

Instructional Considerations to Promote Technology Integration Skills and  
Knowledge Transfer from Instructional Technology Courses at Kuwait University  
into Classroom Teaching: A Design and Development Study

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**ABSTRACT**

In order to address the problem of newly hired teachers' failure to transfer technology integration knowledge and skills, this study used a developmental research approach in which, factors of knowledge transfer were operationalized through using The First Principles of Instructions (Merrill, 2002) to form a set of instructional considerations to promote the transfer of technology integration knowledge and skills from the learning setting to the application setting. A panel of expert reviewers from Kuwait and United states validated these considerations and led the revisions process. This study describes the development process of the instructional considerations, the expert review, and the revision of the final product.

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**GENERAL AUDIENCE ABSTRACT**

Newly hired teachers in the Kuwaiti context often fail to transfer knowledge and skills of technology integration from instructional technology courses to in classroom teaching. Research in knowledge transfer has identified factors that can promote the transfer of skills and knowledge from the learning context to the application context. These factors showed their effectiveness in technology integration literature. This study used a developmental research approach in which factors of knowledge transfer were operationalized through using The First Principles of Instructions (Merrill, 2002) to form a set of instructional considerations to promote the transfer of technology integration knowledge and skills from the learning setting to the application setting. A panel of expert reviewers from Kuwait and United states validated these considerations and led the revisions process. This study describes the development process of the instructional considerations, the expert review, and the revision of the final product.

**Dedication**

To Mom, Dad, Talal, and Shahad

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## TABLE OF CONTENTS

<b>ABSTRACT</b> .....	<b>II</b>
<b>GENERAL AUDIENCE ABSTRACT</b> .....	<b>III</b>
<b>DEDICATION</b> .....	<b>IV</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>V</b>
<b>LIST OF FIGURES</b> .....	<b>IX</b>
<b>LIST OF TABLES</b> .....	<b>X</b>
<b>CHAPTER 1 INTRODUCTION AND NEED FOR THE STUDY</b> .....	<b>1</b>
<i>Need for the Study</i> .....	3
<i>Study Purpose</i> .....	4
<i>Research Questions</i> .....	4
<i>Benefits of the Study</i> .....	4
<i>Organization for the Study</i> .....	4
<b>CHAPTER 2 LITERATURE REVIEW</b> .....	<b>6</b>
INTRODUCTION .....	6
<i>The Kuwaiti Educational Context</i> .....	6
Technology integration approaches .....	8
ISTE Standards .....	9
KNOWLEDGE TRANSFER.....	9
TECHNOLOGY INTEGRATION .....	20
KNOWLEDGE TRANSFER AND THE TRANSFER OF TECHNOLOGY INTEGRATION SKILLS .....	26
<i>Evidence Supporting the Prior Knowledge Factor</i> .....	26
<i>Evidence for the Context of Application Factor</i> .....	27
<i>Evidence Supporting the Modeling Factor</i> .....	28
<i>Evidence Supporting the Peer-Coaching Factor</i> .....	29
<i>Evidence Supporting the Scaffolding Factor</i> .....	29
<i>Evidence Supporting the Self-Efficacy Factor</i> .....	30
OPERATIONALIZATION.....	31
CONCLUSION.....	31
<b>CHAPTER 3 RESEARCH METHODOLOGY</b> .....	<b>34</b>
INTRODUCTION .....	34
RESEARCH DESIGN: DESIGN AND DEVELOPMENT RESEARCH .....	34
<i>Procedures:</i> .....	36
<i>Operationalizing the Knowledge Transfer Factors in the Considerations</i> .....	38
<i>Validation of Considerations</i> .....	38
<i>Evaluation Rubric</i> .....	39
<i>Presentation of the Instructional Considerations</i> .....	40
<i>Conclusion</i> .....	40
<b>CHAPTER 4 RESULTS OF THE DESIGN AND DEVELOPMENT OF THE INSTRUCTIONAL CONSIDERATIONS</b> .....	<b>42</b>
CONSIDERATIONS DESIGN AND DEVELOPMENT.....	43
OPERATIONALIZATION OF KNOWLEDGE TRANSFER FACTORS.....	43
<i>Operationalizing the Prior Knowledge Factor</i> .....	44
<i>Operationalizing Prior Knowledge with First Principles of Instruction</i> .....	44

<i>Instructional Considerations of the Prior Knowledge Factor</i> .....	45
<i>Operationalizing the Context of Application Factor</i> .....	45
<i>Operationalizing Context of Application with First Principles of Instruction</i> .....	45
<i>Instructional Considerations of the Context of Application Factor</i> .....	46
<i>Operationalizing the Modeling Factor</i> .....	47
<i>Operationalizing Modeling with First Principles of Instruction</i> .....	47
<i>Instructional Considerations of the Modeling Factor</i> .....	47
<i>Operationalizing the Peer-Coaching Factor</i> .....	48
<i>Operationalizing Peer-Coaching with the First Principles of Instruction</i> .....	48
<i>Instructional Considerations of the Peer-Coaching Factor</i> .....	48
<i>Operationalizing the Scaffolding Factor</i> .....	49
<i>Operationalizing Scaffolding with First Principles of Instruction</i> .....	49
<i>Instructional Considerations of the Scaffolding Factor</i> .....	49
<i>Operationalizing the Self-Efficacy Factor</i> .....	50
<i>Operationalizing Self-Efficacy with First Principles of Instruction</i> .....	50
<i>Instructional Considerations of the Self-Efficacy Factor</i> .....	50
<i>Summary of the Initial Form of the Developed Instructional Considerations</i> .....	51
Summary of operationalizing.....	52
<i>Design and Conduct of the Formative Evaluation</i> .....	53
CONCLUSION.....	54
<b>CHAPTER 5 RESULTS OF EXPERT REVIEWS .....</b>	<b>55</b>
INTRODUCTION .....	55
QUALITATIVE DATA ANALYSIS .....	55
ANALYSIS RESULTS .....	56
CHANGES .....	57
<i>Category 1: Design</i> .....	57
<i>Modifications Based Upon the Design Category</i> .....	59
<i>Category 2: Content</i> .....	59
<i>Modifications Based on the Content Category</i> .....	61
<i>Category 3: Application</i> .....	61
<i>Modifications Based Upon the Application Category</i> .....	62
REVISION SUMMARY .....	62
OVERALL PERCEPTION .....	65
<i>Design and Conduct Summative Evaluation</i> .....	66
CONCLUSION.....	66
<b>CHAPTER 6 OBSERVATIONS AND SUMMARY .....</b>	<b>67</b>
PURPOSE OF THE STUDY .....	67
STUDY SUMMARY .....	67
STUDY CONTRIBUTIONS .....	68
STUDY LIMITATIONS.....	69
NEXT STEPS .....	69
<b>REFERENCES.....</b>	<b>70</b>
<b>APPENDIX A EXPERT FEEDBACK OVERVIEW .....</b>	<b>77</b>
<b>APPENDIX B EVALUATION RUBRIC .....</b>	<b>80</b>
<b>APPENDIX C IRB APPROVAL.....</b>	<b>83</b>
<b>APPENDIX D EXPERT REVIEW REQUEST .....</b>	<b>85</b>

<b>APPENDIX E MODIFIED VERSION OF THE KNOWLEDGE TRANSFER FACTORS.....</b>	<b>86</b>
<b>APPENDIX F KNOWLEDGE TRANSFER STUDIES AND THEIR RESEARCH BASED EVIDENCE .....</b>	<b>88</b>
<b>APPENDIX G MODIFIED OPERATIONALIZATION MATRIX .....</b>	<b>91</b>
<b>APPENDIX H OPERATIONALIZATION FORM OF THE KNOWLEDGE TRANSFER FACTORS.....</b>	<b>92</b>
<b>APPENDIX I CONSIDERATIONS TO PROMOTE THE TRANSFER OF TECHNOLOGY INTEGRATION SKILLS AND KNOWLEDGE FROM INSTRUCTIONAL TECHNOLOGY COURSES TO IN CLASSROOM TEACHING .....</b>	<b>99</b>

### List of Figures

Figure 1. Literature review procedure and results. ....	33
Figure 2. Target diagram, which illustrates the entire research design. ....	41
Figure 3. Diagram presenting the categories for the expert reviewer feedback. ....	57

## List of Tables

Table 1 Expert Reviewers .....	39
Table 2 Prior Knowledge Factor Summary .....	44
Table 3 Context of Application Factor Summary .....	45
Table 4 Modeling Factor Summary .....	47
Table 5 Peer-Coaching Factor Summary .....	48
Table 6 Scaffolding Factor Summary .....	49
Table 7 Self-Efficacy Factor summary .....	50
Table 8 Operationalization Matrix .....	53
Table 9 Summary of Instructional Consideration Revisions .....	63
Table 10 Expert Feedback Overview .....	77
Table 11 Modified Version of the Knowledge Transfer Factors and their Related Instructional Actions .....	86
Table 12 Knowledge Transfer Studies and their Research Based evidence from the Technology Integration Literature. ....	88
Table 13 Modified Operationalization Matrix .....	91
Table 14 Explains How Each Action of the Identified Knowledge Transfer Factors are Associated with One or More Corollaries of the First Principles of Instructions.....	92

## Chapter 1

### Introduction and Need for the Study

The call to prepare teachers more effectively with the skills they need to employ modern technology in K-12 classrooms is regularly heard in the present era of ever-more-rapidly advancing technology. Historically, instructional technology's influence on teaching practices for K-12 started with the opening of the first School Museum in 1905 (Reiser, 2001). This gave instructors the opportunity to rent a variety of teaching aids to assist them in their work (Reiser, 2001). Interest for implementing technology in K-12 teaching practices has continued to rise ever since, with advances taking place in many areas. For example, with the emergence of motion picture film in the early 20th century, a number of universities and colleges in the United States offered courses to prepare pre-service teachers in the use of film projectors in their classrooms (Reiser, 2001). Moreover, the influence of technology on K-12 teaching blossomed rapidly with progress in personal computing systems and the internet in the 1990s (Bauer & Kenton, 2005; Stallard & Cocker, 2001). As a result, many countries formed and implemented proposals for integrating technology into their national education systems.

Within Kuwait, similarly to other Gulf states, teacher education programs, plans, and projects concerned with technology integration often fall under the influence of standards developed by international education organizations such as the World Bank Group (WBG), the Council for the Accreditation of Educator Preparation (CAEP), and the International Society for Technology in Education (ISTE). For instance, the cooperation between the Kuwaiti government and the WBG began in the mid-70s and continues to the present day. This arrangement involved building a strategy to support the Kuwaiti government's public sector policy reforms. As a result, the National Center for Education Development (NCED), which is affiliated with the Ministry of Education (MoE) in Kuwait, worked in partnership with the WBG to support the effective implementation of Information and Communication Technologies (ICTs) in education systems. This was effectuated via advanced projects, research and knowledge-sharing activities to strengthen the practices of both teaching *and* learning. According to the WBG, "Technology can enhance the effectiveness of teachers and can allow students to learn at their own pace." (World Bank Education Overview, 2018, para 1, p. 1). Teacher education programs in Kuwait, and other countries in the region, seek accreditation for their programs from well-known organizations such as the CAEP. The CAEP has emphasized the importance of integrating technology into

teacher education programs and in preparing pre-service teachers to effectively employ technology when they graduate. As such, the CAEP wove technology integration throughout their Accreditation Standards and Evidence doctrine to reflect the commission's perspective on the importance of technology in K-12 teaching. CAEP technology integration standards are based upon the recent ISTE standards. Therefore, Kuwait's Ministry of Education and the teacher preparation program at Kuwait University designed their technology integration goals according to the ISTE student and educator standards. With their ground-breaking effort to create the National Educational Technology Standards for Students and Educators, the ISTE stressed the importance of integrating technology into K-12 classrooms and better preparation for teachers to implement this technology into their instructional practices. These standards have encouraged teacher education programs in Kuwait and elsewhere to revise their technology integration efforts so that they adhere to international standards (Aldhafeeri, Almulla & Alraqas, 2006; Brenner & Brill, 2016; Mohammad, Mansour, & Wegerif, 2011, Riegel & Tong, 2017).

The primary goal for these 'technology infusion projects' is to produce methods within teacher education programs for promoting the transfer of technology integration knowledge and skills into the K-12 classroom where technology is used to help facilitate teaching and learning (Mohammad et al., 2011; Lei, 2009). As a result, teacher education programs include courses that cover the classroom use of technology; the aim being to prepare teachers to effectively integrate it into their future instructional practices (Ottenbreit-Leftwich et al., 2012). From a review of the relevant literature, it can be inferred that studies have measured and evaluated a multitude of instructional methods and practices — many of which have the potential to promote the transfer of technology integration knowledge and skills, derived from these instructional technology courses, into K-12 teaching practice (Adamy & Boulmetis, 2005; Deng, Chai, So, Qian, & Chen, 2017; Kimmons, Merrill, Amador, David, & Cassidy, 2015; Singer & Maher, 2007; Wang & Newby, 1999).

Perkins and Salomon (1988, 1994) defined transfer as the ability to apply knowledge and skills learned in one context into others that share similar characteristics. That is, 'positive transfer' takes place when learning in one situation improves performance in another (Foley & Kaiser, 2013; Perkins & Salomon, 1994). The inverse corollary, of course, is that 'negative transfer' occurs when learning in one context either negatively affects or fails to assist learning in another (Perkins & Salomon, 1994; Foley & Kaiser, 2013).

The ultimate goal for educators is to enable their students to apply the skills they learn in the classroom to situations elsewhere (Brenner & Brill, 2016; Foley & Kaiser, 2013; Pepper, Blackwell, Monroe & Coskey, 2012). However, decades of empirical research indicate that this critical effort frequently falls short of its intended objective (Billing, 2007; Brenner & Brill, 2016; Ford, 1994; Perkins & Salomon, 1994).

### **Need for the Study**

There is a demand for teachers in Kuwait who can effectively employ technology in their classrooms to meet international education standards. Therefore, Kuwait's only public university, Kuwait University, offers instructional technology courses intended to provide pre-service teachers with the knowledge and skills they need to integrate technology effectively into their future classroom practices. Nevertheless, a comprehensive review of current literature indicates that new teachers often found university technology training courses unrelated to their actual teaching situations and failed to integrate technology into their classroom practices as a result (Al-Awidi & Aldhafeeri, 2017; Aldhafeeri, Palaiologou, & Folorunsho, 2016; Ottenbreit-Leftwich et al., 2012; Riegel & Tong, 2017).

However, studies also suggest that when teachers work towards effective knowledge transfer, their students are better able to apply learned knowledge and skills to other problems and situations (Amy & Rutherford, 2010; Billing, 2007; Foley & Kaiser, 2013; Ford, 1994; Pepper, Blackwell, Monroe, & Coskey, 2012).

A significant number of sources in the literature review revealed studies that have measured and evaluated factors and features which have the potential to promote the transfer of technology integration knowledge and skills, from instructional technology courses and teacher preparation programs, into the classroom environment (Adamy & Boulmetis, 2005; Aldhafeeri et al., 2006, 2016; Al-Awidi & Aldhafeeri, 2017; Deng, Chai, So, Qian, & Chen, 2017; Kimmons, Merrill, Amador, David, & Cassidy, 2015; Singer & Maher, 2007; Wang & Newby, 1999). As such, there is clearly a need for developing a set of instructional considerations to effectuate the transfer of knowledge and skills for technology integration based upon this currently existing research. This study may therefore fill a gap in the literature. It will also help inform teacher educators at Kuwait University regarding how best to deliver instructional technology courses to effectively facilitate and promote the transfer of knowledge and skills concerning technology integration from theory into practice.

## **Study Purpose**

The purpose of this design and development study was to develop instructional considerations to promote the transfer of technology integration knowledge and skills from a pre-service teacher's instructional technology courses at college, into their classrooms once they begin working professionally. A comprehensive review of relevant academic literature helped to produce these considerations which should be easy to implement for teacher educators delivering instructional technology courses at Kuwait University. Information from this study will also lead to the planning, design, and delivery of instruction in a manner that promotes the transfer of knowledge and skills from one context into another.

## **Research Questions**

1. What are the factors that promote knowledge and skills transfer of instructional technology integration?
2. How can the features of instructional strategies and the factors of knowledge transfer be operationalized to promote the transfer of technology integration from instructional technology courses to K-12 practices?

## **Benefits of the Study**

The benefits of this study include informing teacher educators at Kuwait University, and other similar institutions, about how best to teach technology integration and skills for transfer.

## **Organization for the Study**

Chapter 1 offers background information regarding the study, its purpose statement, associated research questions, justifications for conducting it, and any potential benefits it may engender. Chapter 2 provides a review of the literature related to this study; it is split into four distinct parts. The first section addresses the context of the study; this includes an overview of Kuwait's education system, the teacher preparation program at Kuwait University and its instructional technology courses, as well as the required technology integration standards for both the Kuwaiti MoE and the College of Education at Kuwait University. The second section addresses the topic of knowledge transfer - first by defining it, then following with a review of factors known to influence the ability of an individual to transfer knowledge from one application to another within the same or similar context. The third section discusses technology

integration; defining its meaning in relation to the field of education, and its context within this study. The fourth section is essentially an amalgam of the previous two. It describes knowledge transfer and technology integration in context with one another by highlighting the factors which promote the transfer of technology integration skills from a learning situation into their practical application as identified by empirical research. The chapter concludes with a summary of the literature review and the need for instructional considerations to promote the transfer of technology integration skills. Chapter 3 presents information regarding the methodology behind this study. It includes details about the study instrument itself, its design, participants, data collection and analysis procedures. Chapter 4 discusses the design and development of the instructional considerations and their operationalization. Chapter 5 includes analyses derived from expert reviewer evaluations and the resultant modifications to the developed instructional considerations. Chapter Six discusses this study's observations, where the study stands amidst other research in the field of instructional design and technology, and how it contributes to the field's knowledge base.

## **Chapter 2**

### **Literature Review**

#### **Introduction**

The purpose of this study was to develop instructional considerations for teacher educators in the College of Education at Kuwait University. The instructional considerations were designed to promote the transfer of technology integration skills and knowledge, gained from instructional technology courses, into a teacher's classroom practices. Chapter 2 examines literature related to this design and development study, as already discussed in Chapter 1. The first section focuses on the contextual profile of the Kuwaiti educational system and its efforts to integrate technology within the canon, and prepare teachers to use it in their classrooms. The second section concentrates on knowledge transfer by first defining it and its various subtypes, then by describing factors for promoting it and mechanisms for its application. The third section focuses upon technology integration by first reviewing how the term is defined in the educational field, and then presenting empirical data from research related to technology integration which supports factors that promote knowledge transfer. And finally, the chapter concludes by identifying the need for instructional considerations for teacher educators at Kuwait University and how factors which promote knowledge transfer, along with research-based evidence of technology integration, will contribute to the design of said considerations.

#### **The Kuwaiti Educational Context**

This section explores the Kuwaiti educational context, the Kuwaiti government's efforts to provide quality education, and teacher preparation programs in Kuwait.

Kuwait, like many other nations, seeks to offer high quality, advanced education to its citizens in order to achieve the nation's future goals and provide the labor market with what it needs to thrive. Public schooling in Kuwait is free for Kuwaiti citizens; this includes K-12 and tertiary education. The Ministry of Education (MoE) is responsible for administering K-12 schooling, which includes nursery/kindergarten (children ages 4 - 6), primary (for those ages 6 - 11), intermediate (11 - 14 years old) and secondary (14 - 18 years old) (Aldhafeeri et al., 2016). Kuwait's Ministry of Higher Education (MoHE) is responsible for running the nation's public tertiary education system. Their domain includes Kuwait University, the College of Basic Education, the Higher Institute for Theater Arts, and the Higher Institute for Music Arts. The

Kuwaiti government has endeavored to improve the educational system by collaborating with international and global organizations and by following international standards for teaching and learning in the 21<sup>st</sup> century. As an example of this effort, Kuwait's MoE has worked with the WBG to create plans for improving the nation's education system.

Similarly, to other Gulf nations, Kuwait initiated educational reform in 1998 to improve K-12 public school education, with plans extending into 2025 (Mohammad et al., 2011). These undertakings emphasized the importance of cultivating better classroom teaching practices to meet global standards for teaching and learning in the 21<sup>st</sup> century (Mohammad et al., 2011). As the teacher is considered the essential element in the educational system, Kuwait's national curriculum standards stress that teachers must, “ employ teaching and learning methods that integrate innovative and research-proven teaching strategies, modern learning technologies and utilize real-world resources and contexts.” (Ministry of Education, 2015, p.108). Therefore, the MoE launched a number of initiatives and updated requirements to encourage K-12 teachers to integrate technology into their teaching practices. For example:

- Teachers in Kuwaiti public schools must obtain an International Computer Driving License (ICDL). (Al shirija & Qablan, 2012).
- The MoE provides electronic devices for teachers to use at school, including computers, tablets and digital projectors.
- National curriculum books are now available in a digitized format.
- Public schools are now provided with internet access.
- There is now a network between all Kuwaiti schools, which eases communications between teachers and administrators, and allows for better cooperation between schools, teachers and learners.

The Kuwaiti MoHE plays the most important role in preparing and providing qualified teachers to the nation's K-12 public schools, offering teacher education programs at both the College of Education at Kuwait University and the College of Basic Education. In fact, most Kuwaiti K-12 teachers who serve in the nation's public schools have graduated from one of these two institutions (Aldhafeeri et al., 2016).

In this study, we will be concentrating solely on the teacher preparation program at Kuwait University's College of Education and its role in preparing pre-service teachers to meet the State of Kuwait Educational Reform's technology integration requirements.

### ***Kuwait University***

The College of Education at Kuwait University was established in 1981. It is tasked with providing the State of Kuwait with qualified teachers capable of fulfilling the nation's educational reform requirements by collaborating with local and international educational institutions and organizations. To earn a bachelor's degree in education and become a licensed teacher in Kuwait, students at the College of Education must complete 125 credit hours of coursework. These courses are divided between three key disciplines: (1) knowledge and skills of subject matter and curriculum (Content Knowledge); (2) knowledge of learner development; and (3) knowledge and skills of teaching methodologies (Alajmi & Mohammed, 1994). Competence for technology integration in teaching practice falls under section 3.

**Technology integration approaches.** Traditionally, most teacher preparation programs around the world apply one of two approaches to prepare pre-service teachers to employ technology effectively in their future teaching practices.

The first technique, although less commonly employed, is modeling. It is based upon the work of social learning theorists Bandura and Walters (1963) by valuing the role of modeling and imitation. With this method, pre-service teachers must receive effective models of technology integration within the university setting (Ottenbreit-Leftwich et al., 2012; Parra, Raynor, Osanloo & Guillaume, 2019; Koch, Heo & Kosh, 2012). This means that teacher educators must feature a diversity of technological aides, and their implementation, within each course of the teacher preparation program.

The second approach consists of standalone instructional technology courses. Normally, teacher educator programs offer three to six credit hours of instructional technology courses (Ottenbreit-Leftwich et al., 2012; Parra, Raynor, Osanloo & Guillaume, 2018). Parra, Raynor, Osanloo and Guillaume (2018) stated that: "often, Educator Preparation Programs provide a single course for classroom technology integration" (p. 68). Commonly, the learning objectives for both methods are mapped according to the ISTE standards. The College of Education at Kuwait University follows the standalone approach, and its goals and objectives are based upon the recent ISTE standards for educators.

The teacher preparation program at Kuwait University offers 12 credit hours of instructional technology divided between four different, three-credit-hour courses. Of these twelve credits hours, half involve mandatory instructional technology courses, while the other

half are elective. Like most other teacher preparation programs, the course learning objectives are mapped according to the most recent ISTE standards.

**ISTE Standards.** These standards are a product of the International Society for Technology in Education (ISTE). The organization released the National Educational Technology Standards for Students (NETS\*S) in 1998 and, two years later, the National Educational Technology Standards for Teachers (NETS\*T) (ISTE, n.d). Following those initial documents, ISTE has regularly updated standards to accommodate rapid changes in technology (Trust, 2018). The most recent revisions date from 2017; they have moved “from teaching with technology to using technology to empower learners” (Trust, 2018). ISTE cooperates with institutions and organizations around the globe to promote the effective use of technology in teaching and learning practices.

Currently, ISTE is collaborating with The Arab Bureau of Education for the Gulf States; Kuwait is an active participant in that arrangement. As a result, the technology integration skills and knowledge required within the instructional technology courses offered at Kuwait University accommodate the most recent ISTE standards.

To achieve the goal of providing teachers with effective technology integration skills, there is a need to define what ‘knowledge transfer’ actually is and what factors best promote it.

### **Knowledge Transfer**

A successful education program strives to enable its students to apply and perform the knowledge and skills they acquire within the ‘learning’ context into other situations (Brenner & Brill, 2016; Foley & Kaiser, 2013; Pepper et al., 2012). However, for decades, empirical research has demonstrated that this goal is rarely achieved (Billing, 2007; Brenner & Brill, 2016; Ford, 1994). To avoid a ‘failure of transfer’ and to achieve the educator’s ultimate goal, researchers from educational and psychological fields have sought to define ‘knowledge transfer’, study its mechanisms, and determine the various factors and principles which can promote successful knowledge and skill transfer.

For around three decades, David Perkins and Gavriel Salomon demonstrated an extensive interest in examining the concept of knowledge transfer. Perkins and Salomon (1988, 1994) defined it as the ability to apply learned knowledge and skills in other contexts that share similar characteristics with the original learning context (Perkins & Salomon, 1988,1994). In their definition, context is a central element for successful transfer. They explained, for instance, that a

person who learned and mastered the skills for driving a car is likely capable of also driving a truck, because there are similarities between the two contexts (Perkins & Salomon, 1994).

Another definition of knowledge transfer comes from Ford (1994), who recognized the growing interest in ‘failure to transfer’, or as he called it, “the transfer problem” (Ford, 1994). However, unlike Perkins and Salomon, Ford (1994) did not have a specific definition for ‘transfer’. Ford (1994) believed that ‘transfer’ is not a static term and that trying to define it as ‘the ability to apply solutions learned under one set of circumstances to those in others’ belies the complexity underlying the actual concept of knowledge transfer (Ford, 1994). Approaching the problem from this perspective, Ford (1994) asked four questions in order to better understand this complexity. With his initial question, he enquired about the *expectation of change* during a learning session. Then, he queried the required *attitude* and *setting* for applying this learned knowledge or skill. Thirdly, he asked about any *inhibitors* to successful transfer. And finally, he asked about the expected *time duration* required for a student to use and maintain this learned knowledge or skill. Clearly, from Ford’s standpoint, knowledge transfer is too complex to define with a single statement.

Ford (1994) essentially followed the same path as Scott (1970), who believed that ‘transfer of knowledge’ is an operation that involves a gradual process. From Scott’s (1970) perspective, this process is revealed through the application of *The Taxonomy of Educational Objectives* in the teaching practice. Scott (1970) specified two taxonomy categories that are synonymous with knowledge transfer: (1) *Comprehension* or *extrapolation* and (2) *Application*. Essentially, Scott (1970) defined knowledge transfer by describing it as an operation for accomplishing objectives such as ‘application’ and ‘extrapolation’ in the manner that they are illustrated within the *Taxonomy of Educational Objectives* (Scott, 1970).

Yet another definition for knowledge transfer comes from Mayer (2005), whose research interests are oriented around multimedia in an educational setting. Mayer defined knowledge transfer based upon the effects that multimedia can have upon knowledge acquisition. According to Mayer, for knowledge transfer to occur, “...learners must solve problems that were not explicitly given in the presented material - that is they must apply what they learned to a new situation.” (Mayer, 2001, p.16).

Researchers interested in studying knowledge transfer in adult learning settings have also attempted to define it. For example, Foley and Kaiser (2013) defined knowledge transfer as the

continuing ability to use the knowledge and skills acquired during a learning activity to other settings that share similarities to the initial situation (Foley & Kaiser, 2013). Botma, Rensburg, Coetzee and Heyns (2015) designed a framework aimed at promoting the transfer of knowledge in an adult educational setting. In their work, they defined transfer of learning as the degree to which students are able to perform a new task or job by employing previously learned behaviors, attitudes, and/or skills to other contexts or situations (Botma, Rensburg, Coetzee & Heyns, 2015).

Despite the time duration between the various definitions for knowledge transfer outlined above, and the different areas of research they emanated from, they all share some common traits. For example, each definition regarded context as an important component for transfer to occur. Moreover, these definitions all pointed to two specific details we must keep in mind when teaching for transfer: (1) the learning context and (2) the application context. Some definitions pointed to the similar characteristics between these contexts, such as the time and location of each situation and their roles in promoting transfer. Another similarity between definitions is the role of prior knowledge. For example, Ford (1994) and Botma et al. (2015) explained the process in which students use prior knowledge to solve problems. In conclusion, each definition agreed that for transfer to occur, students must be able to use learned knowledge and/or skills to perform a separate task that shares a level of correlation to the initial learning task.

### **Knowledge Transfer and Theories**

This section describes how various theories address and define knowledge transfer.

Woodworth and Thorndike's (1901) *Theory of Identical Elements* is the earliest effort to postulate a definition for knowledge transfer. The theory of identical elements illustrated, via a number of experiments, that effective transfer of learning occurs when the elements in the practice situation share commonalities with those in the performance situation (Thorndike & Woodworth, 1901); i.e. if characteristics of the learning context are similar to those of the application context, then transfer will occur.

Charles Osgood (1949) also developed a theory of transfer based upon behaviorist stimulus-response pairs. This theory identifies three states of knowledge transfer:

1. Positive transfer will occur when the stimulus-response pairs are identical at two sites.

2. Some degree of positive transfer will occur when the stimuli are dissimilar but the responses are the same at two sites.
3. No transfer will occur when stimuli are identical, but responses are different at two sites.

Brown (1990) and Anderson (1989) focused upon the cognitive side of learning transfer. They valued the meaning that knowledge embeds in the human mind, and how it is processed to foster transfer. For example, Brown (1990) explained: “When learning can be organized around a guiding principle...transfer is determined by the extent to which the learner understands the principle” (Brown, 1990, P.109). In other words, knowledge and learning must be stored within the brain in an organized manner for successful retrieval when the learned knowledge is required in another context.

Prenzel and Mandle (1993) reviewed constructivist theories, and wrote a chapter about them in their book. Their findings indicated that the term ‘transfer of learning ’did not occur in constructivist learning theories (Prenzel & Mandle, 1993). However, they also concluded that transfer was present in other concepts, such as problem solving and application (Prenzel & Mandle, 1993). From their perspective, these terms are used to explain the process of transfer and the application needed to employ this knowledge or skill in other situations.

Furthermore, researchers and theorists have asserted that there must be a distinction made between transfer and learning.

### **Transfer and Learning**

It is important to note that ‘transfer ’and ‘learning ’are often defined independently. For instance, Perkins and Salomon (1994) made subtle distinctions in their articles regarding the differences between ‘transfer of learning ’and ‘ordinary learning’. They showed that ‘ordinary learning ’occurs, for example, when a student demonstrates a certain grammatical skill in a language test, but fails to do so in everyday speech (Perkins & Salomon, 1994). In other words, the grammatical skill learned in language class did not travel to other situations or contexts beyond that class and its activities. However, ‘transfer of learning ’is demonstrated when that student is able to display skills or knowledge in a situation where there might be contextual differences from the initial learning experience, such as time and/or the physical setting (Perkins & Salomon, 1994). Returning to our previous hypothetical situation concerning ‘ordinary learning’; if a student actually demonstrates the acquired grammatical skill from language class

in everyday speech as well as under formal examination, then we can say that ‘transfer of learning’ has occurred. As such, Perkins and Salomon (1994) assert that *transfer of learning* is a process that, “...occurs when learning in one context or with one set of materials impacts performance in another context or with other related materials” (p. 6452). Greeno, Collins and Resnick (1996) concur with Perkins and Salomon (1994), echoing that there must be a clear distinction between *learning* and *transfer* processes which must be acknowledged when investigating or defining knowledge transfer. Accordingly, Greeno, Collins and Resnick (1996) defined *learning* as the procedure for acquiring knowledge and skills, and *transfer* as the implementation of that expertise in other situations. And it is the mechanism of knowledge transfer that explains *how* this gained knowledge or skill is applied to other contexts.

### **The Mechanism of Knowledge Transfer**

From the previous section, we can infer that *transfer* is a process. Researchers have explained the mechanism behind this process through their own investigations and by building upon the work of others with an extensive review of the appropriate literature.

Harry Scott (1970) was the first scholar to discuss the mechanism behind transfer, building from Bloom’s *Taxonomy of Educational Objectives* in his claim that the taxonomy provides an operational meaning for the transfer of knowledge.

However, Perkins and Salomon (1988) viewed knowledge transfer as a unique process; one which needs to be addressed carefully in order to enhance instructional practices and provide an effective learning experience. Therefore, Perkins and Salomon (1994) developed the *Low-Road/High-Road* framework to illustrate the mechanism behind knowledge transfer. This framework distinguishes between two types of knowledge transfer mechanisms, based upon the complexity of the learned knowledge or skill. The simpler mechanism, or *low-road transfer*, takes place, “...when stimulus conditions of the transfer context are sufficiently similar to those in a prior context of learning to trigger well-developed semiotic responses.” (Perkins & Salomon, 1994, P.6455). By comparison, *high-road transfer* requires complex cognitive skills and depends upon the mindful abstraction of expertise from the learning experience to the context of its application (Perkins & Salomon, 1994). Therefore, *high-road transfer* is the more demanding process, because it requires more time, deeper exploration, and a significant investment of mental effort to execute (Perkins & Salomon, 1988, 1994).

The *low-road/high-road* framework relates somewhat to Edward Thorndike's 'identical elements theory' discussed earlier, because each concept acknowledges the significant role that the similarities between the *learning* and *transfer* contexts can play.

### **Types of Knowledge Transfer**

Empirical research efforts delving into the concept of knowledge transfer have constructed various mechanisms for its execution based upon several factors, such as the type of knowledge to be learned, the degree of complexity in the application context, the elapsed time between learning and transfer, and the degree of similarity between the learning setting and the application setting. Examples of knowledge transfer include positive transfer, negative transfer, zero transfer, near transfer, far transfer, lateral transfer, vertical transfer, immediate transfer, delayed transfer, and sustained transfer.

***Positive, Negative and Zero Transfer.*** Prior knowledge and previous experiences are key to these transfer types. 'Positive transfer' happens when learning in one situation improves performance in another (Perkins & Salomon, 1994; Foley & Kaiser, 2013). For instance, empirical research indicates that students find it easier to learn languages that are related to their native tongue (Perkins & Salomon, 1994). However, with negative transfer. Prior knowledge plays an opposite role, i.e. when learning in one context negatively affects performance in another (Foley & Kaiser, 2013). For example, research indicates that students commonly apply crude approximations of phonetics from their native dialect to those of the new language they are trying to learn (Perkins & Salomon, 1994). When negative transfer occurs, the learner struggles to apply prior knowledge in another context because of the contrary experiences (Foley & Kaiser, 2013). 'Zero transfer' means that prior knowledge in one discipline neither supports nor hurts the process of acquiring new knowledge or skills in another (Perkins & Salomon, 1994). For example, learning how to use a computer pointing device has no effect, either positive or negative, on the ability to learn history.

***Near and Far Transfer.*** Near transfer means that there are many similar characteristics between the learning and application contexts (Detorman, 1993; Perkins & Salomon, 1994; Foley & Kaiser, 2013). For example, near transfer can occur when students face a collection of examination questions which they have already practiced in previous homework assignments (Perkins & Salomon, 1994).

Far transfer means that the original learning context is significantly dissimilar to the implementation context (Determan, 1993). For example, a student might learn a mathematical skill and then use that acquired knowledge to design an electrical circuit (Foley & Kaiser, 2013).

***Lateral and Vertical Transfer.*** Lateral transfer occurs when the transfer of knowledge or skills occurs between two tasks that share similar degrees of complexity (Determan, 1993). This means that there is no need for additional learning when applying the acquired skill or knowledge to another context. For example, this can take place when a student solves a previously studied mathematical problem which involves a different set of numbers to the initial experience.

Vertical transfer refers to the transfer of expertise from one experience to another of greater complexity (Determan, 1993). This type of transfer implies that a degree of intuitive learning has taken place in the application of expertise garnered in one context, to that in another of higher complexity.

***Immediate and Delayed Transfer.*** Immediate transfer refers to the measurement of a learned task or skill by its immediate application after the learning session (Mariano, 2008). In contrast, 'delayed transfer' refers to the measurement of transfer some distance in time after the learning session (Mariano, 2008). The key factor in this type of transfer is the elapsed time between gaining new expertise and its later application.

***Transient or Sustained Transfer.*** Transient transfer of knowledge refers to embedding the knowledge or skill derived from a learning experience into everyday working memory (Rappolt-Schlichtmann, Tenenbaum, Koepke & Fischer, 2007). However, sustained transfer refers to the transfer of knowledge from working memory into long-term memory. This can occur when students are provided with greater opportunity to practice the application of their newly-acquired know-how in a supportive learning environment (Rappolt-schlichtmann et al., 2007). For example, Schlichtmann et al. (2007) studied how sustained transfer occurred when teaching the principles about density to young learners in a science course. The researchers measured the level of sustained transfer that the students experienced by listening to the reasoning behind their understanding of what makes some objects float in water while others sink.

### **Factors that Promote Knowledge Transfer**

Knowledge Transfer does not take place in isolation; it requires a carefully calibrated instructional program to facilitate the process (Botma, Rensburg, Coetzee, & Heyns, 2015; Brenner & Brill, 2016; Foley & Kaiser, 2013; Ford, 1994; Pepper, Blackwell, Monroe, & Coskey, 2012; Perkins & Salomon, 1994). A number of empirical studies have identified various factors, including the instructional process, methods and techniques, which influence the ability of an individual to transfer knowledge from one environment or context into another. In this section, the author has focused upon the most commonly studied factors involved in promoting knowledge transfer, and these include prior knowledge, situational context of application, modeling, peer-coaching, scaffolding, and the level of self-efficacy.

**Prior Knowledge.** Activating prior knowledge and assessing if it actually resides in a student's memory is one of the most important variables in knowledge transfer. By reviewing a number of empirical studies, Billing found that prior knowledge, "...is important in the acquisition of new knowledge, and has a substantial impact on the learning and transfer processes" (Billing, 2007, p. 500). Volcke's suggestion (as cited in Billing, 2007) that prior knowledge is important in reducing the cognitive load by making schemata more readily available (Billing, 2007). Moreover, Botma (2015) and his colleagues emphasize the importance of prior knowledge in their four step framework which aims to promote transfer of learning on a modular level (Botma et al., 2015). In this model, they indicated that prior knowledge must be retrieved before students can link a new situation to the previous one (Botma et al., 2015). Therefore, before presenting the new material, educators must identify the existing knowledge their students possess, and provide them with opportunities to link the new learning experiences to previous efforts. This means that transfer of knowledge is facilitated when the student has similar representations for both the initial *and* the target tasks, and can therefore process them in similar ways (Billing, 2007). Moreover, cognitive learning theories have highlighted the need for prior knowledge to be organized in the working memory in order to benefit from its example in solving the new problem (Billing, 2007).

**Context of Application.** Providing students with the opportunity to display their prior knowledge is a significant factor in knowledge transfer, according to the published literature, as is the type of context where the application of this knowledge will take place. For it to be worthwhile, application must occur within a certain context; therefore, it is reasonable to discuss

these two factors as one. Perkins and Salomon (1994) asserted that extensive practice of the learned knowledge in various contexts is a vital condition for successful transfer.

Similarly, Ford (1994), as discussed previously when defining knowledge transfer, noted that there are required attitudes regarding certain types of knowledge and the situations that these attitudes should serve. Ford encouraged teachers to fully address this question before building their syllabi, because it is crucial to the design of any application activity in the student learning environment. Therefore, Ford (1994) made a distinction between direct application and indirect application regarding learning outcomes. Direct application refers to the implementation of learned knowledge in the precise situation or activity where the initial learning took place, whereas indirect application refers to the student's ability to take this learned expertise and display it in a variety of new situations (Ford, 1994).

In his review of empirical research data from other studies, Billing (2007) showed that transfer occurs when general principles of reasoning are addressed, along with in-class practices, for a variety of contexts (Billing, 2007). Essentially, this implies that the student must recognize the constraints surrounding the application of learned knowledge and when it is appropriate to employ this expertise (Billing, 2007). Transfer of knowledge is more likely to occur if a student receives examples and non-examples for the application of a particular expertise, combined with the principles and conditions where its employment is an effective strategy, an application opportunity as it were. Such application opportunities are clearly important for the fostering of knowledge transfer, and a teacher must design them carefully for the learning environment in order to represent real world contexts, so that students become aware of the principles and rules undergirding their use.

**Modeling.** Teaching students by using models and/or modeling is a productive tool for affecting knowledge transfer (Billing, 2007; Greeno, Collins & Resnick, 1996). Modeling is an instructional technique where a teacher demonstrates new knowledge to their students, and they learn by observation. In a mixed-method study, Pepper and his colleagues (2012) examined the influence of modeling active learning strategies in one of the foundational teacher education courses (Pepper et al., 2012). The study's findings revealed that there was a significant difference with a pre-service teacher's acquisition of curriculum content in the course sections that incorporated active learning (Pepper et al., 2012). Moreover, pre-service teachers were able to transfer active learning strategies from their learning context to pre-K through 12<sup>th</sup> grade

classrooms, noting that these were effective techniques (Pepper et al., 2012). In another empirical study Rappolt-Schlichtmann and his colleagues (2007) found that modeling provides an important contextual support technique for enabling knowledge transfer in the classroom (Rappolt-schlichtmann et al., 2007). Richey, Klein and Tracey (2011) explained that teachers, their colleagues, student peers, and others can serve as living examples of model behavior in learning and performance settings (Richey, Klein & Tracey, 2011). They also identified two specific modeling techniques: live modeling and symbolic modeling. Live modeling refers to the teachers themselves presenting their knowledge, whereas symbolic modeling involves the use of pictures, cartoon images and avatars; as used frequently in electronic media (Richey, Klein & Tracey, 2011).

**Peer-coaching.** Regarding knowledge transfer, this technique is defined in the literature as, “an observation and feedback cycle in an ongoing instructional or clinical situation” (Joyce & Showers, 1981). Essentially, peer-coaching involves a teacher’s thoughtful reflection with respect to student progress during the learning and teaching process. Coaching can be employed in different forms, including ‘self-coaching’, instructional coaching, and peer-coaching (Joyce & Showers, 1981). However, in the area of knowledge transfer, peer-coaching is highly emphasized (Joyce & Showers, 1981; Ma, Xin, & Du, 2018). Peer-coaching promotes vertical knowledge transfer, because applying the learned skill itself will involve the development of new understanding for where and how to apply that skill in a new context (Joyce & Showers, 1981). Peer-coaching is also important because it develops a common language that can be shared amongst students related to the learned skill or knowledge (Showers, 1985). The process of peer-coaching involves feedback, the sharing of expertise and support to enhance the transfer of learning (Ma et al., 2018). Recently, Ma, Xin and Du conducted a study to examine the effectiveness of a peer-coaching-based personalized learning approach upon the professional development of in-service teachers. They found that peer-coaching was far more effective than guidance from experts at improving in-service teachers’ learning and in-practice abilities (Ma et al., 2018).

**Scaffolding.** This is one of the basic tools that facilitates knowledge and skill transfer from one context to another, especially when the instructor intends to transfer expertise from transient understanding to sustained knowledge. (Foley & Kaiser, 2013; Lajoie, 2005). Foley & Kaiser explain the process of scaffolding, within the field of knowledge transfer, noting that,

“...a learning experience is a combination of ensuring that the learning environment, instructional plan, supporting resources, and instructional delivery are structured in a manner that best supports learning” (Foley & Kaiser, 2013, p. 9). Scaffolding is a temporal strategy in the instructional context that must be employed under certain conditions to be effective (Lajoie, 2005). The instructor must decide when to provide scaffolding, how to employ it, and when to end the process after it is no longer needed (Lajoie, 2005). Scaffolding is provided, for example, when an instructor assists students in class by demonstrating part of a task in order to help them complete it within a contextual support environment (Rappolt-schlichtmann et al., 2007). Rappolt et al. (2007) conducted a study to examine when scaffolding is more effective. They concluded that scaffolding must be employed within a contextual-support-learning environment where students receive assistance from the instructor or their peers whenever needed.

***Establishing Self-Efficacy.*** Establishing self-efficacy increases the ability of students to successfully transfer knowledge and skills to other contexts (Billing, 2007). Self-efficacy, in this instance, essentially refers to student’s belief in their ability to successfully complete a task or apply skills. Therefore, establishing student self-efficacy is an important outcome that instructors must consider carefully when devising their lesson plans (Govaerts, Kyndt, Vreye, & Dochy, 2017).

Employing the previously mentioned factors which govern the transfer of knowledge enhances self-efficacy and student regulation. For example, Ma, Xin, and Du (2018) found when employing peer-coaching to promote transfer that student self-efficacy grows when they are coached by their peers. Moreover, researchers determined that a student’s positive beliefs about the value of their course and its goals enhances their self-efficacy and confidence (Billing, 2007; Ford, 1994). Therefore, it is essential for students to appreciate the value of the knowledge they are gaining and the benefits of the learning process they are involved in. For successful knowledge transfer, the instructor must establish self-efficacy through the employment of teaching strategies and techniques that lead to positive beliefs; supporting students when needed; making sure they understand the desired outcomes; and allowing them to engage in the learning process with their peers (Billing, 2007; Ford, 1994; Govaerts, Kyndt, Vreye, & Dochy, 2017; Ma, Xin, & Du, 2018).

## Technology Integration

This section explores the important historical events associated to the use of technology in education, what technology and integration actually mean in the educational context, and what technology integration refers to.

From a historical perspective, teaching methods have long developed alongside technology. Before the 20<sup>th</sup> century, the principal media used for delivering instruction included textbooks, chalkboards and the teachers themselves (Reiser, 2001). However, in the early 20<sup>th</sup> century, school museums played a role in teaching practice by providing teachers with the opportunity to rent instructional materials such as charts, 3D pictures and books. Later on, motion pictures came into play. Universities and colleges in the United States started offering courses that addressed the use of motion pictures for educational purposes. Moreover, Thomas Edison, proclaimed that books would become “obsolete” and learning would happen via motion picture films (Reiser, 2001). This never came to pass, of course, but it began the trend that, with the advent of a new technology, education would indeed be revolutionized (Reiser, 2001).

Technology has continued to affect educational practice, even playing a critical role in preparing Allied Forces in World War II. Indeed, as in other countries, there was a great emphasis on designing effective instruction films to help teach trainee combatants across the U.S.A. during the Second World War. With the introduction of broadcast television nationwide after the war, there was great interest in using the medium for instruction. As a result, more than 242 instructional channels became available for civilians. As with motion picture films before it, the advent of television promised an education revolution. However, instructors claimed correctly that it carried many expenses. Regardless, technology has sustained a strong influence upon both teaching and learning practices to the present day.

Technology, as a term, has broad connotations, so it is important for educators to both define its *meaning*, as it pertains to their field, and also the *philosophy* behind using technology to assist instructional practices and learning processes. Even so, a precise definition for technology remains elusive, because education researchers have such diverse interests; they study its implications and uses in many different areas. Some define technology as an artifact, while others see it as a process that leads to an outcome. The following review presents various ways in which technology is defined in the educational field.

In the late 19th century, the great philosopher of classical American pragmatism, John Dewey, presented many ideas on *Instrumentalism*, or *Inquiry Theory*; ideas which Larry Hickman categorized as a *Theory of Technology*. Indeed, Dewey's theory looked at the processes performed in the human mind as tools. He argued in his theory of instrumentalism that mental processes such as *coherence*, *consciousness* and *thinking* are functions of a complex organism (Dewey, 1938). Consequently, he perceived these processes to be tools or instruments employed to accomplish certain needs or goals. Moreover, Dewey did not regard concepts and theories as *abstracts*, but rather as *instruments*, with their efficiency distinguished by their description of a phenomenon (Dewey, 1953). As such, instrumentalism is essentially a philosophy that explains how something is used to achieve a particular purpose, or perform some kind of work, and that this something can be viewed as a tool, instrument, or technology (Hickman, 2009; Moore, 2006).

Moore (2006) presumed that Dewey's definition of technology was central to his instrumentalism theory. In other words, technology is defined from Dewey's theory as a *process* that combines the use of mental or abstract tools with physical tools to accomplish work. In current literature, this philosophy is seen as a history of technology, and is used to review the culture of technology as it is used in education. For instance, Hickman (2009) argued that Dewey's theory of instrumentalism and its treatment of education, the aesthetic, logic, social and political philosophy, and the philosophy of nature, should influence the cultural critique of technology (Hickman, 2009). Hickman (2009) suggested that, "The key to understanding Dewey's work as a contribution to the philosophy of technology . . . is an appreciation of his contention that all inquiry or deliberation that involves tools and artifacts, whether those tools and artifacts be abstract or concrete, tangible or intangible, should be viewed as instrumental: in other words, as a form of technology." (Hickman, 2009, p. 43). Essentially, technology comprises not only tangible tools, machines, and factories but also the abstract, such as thoughts and cultural practices that provide contexts for such things and make them possible (Hickman, 2009). Hickman (2009) followed Dewey's lead and, "...characterized technology as the invention, development, and cognitive deployment of tools and other artifacts, brought to bear on raw materials and intermediate stock parts, to resolve perceived problems." (Hickman, 2009, p. 53). From this perspective, technology is a process that involves the application of tools or instruments (both physical and/or intellectual) to achieve the desired goal or outcome.

Moore (2006) characterized *technology* as a means to accomplish work. He asserted that when tools, as defined by Hickman's Deweyan perspective, are used for teaching purposes, they can be described as *instructional technology*.

Moore (2006) argued that inquiry, seen from Deweyan perspective, is not entirely intellectual and involves technology for its operation (Moore, 2006). Dewey (1938) describes inquiry as, "...the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole." (Dewey, 1939, p. 104). Moore (2006) further explained that inquiry does not distinguish between physical and mental, nor between organic and inorganic (Moore, 2006), declaring that, "The mind has a limited reach, but is enhanced and extended by organic technologies such as the eye, ear, and hand." (Moore, 2006, p. 402). These technologies are used in inquiry practices. Moore (2006) concluded his view of inquiry as being synonymous with education; therefore, education is a technological activity.

Moore (2006) claimed that researchers in the field of instructional design use the term 'technology' ambiguously (Moore, 2006). Consequently, he created Instructional Technology typology to provide a reminder of the broad and varied ways in which various kinds of technology can be used for instructional purposes. This typology classifies technology specifically by its role within the educational field and its usefulness in studying technology's functions and structures within an instructional context (Moore, 2006). The typology includes three kinds of technology, which interact with their environment on different levels; these being *Representative*, *Action* and *Observational Technologies*. *Representative Technologies* assists a person in forming and accounting for thoughts and experiences (Moore, 2006). *Action Technologies* allow one to interact with the world around them (Moore, 2006). And finally, *Observational Technologies* permit someone to observe the world and the consequences of our actions (Moore, 2006).

The Association for Educational Communications and Technology (AECT) distinguished between technology types in their previous definition for the field, describing Educational Technology in 2008 as follows: "Educational Technology is the study and ethical practices of facilitating learning and improving performance by creating, using, and managing appropriate technological process and resources." (P. 1). They described the technological process as, "...the systematic application of scientific or other organized knowledge to accomplish practical tasks."

(AECT Definition and Terminology Committee, 2008, p.12). The authors expanded upon this, saying that the technological resources involve both software and hardware, such as pictures, videos, computer programs and DVD players. Unlike the Deweyan perspective for viewing inquiry as a technical process, the AECT definition distinguishes *between* knowledge and the technological process. In summary, AECT defines technology as an inquiry, a process, or an artifact.

*Integration* is a term commonly associated with technology in instructional research, therefore, it is critical to understand its meaning from an educational and instructional perspective. In the 1930s, researchers noticed the appearance of the term *integration* within educational and psychological literature. Knudsen (1937) published an article entitled “*What do Educators Mean by the Word Integration?*” At that time, the author noticed that the word ‘integration’ appeared frequently, and in a variety of ways, within contemporary academic literature. The author explained that these diverse uses of the term ‘integration’ indicated that it had different meanings and applications for both educators and psychologists. To gain a better understanding for this phenomenon, Knudsen examined the published research in both psychological and educational literature. Spencer (as cited in Knudsen, 1937) used the term ‘integration’ in his *Principles of Psychology*, published in 1855. Whereas Alexis Bertrand developed his theory of integrated instruction in 1889 (Knudsen, 1937). From his review of academic literature in the psychological field, Knudsen (1937) summarized the meanings for the term ‘integration’ as follows:

- “A name to designate the process by which units on behavior are combined in the organism.” (p. 19)
- “A name to designate stability of behavior in human beings (functional stability)” (p. 19)
- “A name to designate the process of intelligent adaption” (p. 20)
- “A name to designate functional unity of bodily structure” (p. 20)

Knudsen (1937) also reviewed the educational literature and found other related and more inclusive meanings for the term ‘integration’. One of these was attached to a movement within the field of education concerning acceptance for the philosophy of experimentalism, and the willingness to translate its ideas for their own application (Knudsen, 1937). Knudsen (1937) also

noticed that some educators used the term ‘integration ’to refer to correlations between two entities.

From the variety of definitions for the term ‘integration’, we can infer that it has been used to serve different purposes in the educational and psychological fields. More recently in the field of education, and especially in its subset regarding instructional design and technology, the words ‘integration ’and‘ technology ’are frequently associated with one another when describing the use of technology in learning and teaching environments.

Indeed, Technology Integration has been defined and operationalized in a variety of ways over the past thirty years (Ertmer, 1999; Liu, Ritzhaupt, Dawson, & Barron, 2017). Some definitions involve distinctions between whether technology is used to support traditional instructional practices, or other innovative practices previously rendered impossible without using technology (Ertmer, 1999; Liu, Ritzhaupt, Dawson, & Barron, 2017). Thus, a search for the definition of *technology integration* has provoked responses from different viewpoints.

For example, the U.S. Department of Education (2002) defined technology integration as, “The incorporation of technology resources and technology-based practices into daily routines, work and management of schools” (ch.7, para.3). Additionally, Ertmer (1999) studied the barriers and beliefs that limit or prevent the use of technology in instructional practices, and described technology integration as follows: “Technology adds value to the curriculum, not by affecting quantitative changes (doing more of the same in less time), but by qualitative ones (accomplishing more authentic and complex goals)” (Ermer, 1999, p.49). From Ertmer’s standpoint, technology integration does not refer to the number of computers or other electronic devices in the classroom that are used to accomplish activities and tasks to save the class time, but rather it is about improving teaching practice and providing learners with authentic opportunities to explore certain subjects (Ertmer, 1999). Ertmer suggests that ‘technology integration ’should endeavor, by using technology for communication, collaboration, and creative problem solving, to prepare students for the future they will inherit (Ertmer, 1999).

Motshegwe and Batane (2015) investigated the factors that would influence higher education instructor attitudes towards ‘technology integration’, defining the term as, “The use of technology resources such as computers, data, projectors, video conferencing, VCRs and television sets, the internet, Learning Management Systems, PowerPoint, social media, etc. in

instructional activities, and in the management of a course as a whole.” (Motshegwe & Batane, 2015, p. 2).

Motshegwe and Batane (2015) designed their definition of ‘technology integration ’ around the purpose of their research, which examined the use of technology in higher education. Unlike Ertmer’s definition for technology integration, they focused upon the use of electronic devices and software programs designed to assist instructor communication with students, and to provide them with a variety of ways to present information.

Colklar and Yurdakul (2017) studied ‘technology integration ’ as it relates to the experiences of K-12 teachers. They noted that, “Technology integration is defined as an efficient and effective use of technology embracing all aspects of learning and teaching processes including learning and teaching environments, curriculum, and infrastructure.” (Colklar & Yurdakul, 2017, p. 20). They also asserted that technology integration is important for instructional practices, and that teachers are the main vehicle in the technology integration process, because it will not occur without their active involvement (Colklar & Yurdakul, 2017). Moreover, they stressed that technology integration must be viewed as a multi-dimensional structure consisting of a number of components, such as human and technological resources (Colklar & Yurdakul, 2017).

In a qualitative study, Singer and Maher (2007) asked pre-service and in-service teachers to provide their own definitions for technology integration. Pre-service teachers viewed it as the interaction between a learner and the technology in use, whether a device or software application. However, in-service teachers had a subtly different appreciation for the term ‘technology integration’, seeing it as a teacher’s use of technology to create materials such as PowerPoint presentations and worksheets (Singer & Maher, 2007).

Despite so many researchers having different approaches for describing technology integration, it is worth noting that all of them focused upon a similar theme. This involved the use of technological tools to facilitate effective teaching practices by providing teachers with several of ways to present their information, and students with opportunities for its exploration.

Other definitions for technology integration come from models and frameworks that explain effective procedures and processes for using technology in instructional and learning environments. For instance, Technology Pedagogy and Content Knowledge (TPACK), Technology Integration Matrix (TIM), and Substitution, Augmentation, Modification and

Redefinition (SAMR) are models that attempt to define technology integration as it applies to instructional practice.

Mishra and Koehler (2006), the creators of the TPACK model, describe technology integration as a complex process that, "...comes from an appreciation of rich connections of knowledge among these three components and the complex ways in which these are applied in multifaceted and dynamic classroom contexts" (p. 1117). SAMR is a technology integration model designed to help instructors entwine technology into teaching and learning. While this model does not provide a specific definition for technology integration, it does clarify that technology integration involves designing, developing and embedding digital learning experiences that use technology. By comparison, TIM aims to enhance K-12 learning by using technology integration in teaching practice. This model involves five characteristics of meaningful learning (active, constructive, goal directed, authentic, and collaborative) and five levels of technology integration (entry, adoption, adaption, infusion, and transformation). We can conclude that the previous models of technology integration are more all-encompassing.

### **Knowledge Transfer and the Transfer of Technology Integration Skills**

In the area of technology integration, researchers in Kuwait and other nations with similar situations have conducted a number of studies which focus upon how to promote successful technology integration in an instructional context. The results of these investigations are vital to the purpose behind this study. They support the earlier identified factors involved in knowledge transfer and demonstrate how they have great potential to facilitate the successful transfer of technology integration skills from a learning to an application context. Therefore, this section will explore these studies in greater detail to provide research-based evidence supporting each of the identified factors behind knowledge transfer.

### **Evidence Supporting the Prior Knowledge Factor**

Ertmer, et al., (2012) concluded that a teacher's knowledge of technology, and their ability to use it, is one of the most frequently cited barriers to affecting successful classroom technology integration. Therefore, studies which examined teacher technology skills suggested the importance of measuring pre-service teachers for their facility with technology *before* they begin learning about technology integration in their instructional technology courses, or in the teacher preparation program in general. This means that pre-service teachers should receive

technology integration training based upon the level of their existing knowledge *prior* to starting the course. For instance, Dincer (2018) conducted a study to examine pre-service teacher knowledge, skills and attitudes regarding technology literacy. Dincer (2018) asserted that it is important to measure both technological knowledge *and* aptitude together in order to determine the level of technology literacy in pre-service teachers. This will enable each of them to receive the appropriate degree of instruction for their future successful implementation of technology in classroom practices. The results revealed a generally low level of technology literacy amongst pre-service teacher initiates in both their knowledge and skills (Dincer, 2018). Therefore, Dincer (2018) suggested that, "...courses related to technology literacy must be given in teacher training and curriculum that would provide the integration of these technologies with teaching activities should be developed." (p. 2714). This study's findings are consistent with the theory of knowledge transfer, where measuring and *activating* prior knowledge and the entry skill level increases the chances of positive knowledge transfer and confident learners. This will also help instructors to build and design their classroom instruction and activities according to their student's needs, allowing them to be fully engaged in the learning process.

### **Evidence for the Context of Application Factor**

Kimmons, Miller, Amador, David and Cassidy (2015) conducted a mixed-method study that explored the relationships between course performance tasks and pre-service teacher technology integration learning outcomes in an instructional technology course. The data for this study were obtained from pre-service teachers via a survey as well as reflections about their performance. Processing these data produced results indicating that the type of performance tasks used during the pre-service teacher's technology integration course had an influence upon their use of technology in their teaching practice. Kimmons et al. (2015) suggested that it is crucial to carefully design an authentic context for pre-service teachers to apply their learned technology integration skills. The study's authors suggested that the authentic context should not only relate to the pre-service teacher's prospective teaching environment, but must also involve their knowledge of the subject they are going to teach. Essentially, this means a pre-service teacher practicing a performance task in a context that is close to their future teaching reality is important in promoting the transfer of technology integration.

Other evidence comes from the findings of a case study conducted by Alwidi and Aldhafeeri (2017). This research explored teacher readiness for implementing digital curriculum

in Kuwaiti public schools. The findings identified several impediments to a Kuwaiti teacher's ability to implement technology in their instructional practices. Application context was a dominant factor; one must understand the type of teacher work load required *and* the technology available in Kuwaiti public schools in order to have successful technology integration. Indeed, these findings are consistent with the application and context factors involved in knowledge transfer.

### **Evidence Supporting the Modeling Factor**

Adamy and Boulmetis (2005) conducted a lengthy, survey-type correlational study that investigated the relationship between a teacher educator's modeling of technology integration and the student level of confidence regarding its application in their future teaching environments. Study participants included both pre-service teachers and teacher educators. Teacher educators received technological resources and used them in their professional and instructional practices in various ways. For example, they developed e-portfolios, materials in WebCT, used online programs, and e-mail as a dialogue tool for conducting and managing seminars as well as direct discussions with students. They used online software to design and develop materials to support the information content they were teaching. Using anonymous confidential surveys, the researchers collected data from pre-service teachers after each semester ended. The survey's overall findings indicated that modeling had a positive impact on pre-service teachers; their confidence levels increased, as did their willingness to use technology in their future teaching practices.

Bagci and Chelik (2018) conducted a study in Turkey examining the effectiveness of teacher modeling upon a pre-service teacher's intentions to use web-based technology in their future instructional practice. The student teachers involved in this study indicated that they were more confident to use this technology in their future classrooms.

The modeling approach discussed in these studies can be related to the modeling factors which Pepper et al. (2012) revealed (as discussed earlier in the academic literature review concerning knowledge transfer). In this study, teacher educators modeled active learning as an instructional strategy, and the findings indicated that students were able to transfer this knowledge to their teaching practice. Similarly, in the area of technology integration, students found themselves confident in their ability to integrate technology into their teaching practices.

Therefore, it is clear that modeling is an effective method for promoting the successful transfer of technology integration skills from the teacher preparation program into future practice.

### **Evidence Supporting the Peer-Coaching Factor**

Singer and Maher (2007) conducted a study involving pre-service teachers to identify effective approaches for promoting the transfer of technology integration knowledge from a learning context into its teaching equivalent. This was a case study; it explored the use of student teaching experience as an avenue for both pre-service and in-service teacher professional development with respect to educational technology. The researchers in this study examined the extent to which pre-service teachers were able to implement a technology-rich curriculum in their field experience, and how they would facilitate cooperation with their mentor teachers' acquisition of these same skills. The study's findings indicated that the relationship between pre-service and in-service teachers is critical. Pre-service teachers helped in-service teachers use technology in the classroom and coached their fellow pre-service teachers in a collaborative environment assisting them to better integrate technology into their teaching practices. The authors of this study suggested that the relationship between pre-service and in-service teachers must be empowered and strengthened in order to promote successful technology integration.

Mohammad, Mansour and Wegrif (2011) conducted a study concerned with future Kuwaiti schools and teacher perspectives regarding information technology uses. In this study, teachers in Kuwaiti schools took on the role of action-researchers, reflecting upon their own technology use, that of their colleagues at the same school, and their mutual collaboration. The study findings, derived from teacher-interviews, indicated that mutual teacher assistance, and reflection with their peers, had a positive impact upon teacher technology integration.

The method with which the authors conducted this study, evaluating the symbiotic relationships built between teachers regarding their use of technology in the classroom, demonstrated the knowledge transfer factor known as *peer-coaching*. This relates closely to what was discussed earlier in the knowledge transfer section where more seasoned students can assist their less experienced colleagues in a collaborative learning environment.

### **Evidence Supporting the Scaffolding Factor**

Chen (2017) conducted a study to explore scaffolding modes in a professional development course to promote the transfer of technology integration skills from the learning

environment to in-classroom practices. This study investigated teacher learning experiences in a scaffolding project-based environment and the effects of this teaching strategy upon future technology integration. It was a mixed-method study due to the use of both quantitative and qualitative data collection methods. The study population comprised fifty-five teachers who were enrolled in a graduate-level course on information and communication technology. Their course activities were based upon different modes of scaffolding, where students received support from a variety of resources including the internet, guiding questions, instructors, peers, and technology tools in a collaborative learning environment. The researchers collected data from participants via both survey and interview. Study findings indicated that students had a positive learning experience and believed that they would be able to apply what they had learned in their future teaching practice.

In the area of knowledge transfer, scaffolding was identified as a teaching technique with a high potential for promoting knowledge transfer from one context to another. Both studies in the area of technology integration and knowledge transfer asserted that scaffolding should be employed in a collaborative and supportive learning environment (Chen, 2017; Foley & Kaiser, 2013; Lajoie, 2005). Therefore, scaffolding is a common factor in both technology integration and knowledge transfer.

### **Evidence Supporting the Self-Efficacy Factor**

Wang, Ertmer, and Newby (2004) conducted a study to examine teacher self-efficacy regarding technology integration. The study was created to determine how self-efficacy could be enhanced in teacher education programs in order to facilitate positive technology integration in their future classroom practices. This study involved quantitative, mixed-method factorial research designed to determine whether student self-efficacy would increase with exposure to vicarious experiences. It involved three groups of participants, two of them being experimental groups while one acted as a control group. In this study, the researchers identified self-efficacy as a significant factor with the potential to promote technology integration transfer from a teacher education program to its real world application in the classroom. Results indicated that, "...pre-service teachers who were exposed to vicarious experiences that were related to successful technology integration ... experienced significantly greater increases in judgments of self-efficacy for technology integration than those who were not." (Wang, Ertmer & Newby, 2004, p. 232). These findings, along with the study's identification of self-efficacy as a

prominent factor in facilitating future technology integration, are consistent with the knowledge transfer literature review discussed earlier. As noted previously, those studies indicated that establishing self-efficacy is a key factor for promoting the transfer of knowledge and skills from one context to another (Govaerts, Kyndt, Vreye, & Dochy, 2017). In this particular study, the authors not only identified self-efficacy as a prominent technology integration facilitator, but also asserted that establishing and increasing self-efficacy during the learning process with respect to technology integration is key to promoting its future use in the classroom. These results are consistent with those presented by Habeeb (2018) for a study evaluating the effectiveness of a teacher training program in promoting the use of ‘smart’ whiteboards in Kuwaiti public kindergarten schools. This study indicated that classroom smart-board adoption will not happen by itself and that there is a demand to establish self-efficacy through training programs.

### **Operationalization**

In this chapter the researcher identified six factors of knowledge transfer and supported these factors with research from the area of technology integration. However, these factors need to be ‘operationalized’ in order to develop a set of instructional considerations that teacher educators can then implement in the technology courses they instruct to promote the transfer of technology integration knowledge and skills from a learning setting into the application setting. To accomplish this, the researcher selected the First Principles of Instruction by David Merrill (2002); citing two specific reasons for doing so. For one, Merrill (2002) developed his First Principles of Instruction by thoroughly reviewing instructional design theory. As a result, the factors of knowledge transfer he distilled from this research are deeply rooted in learning theory. And secondly, since the purpose of this study is to promote knowledge and skills transfer from a learning environment into the application context, First Principles of Instructions fits perfectly because it emphasizes the ability of learners to apply what they have learned from one context into those of another.

### **Conclusion**

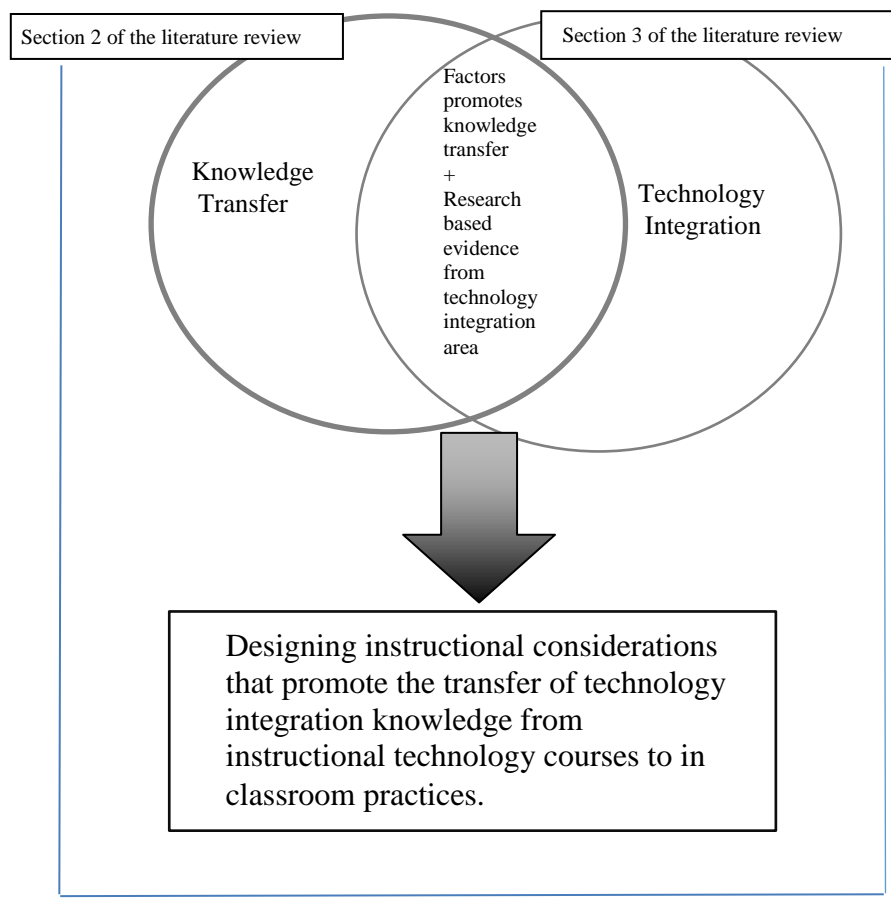
This chapter investigated three bodies of literature: The Kuwaiti educational context, knowledge transfer, and technology integration. These three areas are essential elements in

developing instructional considerations to promote the transfer of technology integration skills from instructional technology courses to in-class practice.

Through the literature review of the Kuwaiti educational context, it became apparent that there is a need to improve teacher knowledge and skills regarding the effective classroom use of technology according to the recent standards of technology integration.

The review of academic literature concerning knowledge transfer explored various types of knowledge transfer, their mechanisms and the factors which promote positive knowledge transfer through examined research. Furthermore, the literature review isolated 'Positive Knowledge Transfer' as the ideal for the purposes of the research conducted in this study, while also noting other factors promoting knowledge transfer that will contribute towards the same ends.

The review of technology integration literature revealed that factors which promote knowledge transfer are supported by reliable empirical research in the area of technology integration. To operationalize the identified factors of knowledge transfer, the researcher selected Merrill's First Principles of Instruction as its model. The following diagram summarizes this chapter and the discussed bodies of knowledge.



[Section 1 of the lit. review] The considerations work according to Kuwait University Context (Standalone approach)

Figure 1. Literature review procedure and results.

## **Chapter 3**

### **Research Methodology**

#### **Introduction**

This study was concerned with the design, development, and validation of instructional considerations for teacher educators to use in their instructional technology courses within Kuwait University's teacher preparation program. The aim for these considerations is to promote the transfer of knowledge and skills from instructional technology courses for pre-service teachers to their future in-class practices. The steps taken to develop and validate these considerations included the following: (a) conduct a literature review to identify factors which promote the transfer of knowledge and skills from one context into another; (b) provide research-based evidence from studies involving technology integration that supports these knowledge transfer factors; (c) explain how these factors were operationalized in the considerations; (e) explain how the considerations were validated; (f) explain how the considerations were revised; (g) explain how the results were reported.

#### **Research Design: Design and Development Research**

Design and development research is a method of inquiry unique to the field of instructional design and technology (Richey & Klein, 2007). This type of research seeks to generate knowledge through a systematic analysis of learning and performance problems; addressing these issues through the creation of instructional or non-instructional solutions. Richey and Klein (2007) identified two categories of design and development research. The first involves 'product and tool' research, which is commonly referred to as *type 1*, while the second category is model research, or *type 2*.

This study involves *type 1* design and development research. In their definition, Richey and Klein (2007) stated that, "Product and tool research typically involves situations in which the design and development process used in a particular situation is described, analyzed, and a final product is evaluated." (p. 9). This means that product and tool research is normally concerned with a particular context or project; context specific studies with generalizable conclusions are therefore, valued (Richey & Klein, 2007).

Richey and Klein (2007) asserted that identifying an appropriate problem is an essential component in design and development research methodology. They further stated that once a

researcher identifies the problem, it is important for them to distill the topic sufficiently in order to clarify the questions which their study should pursue. This occurs after identifying the problem's components and then determining the operational variables. This study's research problem focused upon teachers in Kuwait who have difficulty integrating technology into their instruction and teaching practices due to insufficient transfer of knowledge and skills in this area. Research findings, in this specific context, indicate that newly-hired teachers in Kuwait did not find that their teacher-training programs related well to their actual, in-class practices regarding technology integration. Therefore, knowledge and skills transfer along with technology integration skills, are components of this research problem. The factors that promote knowledge transfer were identified as the operationalizing variables for this specific problem, provoking the following research questions:

1. What are the factors that promote knowledge and skills transfer of instructional technology integration?
2. How can the features of instructional strategies and the factors of knowledge transfer be operationalized to promote the transfer of technology integration from instructional technology courses into K-12 teaching practices?

After determining the research problem and its associated research questions, it was then necessary to review the relevant academic literature to identify learning outcomes which previous instructional considerations had already addressed, and to identify the specific context around which these considerations were developed (Richey & Klein, 2007). As already noted, the desired learning outcome for the instructional considerations under development in this study is to enable Kuwait University's pre-service teachers to transfer the knowledge and skills they learn during their instructional technology courses. Therefore, this study's academic literature review focused upon knowledge transfer studies conducted in adult learning settings; identifying the factors that promote knowledge transfer from a learning context to an application context in these studies. Once these factors were established, the researcher expanded the review to locate supporting information from studies conducted in the area of technology integration with contexts similar to those found within Kuwait University's educational and cultural environment.

After conducting the literature review, the identified factors of knowledge transfer were operationalized by selecting an appropriate instructional design model to both create *and* develop

the considerations. The researcher therefore selected the First Principles of Instruction to accomplish this task.

According to Richey and Klein (2007), once the research tool has been designed, the next step in the process involves recruiting appropriate expert reviewers to evaluate it. These reviewers have to be chosen carefully; their selection depending upon the proximity of their areas of expertise with those pertaining to the study and the designed tool. In this particular case, the researcher chose expert reviewers according to their expertise in teacher preparation programs, technology integration and instructional design. Their opinions and advice, based upon their considerable professional experience, helped to revise and finalize the instructional considerations developed in this study.

### **Procedures:**

#### **Identifying knowledge transfer factors from the literature review.**

The researcher used six factors related to knowledge transfer to guide the design and development of the instructional considerations created through this study. While these factors are fully described in Chapter 2, they are summarized below for convenience.

***Prior Knowledge.*** Activating prior knowledge, and assessing whether or not a learner already possesses newly-introduced knowledge via previous experience, is important when teaching for transfer. Educators are advised to activate prior knowledge in their students, and to relate it to their newly-learned knowledge or skill, in order to enhance the process of knowledge transfer.

***Context of Application.*** Providing learners with opportunities for displaying their learned knowledge and skills is a significant factor in knowledge transfer literature. Indeed, studies in the area of knowledge transfer recommend that the context of application must be authentic, i.e. of similar characteristics to the real-world or application context. Educators are also advised to inform learners about the appropriate circumstances and rules for applying their learned knowledge or skill.

***Modeling.*** Using models and modeling while teaching have shown their effectiveness in knowledge transfer research. Modeling is considered a teaching technique in this case. Educators seeking knowledge transfer are advised to model the knowledge they are teaching by demonstrating it to students. Findings from knowledge transfer studies indicate that when

modeling is applied as a teaching technique, learners will be able to transfer the knowledge they gain to other contexts due to their observation.

***Peer-Coaching.*** There are a number of types of coaching, however peer-coaching has a significant impact upon a learner's ability to transfer their learned knowledge and skills from one context to another. When educators employ this technique, their students will be able to develop a common language which they can then share amongst other students familiar with this learned knowledge or skill.

***Scaffolding.*** Scaffolding is regarded as one of the more important teaching techniques in the area of knowledge transfer, but this technique must be employed under certain conditions. Educators must know when it is appropriate to provide support and feedback to their learners in order to promote positive knowledge transfer.

***Establishing Self-Efficacy.*** Research in the area of knowledge transfer indicates that establishing a learner's self-efficacy increases their chances for successfully transferring their knowledge to another context. Therefore, it is an important outcome which educators must consider when they are teaching for transfer.

### **Selection Criteria**

The knowledge transfer factors identified in the literature review were used to design and develop the instructional considerations based upon the following criteria:

***Selection Criterion #1- The factors are applicable to instructional practices in a higher education context.***

The reviewed studies featuring the six identified factors of knowledge transfer were conducted in adult learning settings, which indicates that they are applicable instructional methods and techniques that can be applied in the context of this study.

***Selection Criterion #2- Components are well supported by research-based evidence from the area of technology integration.***

As revealed in Chapter 2, the six factors of knowledge transfer were supported by research-based evidence from the area of technology integration. These factors were studied in research conducted in teacher preparation programs and professional development settings. They were regarded as being effective methods for promoting future technology integration in both teaching and learning practices.

Additionally, these studies were conducted in contexts similar to those at Kuwait University. These similarities included following a standalone approach for technology integration in their teacher preparation program, and employing the ISTE standards of technology integration.

### **Operationalizing the Knowledge Transfer Factors in the Considerations**

The next step in developing the considerations was to determine the appropriate instructional design model to operationalize the identified factors of knowledge transfer. As such, this study chose to use the First Principles of Instruction (Merrill, 2002) to develop the instructional considerations that promote the transfer of technology integration knowledge and skills from instructional technology courses at Kuwait University to in-class practice. First Principles of Instruction fit the context of this study and meshed well with the factors that promote knowledge transfer. Indeed, higher education research efforts have frequently turned to the First Principles of Instruction to develop courses, evaluate student progress and measure student ability to apply what they have learned (Lo & Hew, 2017; Tu & Synder, 2017).

### **Validation of Considerations**

Qualitative research methods are often employed in product and tool research to determine the practicality and effectiveness of the developed tool or product (Richey & Klein, 2007). As this kind of research is involved with real-life and context-specific issues, validation of the developed product or tool must involve using experts who have significant experience and professional credibility regarding the subject involved. Therefore, the developed instructional considerations in this study were reviewed by experts with specialized expertise in the areas of instructional technology, instructional design and teacher education programs. The researcher selected six Expert Reviewers (two from the USA and four from Kuwait) to validate and determine the effectiveness and practicality of the developed considerations. They also needed to determine whether the developed instructional considerations served the purpose of the study. These experts had backgrounds in teacher preparation programs, technology integration, and instructional design and technology. The following table provides details about the expert reviewers who served in validating the developed considerations.

Table 1

*Expert Reviewers*

<b>Name</b>	<b>Institution</b>	<b>Primary area of expertise</b>
Dr. Aimee Brenner	Averett University, Virginia, USA	Teacher preparation program. Instructional Design and Technology.
Dr. Abdullah Al-Failakawei	Kuwait University, Kuwait	Teaches instructional technology courses at Kuwait university.
Dr. Fayez Al-Dhafeerie	Kuwait University, Kuwait	Teaches instructional technology courses at Kuwait university.
Dr. Jesse Strycker	Ohio University, Ohio, USA	Technology integration in teacher education and instructional design and technology.
Dr. Moussa Al-Qattan	Kuwait University, Kuwait	Teaches instructional technology courses at Kuwait university.
Dr. Suaad Al-Furaih	Kuwait University, Kuwait	Teaches instructional technology courses at Kuwait university.

**Evaluation Rubric**

The researcher developed a rubric (see Appendix B) for the expert reviewers to follow. This rubric design allowed the expert reviewers to offer their insights regarding the selected factors of knowledge transfer, the developed instructional considerations and about the entire design and development process involved. The rubric structure involved open-ended questions, allowing collection of detailed amount of data during the reviewing process.

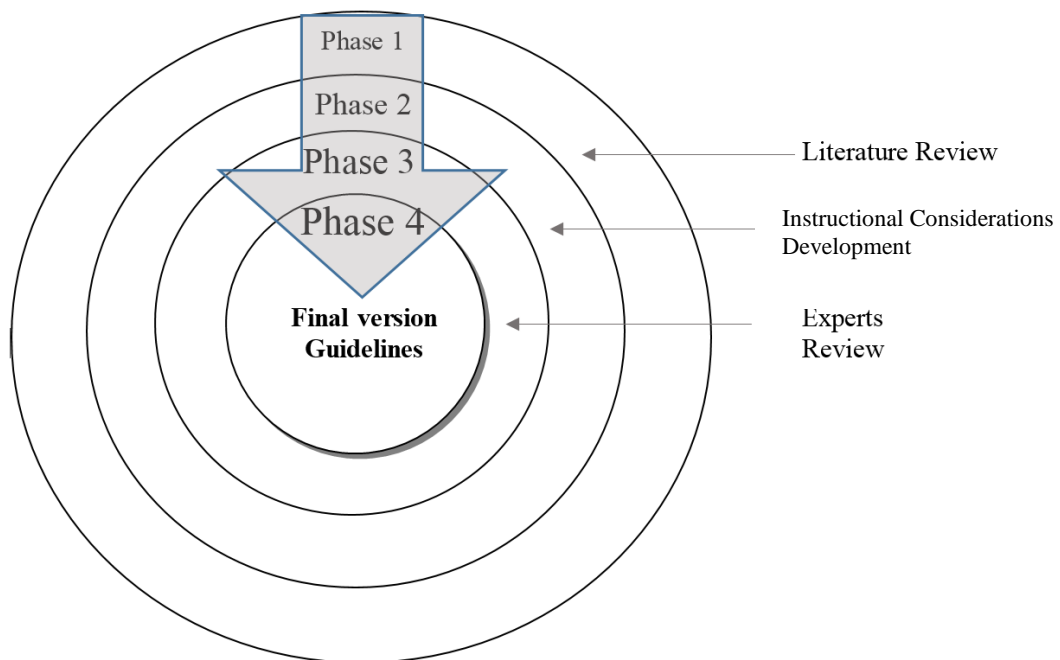
The evaluation rubric was split between two sections, the first of which addressed the identified six factors of knowledge and skills transfer in terms of their validity, practicality, and effectiveness in the context of this study. The second rubric section asked the expert reviewers to evaluate the overall design and development of the considerations and their usability. The expert reviewers submitted their completed surveys to the researcher, who then analyzed their responses and used these data to revise and improve the considerations. The analysis and modification of the instructional considerations is discussed in Chapter 5.

## **Presentation of the Instructional Considerations**

The researcher emailed the initial version of the instructional considerations to the expert reviewers, along with the validation rubric, as a Word Document. The researcher chose to use a Word Document because it was a straightforward way of supplying the information, presented in a format that the reviewers would be able to open easily. The document started with an introduction about technology integration in teacher education programs in general and Kuwait University specifically, the research problem, and the role that knowledge transfer plays in addressing it. Next, the document presented details about how technology integration is defined and discussed in the field of teacher education. Then, the document discussed knowledge transfer, the identified factors of knowledge transfer and also their definitions. Following this, the researcher presented tables that included the identified factors of knowledge transfer and how they are supported by research in the area of technology integration. Then the researcher discussed how they applied the First Principles of Instruction (Merrill, 2002) to operationalize the factors of knowledge transfer in designing a set of instructional considerations that teacher educators at Kuwait University can use to promote the transfer of technology integration knowledge and skills from a learning setting to an application setting. The final page of the document included the newly-developed instructional considerations, all 21 of them, and concluded with the evaluation rubric. The rubric questions were detailed, with some of them being very specific; therefore, for the convenience of the expert reviewers, the researcher included page number references for these questions.

## **Conclusion**

The purpose of this study was to design and develop instructional considerations which promote the transfer of technology integration knowledge and skills from a pre-service teacher's instructional technology training courses into their eventual in-class practices as professionals. The study consisted of four phases, with the first being to analyze its context and identify the appropriate factors of knowledge transfer (see Chapter 2). The researcher developed and operationalized the instructional considerations during the second phase, while the third phase involved validating them via expert reviews. And finally, the fourth phase saw the researcher apply feedback gleaned from the expert reviewer evaluation process to modify and revise the considerations, and thus improve them. The following diagram describes the study's phases.



*Figure 2.* Target diagram, which illustrates the entire research design.

## Chapter 4

### Results of the Design and Development of the Instructional Considerations

Richey and Klein (2007) specified that the research problem is the basis for any design and development study. They further stated that research problems should address important questions that contribute to the knowledge base of the instructional design and technology field, and to its practice. Therefore, there must be a rationale and process behind selecting a design and development research problem. While the researcher discussed this study's approach earlier on, it is summarized here for convenience.

In the present era of more rapid technology development, there is a consistent demand for preparing teachers to be more effective with their abilities to integrate technology into their instruction. In Kuwait, and other nations with similar contexts, K-12 teachers are required to employ technology in their instruction to meet the national standards. Therefore, Kuwait University offers instructional technology courses to prepare teachers to integrate technology in their professional practice. Nevertheless, a review of related literature indicates that newly-hired teachers often fail to integrate technology into their instruction. Therefore, there is a need to promote the transfer of technology integration skills and knowledge from pre-service teacher's instructional technology courses to their professional in-class teaching practices. As a result, the researcher developed a set of instructional considerations in this study that can be used by faculty members who teach instructional technology courses at Kuwait University and similar contexts to promote the transfer of technology integration skills and knowledge to in-class teaching. The design and development process was based upon a comprehensive academic literature review in the areas of knowledge transfer and technology integration. From reviewing the literature concerning knowledge transfer, the researcher was able to identify six factors of knowledge transfer.

These six factors were: (i) prior knowledge; (ii) context of application; (iii) modeling; (iv) peer-coaching; (v) scaffolding, and; (vi) establishing self-efficacy. Studies in the area of technology integration supported each of these factors, assuring their effectiveness for promoting the transfer of technology integration knowledge and skills from a learning context (instructional technology courses) to an application context (in-class teaching practice).

After identifying the problem and its components, the researcher selected the appropriate factors, and the instructional design model, to design and develop an initial set of instructional

considerations. A panel of six expert reviewers then evaluated these considerations. The researcher analyzed their responses, presenting results in Chapter 5.

### **Considerations Design and Development**

#### **Model Selection**

The researcher used David Merrill's First Principles of Instruction (2002) to operationalize the factors of knowledge transfer identified in the literature review to design and develop a set of instructional considerations that promote the transfer of knowledge and skills for technology integration from one setting into another. There are two reasons why the First Principles of Instruction (Merrill, 2002) fits the purpose of this study. For one, Merrill (2002) developed his First Principles of Instruction by thoroughly reviewing instructional design theories "... to identify prescriptive principles that are common to the various theories" (Merrill, 2002). As such, the factors of knowledge transfer identified via this research are rooted in a diverse array of learning theories, making them ripe for operationalization. Additionally, since the purpose of this study is to promote the transfer of knowledge and skills, regarding technology integration, from a learning context into an application context, the First Principles of Instruction is a natural fit because it emphasizes the ability of learners to apply what they have learned in one context to those in another.

The First Principles of Instruction consists of the following: "(a) Learning is promoted when learners are engaged in solving real-world problems. (b) Learning is promoted when existing knowledge is activated as a foundation for new knowledge. (c) Learning is promoted when new knowledge is demonstrated to the learner. (d) Learning is promoted when new knowledge is applied by the learner. (e) Learning is promoted when new knowledge is integrated into the learner's world." (Merrill, 2002). Each of these principles also has at least one corollary. The researcher associated these First Principles of Instruction, and their corollaries, with the identified factors of knowledge transfer to develop a set of instructional considerations for Kuwait University's teacher educators, and those with similar contexts, to use in their instructional technology courses.

#### **Operationalization of Knowledge Transfer Factors**

Each action of the six factors of knowledge transfer is associated with one or more corollaries of the First Principles of Instruction. There is an individual table for each of these

factors to illustrate their characteristics. Each of these tables is followed immediately with bullet points describing how the specific factor relates to the First Principles of Instruction, and then by text which outlines the resulting, researcher-developed instructional consideration. The full table of operationalization is presented on page (70).

### Operationalizing the *Prior Knowledge* Factor

Table 2

#### *Prior Knowledge Factor Summary*

Knowledge Transfer Factor	Meaning	Instructional Actions	Supportive studies from the Area of Technology Integration
<b>Prior Knowledge</b>	Activating prior knowledge, and assessing whether introduced knowledge exists in prior learner experiences, is important when teaching for transfer. Teachers and educators are advised to activate prior knowledge, and relate it to the newly-learned knowledge or skill, in order to enhance the process of knowledge transfer.	<ol style="list-style-type: none"> <li>1. <b>Activating</b> prior knowledge.</li> <li>2. <b>Assessing</b> prior knowledge.</li> </ol>	<p>Dincer, S. (2018). Are preservice teachers really literate enough to integrate technology in their classroom practice? Determining the technology literacy level of preservice teachers. <i>Educational Information Technology</i>, 23, 2699–2718.</p> <p>Sadaf A., Newby T. &amp; Ertmer P. (2012). Exploring factors that predict preservice teachers' intentions to use web 2.0 technologies using decomposed theory of planned behavior. <i>Journal of Research on Technology in Education</i>, (45) 2, 171–195.</p>

### Operationalizing *Prior Knowledge* with First Principles of Instruction

1. Assessment of *Prior Knowledge* is associated with three corollaries of the First Principles: (a) Show task of the Problem Centered Principle; (b) New experience of the Activation Principle; (c) Structure of the Activation Principle.
2. Activation of *Prior Knowledge* is associated with one corollary of the First Principles: (a) Previous experience of the Activation Principle.

### Instructional Considerations of the *Prior Knowledge* Factor

1. Assess learner skills and knowledge before teaching them new technology integration skills or knowledge. This can be accomplished by showing students the task that they need to perform, and observing their levels of confidence. Assess student ability at the end of the learning process by providing them with opportunities to practice their newly-learned knowledge or skill.
2. Show students relevant experiences to use as a foundation for the desired learning outcome. The instructor can observe the level of learner expertise via this exercise.
3. At the end of this assessment process, the instructor must provide students with a course, structured around their level of expertise, to build their new technology knowledge or skill.

### Operationalizing the *Context of Application* Factor

Table 3

#### *Context of Application* Factor Summary

Knowledge Transfer Factor	Meaning	Instructional Actions	Supportive Studies from the Area of Technology Integration
<b>Context of Application</b>	Providing learners with opportunities to display the learned knowledge or skill is a significant factor in knowledge transfer literature. Studies in the area of knowledge transfer recommend that the context of application must be authentic, or similar in characteristics, to the real-world/application context. Educators are also advised to explain the appropriate circumstances and rules for applying the learned knowledge or skill.	<ol style="list-style-type: none"> <li>1. Providing <b>direct</b> context of application</li> <li>2. Providing <b>indirect</b> context of application</li> <li>3. Increase learner awareness for the <b>constraints</b> of application.</li> </ol>	<p>Kimmons, R., Miller, B.G., Amador, J., David, C., &amp; Cassidy, D. (2015). Technology integration coursework and finding meaning in pre-service teachers' reflective practice. <i>Educational Technology Research and Development</i>, 63(6), 809-829.</p> <p>Al-Awidi, H., &amp; Aldhafeeri, F. (2017). Teachers' readiness to implement digital curriculum in Kuwaiti schools. <i>Journal of Information Technology Education: Research</i>, 16, 105-126.</p>

### Operationalizing *Context of Application* with First Principles of Instruction

1. Providing direct *Context of Application* is associated with one corollary of the First Principles: (a) Practice Consistency of the Application Principle.

2. Providing indirect *Context of Application* is associated with one corollary of the First Principles: (a) Diminishing Coaching of the Application Principle.
3. Understanding the Constraints of Application is associated with one corollary of the First Principles: (a) Varied Problems of the Application Principle.

**Instructional Considerations of the *Context of Application* Factor**

1. Provide students with consistency practice and application opportunities to demonstrate their learned knowledge with the implied objectives. This can be achieved by recalling information, providing a variety of examples to draw from, and by making students aware, through their predicting the consequences of applying their knowledge - the results of these predictions will reveal their understanding.
2. Provide indirect context of application by providing learners with problem-solving opportunities - and feedback when needed.
3. Make sure that learners are aware of the constraints of application by providing them with a sequence of varied problems to solve that relate to technology integration

## Operationalizing the *Modeling* Factor

Table 4

### *Modeling Factor Summary*

<b>Knowledge Transfer Factor</b>	<b>Meaning</b>	<b>Instructional Actions</b>	<b>Supportive Studies from the Area of Technology Integration</b>
<b>Modelling</b>	Using models, and modeling while teaching, have shown effectiveness in knowledge transfer research. Modeling, in this case, is considered a teaching technique. Educators seeking knowledge transfer are advised to model knowledge by <i>demonstrating</i> it to students. Studies of knowledge transfer findings indicate that when modeling is applied as a teaching technique, learners will be able to transfer knowledge to other contexts through their observation.	<b>1. <i>Demonstrating</i></b> the application of the new technology skill or knowledge while teaching.	Adamy, P., & Boulmetis, J. (2005). The impact of modeling technology integration on pre- service teachers 'technology confidence. <i>Journal of Computing in Higher Education</i> , 17(2), 100–120. Bagci, K., & Chelik, H. E. (2018). Examination of factors affecting continuance intention to use web-based distance learning system via structural equation modelling. <i>Eurasian Journal of Educational Research (EJER)</i> , (78), 43–65.

## Operationalizing *Modeling* with First Principles of Instruction

Modeling is associated with three corollaries of the First Principles: (a) Demonstrated Consistency of the Demonstration Principle; (b) Learner Guidance Corollary of the Demonstration Principle; (c) Relevant Media Corollary of the Demonstration Principle.

### **Instructional Considerations of the *Modeling* Factor**

1. Associate your demonstration with the learning goal and let learners know about it. This can be achieved by; (a) providing learners with examples and non-examples for the desired knowledge or skill of technology integration; (b) demonstrating the procedures; (c) visualization of the procedures and modeling.
2. Provide learners with appropriate guidance by; (a) directing them to relevant information; (b) providing them with a variety of representations, and; (c) comparing related subjects.
3. Use media relevant to the technology integration skill or knowledge you are teaching.

## Operationalizing the *Peer-Coaching* Factor

Table 5

### *Peer-Coaching* Factor Summary

<b>Knowledge Transfer Factor</b>	<b>Meaning</b>	<b>Instructional Actions</b>	<b>Supportive Studies from the Area of Technology Integration</b>
<b>Peer-coaching</b>	There are various types of coaching however, peer-coaching has a significant impact upon a student's ability to transfer learned knowledge and skills from one context into another. When educators employ this technique in their instruction, students will be able to develop a common language that can then be shared among students related to the learned skill or knowledge.	<ol style="list-style-type: none"> <li><b>1. Observing</b> their peers.</li> <li><b>2. Providing</b> feedback to their peers.</li> </ol>	<p>Singer, J., &amp; Maher, M. (2007). Preservice teachers and technology integration: Rethinking traditional roles. <i>Journal of Science Teacher Education, 18</i>(6), 955–984.</p> <p>Mohammad H., Mansour N. &amp; Wegrif R. (2011). Kuwait's future schools teachers' perspective on ICT integration in classroom. ResearchGate.</p>

### Operationalizing *Peer-Coaching* with the First Principles of Instruction

1. Observation is associated with two corollaries of the First Principles: (a) Practice Consistency Corollary of the Application Principle. (b) Diminishing Coaching Principle of the Application Principle.
2. Feedback is associated with one corollary of the First Principles: (a) Diminishing Coaching of the Application Principle.

### Instructional Considerations of the *Peer-Coaching* Factor

1. Associate the given practice with the learning objectives and make learners aware of them. While practicing, ask learners to observe their colleagues and predict the process of their practice.
2. Ask the more advanced students to guide their less advanced colleagues when practicing the new knowledge or skill. This can be achieved by asking advanced learners to provide appropriate feedback, including error detection and correction.
3. Allow learners to solve problems by providing them with appropriate feedback, when needed, and gradually withdrawing that feedback.

## Operationalizing the *Scaffolding* Factor

Table 6

### *Scaffolding Factor Summary*

<b>Knowledge Transfer Factor</b>	<b>Meaning</b>	<b>Instructional Actions</b>	<b>Supportive Studies from the Area of Technology Integration</b>
<b>Scaffolding</b>	Scaffolding is considered one of the most important teaching techniques in the area of knowledge transfer, but this technique must be employed only under certain conditions. Educators must know when it is appropriate to provide support and feedback to their learners in order to promote positive knowledge transfer.	1. Providing learners with <b>assistance</b> and <b>support</b> whenever needed.	Chen, H. C. (2017). Exploring scaffolding modes in pjbl: A professional development course to promote in-service teachers' technology integration. <i>Journal of Educational Multimedia Hypermedia</i> , 26(2), 105-129.

## Operationalizing *Scaffolding* with First Principles of Instruction

*Scaffolding* is associated with four corollaries of First Principles: (a) Task Level of the Problem Principle; (b) Problem Progression Corollary of the Problem Principle; (c) Diminishing Coaching Principle of the Application Principle; (d) Creation Corollary of the Integration Principle.

### Instructional Considerations of the *Scaffolding* Factor

1. Provide learners with real-world level problems to solve. However, before reaching this level, make sure students understand the nature of the problem and tasks required to solve it.
2. Provide learners with a set of real-world problems to solve while gradually increasing their difficulty and complexity.
3. Provide learners with feedback, when needed, while they solve real-world problems.
4. Allow students to use their own ways of using their newly-learned knowledge or skill.

## Operationalizing the *Self-Efficacy* Factor

Table 7

### *Self-Efficacy* Factor summary

<b>Knowledge Transfer Factor</b>	<b>Meaning</b>	<b>Instructional Actions</b>	<b>Supportive Studies from the Area of Technology Integration</b>
<b>Self-Efficacy</b>	Knowledge transfer research indicates that establishing learner self-efficacy increases their success in transferring knowledge to other contexts. Therefore, self-efficacy is an important outcome which educators must consider when teaching for transfer.	1. <b><i>Increasing learner self-belief</i></b> in their ability to apply what they have learned.	Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. <i>Journal of Research on Technology in Education</i> , 36(3), 231–250.  Habeeb K.(2018). Effects of interactive whiteboard training programs on teacher efficacy and student outcomes in kindergartens. <i>Educational Information Technology</i> (23), 2201–2212.

## Operationalizing *Self-Efficacy* with First Principles of Instruction

Raised self-efficacy is associated with four corollaries of First Principles: (a) Diminishing Coaching of Application Principle; (b) Watch Me Corollary of the Integration Principle; (c) Reflection Corollary of the Integration Principle; (d) Creation Corollary of the Integration Principle.

### Instructional Considerations of the *Self-Efficacy* Factor

1. Try to diminish coaching throughout student application and practice. This will increase a learner's positive beliefs.
2. Give learners opportunities to demonstrate their learned skill or knowledge.
3. Allow learners to reflect upon their newly-learned knowledge and skills through discussion.
4. Give learners opportunities to create new ways to present their newly-learned knowledge.

## Summary of the Initial Form of the Developed Instructional Considerations

The following is a summary of the initial form of the instructional considerations; before the expert review process.

To promote the transfer of technology integration knowledge and skills from instructional technology courses to in-class teaching practices, please consider the following considerations:

1. Assess the level of student skills or knowledge by showing them the task that they should be able to accomplish by the end of their learning process.
2. Show students relevant experiences that they can use as a foundation for the desired learning outcome. This exercise can also reveal the level of learner expertise.
3. Following the assessment process, the instructor must provide students with coursework, structured around their level of expertise, to build their technology knowledge or skills.
4. Activate prior knowledge or experience by directing learners to recall, relate, describe or apply knowledge they acquired in previous experiences. Their prior knowledge can serve as a foundation upon which to build new technology integration knowledge.
5. Provide students with consistent practice and application opportunities to apply the learned knowledge with the implied objectives. This can be achieved by recalling information, providing a variety of examples to draw from and by making students aware, through their predicting the consequences of applying their knowledge - the results of these predictions will reveal their level of understanding.
6. Provide students with an indirect context of application by giving them problem solving opportunities (and feedback when needed).
7. Provide students with an understanding for the constraints of application by offering them a sequence of varied problems to solve that relate to technology integration.
8. Associate your demonstration with the learning goal and inform students about it. This can be achieved by: (a) providing learners with examples and non-examples for the desired knowledge or skill of technology integration; (b) demonstrating the procedures; (c) visualization of the procedures, and; (d) modeling teacher behavior.
9. Provide learners with appropriate guidance by directing them to relevant information that offers various representations of the task and comparisons to related subjects.
10. Use media relevant to the technology integration skill or knowledge you want teach.

11. Associate the given practice with the learning objectives, and make students aware of them. While they practice, ask learners to observe their colleagues and predict the process of their application.
12. Ask the more advanced students to guide their less-advanced colleagues when practicing new skills or knowledge. This can be achieved by asking advanced learners to provide appropriate feedback, including error detection and correction. Withdraw this coaching gradually.
13. Allow students to solve related problems by providing them with relevant feedback, as needed, via error detection and correction. Gradually withdraw this feedback.
14. Provide students with real-world level problems to solve; make sure students understand the problem's nature and the tasks required to solve it before they begin.
15. Provide learners with a set of real-world problems to solve and gradually increase their difficulty and complexity.
16. Provide learners with feedback, when needed, while they solve real-world problems.
17. Allow learners to use their own ways or applying their new knowledge or skill.
18. Diminishing the level of coaching provided to students during their knowledge/skill application and practice sessions will raise their positive belief in their abilities.
19. Give learners opportunities to demonstrate their newly-learned skill or knowledge.
20. Allow students to reflect upon their newly-learned knowledge or skills via discussion.
21. Provide students with opportunities to create new ways of presenting their newly-learned knowledge or skills.

**Summary of operationalizing.** A summary table revealing which First Principles of Instruction (y-axis) were used to operationalize which knowledge transfer factors (x-axis) to create a instructional consideration. Each dot represents a single instructional consideration.

Table 8

*Operationalization Matrix*

Factors Promotes Knowledge Transfer		Prior Knowledge (PK)		Context of Application (CoA)			Modeling (M)	Peer Coaching (PC)		Scaffolding (S)	Establishing Self-efficacy (ES)
		Activation	Assessment	Direct	Indirect	Constraints	Demonstration	Observation	Feedback	Assistance/Support	Increasing positive beliefs
First Principles											
Problem	Show Task		•								
	Task Level									•	
	Problem Progression									•	
Activation	Previous Experience	•									
	New Experience		•								
	Structure		•								
Demonstration	Demonstration Consistency						•				
	Learner Guidance						•				
	Relevant Media						•				
Application	Practice Consistence			•				•			
	Diminishing Coaching				•			•	•	•	•
	Varied Problems					•					
Integration	Watch Me										•
	Reflection										•
	Creation								•		•

**Design and Conduct of the Formative Evaluation**

Two panels of expert reviewers inspected and evaluated the completed version of the developed instructional considerations; four experts reviewers were from Kuwait and two from the USA. As discussed in Chapter 3, both panels of expert reviewers were selected based upon their expertise in the areas of instructional design and technology, technology integration, and teacher education.

The expert reviewers were given a rubric to evaluate the developed set of instructional considerations. The rubric included a set of questions for each of the six factors of knowledge transfer and a set of questions to evaluate the overall quality and usability of the developed instructional considerations. Overall, the rubric was designed to address the following aspects: (a) the overall rationale behind the developed instructional considerations; (b) the applicability and appropriateness of the selected factors of knowledge transfer and their related actions; (c) the quality of explanation provided regarding the knowledge transfer factors as well as the quality and rationale of the selected studies; (d) how well the First Principles of Instruction operationalized the knowledge transfer factors, and how well the actions of these factors meshed

together with the First Principles of Instruction; (e) the overall design process of the developed instructional considerations. The questions in the developed rubric were open-ended to allow each expert reviewer to comment on any aspect of the developed instructional considerations.

Eventually, six replies were received from the selected expert reviewers (the full analysis and revision processes are discussed in Chapter 5). The expert reviewers provided several suggestions and modifications to improve the initial draft of the developed instructional considerations.

### **Conclusion**

The failure of newly-hired teachers to transfer technology integration knowledge and skills from their instructional technology courses at university to their in-class teaching practices has been identified as a problem in the literature cited in this design and development research. Knowledge transfer factors and research conducted in the area of technology integration were suggested as critical components for addressing this problem. As reported in this chapter, the researcher was able to operationalize the identified factors of knowledge and skills transfer by applying the First Principles of Instruction (Merrill, 2002). As a result, twenty-one instructional considerations were developed to promote the transfer of technology integration knowledge and skills from instructional technology courses to in-class teaching practices. Six expert reviewers inspected and evaluated these instructional considerations. The formative evaluations provided by the six reviewers are discussed in Chapter 5.

## **Chapter 5**

### **Results of Expert Reviews**

Six expert reviewers validated the developed set of Instructional Considerations presented in Chapter 4. They provided detailed answers to the evaluation rubric and three categories emerged from their feedback and suggestions. These categories, and their related codes, are discussed in detail in this chapter. As a result of the expert reviewer feedback and suggestions, the researcher made a number of changes to the developed Instructional Considerations to improve their effectiveness.

#### **Introduction**

As explained by Richey and Klein (2007), the role of expert reviewers in tool and product research is to evaluate the entire design and development process of said tool or product; they should also evaluate its effectiveness and usefulness for the intended purpose and context as well. Therefore, the expert reviewers in this study scrutinized not only the Instructional Considerations, but also the entire process the researcher undertook to design and develop them. In summary, the expert reviewers first evaluated the purpose of the study, then the methodology the researcher used to design the set of Instructional Considerations, and finally, they evaluated the effectiveness of these developed considerations.

The researcher selected these six expert reviewers (four from Kuwait and two from the USA) based upon their expertise in the areas of technology integration, teacher education, and knowledge transfer. Dr. Abdullah Al-Failakawei, Dr. Fayeze Al-Dhaferie, Dr. Mousa Al-Qattan and Dr. Suaad Al-Furaih serve as instructional technology professors at the College of Education at Kuwait University in Kuwait. Each of them are experts in the area of technology integration and in teaching instructional technology courses at Kuwait University. The US-based expert reviewers, Dr. Aimee Brenner and Dr. Jesse Strycker, both have expertise in the areas of instructional design, technology integration and teacher education. Of particular relevance to the researcher's study, Dr. Brenner's doctoral dissertation investigated how knowledge transfer affects technology integration in teacher preparation programs.

#### **Qualitative Data Analysis**

The expert reviewers provided detailed answers to the given evaluation rubric. The researcher followed qualitative data analysis procedures to analyze their responses, with the aim

of identifying areas needing improvement and then finding ways to modify and improve the developed set of Instructional Considerations. As indicated by Marshal and Rossman (2016), typical data analysis procedures include the following steps: i) organize the data; ii) generate possible categories; iii) code the data; iv) offer interpretation through analytic memos; and v) write the final format to present the study. Additionally, Creswell (2007) indicated that the research questions can be used to guide category development. Therefore, for this study, the researcher decided to use the rubric questions as guidance to organize the data and create categories. The researcher then coded expert reviewer responses and attached them to their relevant category. Finally, based upon the emerged categories and their codes, the researcher made decisions to modify the developed set of Instructional Considerations.

### **Analysis Results**

Three categories and seven codes emerged from expert reviewer feedback (see Figure 4). These categories were paramount to the plan for modifying the initial set of developed Instructional Considerations presented in Chapter 4. The first category (Design) related to the ‘design phase’ of the study, where the expert reviewers provided feedback on the presented definitions for the various knowledge transfer factors, and their operationalized forms. Therefore, ‘Operationalization’ and ‘Definitions’ were the codes associated with the Design category. The second category (Content) related to the ‘content’ of the Instructional Considerations, or more specifically their specific language, formulation, and organization. The third category (Application) covered enhancements for making the developed Instructional Considerations easier to implement. This involved making them more ‘user-friendly’ and adding ‘how-to’ examples to help provide teacher educators clearer insight. The following diagram details the emerged categories and their related codes:

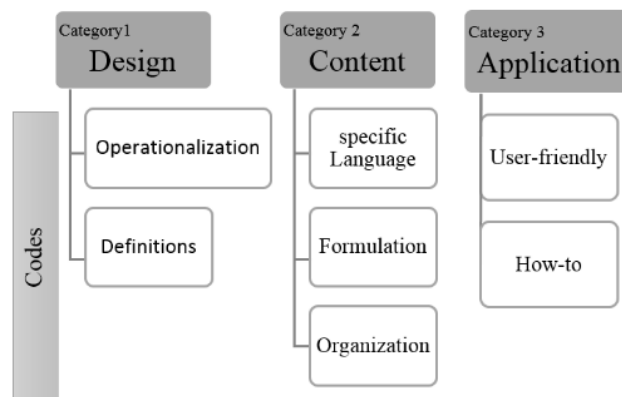


Figure 3. Diagram presenting the categories for the expert reviewer feedback.

Appendix A includes a table which provides an example of expert reviewer feedback and its related codes and category.

### Changes

This section individually addresses the emerged categories and related codes. Charting the results in this manner assured that all expert reviewer-provided feedback and suggestions were considered properly in the effort to modify and improve the final form of this research product. Following each category discussion, the researcher describes the resulting modifications to the Instructional Considerations.

#### Category 1: Design.

This category focused upon the design phase of the developed product. The expert reviewers provided feedback on a) the researcher-provided definitions for the various knowledge transfer factors; b) the selection of studies upon which the researcher based these definitions; c) the operationalized forms of the knowledge transfer factors, and; d) how well they meshed with the First Principles of Instruction.

Two of the expert reviewers suggested revising the definition the researcher provided for the *Modeling* factor of knowledge transfer. They recommended avoiding the word “model” in this definition.

Dr. Jesse Strycker: “It is often a sign of concern when a word, or versions of itself, are used as part of the definition. While most readers should have a sense of what modeling means,

there does not appear to be a definition of it present. For example, ‘Modeling is the use of models or modeling while teaching’... If one doesn’t know what a model or modeling is, that type of explanation will not help them. However, the information in the Instructional Actions column makes it very clear.”

Dr. Suaad Alfuraih: “I find your definition is clear, but you should include peers and faculty as models - not just faculty.”

Additionally, Dr. Alfuraih suggested including the *Reflection* corollary of the First Principles of Instruction as an operational form of the *Modeling* factor.

Dr. Suaad Alfuraih: “Consider adding *Reflection* in the First Principles, and relate it to the modeling factor. I think when learners reflect on what they have observed from their teacher and peers, they will modify their behavior, and this will help in transferring technology integration skills”

Five of the expert reviewers provided suggestions to amend the design and operationalization of the *Scaffolding* factor of knowledge transfer. These suggestions included revising the factor’s definition and operationalized form, and to support this factor with an additional study from the area of technology integration.

Expert reviewer suggestions relating to the *Scaffolding* factor’s definition included:

Dr. Moussa Alqattan: “I think the word ‘support’ in the definition needs more clarification. Like, should the support be all the time, or just when the learner is in need of support. For example; when he have a problem under specific conditions.”

Dr. Fayez Aldhafeerie: “*Scaffolding* is helping learners to construct knowledge through providing activities that help the learners build their knowledge toward the objective. This can be done through also considering their prior knowledge and prior experience. That’s *Scaffolding* in my opinion.”

Expert reviewer suggestions relating to the operationalization of the *Scaffolding* factor included:

Dr. Jesse Strycker: “This seems to fit well with the First Principles, though I still tend to think of things like ‘hard’ and ‘soft’ *Scaffolding*, which I don’t feel are represented as much. The progression aspects are well represented though.”

Dr. Fayez Aldhafeerie: “Consider relating the *Reflection* corollary with the *Scaffolding*

factor.”

Examples of suggestions related to the selection of studies included:

Dr. Aimee Brenner: “I think I mentioned this in an earlier statement; I would try to find at least one more study to accompany the study you have for the technology integration side.”

The researcher contemplated all of the suggestions related to the Design category, and modified this study's product accordingly. These changes are described in the following section.

### **Modifications Based Upon the Design Category**

Expert reviewer feedback in the Design category produced a number of adjustments to the developed set of Instructional Considerations. These modifications included revising the definition for the *Modeling* factor - making it clearer by applying an alternate term for the word ‘model’ and by also providing examples for how to represent the knowledge and skills of technology integration via this factor. Moreover, as suggested by Dr. Alfuraih, the *Reflection* corollary was added as an operationalization form for the *Modeling* factor. This addition also led to the provision of example activities one might implement while teaching for transfer.

Expert reviewer feedback suggested a need for clarifications to the definition of the *Scaffolding* factor. They also noted that the Instructional Considerations should specify the type of support involved with implementing considerations that relate to the *Scaffolding* factor. Therefore, the definition now specifies two different types of support that can be used when teaching for technology integration transfer: *Soft Scaffolding* and *Hard Scaffolding*. The researcher also included an additional study undergirding the *Scaffolding* factor from the area of technology integration. This means that instead of using only *Support or Assistance* as an action for the *Scaffolding* factor, *Soft* and *Hard Scaffolds* are also applicable; operationalized by the First Principles of Instruction. These modifications offered further clarity to the Instructional Considerations related to the *Scaffolding* factor by providing different types of support when needed.

### **Category 2: Content**

This category focused upon the content of the Instructional Considerations. The expert reviewers provided comments and feedback regarding the precise wording of the Instructional Considerations, recommending the researcher make them more context-specific. Some of the expert reviewers also advised modifying the arrangement of the considerations, grouping them

by the factors of knowledge transfer they most closely related to.

The first code in this category relates to the specific language used in forming the Instructional Considerations. Two of the expert reviewers recommended making the Instructional Considerations more context-specific to instructional technology courses.

Dr. Jesse Strucker: “In most instances, there is not a mention of technology or technology integration in the considerations. I’m sure readers could likely insert these concepts into each one, but that is an additional task for readers. For some you may want to make this as explicit as possible. This might be accomplished not only by including the words technology or technology integration in each consideration, but also possibly providing a contextual example for each one.”

Dr. Aimee Brenner: “You could add text to make it more specific to technology integration.”

The expert reviewers also suggested clarifying some of the considerations by slightly rephrasing them. For example:

Dr. Abdullah ALfailakawei: “For consideration 12, I would say: “ Ask learners to gather in groups and work cooperatively with each other, and ensure that the groups are mixed with advanced and less advanced learners”

Dr. Suaad Alfuraih: “For consideration 3, I think the curriculum should be built based on the literature and the required competencies at the course level, not based on their skill level, and the faculty help them to reach these competencies through practices and projects related to technology integration skills.”

The expert reviewers suggested rearranging the order of the Instructional Considerations. For example, Dr. Brenner suggested moving the set of considerations related to the *Context of Application* factor to the end, while Dr. Al-Failakawei suggested swapping the positions for two considerations. The following examples related to this code:

Dr. Abdullah Alfaiakawei: “I suggest that you shift consideration number 7 to number 6, and 6 will be number 7. This way it’s more logical to read and apply”

Dr. Aimee Brenner: “I think it would be good to also present the factors in the order of which learning usually occurs. For this, I would move *Scaffolding* after *Modeling*, because these two strategies would most likely occur BEFORE *Peer-Coaching*. I understand that learning is

very fluid, and these factors often overlap.”

These suggestions resulted in the following modifications to the developed product:

### **Modifications Based on the Content Category**

The suggestions and feedback related to the content of the Instructional Considerations resulted in several changes. Two of the expert reviewers recommended using language that makes them more context-specific to technology integration. The researcher found this suggestion significant, because the developed set of Instructional Considerations are supported by literature from the area of technology integration. Therefore, the researcher revised the Instructional Considerations to include language making them more specific to instructional technology courses.

The researcher absorbed the expert reviewer advice, and refined the Instructional Considerations accordingly.

Firstly, the researcher re-ordered the considerations to flow more logically, moving those related to the *Context of Application* factor to the end of the list, and shifting the *Modeling* factor considerations ahead of those related to *Scaffolding*.

The researcher then modified the Instructional Considerations to be more context-specific, clarifying them further by adding relevant practical examples for some of the considerations to make them easier for teacher educators to implement.

### **Category 3: Application**

This category focused upon enhancing the application and implementation of the developed product. The expert reviewers provided suggestions to make the Instructional Considerations more ‘user-friendly’, and recommended ways to include practical ‘how-to’ examples to implement specific considerations.

For example, the expert reviewers suggested organizing the Instructional Considerations in a table with headings.

Dr. Aimee Brenner: “I think I already mentioned this, but I would organize the considerations by headings related to each factor, so that it is easier to discern which relates to which.”

Dr. Moussa Alqattan: “I think you should include how-to-apply, or what practices should be done, and you also should highlight which consideration is related to which factor of

knowledge transfer.”

Dr. Fayez Aldhaferie: “Yes, I would suggest that you include an application section for each consideration, or set of considerations, based on the factors of knowledge transfer.”

Two of the expert reviewers suggested including a checklist for easier application of the developed product.

Dr. Aimee Brenner: “I think it would be neatly packaged in an easy-to-reference format. This might be done through a checklist, with space to document.”

Dr. Moussa Alqattan: “I would suggest that you include an exercise for the instructor for application like: micro-teaching, recording students application, checklist.”

Expert reviewer suggestions related to the Application category were carefully examined and, where practical, adapted/absorbed into the Instructional Considerations to improve the implementation quality of the developed product.

### **Modifications Based Upon the Application Category**

Suggestions relating to the Application category yielded three modifications to enhance the quality of product implementation.

First, the Instructional Considerations were re-organized in a table format, instead of as a single, large list. The researcher also added headings, grouping considerations together by their relevance to a specific factor of knowledge transfer.

Second, the researcher included a section in the table to recommend specific activities or instructional strategies for each of the Instructional Considerations.

And finally, the researcher created a checklist (page 140) for the teacher educator to use when implementing these considerations.

### **Revision Summary**

Table 9 summarizes the modifications made to improve the quality of the developed product based upon expert reviewer feedback. In total, five modifications were made regarding the *Design* category, three for *Content*, and three for *Application*.

Table 9

*Summary of Instructional Consideration Revisions.*

Category	Recommendations	Resolutions
<p><b>1. Design:</b></p>	<ol style="list-style-type: none"> <li>1. Do not include the word ‘model’ or ‘modeling’ in the definition of the <i>Modeling</i> factor.</li> <li>2. Add the <i>Reflection</i> factor as an operationalized form of the <i>Modeling</i> factor.</li> <li>3. Revise the definition for <i>Scaffolding</i> by clarifying the different types of support this knowledge transfer factor can provide.</li> <li>4. Try to include an additional study to accompany the knowledge transfer side.</li> <li>5. Try to specify the types of support in the operationalization table.</li> </ol>	<ol style="list-style-type: none"> <li>1. The <i>Modeling</i> factor definition was revised to clarify its meaning. This was attained by forgoing use of the word ‘model’ and providing examples of how to represent knowledge via this factor.</li> <li>2. The <i>Reflection</i> corollary was added as an operationalized form to the <i>Modeling</i> factor.</li> <li>3. The <i>Scaffolding</i> definition was revised and now includes two identified types of support.</li> <li>4. Added a study that investigates ‘soft’ and ‘hard’ <i>Scaffolding</i> in instructional technology courses.</li> <li>5. ‘Hard’ and ‘soft’ <i>Scaffolding</i> replaced this factor’s support action to clarify types of support.</li> </ol>

(continued)

Table 9 (cont.)

Category	Recommendations	Resolutions
<b>2. Content:</b>	<ol style="list-style-type: none"> <li>1. Form the instructional consideration in a way that makes it more specific to the technology integration context.</li> <li>2. Clarify the meaning of some of the considerations.</li> <li>3. Reorganize the factors of knowledge transfer and their related considerations based upon how learning occurs.</li> </ol>	<ol style="list-style-type: none"> <li>1. The Instructional Considerations were revised to include language making them more specific to instructional technology courses.</li> <li>2. These suggestions were contemplated; the researcher tried to clarify their meaning by implementing expert reviewer suggestions and including examples.</li> <li>3. The organization of the Instructional Considerations was revised based upon expert reviewer suggestions. This included moving considerations related to the <i>Context of Application</i> factor to the end and preceding <i>Scaffolding</i> with <i>Modeling</i> considerations.</li> </ol>
<b>3. Application</b>	<ol style="list-style-type: none"> <li>1. Try to organize the Instructional Considerations in a table or include headings.</li> <li>2. Provide examples for how to implement these considerations.</li> <li>3. Think about including a checklist as a teaching aid for employing these considerations.</li> </ol>	<ol style="list-style-type: none"> <li>1. The Instructional Considerations are now organized in a table instead of as one large list. Headings were also added to specify which considerations belongs to which factor of knowledge transfer</li> <li>2. Included a section in the table to recommend specific activities or instructional strategies for each of the Instructional Considerations.</li> <li>3. Created a checklist (page 140) for the teacher educator to use when implementing these considerations to promote the transfer of technology integration knowledge and skills.</li> </ol>

### Overall Perception

Generally speaking, expert reviewer feedback indicated that there is a need to take action regarding the failure-to-transfer problem for the transfer of technology integration knowledge and skills from a pre-service teacher's instructional technology courses to their in-class teaching practices following graduation. Expert reviewer feedback also supported the position that the researcher's developed Instructional Considerations offer a potential solution to this problem. For instance, Dr. Al-Qattan remarked that, "I believe investigating the transfer problem is important, especially as many of my graduates told me that they learned a lot in our courses, but when they graduate and enter the field, it's hard for them to apply what they have learned." Kuwaiti expert reviewers also noted that there is a good chance these Instructional Considerations will be adopted by faculty members who teach instructional technology courses. For example, Dr. Al-Dhaferie stated that, "I found it clear and logical to relate the six factors of knowledge transfer with the First Principles, and I liked how you presented them in the matrix you created. I think your work is well organized. I find that having a set of guidelines with the focus on the promoting of transferring technology integration skills is unique and your design has great potential to be applied in our instructional technology courses." Clearly, Dr. Aldhaferie believes that there is a strong possibility of seeing these Instructional Considerations applied in the Kuwaiti context.

Other expert reviewers also thought that these considerations have the potential to promote the transfer of technology integration knowledge and skills. However, they added that the researcher needed to also appreciate issues relating to teacher beliefs about technology integration, and how these affect their ability to use technology in their teaching practice. For example, Dr. Strycker stated, "They seem to all be reasonable. The only item I would wonder about being absent would be entrenched belief systems. If a student has an entrenched belief that technology has little or no value in a specific subject area, it may be very challenging for any of the factors to adequately transfer knowledge unless their belief is adequately challenged to make them question their belief or revise it." The researcher agrees with Dr. Strycker's perspective; the issue of belief systems and other problems relating to technology integration and teachers is discussed in the following chapter.

### **Design and Conduct Summative Evaluation**

Based upon responses from the expert reviewers, the researcher carefully revised the initial version of the instructional considerations. The revised, final form of the instructional considerations appears in Appendix I. The instructional considerations are now ready for teacher-educators to apply in their instructional technology courses within the teacher education programs at Kuwait University, or any other institution of similar context. Such an implementation of the final version of the instructional considerations will serve as the ultimate form of summative evaluation.

### **Conclusion**

Tool and development research often focuses upon context-specific problems and finding ways to develop tools and products to bridge the gap between theory and practice (Richey & Klein, 2007). The tool and product research for this study investigated the failure to transfer technology integration knowledge and skills from instructional technology courses for pre-service teachers at Kuwait University to their later in-class teaching practices. To address this problem, the researcher developed a set of Instructional Considerations to assist teacher educators in their efforts to successfully transfer technology integration knowledge and skills to the pre-service teachers on their courses. The entire design and development phase for the developed Instructional Considerations has been evaluated by six expert reviewers who are authorities in the areas of teacher education and technology integration. The researcher has analyzed and revised the developed set of Instructional Considerations based upon their feedback; the updated version is included in Appendix I.

## **Chapter 6**

### **Observations and Summary**

#### **Purpose of the Study**

In order to meet national educational standards in Kuwait, there is a demand for teachers to use technology effectively in their classrooms (Al-Awidi & Aldhafeeri, 2017). As a result, Kuwait University offers courses to prepare pre-service teachers to integrate technology into their future teaching practices. However, as indicated in the literature review, research shows that despite these efforts, newly-hired teachers fail to integrate technology *effectively* into their instruction. To combat this issue, the researcher embarked upon the effort documented in this dissertation to develop a set of instructional considerations. These considerations were created for Kuwait University teacher-educators to implement within their instructional technology courses and intended to help them promote the transfer of technology integration knowledge and skills into their students' professional teaching practices.

#### **Study Summary**

After identifying the aforementioned problem, the researcher conducted a comprehensive literature review focused upon two defined interests (Chapter 2). The first of these related to knowledge transfer; i.e. identifying the factors in previous research which have a demonstrated capacity for promoting the transfer of knowledge from a learning context to an application context. Secondly, the literature review sought out studies which support the previously noted factors of knowledge transfer in ways that apply to the Kuwaiti educational context.

The next step in the process was to operationalize these identified factors using Merrill's First Principles of Instruction (Merrill, 2002). This endeavor yielded a set of instructional considerations with the fundamental aim of promoting the transfer of technology integration knowledge and skills from related university courses for pre-service teachers to their future professional in-class practices.

Six expert reviewers who specialize in the areas of technology integration and teacher education then evaluated the set of instructional considerations. Four of these expert reviewers work at Kuwait University while the other two are based in the USA. Following this evaluation, the researcher analyzed and systemically coded expert reviewer feedback and suggestions. This review process resulted in several changes and modifications to the developed product.

### Study Contributions

This study established a set of instructional considerations which aim to promote the transfer of technology integration knowledge and skills from instructional technology courses to in-class teaching practice. As a result of this developmental process, the information gathered from the literature review had both theoretical and practical implications.

***Theoretical implications:*** As indicated in the literature, teachers and educational institutions should teach towards the transfer of knowledge from the learning context to the application context. Given this connection, the identified factors of knowledge transfer, gathered from a comprehensive literature review, have great potential for promoting knowledge transfer from a learning setting to an application setting. Indeed, the effectiveness of these knowledge transfer factors is supported by considerable research-based evidence from the areas of technology integration and teacher education. An outcome of this literature review is that these factors - conveniently identified, grouped together and operationalized via this study - can be used in other studies serving issues related to knowledge transfer and technology integration.

Also of note; the evaluation rubric in this study proved particularly effective. The feedback it helped gather from the expert reviewers was rich with information, and they thoroughly answered the open-ended questions. This developed rubric could therefore serve as a model for other studies, because the questions were sufficiently detailed, addressing all aspects of the design and developmental process, and included a comprehensive selection of reliable knowledge transfer factors. Additionally, the manner in which the rubric was designed could also assist other related studies (see Appendix B).

As indicated by Richey and Klein (2007), design and developmental research should contribute to the overall knowledge base for instructional design and technology. The phases of this study followed this principle. One significant contribution involves the way that the data gathered from the literature review, supported by evidence from the technology integration field, was used to develop a product to support instructional practices. A second contribution relates to the operationalized form of the developed product; the researcher created a matrix linking the identified factors of knowledge transfer with the relevant sections of Merrill's First Principles of Instruction (Merrill, 2002). The expert reviewers noted that this matrix was effective - illustrating that this study has contributed to design and developmental research.

This study also contributes to the educational field by directly addressing problems

relating to the present failure of many teachers to integrate technology into their instructional practices. As indicated in the literature, there are three primary barriers affecting classroom technology integration (Ertmer, 1999). These include the level of teacher knowledge and skills concerning technology integration, their regard for the benefits of using technology in their instructional practices (beliefs), and the availability of instructional technology tools (Ertmer, 1999). This design and developmental research addresses the first barrier of technology integration by providing newly hired teachers with the support needed to transfer technology integration knowledge and skills from instructional technology courses to in classroom teaching.

***Practical Implications:*** Design and developmental research endeavors to create solutions linking theories to their practical application. Moreover, the field of instructional design is pragmatic in nature; it tries to solve real-world problems via instructional and non-instructional solutions. Indeed, the set of instructional considerations established in this study (see Appendix I) were tailored to bridge the gap between knowledge transfer factors and teaching practices for instructional technology courses at Kuwait University. More specifically, they are meant to be implemented by Kuwait University's teacher-educators to solve the problem of technology integration knowledge and skills transfer. However, despite the initial intent for these instructional considerations to find use in pre-service teacher technology integration courses at Kuwait University, they do have broader application potential and could be adapted for use in similar contexts, such as teacher professional development courses provided for in-service teachers to integrate technology.

### **Study Limitations**

It should be noted here though, that these instructional considerations were never intended to solve issues related to teacher beliefs regarding technology integration nor the availability of instructional technology in schools.

### **Next Steps**

Implementation of the developed set of instructional considerations is the logical next step. The revised set of instructional considerations, refined using advice from expert reviewers, has the potential to be applied in instructional technology courses at Kuwait University and similar contexts. They are now ready for testing in such a setting.

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## Appendix A

### Expert Feedback Overview

Table 10

*Expert Feedback Overview*

Category	Examples
<p><b>1. Design</b></p> <p>Operationalization</p>	<p>“Because my position as an associate professor is mostly focused on instructional design and teaching, here is one concept I feel you might want to consider adding. I think it could be important to mention differentiation here. Once you have activated and assessed prior knowledge, the instructor then has the data that they need to differentiate instruction to better meet the needs of their learners since not every student is going to have the same level of prior knowledge when it comes to technology integration.” Dr. Aimee Brenner</p> <p>“This seems to fit well with the First Principles, though I still tend to think of things like hard and soft scaffolding, which I don’t feel are represented as much. The progression aspects are well represented though.” Dr. Jesse Strycker</p> <p>“Consider to relate the reflection corollary with scaffolding factor.” Dr. Faye Aldhaferie</p>
<p>Definitions</p>	<p>“You might want to include something about scaffolding instead of appropriate guidance” and then state that as learners attempt to reach the learning goal that instructional support will be gradually released until they master the goal. The other considerations look descriptive enough.” Dr. Aimee Brenner</p> <p>“the definition seems to be too general in nature. In other sections the Instructional Actions column as helped to provide a contextual explanation and therefore a definition as well, but this time the Instructional Action also appears to be a little too general. I believe it would be beneficial to explore the literature regarding soft and hard scaffolding to help get some ideas on how you might help to both explain and constrain what kind of support teachers and educators are providing.” Dr. Jesse Strycker</p> <p>“Scaffolding is helping learners to construct knowledge through providing activities that help the learners build the learners the knowledge toward the objective. This can be done through also considering their prior knowledge and prior experience. That’s scaffolding in my opinion.” Dr. Faye Aldhaferie</p> <p>“It is often a sign of concern when a word or versions of itself are used as part of the definition. While most readers should have a sense of what modeling means, there does not appear to be a definition of it present. For example, Modeling is the use of models or modelling while teaching... If one doesn’t know what a model or modeling is, that type of explanation will not help them. However, the information in the Instructional Actions column make it very clear.” Dr. Jesse Strycker</p>

(continued)

Table 10 (cont.)

Category	Examples
<p><b>Design</b></p> <p>Operationalization</p>	<p>“Because my position as an associate professor is mostly focused on instructional design and teaching, here is one concept I feel you might want to consider adding. I think it could be important to mention differentiation here. Once you have activated and assessed prior knowledge, the instructor then has the data that they need to differentiate instruction to better meet the needs of their learners since not every student is going to have the same level of prior knowledge when it comes to technology integration.” Dr. Aimee Brenner</p> <p>“This seems to fit well with the First Principles, though I still tend to think of things like hard and soft scaffolding, which I don’t feel are represented as much. The progression aspects are well represented though.” Dr. Jesse Strycker</p> <p>“Consider to relate the reflection corollary with scaffolding factor.” Dr. Faye Aldhaferie</p>
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(continued)

Table 10 (cont.)

Category	Examples
<p>2. Content</p> <p>Specific Language</p> <p>Formulation</p> <p>Organization</p>	<p>“You could include language that makes it more specific to technology integration” Dr. Aimee Brenner</p> <p>“In most instances there is not a mention of technology or technology integration in the considerations. I’m sure readers could likely insert these concepts into each one, but that is an additional task for readers. For some you may want to make this as explicit as possible. This might be accomplished not only by including the words technology or technology integration in each consideration, but also possibly providing a contextual example for each one.” Dr. Jesse Strycker</p> <p>“For consideration 5. I would say “provide learners with real world examples instead of saying different kinds of examples” wording the consideration in this way is more rational and consistence with the definition you provided for context of application factor.” Dr. Fayeze Al-dhaferie</p> <p>“For consideration 3. I think the curriculum should be built based on the literature and the required competencies at the course level not based on their skill level and the faculty help them to reach these competencies through practices and projects related to technology integration skills.” Dr. Suaad Alfuraih</p> <p>“However, I suggest that you shift consideration number 7 to number 6 and 6 will be number 7. This way its more logic to read and apply.” Dr. Abdullah AlFailakawei</p>
<p>3. Application</p> <p>User-friendly</p> <p>How-to</p>	<p>“Yes, the strategies you suggested are well selected but it could be more organized maybe you can use headings for practices or put them in a table.” Dr. Abdullah Alfailakawei</p> <p>“Yes, I would suggest that you include an application section for each consideration or set of considerations based on the factors of knowledge transfer.” Dr. Moussa Alqattan</p> <p>“In this case, the considerations do provide sufficient prior knowledge, but I think it could be strengthened with mention of how the assessing prior knowledge then allows the instructor to differentiate instruction when moving forward to the other factors.” Dr. Aimee Brenner</p> <p>“Yes, I find you have included sufficient considerations for peer coaching. I would include grouping as a way for applying peer couching and the instructor can design the groups of students based on their level of expertise.” Dr. Mousa Alqattan</p> <p>“I find that the corollaries mesh well with the prior knowledge. For example, show a task this could be done through showing them previous students’ project.” Dr. Suaad Alfuraih</p>

## Appendix B Evaluation Rubric

**Expert Reviewer Name:**

The following questions are specific to each of the specific factor of knowledge transfer:

### **Prior Knowledge:**

1. Based on your review of the information contained on the Knowledge Transfer Table is the prior knowledge factor adequately explained? If yes, how? If no, why? (P. 7)
2. Has an adequate amount of research explaining the prior knowledge factor been provided? If no, why? (p. 9)
3. Do the considerations provide sufficient prior knowledge to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no Why?
4. Does the considerations related to prior knowledge explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of the prior knowledge factor mesh well with the First Principles of Instruction? If yes, how? If no, why? (p. 15 & 16)

### **Context and Application:**

1. Based on your review of the information contained on the Knowledge Transfer Table is the context and application factor adequately explained? If yes, how? If no, Why? (p. 7)
2. Has an adequate amount of research explaining context and application factor been provided? If no, why? (p. 9)
3. Do the considerations provide sufficient context of application to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no, why?
4. Does the considerations related to the context and application factor explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of the context and application factor mesh well with the First Principles of Instruction? If yes, how? If no, why? (P. 15 & 16)

**Modelling:**

1. Based on your review of the information contained on the Factors of knowledge Transfer Table is the modelling factor adequately explained? If yes, how? If no, why? (p. 7)
2. Has an adequate amount of research explaining modelling factor been provided? If no, why? (p. 10)
3. Do the considerations provide sufficient Modelling to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no, why?
4. Does the considerations related to the modelling factor explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of the modelling factor mesh well with the First Principles of Instruction? If yes, how? If no, why? (p. 15 & 18)

**Peer Coaching:**

1. Based on your review of the information contained on the Factors of knowledge Transfer table is peer coaching factor adequately explained? If yes, how? If no, why? (p. 7)
2. Has an adequate amount of research explaining peer coaching factor been provided? If no, why? (p. 11)
3. Do the considerations provide sufficient peer coaching to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no, why?
4. Does the considerations related to peer coaching factor explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of the peer-coaching factor mesh well with the First Principles of Instruction? If yes, how? IF no, why? (p. 15 & 19)

**Scaffolding:**

1. Based on your review of the information contained on the Factors of knowledge Transfer table is scaffolding factor adequately explained? If yes, how? If no, why? (p. 8)
2. Has an adequate amount of research explaining scaffolding factor been provided? If no, why? (p. 11)
3. Do the considerations provide sufficient scaffolding to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no, why?

4. Does the considerations related to scaffolding factor explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of the scaffolding factor mesh well with the First Principles of Instruction? If yes, how? If no, why? (p. 15 & 19)

**Establishing self-efficacy:**

1. Based on your review of the information contained on the Factors of Knowledge Transfer table is establishing self-efficacy factor adequately explained? If yes, how? If no, why? (p.8)
2. Has an adequate amount of research explaining of establishing self-efficacy factor been provided? If yes, how? If no, why? (p.12)
3. Do the considerations provide sufficient self-efficacy to accomplish the necessary transfer from the college classroom to real settings? If yes, how? If no Why?
4. Does the considerations related to establishing self-efficacy factor explains how it may be used instructionally in technology integration course? If yes, how? If no, why?
5. Does the operation form of establishing self-efficacy factor mesh well with the First Principles of Instruction? If yes, how? If no, why? (p. 15 & 19)

**The following questions relate to the overall development of the considerations:**

1. Are the knowledge transfer factors appropriately selected?
2. Is there a technology integration research based evidence behind each of the factors and is this apparent in the considerations?
3. Is the presentation of the considerations in need of any modifications?
4. What changes need to be made?
5. Does the considerations holds the potential to be of use to teacher educators at Kuwait University or in a standalone approach of technology integration in teacher preparation program? If no which one do not? why?
6. Does the overall operation form of the considerations mesh well the First Principles of Instruction?

## Appendix C

### IRB Approval



#### BRANY SBER IRB

DATE: 09/26/2019  
 TO: Ken Potter, Ph.D.  
 CC: [commercialirb@vt.edu](mailto:commercialirb@vt.edu), Ghader Alemtairy,  
 FROM: Raffaella Hart, MS, CIP, BRANY SBER IRB (IRB00010793)

SUBMISSION TYPE: SBER-Initial Review (Event ID# 159647)  
 PROTOCOL NUMBER: 19-043-568 / VT IRB #19-612  
 STUDY TITLE: 19-612 Instructional Considerations to Promote Technology Integration Skills Transfer from Instructional Technology Courses at Kuwait University into Classroom Teaching: A Design and Development Study

**IRB DETERMINATION: NOT HUMAN SUBJECT RESEARCH**

DETERMINATION DATE: 9/26/2019  
 EXPIRATION DATE: NA  
 REVIEW TYPE: Not Human Subject Research

Thank you for your submission for the above-referenced study.

1. **BRANY SBER IRB Determination**

The BRANY SBER IRB has determined the activity mentioned above **does not constitute research involving human subjects** that is regulated by DHHS or FDA regulations and is therefore not subject to further BRANY SBER IRB review.

BRANY SBER IRB concluded your proposed activity does not meet the definition of research involving human subjects according to DHHS regulations because, while the activity is a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge, the activity **does not involve human subjects** because the data the investigator plans to collect is not about the individuals who will respond to the surveys/questionnaires.

This determination requires that all procedures and activities are performed in accordance with relevant state and local law (including tribal law, when applicable).

2. **Documents Acknowledged with this Submission**

- a. VT IRB-19-612 Authorization Letter
- b. Abstract
- c. IRB-19-612-Research Protocol
- d. Consent to Take Part in a Research Study
- e. Expert Reviewer's Rubric
- f. SBER Study Application xForm

3. **Provisions of BRANY SBER IRB's Determination**



#### BRANY SBER IRB

Although BRANY SBER IRB determined this activity is not research involving human subjects and the activity does not require further IRB review, any proposed changes must be reviewed by the BRANY SBER IRB prior to implementation. The BRANY SBER IRB will evaluate the proposed change(s) and determine whether the changes constitute human subjects research.

If you have any questions or require any additional information, please call me at 516-470-6909, or send an email to me at [rhart@brany.com](mailto:rhart@brany.com). Thank you.

**Appendix D**  
**Expert Review Request**

Ghader M. Alemtairy, Ph.D. Candidate  
5409981799  
ghader17@vt.edu

June \_\_\_\_\_, 2019

Dear Reviewer,

My name is Ghader Alemtairy and I am a Doctoral Candidate in the Instructional Design and Technology program at Virginia Tech. I am mailing to request that you act as an expert reviewer for a set of considerations that I am designing and developing in partial fulfillment of the requirements of my doctoral program. My goal is to create a set of instructional considerations that can be used by teacher educators in instructional technology courses offered within teacher education programs. The considerations are designed based upon knowledge transfer literature and aim to promote the transfer of instructional technology skills and knowledge from instructional technology courses to in-classroom practices.

You have been identified as a potential reviewer based upon your scholarly reputation in the (Instructional Design/Teacher Education) field. Such expertise would be useful in ensuring that the developed considerations are sound and will meet their specified goal. Should you elect to act as an expert reviewer, you will be provided with a rubric that can be used to evaluate the proposed considerations. Both the rubric and the considerations can be accessed electronically, and the completed rubric can be emailed to me. I estimate that your full participation will take between 30 and 60 minutes.

If you are willing to help review and validate my proposed considerations, please reply to this email by (INSERT DATE HERE). Once I receive your reply, I will email an electronic copy of the rubric and developed considerations to you.

Based upon your reputation as a scholar, I believe you have the potential to provide valuable insight to my research, and I appreciate your consideration of this request.

Sincerely,

Ghader Alemtairy

**Appendix E**  
**Modified Version of the Knowledge Transfer Factors**

Table 11

*Modified Version of the Knowledge Transfer Factors and their Related Instructional Actions*

<b>Knowledge Transfer Factors</b>	<b>Meaning</b>	<b>Instructional Actions associated with each factor</b>
<i>Prior knowledge</i>	Activating prior knowledge and assessing if the introduced knowledge exist or not in learners' previous experiences is an important when teaching for transfer. Teacher and educators are advised to activate prior knowledge and relate it to the newly learned knowledge or skill in order to enhance the process of knowledge transfer.	<ol style="list-style-type: none"> <li>1. <b>Activating</b> prior knowledge.</li> <li>2. <b>Assessing</b> prior knowledge.</li> </ol>
<i>Context of application</i>	Providing learners with opportunities to display the learned knowledge and skill in is a significant factor in knowledge transfer literature. Studies in the area of knowledge transfer recommends that the context of application must be authentic or similar in its characteristics to the real-world or application context. Educator are also advised to explain to the learners the appropriate circumstances and the rules of applying the learned knowledge or skill.	<ol style="list-style-type: none"> <li>1. Providing <b>direct</b> context of application</li> <li>2. Providing <b>indirect</b> context of application</li> <li>3. Increase learners awareness of the <b>constraints</b> of application.</li> </ol>
<i>Modelling</i>	Modelling in knowledge transfer is consider as a teaching technique. Educators who aim for knowledge transfer are advised to be live examples for their learners. Therefore, teachers should employ the knowledge and skills in their teaching. Studies of knowledge transfer findings indicates that when teachers employ the desired skills in their teaching learners will be able to transfer knowledge to other contexts because of their observation.	<ol style="list-style-type: none"> <li>1. <b>Demonstrating</b> the application of the new skill or knowledge of technology while teaching.</li> </ol>

(continued)

Table 11 (cont.)

<b>Knowledge Transfer Factors</b>	<b>Meaning</b>	<b>Instructional Actions associated with each factor</b>
<i>Peer-coaching</i>	There are a number of types of coaching; however, peer coaching has a significant impacts on learners ability to transfer the learned knowledge and skills from one context to another. When educators employ this technique in their instruction students will be able to develop a common language that can be shared among students related to the learned skill or knowledge.	<ol style="list-style-type: none"> <li>1. <b>Observing</b> their peers.</li> <li>2. Providing <b>feedback</b> to their peers.</li> </ol>
<i>Scaffolding</i>	Scaffolding is providing assistance and support to learners. This assistance and support can be from the instructor or the peers and must be tailored based on student's need, skill or knowledge level. Support can be provided through soft scaffolds strategies and hard scaffolds to promote the transfer of technology integration knowledge and skills. Therefore, Educators must know when it's appropriate to provide support and feedback to their learners in order to promote positive knowledge transfer. This support should be gradually removed.	<ol style="list-style-type: none"> <li>1. <b>Soft scaffolds:</b> "dynamic, situation-specific aid provided by a teacher or peer to help with the learning process. Such scaffolding requires teachers to continuously diagnose the understandings of learners and provide timely support based on student responses." (Brush &amp; Saye, 2002)</li> <li>2. <b>Hard scaffolds:</b> "are static supports that can be anticipated and planned in advance based upon typical student difficulties with a task. These support structures can be embedded within multimedia and hypermedia software to provide students with support while they are using the software." (Brush &amp; Saye, 2002)</li> </ol>
<i>Establishing self-efficacy</i>	Research in the area of knowledge transfer indicates that establishing learners' self-efficacy increases their success of transferring knowledge to other context. Therefore, it is an important outcome that educators must take into their consideration when they are teaching for transfer.	<ol style="list-style-type: none"> <li>1. <b>Increasing positive believes</b> of learners' ability to apply what they have learned.</li> </ol>

## Appendix F

### Knowledge Transfer Studies and their Research Based evidence

Table 12

*Knowledge Transfer Studies and their Research Based evidence from the Technology Integration Literature.*

<b>Supported Factors</b>	<b>Studies in the area of Knowledge Transfer</b>	<b>Studies in the area of Technology Integration</b>
Prior Knowledge	<p>Billing, D. (2007). Teaching for transfer of core/ key skills in higher education : Cognitive skills. <i>Higher Education</i>, 53(10), 483-516.</p> <p>Botma, Y., Rensburg, G. H. Van, Coetzee, I. M., &amp; Heyns, T. (2015). A conceptual framework for educational design at modular level to promote transfer of learning, 52(5), 499–509.</p>	<p>Dincer, S. (2018). Are preservice teachers really literate enough to integrate technology in their classroom practice? Determining the technology literacy level of preservice teachers. <i>Educational Information Technology</i>, 23, 2699–2718.</p> <p>Sadaf A., Newby T. &amp; Ertmer P. (2012). Exploring factors that predict preservice teachers’ intentions to use web 2.0 technologies using decomposed theory of planned behavior. <i>Journal of Research on Technology in Education</i>. (45) 2, 171–195.</p>
Context of Application	<p>Billing, D. (2007). Teaching for transfer of core/ key skills in higher education: Cognitive skills. <i>Higher Education</i>, 53(10), 483-516.</p> <p>Ford, J. K. (1994). Defining transfer of learning. (cover story). <i>Adult Learning</i>, 5(4), 22.</p>	<p>Kimmons, R., Miller, B.G., Amador, J., David, C., &amp; Cassidy, D. (2015). Technology integration coursework and finding meaning in pre-service teachers’ reflective practice. <i>Educational Technology Research and Development</i>, 63(6), 809-829.</p> <p>Al-Awidi, H., &amp; Aldhafeeri, F. (2017). Teachers’ readiness to implement digital curriculum in Kuwaiti schools. <i>Journal of Information Technology Education: Research</i>, 16, 105-126.</p>

(continued)

Table 12 (cont.)

Supported Factors	Studies in the area of Knowledge Transfer	Studies in the area of Technology Integration
Modelling	<p>Billing, D. (2007). Teaching for transfer of core/ key skills in higher education: Cognitive skills. <i>Higher Education</i>, 53(10), 483-516.</p> <p>Greeno, J. G., Collins, A. M., &amp; Resnick, L. B. (1996). Cognition and learning. In D. C. Berliner &amp; R. C. Calfee (Eds.), <i>Handbook of Educational Psychology</i> (pp. 15-46). New York, NY, US: Macmillan Library Reference USA.</p> <p>Pepper, K., Blackwell, S., Monroe, A., &amp; Coskey, S. (2012). Transfer of active learning strategies from the teacher education classroom to preK-12th grade classrooms. <i>Current Issues in Education</i>, 15(3), 1–22.</p> <p>Rappolt-Schlichtmann, G., Tenenbaum, H. R., Koepke, M. F., &amp; Fischer, K. W. (2007). Transient and robust knowledge: Contextual support and the dynamics of children’s reasoning about density. <i>Mind, Brain &amp; Education</i>, 1(2), 98–108.</p>	<p>Adamy, P., &amp; Boulmetis, J. (2005). <i>The impact of modeling technology integration on pre- service teachers’ technology confidence. Journal of Computing in Higher Education</i>, 17(2), 100–120.</p> <p>Bagci, K., &amp; Chelik, H. E. (2018). Examination of factors affecting continuance intention to use web-based distance learning system via structural equation modelling. <i>Eurasian Journal of Educational Research (EJER)</i>, (78), 43–65.</p>
Peer Coaching	<p>Joyce, B. R., &amp; Showers, B., (2018). Transfer of training: The contribution of coaching. <i>The Journal of Education</i>, 163(2), 163-172.</p> <p>Ma, N., Xin, S., &amp; Du, J. (2018). A peer coaching-based professional development approach to improving the learning participation and learning design skills of in-service teachers, <i>21(2)</i>, 291–304.</p>	<p>Singer, J., &amp; Maher, M. (2007). Preservice teachers and technology integration: Rethinking traditional roles. <i>Journal of Science Teacher Education</i>, 18(6), 955–984.</p> <p>Mohammad, H., Mansour, N., &amp; Wegrif, R. (2011). Kuwait’s future schools teachers’ perspective on ICT integration in classroom. <i>ResearchGate</i>.</p>

(continued)

Table 12 (cont.)

<b>Supported Factors</b>	<b>Studies in the area of Knowledge Transfer</b>	<b>Studies in the area of Technology Integration</b>
Scaffolding	<p>Lajoie, S. (2005). Extending the scaffolding metaphor. <i>Instructional Science</i>, 33(5/6), 541–557.</p> <p>Foley, J. M., &amp; Kaiser, L. M. R. (2013). Learning transfer and its intentionality in adult and continuing education, <i>137</i>(10), 5–16.</p> <p>Rappolt-Schlichtmann, G., Tenenbaum, H. R., Koepke, M. F., &amp; Fischer, K. W. (2007). Transient and robust knowledge: Contextual support and the dynamics of children’s reasoning about density. <i>Mind, Brain &amp; Education</i>, 1(2), 98–108.</p>	<p>Chen, H. C. (2017). Exploring scaffolding modes in pjbl: A professional development course to promote in-service teachers’ technology integration. <i>Journal of Educational Multimedia Hypermedia</i>, 26(2), 105-129.</p> <p>Brush, T. A., &amp; Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment. <i>Journal of Interactive Online Learning</i>, 1(2), 1–12.</p>
Establishing Self-efficacy	<p>Billing, D. (2007). Teaching for transfer of core/ key skills in higher education : Cognitive skills. <i>Higher Education</i>, 53(10), 483-516.</p> <p>Ford, J. K. (1994). Defining transfer of learning. (cover story). <i>Adult Learning</i>, 5(4), 22.</p> <p>Ma, N., Xin, S., &amp; Du, J. (2018). A peer coaching-based professional development approach to improving the learning participation and learning design skills of in-service teachers, <i>21</i>(2), 291–304.</p> <p>Govaerts, N., Kyndt, E., Vreye, S., &amp; Dochy, F. (2017). A supervisors’ perspective on their role in transfer of training. <i>Human Resource Development Quarterly</i>, 28(4), 515–552.</p>	<p>Wang, L., Ertmer, P. A., &amp; Newby, T. J. (2004). Increasing preservice teachers’ self-efficacy beliefs for technology integration. <i>Journal of Research on Technology in Education</i>, 36(3), 231–250.</p> <p>Habeeb K. (2018). Effects of interactive whiteboard training programs on teacher efficacy and student outcomes in kindergartens. <i>Educational Information Technology</i> (23), 2201–2212.</p>

## Appendix G

### Modified Operationalization Matrix

Table 13

*Modified Operationalization Matrix*

Factors Promotes Knowledge Transfer First Principles		Prior Knowledge (PK)		Context of Application (CoA)			Modeling (M)	Peer Coaching (PC)		Scaffolding (S)		Establishing Self-efficacy (ES)
		Activation	Assessment	Direct	Indirect	Constraints	Demonstration	Observation	Feedback	Soft scaffolds	Hard Scaffolds	Increasing positive beliefs
Problem	Show Task		•									
	Task Level									•		
	Problem Progression									•		
Activation	Previous Experience	•										
	New Experience		•									
	Structure		•									
Demonstration	Demonstration Consistency						•					
	Learner Guidance						•					
	Relevant Media						•					
Application	Practice Consistence			•				•			•	
	Diminishing Coaching				•			•	•	•		•
	Varied Problems					•					•	
Integration	Watch Me										•	•
	Reflection						•					•
	Creation									•		•

**Appendix H**  
**Operationalization Form of the Knowledge Transfer Factors**

Table 14

*Explains How Each Action of the Identified Knowledge Transfer Factors are Associated with One or More Corollaries of the First Principles of Instructions.*

<b>Factors of Knowledge Transfer and their actions or conditions</b>	<b>Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions</b>	<b>Operation Form</b>
<p>Prior Knowledge (PK)  <u><i>Actions of PK</i></u>            1. <i>Assessment</i> of prior knowledge.</p>	<p>1. Assessment of prior knowledge is associated with three corollaries of the First Principles, which are: (a) show task of problem centered principle. (b) New experience of the activation principle. (c) Structure of the activation principle.</p>	<p>1. Assessment of prior knowledge            (a) To assess at what level the learners skills or knowledge through showing them the task that they should accomplish at the end of the learning process and assess at what level are your learners.            (b) Show the learners relevant experience that can be used as a foundation for the desired learning outcome. Through doing this the instructor can also know at what level of expertise is his learners.            (c) At the end of the assessment process the instructor must provide his learners with a structure based on their level of expertise to build the new technology knowledge or skill on.</p>

(continued)

Table 14 (cont.)

<b>Factors of Knowledge Transfer and their actions or conditions</b>	<b>Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions</b>	<b>Operation Form</b>
2. <i>Activation</i> of prior knowledge.	2. Activation of prior knowledge is associated with one corollary of the first principles which is: (a) Previous experience of the Activation Principle.	2. Activate prior knowledge or experience through directing learners to recall, relate, describe or apply knowledge from previous experience which can be used as a base for the new technology integration knowledge.
Context of Application (CoF) <b><i>Actions of CoF</i></b> 1. Providing direct context of application.	1. Providing direct context of application is associated with one corollary of the First Principles which is: (a) practice consistency of the application principle.	1. Providing consistence practice and application opportunities to apply the learned knowledge with the implied objectives. This can happen through recalling information, providing multiple kinds of examples and making learners aware (predicting) the consequences of applying the knowledge by knowing the conditions or find faulted conditions given an unexpected consequence.
2. Providing indirect context of application.	2. Providing indirect context of application is associated with one corollary of the First Principles which is: (a) Diminishing coaching of the Application principle.	2. Providing indirect context of application through providing learners with problem solving opportunities and providing them with feedback when needed.
3. Understanding the constrains of application.	3. Understanding the constrains of application is associated with one corollary of the First Principles which is: (a) varied problems of the application principle.	3. Understanding the constrains of application through providing learners with a sequence of varied problems related to technology integration to solve.

(continued)

Table 14 (cont.)

Factors of Knowledge Transfer and their actions or conditions	Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions	Operation Form
Modelling (M) <u>Action of (M)</u> 1. Demonstration	1. Demonstration is associated with four corollaries of the First Principles which are: (a) Demonstration consistency of the Demonstration principle. (b) Learner guidance corollary of the Demonstration principle. (c) Relevant media corollary of the Demonstration principle. (d) Reflection corollary of the Integration Principle.	1. Modelling through demonstration. (a) associate your demonstration with the learning goal and let the learners know about it. This can be done through: providing learners with examples and non-examples for the desired knowledge or skill of technology integration, demonstrating the procedures, visualization of the procedures and modeling the teacher behavior. (b) Provide learners with appropriate guidance through directing them to relevant information, providing them with kinds of representations and comparing related subjects. (c) Use relevant media to the technology integration skill or knowledge you want teach. (d) Provide learners opportunities to reflect on what they have seen from their instructor and peers.

(continued)

Table 14 (cont.)

Factors of Knowledge Transfer and their actions or conditions	Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions	Operation Form
Peer Coaching (PC) <u>Actions of (PC)</u> 1. Observation	1. Observation is associated with two corollaries of the First Principles which are: (a) Practice consistence corollary of the application principle. (b) Diminishing coaching principle of the application principle.	1. Observation in peer coaching. (a) Associate the given practice with the learning objectives and make the learners aware of them. While practicing ask learners to observe their colleagues and predict the process of the practice. (b) Ask the more advanced learned to guide their less advanced colleagues when practicing new knowledge or skill. This can be done through asking the advanced learners to provide appropriate feedback including error detection and correction. Withdraw this coaching gradually.
2. Feedback	2. Feedback is associated with one corollary of the Application principle is: (a) the diminishing coaching of the First Principles.	2. Allow learners to solve problems related by providing them with appropriate feedback when needed through error detection and correction. Gradually withdraw feedback.

(continued)

Table 14 (cont.)

Factors of Knowledge Transfer and their actions or conditions	Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions	Operation Form
Scaffolding (S) <u>Actions of (S)</u> 1. Provide support through soft scaffolds.	1. Providing support through soft scaffold can be associated with two corollaries of the First Principles which are: (a) Problem Progression corollary of the Problem principle. (b) Diminishing coaching principle of the application principle.	1. Providing support and assistance through soft scaffolds. (a) Provide learners with a set of real-world problems to solve and increase the difficulty and the complexity of the problem gradually. (b) Provide learners with feedback when needed when they are solving real-world problems.

(continued)

Table 14 (cont.)

<b>Factors of Knowledge Transfer and their actions or conditions</b>	<b>Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions</b>	<b>Operation Form</b>
2. Provide support through hard scaffolds.	2. Provide support through hard scaffolds can be associated with four corollaries of the First Principles. (a) practice consistency of the Application Principle. (b) Varied Problems of the Application Principle. (c) Watch me of the Integration Principle. (d) Creation of the Integration principle.	2. Providing support and assistance through hard scaffolds: (a) Allow learners to use their own ways to use the new knowledge or skill related to technology integration. (b) Increase the level of practice or application gradually when learners are using a technological software and allow them to receive support from the instructor or their peers when needed. (c) Ask learners to think about predicting the types of issues and problems when using technological teaching aid and run a discussion among learners to this about the solutions. (d) Allow learners to watch their own progress while using an instructional technology tool. through asking their permission to record them while they are presenting or receiving anonymous feedback from their peers.

(continued)

Table 14 (cont.)

Factors of Knowledge Transfer and their actions or conditions	Associating The Actions of Knowledge Transfer Factors with the First Principles of Instructions	Operation Form
Establishing Self-efficacy (ES) <u>Actions of (ES)</u> 1. Increasing positive believes	1. Increasing self-efficacy believes is associated with four corollaries of the First Principles which are: (a) Diminishing coaching of application principle. (b) Watch me corollary of the integration principle. (c) Reflection corollary of the integration principle. (d) Creation corollary of the integration principle.	1. Increasing positive believes in self-efficacy. (a) Diminishing coaching throughout the application and practice will increase learners positive believes. (b) Give learners opportunities to demonstrate their learned skill or knowledge. (c) Allow learners to reflect on their newly learners knowledge and skills through discussions. (d) Give learners to create new ways to present their newly learned knowledge.

## Appendix I

### Considerations to Promote the Transfer of Technology integration Skills and Knowledge from Instructional Technology Courses to in Classroom Teaching

#### Instructional Considerations to Promote the Transfer of Technology Integration Knowledge and Skills from Instructional Courses to In-Class Teaching Practices

Please contemplate applying the following Instructional Considerations when teaching instructional technology courses to promote the transfer of technology integration knowledge and skills. The considerations are segregated according to specific knowledge transfer factors.

Instructional Considerations	Suggested Practices & Examples
<p><b>Considerations Related to <i>Prior Knowledge</i></b></p> <p>1. Assess learner skills or knowledge before teaching them new technology integration skills or knowledge. Assess students at the end of the learning process by providing them opportunities to practice the newly-learned knowledge or skill.</p>	<p>To achieve this, show students the task they must complete and assess their confidence levels. You can also use a checklist, or pre-test, asking learners to state their expected gains from the desired instructional technology objective. Similar assessment is repeated after the teaching period.</p>
<p>2. Differentiate between learner levels of expertise regarding technology integration. Set an appropriate objective for them based upon this assessment.</p>	<p>Instructors can group learners based upon their expertise with instructional technology (beginners-moderate-experts). Learners need not be aware of these groupings.</p>
<p>3. Show learners relevant experiences that can be used as a foundation for the desired learning outcome.</p>	<p>Instructors can use previous instructional technology projects from earlier courses as examples for their learners. This will also help students to learn the desired standards.</p>

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<b>Instructional Considerations</b>	<b>Suggested Practices &amp; Examples</b>
4. Activate prior knowledge or experience by directing learners to recall, relate, describe or apply knowledge from previous experiences which can be used as a foundation for new technology integration knowledge.	In '100 level' instructional technology courses, instructors can ask students about previous learning experiences where they used technology or software for making presentations. In '300 level' instructional technology courses, teachers ask learners to remember their '100 level' instructional technology class experiences.
<p data-bbox="203 581 695 617"><b>Considerations Related to <i>Modeling</i></b></p> <p data-bbox="203 657 776 909">5. Associate your demonstration with the learning goal, and make learners aware of it. This can be achieved by providing learners with examples and non-examples of the desired technology integration knowledge or skill, demonstrating the procedures, visualization of procedures and modeling.</p>	Make sure that there is no conflict between what you are doing while using an instructional technology tool and what is expected from learners.
6. Provide learners with appropriate guidance by directing them to relevant information, by giving them a variety of representations of certain instructional technology tools, and by comparing related subjects.	Example: If the objective is to learn presentation technology, direct them to explore different software such as PowerPoint, Prezi, Keynote, etc. Give them the opportunity to compare between instructional tools within the same category.
7. Use media relevant to the technology integration skill or knowledge you want teach.	Example: If the objective is to use video or movies, try to use them while you are teaching. If the objective is to manage a class by using technology, try to use it in your instructional technology course.
8. Ask learners to reflect upon what they have observed from their instructor or peers when they were using a certain instructional technology tool.	This can be achieved by asking learners questions, holding class discussions, or by asking learners to record notes in a journal for sharing later with others.

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Instructional Considerations	Suggested Practices & Examples
<p><b>Considerations Related to <i>Peer-Coaching</i></b></p> <p>9. While practicing, ask learners to observe their colleagues and predict the process/steps of the given instructional technology practice or project.</p>	<p>Example: Ask learners to work with a partner. While one of them is applying what they have learned about an instructional technology practice or tool, the other student will evaluate their partner's application procedure. Feedback can be shared between teams.</p>
<p>10. Indirectly; ask the more advanced learners to guide their less advanced colleagues when practicing with a new knowledge or skill related to technology integration. This can be achieved by asking the advanced learners to provide appropriate feedback to their peers, including error detection and correction.</p>	<p>Provide learners with a checklist or rubric to evaluate each other's work.</p>
<p>11. Allow learners to solve instructional technology problems by providing them with appropriate feedback, when needed, and gradually withdraw this feedback as they progress.</p>	<p>Example: If pre-service teachers are learning about using videos while teaching, and the audio fails to work during this process, what instructional solutions can they make? Answers could include; 'I will try to write down the script and read it to the students,' or 'I will enable the subtitle feature, but if this does not work, I will try to summarize what the audio covers,' etc. (Try to do this when they are learning about a new instructional technology tool).</p>
<p><b>Considerations Related to <i>Scaffolding</i></b></p> <p>12. Provide learners with a set of real-world instructional technology problems to solve, and gradually increase problem difficulty/complexity.</p>	<p>Example: If students are making a classroom presentation using Prezi and their internet connection suddenly disappears, what instructional solutions can be made?</p>
<p>13. Provide learners with feedback, when needed, while they are solving real-world problems.</p>	<p>Allow learners to share feedback about their solutions via discussions. Such discussions can be in-class or online.</p>

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<b>Instructional Considerations</b>	<b>Suggested Practices &amp; Examples</b>
14. Allow learners to use their own methods of using the new knowledge or skill related to technology integration.	Example 1: Let students decide what tool they would like to use to present their projects. Example 2: Let students explore different apps for classroom management, and let them decide which one is best for them based upon the features they prefer or will benefit most from.
15. Increase the level of practice or application gradually when learners are using technological software, and allow them to receive support from their instructor or peers when needed.	Example: If the objective relates to using presentation software, initially ask students to use 2 to 4 software features, but require them to use more features in subsequent efforts. Allow them to share their thoughts openly with each other in class, or online via Blackboard.
16. Ask learners to think about predicting the types of issues and problems they may encounter when using technological teaching aids, and hold a discussion between learners to brainstorm solutions to potential difficulties.	Example: Ask learners to write (and share) a list of problems they might face while using an instructional technology tool. Example 1: This can be achieved by asking students for permission to tape their presentations so they can watch themselves or share with others. Example 2: Let them receive anonymous feedback about their projects from peers.
<p data-bbox="203 1213 732 1276"><b>Considerations Related to <i>Establishing Self-Efficacy</i></b></p> <p data-bbox="203 1325 776 1461">18. Diminish coaching throughout the application and practice. This will increase a learner's positive self belief. (c</p>	Allow learners to receive feedback and assistance as needed from the instructor and their peers at the beginning of the semester, then gradually diminish this support as the semester progresses.
19. Give students opportunities to demonstrate their newly-learned instructional technology knowledge or skill.	Example: Coursework could involve exploring an instructional technology tool. Let pre-service teachers share what they have learned in using this tool.

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<b>Instructional Considerations</b>	<b>Suggested Practices &amp; Examples</b>
20. Allow learners to reflect upon their newly-learned knowledge and skills via discussion.	Example: Hold an in-class discussion asking pre-service teachers about their own use or application of a certain technological tool. Questions could include: ‘What did you feel while using this tool? Was it complicated? Will you consider using it in the future?’
24. Give learners opportunities to create new ways to present their newly-learned knowledge.	Example: Learners can perform round-tables instead of regular presentations to display their work. Or they can record videos to show their work using a certain type of instructional technology tool.
<p data-bbox="201 745 706 814"><b>Considerations Related to <i>Context of Application</i></b></p> <p data-bbox="201 852 792 1360">25. Provide learners with consistency practice and application opportunities to apply the learned knowledge with the implied technology integration objectives. This can be achieved through recalling information, providing real-world examples of instructional technology application, and by making learners aware (predicting) the consequences of applying this knowledge. The latter is accomplished through student understanding for the normal operating conditions, and what to do when unexpected faults occur while using the technology in their teaching.</p>	<p data-bbox="821 852 1409 1066">Consider doing a micro-teaching activity in the 300 level courses. Note that instructional technology projects are time consuming. Therefore, make learners aware of the type of the projects they have to complete and set a timetable at the beginning of the semester.</p>
23. Provide indirect context of application for the learned knowledge or skills of technology integration.	Example: Learners can apply and share what they have learned by using Blackboard instead of an in-class application.
24. Make sure learners are aware of the constraints of application by providing them with a sequence of varied problems to solve that relate to technology integration.	Consider providing a checklist for any instructional technology project.

## Instructional Consideration Checklist

Check box if completed	Date	Notes
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### 1. Prior Knowledge:

#### Activation of prior knowledge

- Previous experience

#### Assessment of Prior Knowledge

- Show task
- New experience
- Structure

### 2. Modeling

#### Demonstration

- Demonstration Consistency
- Learner Guidance
- Relevant Media
- Reflection

### 3. Peer Coaching

#### Observation

- Practice Consistence
- Diminishing Coaching

#### Feedback

- Diminishing Coaching

### 4. Scaffolding

#### Support through soft scaffolds

- Problem Progression
- Diminishing Coaching

#### Support through hard scaffolds

- Practice Consistence
- Varied Problems
- Watch Me
- Creation

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## **5. Establishing Self-efficacy**

### **Increasing Positive Believes**

- Diminishing Coaching
- Watch Me
- Reflection
- Creation

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## **6. Context of Application**

### **Direct**

- Practice Consistence

### **Indirect**

- Diminishing Coaching

### **Constrains**

- Varied Problems