **12**    |                 |                                                              | **20**
Ulkar Babayeva
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(+99412) 434 6021 (h), (+994 50) 641 0579 (c)
ubabayeva@yahoo.com

EDUCATION

  *Area of specialization: Instructional Design for Online Teaching and Learning*
  *Dissertation Focus: Educational Technology: The Case of Azerbaijan*
• Continuing education on “Virtual Teacher Program”, University of California Irvine. California, USA 2014
• E-learning Specialist, GIZ. Germany 2012
• Continuing education on “Effective Online Tutoring”, University of Oxford. UK 2011
• Master’s in Education and World Literature, honors, Azerbaijan University of Languages. Baku, Azerbaijan 2006
• Bachelor’s in Education and Linguistics, honors, Azerbaijan University of Languages. Baku, Azerbaijan 2004
• B.A. in International Affairs, Minnesota State University Moorhead. Minnesota, USA 2003

PROFESSIONAL HISTORY

• Contributing to short and long-term strategic planning of the Institute
• Coordinating with the director and overseeing the implementation of strategic projects
• Maintaining competency in all organization policies and participating in various outreach events
• Monitoring staff activities according to existing policies and performing performance-based appraisals
• Ensuring the evaluation of existing programs and/or education policies
• Developing new projects and programs in line with the annual action plan
2021 – present  Adjunct Instructor, Azerbaijan State Pedagogical University, Baku, Azerbaijan.

- Teaching graduate students (both f2f and online)
- Developing course syllabi
- Preparing teaching and learning materials
- Assessing student learning
- Courses taught
  - Neuroscience in Education
  - Instructional Design and Technology

2018 – present Adjunct Instructor, ADA University, School of Education, Baku, Azerbaijan.

- Teaching graduate students (both f2f and online)
- Developing course syllabi
- Preparing teaching and learning materials
- Assessing student learning
- Courses taught
  - Educational Policy
  - Inquiry I/II
  - Educational Policy and Management - Capstone I/II
  - Using Student Assessment Data for Organizational Improvement


- Developing and managing the implementation of the strategic and operational plans of the Economic Education Service
- Ensuring effective representation of the Service’s interests within and outside the Central Bank
- Supporting the advancement of project leadership within the Service
- Effective supervision of all projects implemented by the Service and appropriate management of the Service budget
- Building fruitful partnerships with diverse public and private organizations and facilitating communication among them
- Preparing annual reports for the top management and other pertinent government structures
- Overseeing the monitoring and evaluation process


- Overseeing and managing all projects of the Education Division, especially of the Bilasuvar Education Complex (Lyceum and Kindergarten)
- Facilitating communication among project managers and
providing leadership to all strategic projects implemented by the division

• Preparing annual reports for the top management in cooperation with relevant stakeholders
• Supervising all processes (particularly student and teacher recruitment, curriculum and instruction, library and information management, parental involvement, etc.) of the Bilasuvar Education Complex
• Developing and performing the monitoring and evaluation of all events and activities

2009 – 2014

Research & Development Manager, Madad Azerbaijan, Baku, Azerbaijan.

• Responsible for providing leadership and management to the programs and activities of the Research and Development Department
• Evaluating and developing improved techniques for the control of educational activities
• Strategic planning and management of educational projects as well as e-learning
• Overseeing the development of organization’s current educational products
• Researching the innovative approaches to both modern pedagogy and educational technology

2007 – 2009

Programs Manager, Madad Azerbaijan, Baku, Azerbaijan.

• Managing various programs funded by various international and local organizations and overseeing programs being implemented in over 40 regions focusing on trainings, community development, education and ICT.
• Ensuring achievement of program objectives and targets, program monitoring and evaluation, receiving feedback from beneficiaries, reporting, communication, and representation when required.

2004 – 2007

Program Officer, Relief International, Baku, Azerbaijan.

• Responsible for proposal development including proposal writing and project, budget and work-plan design, setting up monitoring and evaluation, preparation of project reports, and supervision of implemented projects.

2003 – 2004

Moderator, IREX/IATP, Baku, Azerbaijan.

• Managed survey conduction process and was responsible for moderating three focus groups, conducting case study interviews, compiling and analyzing data, writing and submitting reports in English.
TRAININGS, AWARDS AND CERTIFICATES

- Review committee member at the ADA International Education Conference on “Strategizing Education Development: Reflections and Way Forward” organized by the ADA University. Baku, Azerbaijan, June 2018
- Jury member at the "Education Policy and Research Forum" organized by the ADA University, the US-Educated Azerbaijani Alumni Association and the Ministry of Education of the Azerbaijan Republic. Baku, Azerbaijan, March 2016
- Presenter at the International Conference UNESCO IITE “ICT in Education: Pedagogy, Educational Resources and Quality Assurance”. Moscow, Russia, November 2012
- Presenter at the International Conference UNESCO IITE “Teacher Competencies in Knowledge Society: Policy, Pedagogy, Social Skills”. Baku, Azerbaijan, December 2011
- Training on “E-Learning” conducted by Common Sense via GIZ Baku, Azerbaijan, October 2011
- Intel International Science and Engineering Fair, the Intel ISEF Educator Academy. California, USA, May 2011
- Youth Leadership Program on Free Expression, USA - Participated in a month-long exchange as a program staff from Relief International-Azerbaijan, 2007
- Alumni Continuing Education Training on “Proposal Writing” IREX, One Continuing Education Unit from George Mason University. Virginia, USA, 2006
- Course on “Academic Writing and Basic Research Issues” organized by the Caucasus Research Resource Center. Baku, Azerbaijan, 2006
- Workshop on “Monitoring and Evaluation” organized by INTRAG. Harnosand, Sweden, 2005
- Winner of “Consolidated Budget Competitions for AGT Communities” organized by BTC Company. Ganja, Azerbaijan, 2005
• Project Smile Grant recipient, US Department of State and IREX. Baku, Azerbaijan, 2006
• Project Smile Grant recipient, US Department of State and IREX. Baku, Azerbaijan, 2005
• Pi Sigma Alpha, the National Political Science Honor. Minnesota, USA, 2003
• Dean’s List, Minnesota State University Moorhead, Fall 2002 and Spring 2003
• Certificate in recognition of academic achievement and participation in the Fifth Annual Student Academic Conference. Minnesota, USA, 2003
• First Recipient of the Azerbaijan Society of America’s Young Leaders Scholarship. Washington, DC, USA, 2003
• Certificate in recognition of cooperative and active participation in multilateral diplomacy. Arrowhead Model UN Conference. Michigan, USA, 2003
• Certificate in recognition of cooperative and active participation in multilateral diplomacy. Arrowhead Model UN Conference. Minnesota, USA, 2002

OTHER

• Author of 9 training manuals, 5 articles and 7 research briefs
• Specialized in technology-enhanced education, instructional design, curriculum, instruction, and assessment, educator professional learning
• Co-founder of an educational consulting company “EduInt”, working mainly with Azerbaijanis wishing to study abroad
• Author of the “Young Scholars and Financial Literacy” competition held among young scholars of Azerbaijan. This competition was administered by the Central Bank of Azerbaijan, the Science Development Foundation under the President of the Republic of Azerbaijan, and Savings Banks Foundation for International Cooperation
• Author of the “Life Skills and Financial Literacy” and “Save Today, Safe Tomorrow” competitions held among teachers and students respectively. Both competitions were administered by the Central Bank of Azerbaijan and Ministry of Education

LANGUAGES

Fluent in Azeri, English, Russian, good command of Turkish and German

COMPUTER SKILLS

Efficient command of all Microsoft Office 2016 applications, SPSS, Dedoose, Adobe Acrobat, Photoshop, Moodle, ExeLearning, Movie Maker, Internet and e-mail
REFERENCES

Available upon request