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Educators' Perceptions of the Substitution, Augmentation, Modification, Redefinition Model for Technology Integration

Mark Angelo Savignano

UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

EDUCATORS' PERCPETIONS OF THE SUBSTITUTION, AUGMENTATION, MODIFICAITON, REDEFINITION MODEL FOR TECHNOLOGY INTEGRATION

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Mark Angelo Savignano

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Accepted by the Doctoral Committee

_____
Mia Kim Williams, Ph.D., Research Advisor

_____
Heng-Yu Ku, Ph.D., Committee Member

_____
David Aske, Ph.D., Committee Member

_____
Eugene Sheehan, Ph.D., Faculty Representative

Date of Dissertation Defense _____.

Accepted by the Graduate School

_____
Linda L. Black, Ed.D.
Associate Provost and Dean
Graduate School and International Admissions

ABSTRACT

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The Substitution, Augmentation, Modification, Redefinition (SAMR) model has been introduced (Puentedura, 2006) claims that use of technology could predict student outcomes. School districts and educational institutions have been adopting this model in hopes to enhance the educational experience and outcomes for their students (SAMR Model, n.d.). This study explored six teachers' and three administrators' perception of the SAMR model in integrating technology into the classroom environment. This qualitative research, used surveys and interviews for indicative analysis using the constructivist approach. Data analysis found that educators using the SAMR model were and had a common level used for technology integration as well as a favorite level. This study also found the SAMR model changed teacher practices by encouraging them to integrate technology at a higher level. With regard to integrating technology, this study found three areas of agreement between teachers and administrators: teachers require increased planning time; the use of technology in the classroom can lead to off-task behavior; and when implemented correctly, digital tools increase student achievement. Furthermore, three new issues were found. First, educators suggested the SAMR model puts too much emphasis on higher-level integration. Second, educators mentioned an increase in off-task behavior when using technology. Third, educators believed the SAMR model is best used

as a secondary consideration during lesson development. This study suggested three changes for the SAMR model. My first suggestion is to transform the SAMR model into a box-shaped diagram, opposed to its current hierarchical arrangement, to place equal significance on each level of technology integration. Second, it is recommended that the SAMR model be integrated into existing instructional design models. Third, new language added to digital citizenship standards to include behavior with technology.

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I would like to thank my parents for supporting me through this process. I would also like to thank John Holbrook for the countless hours of advice.

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CHAPTER I

INTRODUCTION

In the United States, there has been a big push for teachers to integrate technology into the classroom. The Common Core State Standards (Colorado Department of Education, 2014) included technology benchmarks aimed at developing students' proficiency with digital tools. Likewise, the earlier No Child Left Behind legislation provided funding earmarked for training teachers to integrate technology (Lawless & Pellegrino, 2007). In 2013, the United States spent $13 billion on classroom technology to improve student performance (Jones, 2013; Nagel, 2014). Educators have been evaluating the best methods to integrate technology in education (Herro, Kiger, & Owens, 2013; Wang, Ke, Wu, & Hsu, 2012; Wood, White, Woodruff, Anderson, & Goldstein, 2011). Research on technology integration has spanned across school subjects, such as, but not limited to, language arts (McGrail, 2007; McNabb, 2005; Yim, Warschauer, Zheng, & Lawrence, 2014), mathematics (Adamy, 1999; Dawson, Ritzhaupt, Liu, Rodriguez, & Frey, 2013), tutoring (Chen, Liao, Chen, & Lee, 2011; Chi, Siler, Jeong, Yamauchi, & Hausmann, 2001; Corrigan, 2012), and science (Campbell & Abd-Hamid, 2013; Dolenc & Aberšek, 2015; Reiss & Millar, 2014). In addition to integration into subjects, several models have been created detailing how teachers are integrating technology (Angeli & Valanides, 2014; Puentedura, 2006). However, technology adoption within the classroom has been slow (Laferriere, Hamel, & Searson, 2013; Lavicza, 2010; Lu & Overbaugh, 2009; Wachira & Keengwe, 2011) and the

success of such practical application of technology integration in teaching practices for student learning, unevaluated. One method of evaluating technology integration has been Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) model, which has encouraged teachers to move away from integrating technology as a substitution for traditional methods, towards a redefinition of instruction using technology in innovative ways. Puentedura's (2006) model reflects this by ranking technology integration from the basic form of integration level, substitution, to a more complex level of integration; the redefinition level.

Description of the Problem

Although schools in the United States have spent considerable money on digital devices each year (Bulman & Fairlie, 2016), teachers have been slow to integrate technology into their classroom and curriculum (Keengwe, Onchwari, & Wachira, 2008; Laferriere et al., 2013). To assist in technology integration, school districts have turned to technology integration models to hold teachers to a standard of integration. Such models have suggested methods and strategies for incorporating the latest technological tools and address changing pedagogies (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013; Machado & Laverick, 2015; Ottenbreit-Leftwich, Glasewski, Newby, & Ertmer, 2010).

One such model designed to guide educators' integration of technology into the learning environment has been Puentedura's (2006) SAMR model. This model has suggested digital tools may be incorporated at four distinct levels of integration. Further, it has assumed a digital tool could be used at each of the four levels, provided the software was versatile enough to allow it (Puentedura). The SAMR model has predicted

that integration at the lower levels would have a modest influence on student performance; likewise, integration at the higher levels would have a positive effect upon student performance. In accordance with the substitution level of the SAMR model (Puentedura), Ligas (2002) used computer-assisted instruction in place of traditional instruction. The computer-assisted instruction adjusted to students' reading needs, assessed their progress, gave additional tutoring, and was at the appropriate learning level. Ligas (2002) found computer-assisted instruction increased learning for at-risk students compared to controls.

Barriers to technology integration have included, but are not limited to, valuing technology in the classroom (Inan & Lowther, 2010), knowledge of technology and its use (Angeli & Valanides, 2014; Ertmer, 1999), and teacher attitude towards technology (Cubukcuoglu, 2013; Mills, & Tincher, 2003). To date, there has been little formal research conducted on the SAMR model (Puentedura, 2008). The focus of this study was to understand educators' perceptions of using the SAMR model (Puentedura) for integrating technology.

Significance of the Study

Educational institutions in America have been adopting the SAMR model (Puentedura, 2006) to guide technology integration (Become a SAMuRai Teacher, 2014; Brandywine Heights Area School District, 2015; SAMR Model, n.d.). This dissertation adds empirical data to test the validity of SAMR model (Puentedura, 2006) by measuring achievement and intrinsic motivation when using different media appropriate to the substitution and redefinition level. The substitution level of the SAMR model (Puentedura) has been the replacement of a traditional learning tool with its digital

counterpart, i.e., students use Microsoft Word® instead of paper and pen. At the augmentation level, the digital tool has acted as a replacement of traditional methods, while adding additional functionality afforded by the tool. Yet, the general process of the learning activity remains. For example, using Microsoft Word to write a persuasive essay instead of paper and pencil, but using the affordances of the editing and spelling tools, or by adding Grammarly® alongside Microsoft Word to assist the students' grammar and spelling. The substitution and augmentation levels have been grouped together as levels of enhancement that have resided below a dividing line to the next group, representing lower levels of technology integration. At the next level, modification, the digital tool has enabled the learning task to be significantly reformed. An example of modification could be the use of mobile phones where students create video blogs to embed a digital, multimodal element to the essay. This could enhance the persuasion of the essay or allow for multiple modes of communication to better connect with the audience. Redefinition has occurred when a digital tool was used to accomplish a task that could not be done with the tools; the essence of the learning remains (writing a persuasive essay), i.e., using a 3D modeling simulator versus sketching software to design prototype for a sales pitch; creating an animation advertisement, or establishing a social media campaign to advocate for a cause. These are all examples of digital-rich persuasive writing that no longer represent their traditional paper and pencil persuasive essay. They are redefined. It is impossible to recreate such learning experiences without the digital tools.

There has been a lack of research on teachers' and administrators' view on the SAMR model (Puentedura, 2006) for incorporating technology into the classroom (Hamilton, Rosenberg, & Akcaoglu, 2016). This study adds to the literature on how

educators perceive the model, integrate technology using the SAMR model (Puentedura, 2006), and it provides insights to perceived deficiencies educators have with the model.

Purpose of the Study

The existing literature has extensively addressed issues with school-wide technology integration (Graham, Tripp, & Wentworth, 2009; Grisham, & Wolsey, 2006; Herro et al., 2013; Lawless & Pellegrino, 2007; Wang et al., 2012; Wood et al., 2011). However, there has been little research (Hamilton et al., 2016) on the SAMR model (Puentedura, 2006) despite its growing popularity as an evaluative tool within PK-12 learning environments. This study aimed to examine teachers' and administrators' perceptions of the SAMR model used for promoting technology integration.

Research Design

Research Questions

Q1 What are educators' perceptions of the Subsitution, Augmentation, Modification, Redefinition (SAMR) Model?

Q2 How does the Substitution, Augmentation, Modification, Redefinition (SAMR) model transform educators' practices?

Q3 From the perception of the participants in this study, how effectively aligned are administrators' views to the teachers' views when using the Substitution, Augmentation, Modification, Redefinition (SAMR) model for effective technology integration?

Methodology

This research employed a qualitative phenomenological approach to build meaning of the collective experience (Merriam, 2009). This qualitative phenomenological study utilized observed data from interviews and an online survey to reconstruct the human experience (Creswell, 2013; Schwandt, 2007).

Methods

Utilizing a phenomenological approach allowed the researcher to provide perspective on the experience humans construct from a phenomenon (deMarris & Lapan, 2004). This approach also allowed the researcher to expand on the participants' experience and, through additional questioning, uncover deeper meaning behind the knowledge in the study (Creswell, 2012).

Data Collection and Procedures

This study used semi-structured, one-on-one interviews following the Merriam, Tisdell, and Ebooks Corporations (2015) format and an exploratory online survey. The online survey was used to gain greater depth to the answers of the one-on-one interviews.

Data for this study were collected through interviewing teachers and administrators, who are grouped together as *educators*. The inclusion of both teachers and administrators was to gain a broad perspective of the SAMR model (Puentedura, 2006). Participants in this study were from two K-12 school districts along the Front Range of Northern Colorado and were selected using purposeful sampling and criteria-selection.

Both administrators and teachers were contacted through various forms of media asking if they were willing to participate. Both the researcher and participants agreed on a time and place to meet. Sometime before the meeting took place, the participant received a link to an online survey to complete. Once the online interview was completed, the researcher reviewed the data for any area or topic to guide probing questions. Before the interview, the researcher went over the participant consent form (Appendix A) and engaged in small banter to create a sense of rapport with the participant. Interviews lasted

between 30 minutes and an hour. Locations of the interviews varied between coffee houses, participants' home, researchers' home, and restaurants.

Data Analysis

Data were analyzed through the phenomenological strategy of emergent analysis (Schwandt, 2007). Emergent analysis enabled the researcher a degree of flexibility to code the data as it were collected (Creswell, 2012). While the data were being collected, the researcher coded and sorted it into themes and sub-themes. Through open-coding, this process was repeated once the data were collected to find additional themes and sub-themes. Similar open codes were coded into final themes through an axial coding process (Creswell, 2012).

Theoretical Framework

The use of the SAMR model (Puentedura, 2006) for technology integration was viewed through the lens of the Technological, Pedagogical, Content Knowledge (TPACK) framework (Koehler & Mishra, 2009). The purpose of the TPACK framework (Koehler & Mishra, 2009) was created to help educators integrate technology into the classroom. Understanding the relationship of technological knowledge with pedagogical knowledge and content knowledge would improve their effectiveness as an educator (Koehler & Mishra, 2009). The research sought to understand educators' perception of the SAMR model (Puentedura, 2006) of technology integration through the TPACK framework (Koehler & Mishra, 2009).

Assumptions

This study had two major assumptions for technology integration using the SAMR model (Puentedura, 2006). First, this study assumed the descriptive nature of the

SAMR model (Puentedura, 2006) with its explicit levels of integration would help educators develop more effective lessons. Past literature (Karatas, 2014) has provided evidence that teachers using similar models have seen positive results; thus perceived positive results were transferred to the SAMR model.

Second, this study presumed that the SAMR model (Puentedura, 2006) had created a common language between teachers and administrators for talking professional about technology integration. This common language between teachers and administrators may help accurately identify learning goals, assessments, and instructional methods that involve technology integration.

Parameters

The small sample size of this study allowed for a qualitative, personal perspective of the SAMR model. Interviews and online survey data from every district and school that has adopted the SAMR model (Puentedura, 2006) was not achievable. Thus, for reasons of time and expense as suggested by Fraenkel and Wallen (1996), a smaller sample size was deemed more reasonable. While this study focused on perceptions of educators' use of the SAMR model (Puentedura, 2006), other aspects of technology integration, such as motivation and student achievement, were not directly addressed.

Another constraint of this study was the geographic area where participants were selected. All participants in this study resided and taught along the Front Range of the Rocky Mountain region in Colorado. Other factors may influence the perceptions of these localized participants related to unforeseen understandings related to the region, culture of schooling, or local influence. Thus, findings are specific as in most qualitative research.

The data collected within this research were mainly self-reported. Teachers and administrators were using experience to draw conclusions and respond to questions in the interviews and surveys. There was a risk that self-reporting may lead to inaccurate responses, perhaps adopted from district rhetoric or, simply, reporting what the participant assumed the researcher wanted to hear.

This research also did not incorporate any other technology initiatives that teachers or administrators were implementing in addition to their current roles. These other educational initiatives like literacy programs or math improvements plans could potentially influence responses in this research.

Definition of Terms

A.S.S.U.R.E. Model. The A.S.S.U.R.E. model is an instructional design model that separates lesson design into steps. The letters in A.S.S.U.R.E. stands for Analyze learners, State objectives, select methods, media and materials, utilize technology, media and materials, require learner participation, evaluate and revise (Heinich, Molenda, Russel, & Smaldino, 1999).

Bloom's Taxonomy. A taxonomy of definitions that define six categories of the cognitive domain (Krathwohl, 2002).

Educator. A professional in the field of education; for the purposes of this study, professionals specifically employed in the role of teacher or administrator at a public k-12 school district. Colorado Department of Education (2014) defines an educator as "a person, such as a principal, assistant principal, administrator, teacher, specialized service professional or other school or school system employee who is involved in educating learners" (p. 326).

Emergent analysis. Emergent analysis is a data analyzation technique that empowers the research to code the emerging data as they were collected (Creswell, 2012).

Instructional Technology. Technology that is used to facilitate, promote, and enhance learning (Ivy, 2011).

Levels of Technology Integration (LoTi). The technology integration model LoTi combines instructional practice, assessment and evaluation, and technology together (Barron, Kemker, Harmes, & Kalaydjian, 2003).

Pedagogy. A field of academic study in the profession of education that encompasses the theory of teaching, practice of teaching, theory of learning, and curricular demands (Pedagogy,2015).

Phenomenology. The translation of the human experience into consciousness (Merriam, 2009).

SAMR Model. Substitution, Augmentation, Modification, and Redefinition Model. A model detailing how technology is integrated into schools and the different tools used (Puentedura, 2006).

Second-order barriers. Second-order barriers are school-level factors such as a teachers' beliefs and attitudes toward technology integration and their beliefs and attitudes towards change (Ertmer, 1999, 2001).

Technological, Pedagogical, Content, Knowledge (TPACK). Three flexible bodies of knowledge to help teachers integrate technology and develop effective instructional practices (Koehler & Mishra, 2009).

Summary

In recent years, American schools spent billions of dollars integrating technology into the classroom (Inan, Lowther, Ross, & Strahl, 2010). Despite this effort, schools have sluggishly incorporated technology (Laferriere, Hamel, & Searson, 2013; Lavicza, 2010; Lu & Overbaugh, 2009; Wachira & Keengwe, 2011). Puentedura (2006) created the SAMR model – a guide to using educational technology – to encourage educators to use digital tools in novel ways. This qualitative phenomenological study sought to investigate the potential advantages and drawbacks of the SAMR model, specifically from the perspective of educators in Colorado's Front Range. Through the use of an online survey and one-on-one interviews, collected data were analyzed through emergent analysis, and coding the information into themes and sub-themes. The findings in this study provided data on educators' perceptions of technology integration using the SAMR model.

CHAPTER II

LITERATURE REVIEW

Introduction

The growing availability of new technology created a shift in classroom pedagogy and challenged traditional understandings of teaching content knowledge (Donnelly & Kyei-Blankson, 2015). A myriad of technology integration models developed in response to this shift; these include the SAMR model (Puentedura, 2006), Levels of Technology Integration (LoTi) Framework (Barron et al., 2003), and Technology Integration Matrix (TIM; Welsh, Winkelman, & Harmes, 2016).

This chapter examines the SAMR model (Puentedura, 2006), the TPACK framework (Koehler & Mishra, 2009), and TPACK (Koehler & Mishra, 2009). It further examines methods to gain administrators' support for assisting teachers with technology integration.

The Substitution, Augmentation, Modification, Redefinition Model

Dr. Ruben R. Puentedura (2006) designed the SAMR model to consist of four levels of technology integration (Jude, Kajura, & Birevu, 2014). From lowest to highest, the levels are substitution, augmentation, modification, and redefinition (Rowe, 2014). In Puentedura's (2006) self-published blog, he stated the effects of incorporating computer technology at the higher levels may improve learning between .4 and 2.0 standard deviations. Whicker (2012) considered the lower two

levels, substitution and augmentation, an enhanced form of technology integration. Bloemsma (2013) considered the higher levels, modification and redefinition, transformative forms of technology integration. Figure 1 presents a visual representation of the SAMR model.

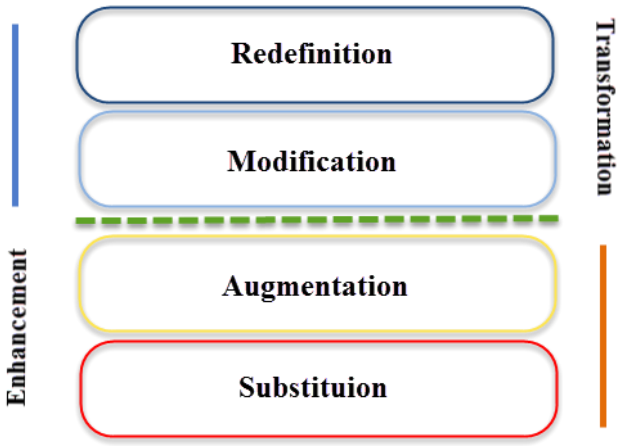

Figure 1. Visual model of the Substitution, Augmentation, Modification, Redefinition (SAMR) Model. *Note*. From a discussion by Ruben Puentedura (2014).

The lowest level of the SAMR model (Puentedura, 2006), substitution, is the integration of digital tool without any functional change to the lesson. This type of integration involves replacing traditional teaching tools, such as markers and poster board, with digital equivalents. For example, teachers may require students to create a PowerPoint® presentation instead of a poster.

The second level of the SAMR model (Puentedura, 2006), augmentation, continues to utilize digital tools in place of traditional tools. At this level, however, the digital tool has improved functional options. For example, students working on a group project could add an interview to their presentation by using digital tools. Students could use mobile technology to record the interview and add it to a presentation. The use of mobile technology to conduct an interview provides added functionality; mobile

technology is easily portable, has a simple interface, and allows for on-the-spot video editing. While using a computer to create a presentation is the substitution of creating a poster, the use of a mobile device to create a video adds functionality to the presentation. This added functionality is the core of the augmentation level of technology integration.

At the third level of the SAMR model (Puentedura, 2006), modification, technology integration becomes transformative, requiring a redesign of the lesson around the digital tool. In the case of the modification level, the digital tool gives the students the ability to access environments outside the classroom. For example, students might be required to read an online article in a forum like Edmodo, then respond to the article and discuss it with classmates in a private, online forum.

The final level of the SAMR model (Puentedura, 2006), redefinition, includes teaching with technology in a way that would be impossible with traditional tools. For example, students might explore a historical site using Google Street View, then share and discuss what they found on social media.

The transformative properties of Puentedura's (2006) SAMR model were designed around the cognitive domain of Blooms Taxonomy 2.0 learning framework (Krathwohl, 2002; Puentedura, 2014). Bloom's Taxonomy 2.0 was designed to give educators a common language when discussing: educational learning goals; curricular goals, activities, and lesson progression; and educational possibilities (Krathwohl, 2002). Bloom's revised taxonomy ranked learning from simple recall of facts to complex understanding that created new meaning and new knowledge (Krathwohl, 2002). The cognitive domain included six levels from lowest to highest: remember, understand,

apply, analyze, evaluate, and create (Krathwohl, 2002). A breakdown of each level and the cognitive requirements by the learner are found in Table 1.

Table 1

Bloom's Revised Taxonomy Cognitive Domain

Level	Cognitive requirement
Remember	Recognizing, Recall
Understand	Interpreting, Exemplifying, Classifying, Summarizing, Inferring, Comparing, Explaining
Apply	Executing, Implementing
Analyze	Differentiating, Organizing, Attributing
Evaluate	Checking, Critiquing
Create	Generating, Planning, Producing

The six levels of Bloom's revised taxonomy (Krathwohl, 2002) correspond to the hierarchical arrangement of the SAMR model. Figure 2 demonstrates the relationship of Bloom's revised taxonomy to the SAMR model (Puentedura, 2006).

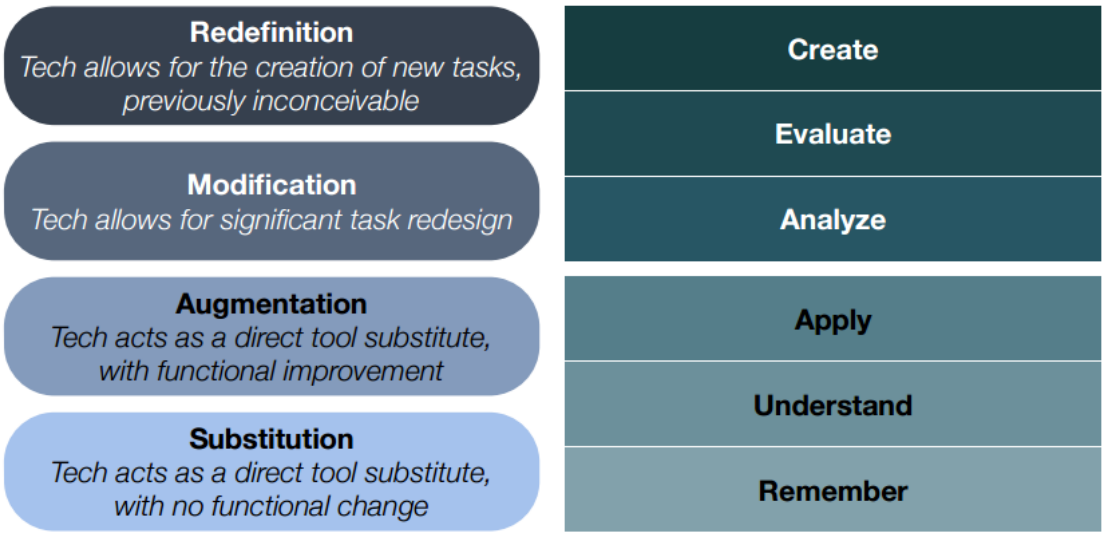

Figure 2. Visual model of the Substitution, Augmentation, Modification, Redefinition (SAMR) model and Bloom's Taxonomy. On the left is the SAMR model and Bloom's Taxonomy on the right. *Note*. From a discussion by Ruben Puentedura (2014).

The higher levels of the SAMR model make greater cognitive requirements with regard to Bloom's taxonomy, whereas the lower levels of the SAMR model correspond to Bloom's more basic levels of learning. The lowest level of the SAMR model (Puentedura, 2006), substitution, corresponds with the remember dimension of Bloom's taxonomy. At this level, the learner mainly uses knowledge to recall and recognize information (Puentedura, 2014). For example, an educator may require students to use a pen and pencil to write down and memorize a list of vocabulary words. Integrating technology at the substitution level of the SAMR model does nothing to increase the cognitive demands of the lesson. In this example, a teacher may substitute the pencil and paper with Microsoft Word® to create and memorize the list of vocabulary words. Despite substituting digital tools, the goal of recalling words is still at the remember domain of Bloom's revised taxonomy (Puentedura, 2014). Using Microsoft Word®,

students could use the same software to adding pictures to their vocabulary list. By applying knowledge to find visual depictions of the words on vocabulary lists, students are using the digital tool at the augmentation level. Creating such a visual reference would be consistent with the apply domain of Bloom's taxonomy (Puentedura, 2014).

If the educator decided to use a digital tool with greater interactivity, this would move the task of creating a vocabulary list to the modification level of the SAMR model (Puentedura, 2006). With regard to vocabulary lists, students could create visual representations of their lists, then view and sort similar images. At this level of the SAMR model (Puentedura), students would analyze and evaluate the word's relationship to other words. If the educator decided to use a social feature of the software, for example viewing and commenting on the others' selected images, this could represent integration at the redefinition level. At this level of the SAMR model (Puentedura), students' cognitive load be consistent with the create dimension of Bloom's revised taxonomy. Students would not be creating connections to other students' words, editing peer work, and sharing ideas across a domain otherwise not available.

Substitution, Augmentation, Modification, Redefinition Model and Higher Order Thinking

In the SAMR model defines "outcome" as the student's grade (Puentedura 2006, 2008). Puentedura (2006) suggests using the appropriate digital tool corresponds to an increase of two letter grades. Puentedura (2006) claimed the increase of two letter grades was based on research done by Bloom (1984) and Walberg (1984) on variables that improve students' grades. The ranking of variables on increasing student grades is found in Table 2.

Because technology can serve the same function as these variables, software use which follows the same guidelines should yield the same results (Puentedura, 2006). Based on this presumed association, Puentedura (2006) claimed the effective use of digital technology could yield .2 to 2.0 change in letter grades.

Substitution, Augmentation, Modification, Redefinition in Society

Puentedura (2006) modeled the progressive nature of the SAMR model on how educators have adopted technology into the classroom. Districts (Become a SAMuRai Teacher, 2014; Brandywine Heights Area School District, 2015; SAMR Model, n.d.) have used the model to engage students and improve learning outcomes. Researchers (Curran, 2015; Jude et al., 2014; Rowe, 2014) used the model to assess technology integration within schools and districts. However, despite its growing popularity, districts (Become a SAMuRai Teacher, 2014; Brandywine Heights Area School District, 2015; SAMR Model, n.d.) and researchers (Curran, 2015; Jude et al., 2014; Rowe, 2014) have implied, without any empirical evidence, that opposed to the lower levels, technology integration at the higher levels of integration would have an even greater positive effect on learning and engagement.

Table 2

Puentedura's List of Variables that Increase Student Grades

Variable	Effect on Grade
Tutorial Instruction	2.0
Reinforcement	1.2
Feedback-corrective (Mastery Learning)	1.0
Cues and explanations	1.0
Student classroom participation	1.0
Student time on task	1.0
Improved reading/study skill	1.0
Cooperative learning	0.8
Homework (graded)	0.8
Classroom morale	0.6
Initial Cognitive Prerequisites	0.6
Home environment intervention	0.5
Peer and cross-age remedial tutoring	0.4
Homework (assigned)	0.3
Higher order questions	0.3
New science & math curricula	0.3
Teacher expectancy	0.3
Peer group influence	0.2
Advance organizers	0.2

Note. Numbers represent effect size.

School districts such as Boulder Valley School District St. Vrain Valley School District, and Brandywine Heights Area School District have introduced the SAMR

model (Puentedura, 2006) to guide and evaluate technology integration. St. Vrain Valley School District (Become a SAMuRai Teacher, 2014) offered classes to help teachers understand the model and how it may affect teaching and learning. The district has asked teachers participating in professional development courses to integrate technology above Level 2, the augmentation level, of the SAMR model (Puentedura, 2006). Boulder Valley School District (SAMR Model, n.d) provided an article for teachers on their Information Technology page on how Google Apps fit into the SAMR model (Puentedura, 2006). Brandywine Heights Area School District (2015) has incorporated the SAMR model (Puentedura, 2006) to assess technology integration and relate it to student engagement. These few school districts have used the model to help educators improve engagement and learning, with the implication that higher levels of engagement equate to better outcomes.

Higher education began to use the SAMR model (Puentedura, 2006) to measure levels of technology integration (Bloemsma, 2013; Curran, 2015; Rowe, 2014; Whicker, 2012). When used to measure the level of technology integration, the SAMR model (Puentedura, 2006) explicitly assumes higher levels of integration are better. Despite its widespread acceptance in education, little evidence was available on whether the model predicted student outcomes. Jude et al. (2016) conducted a study to find why technology has proceeded at such a slow pace. Through surveys, participants described how they used technology in the classroom. The survey the SAMR model (Puentedura, 2006) to measure how teachers used digital tools. Jude et al. attributed the lack of technology use in the classroom to the lack of instructional focus on classroom technology, poor

educator understanding of how to use technology, inaccessibility of applicable digital tools, and lack of policy.

Schools districts have turned to the SAMR model (Puentedura, 2006) as a guide to implementing technology in the classroom (Become a SAMuRai Teacher, Google Apps, and the SAMR Framework Infographic--e-Learning Infographics, SAMR model). Further research should define the effect technology has on different learning outcomes. In this dissertation, the research explored educators' perception of Puentedura's (2006) SAMR model of when using the model for integrating technology.

Pedagogical Content Knowledge

In the mid-1980s, Lee Shulman (1986) emphasized successful teachers need extensive knowledge in the areas of content knowledge (CK) and pedagogical knowledge (PK). These concepts formed the framework Pedagogical Content Knowledge (PCK), shown in Figure 3. Content knowledge (CK) is "the amount and organization of knowledge per se in the mind of the teacher" (Shulman, 1986, p. 9). This includes theories, facts, and concepts within a teachers' subject matter (Shulman, 1986). This knowledge is what makes up the information in lessons for instruction in the classroom (Koehler & Mishra, 2009). Teachers who lack content knowledge risk transferring incorrect information to the students (Harris, Mishra, & Koehler, 2009). Teachers must have a strong content knowledge to effectively teach their subject. Pedagogical knowledge is teachers' theory of practice or how to take the theories, facts, and concepts and create easily digestible lesson (Shulman, 1986).

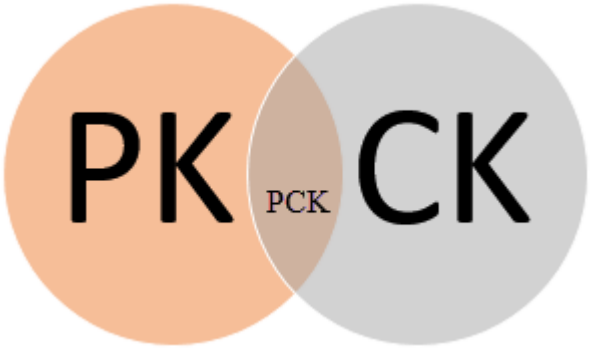

Figure 3. The Pedagogical Content Knowledge (PCK) Model (Shulman, 1986).

Technological, Pedagogical, Content, Knowledge

Over the past few decades, the use of technology in the classroom has become more prevalent in American schools. To address the changes technology effected in public schools, Mishra and Koehler (2006) added an additional paradigm to the PCK; Technological Knowledge (TK). The additional TK to the framework changed the name from PCK to TPACK. Adding TK to the framework also introduced a new interaction with pedagogical knowledge, PK, and content knowledge, CK, by requiring teachers to not only have knowledge of technology and its uses but the interaction of the three knowledge bases. The TPCK mode is represented in Figure 4.

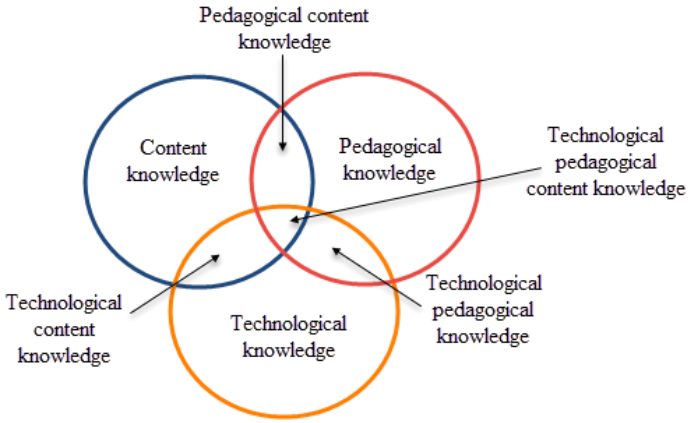

Figure 4: Technological, Pedagogical Content, Knowledge (TPCK) Model. *Note.* Taken from Koehler & Mishra's (2009) article *What is Technological Pedagogical Content Knowledge*.

Technological knowledge (TK) has been defined by Pamuk, Ergun, Cakir, Yilmaz, and Ayas (2015) "as all tools, materials and technical skills to be used in teaching and learning" (p. 245). This included the use of software tools like office programs (spreadsheets, word processes, databases) and how to use them in classroom instruction (Graham, Tripp, & Wentworth, 2009). Technological Content Knowledge (TCK) is the relationship between a teachers' knowledge of the subject matter and extensive knowledge of technologies use in the classroom (Koehler & Mishra, 2009) A strong knowledge of both TK and CK has been used to transform knowledge, concepts, and theories into an enriched classroom experience (Pamuk et. al., 2015). Technological, Content, Knowledge (TCK) model focused on the use and selection of technologies to communicate contents of the subject matter (Harris & Hofer, 2009). Technological Pedagogical Knowledge (TPK) is the educators' knowledge of implementing technology in differentiating methods (Koh, Chai, & Tsai, 2010). This has included knowledge of teaching with technology that included the wide array of tools and the complexity of

implanting digital tools (Koehler & Mishra, 2009). The previously mentioned frameworks (PK, TK, CK, PCK, TCK, TPK) make up TPACK. Technological, Pedogeological, Content, Knowledge model, defined by Koehler and Mishra (2009) as:

> The basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to tech content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones. (p. 66)

In sum, highly effective teachers should have strong content area knowledge, familiarity with multiple pedagogical methods, and a framework for using technology to transform the classroom (Koh et al., 2010).

Substitution, Augmentation, Modification, Redefinition Model and Technological, Pedagogical, Content, Knowledge

Little research has been conducted on the SAMR model (Hamilton et al., 2016). However, Puentedura (2008) described the relationship between the SAMR model (Puentedura, 2006) and TPACK (Koehler & Mishra, 2009). In a podcast, titled *TPCK and SAMR: Models for Enhancing Technology Integration* (December 22, 2008), he discussed the SAMR model's place within the TPCK framework. Puentedura (2008) technological knowledge, TK, was best thought of as the tools to expand an educators' technological knowledge. For example, a digital calculator or online spreadsheet would represent technology integration at the substitution and augmentation levels. The digital calculator is a direct substitution of a physical calculator adding no functionality (Puentedura). The online spreadsheet represented integration at augmentation level due to

the program's added functionality; namely, storing data and running simulations (Puentedura). The relationship of the substitution and augmentation level within TK is represented in Figure 5.

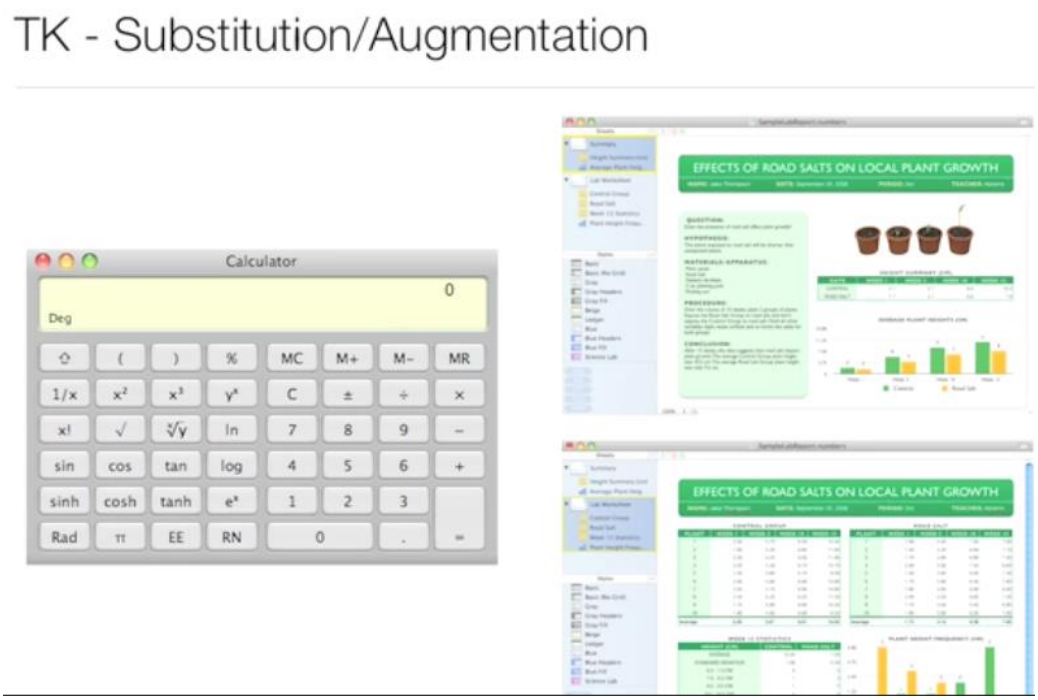

Figure 5. Technological Knowledge-Substitution/Augmentation (Puentedura, 2008)

GeoGrebra and NetLogo software provided opportunities for educators to expand their technological knowledge – knowledge of tools that can be used at the modification and redefinition levels - due to the software's extended functionality. GeoGrebra is math software that allows students to interact and manipulate math equations. This software corresponds with Puentedura's (2008) modification level of integration as it allows students to create equations and demonstrate mathematical processes. NetLogo, another type of math software, represents the redefinition level of technology integration as it

allows students to create and collaborate. Figure 6 shows the association of TK with the modification and redefinition levels of the SAMR model (Puentedura, 2006).

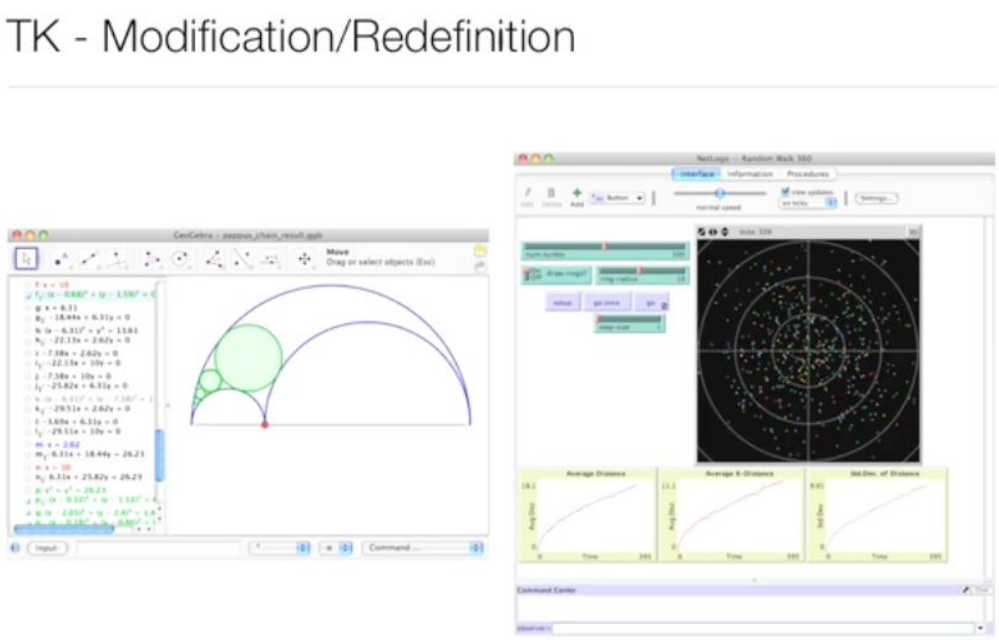

Figure 6. Technological Knowledge-Modification/Redefinition (Puentedura, 2008).

The SAMR model consists of four levels at which technology may be integrated. The levels are arranged hierarchically. The bottom-most levels of integration involve replacing a traditional learning tool with a digital one. The upper levels represent the greatest potential of technological integration - a transformative tool for educators. For technology integration to be successful, teachers must know software, its uses, and functionality (Pamuk et al., 2015). At the substitution level, the use of technology is replacing its analog counterpart. By replacing of the traditional tool, the teachers' methods do not change. The teacher is teaching in the same way as always, except for the use of the digital tool. Massachusetts Institute of Technology's (MIT) Open Course Ware on *Introduction to Fiction,* in Figure 7, exemplified the substitution level (Puentedura,

2008). The *Introduction to Fiction* course directly substitutes readings and video for the more traditional lectures and paper readings. Thus, the website is a direct substitution to the teacher and lesson plans.

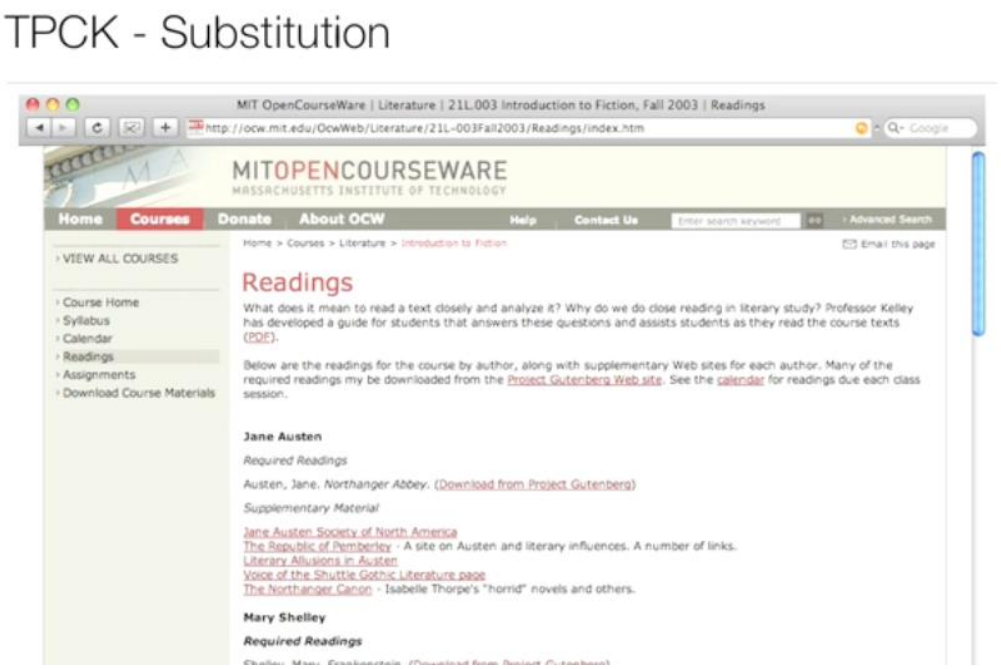

Figure 7. Technological, Pedagogical, Content, Knowledge-Substitution (Puentedura, 2008).

The augmentation level helps expand a teachers' TPACK framework. This may be demonstrated through an online Introduction to Statistics course. This course allows students to interact with different charts and data (Puentedura, 2008). At the root of this course is a direct substitution of a traditional statistics course, however, since the author has integrated charts that could be manipulated, the added functionality puts it at the augmentation level (Puentedura) A screenshot of this relationship from his podcast is shown in Figure 8.

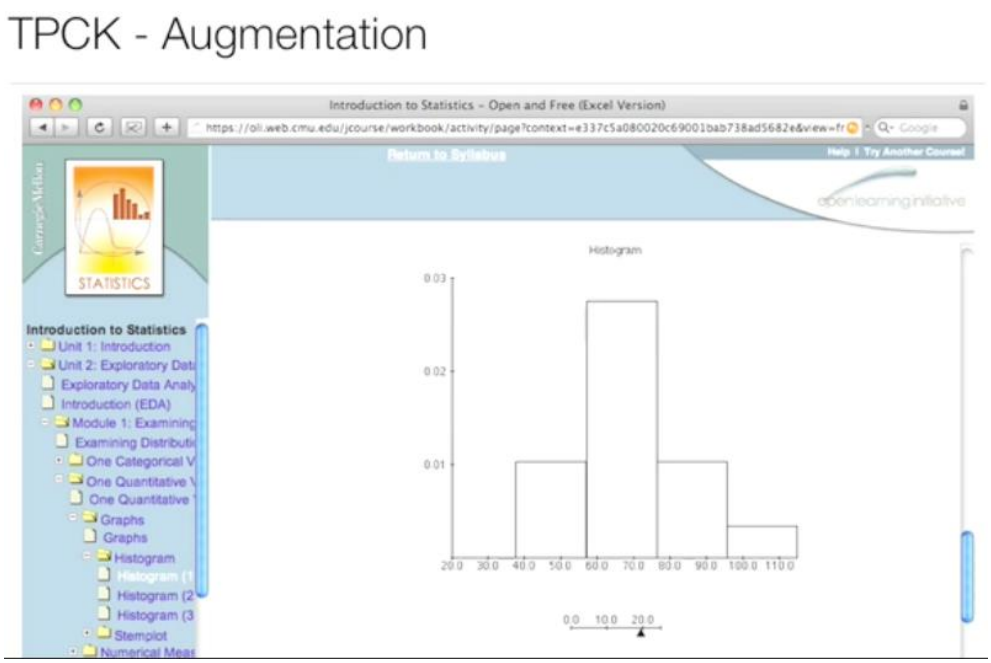

Figure 8. Technological, Pedagogical, Content, Knowledge-Augmentation (Puentedura, 2008).

An example of the modification level involves a course on southern slavery. In this course, students become historical researchers. In this lesson, students use online historical data to create new data to add to a shared online database (Puentedura, 2008). The added functionality of the digital tool allows students to create knowledge online and collectively; this places the course at the modification level. The aspects of this online course substitute the pedagogical knowledge, PK, and content knowledge, CK, of a traditional classroom teacher with the added technological, TK, of using an online medium. A screenshot from his podcast (Puentedura, 2008) showing the relationship between TPACK and the modification level is in Figure 9.

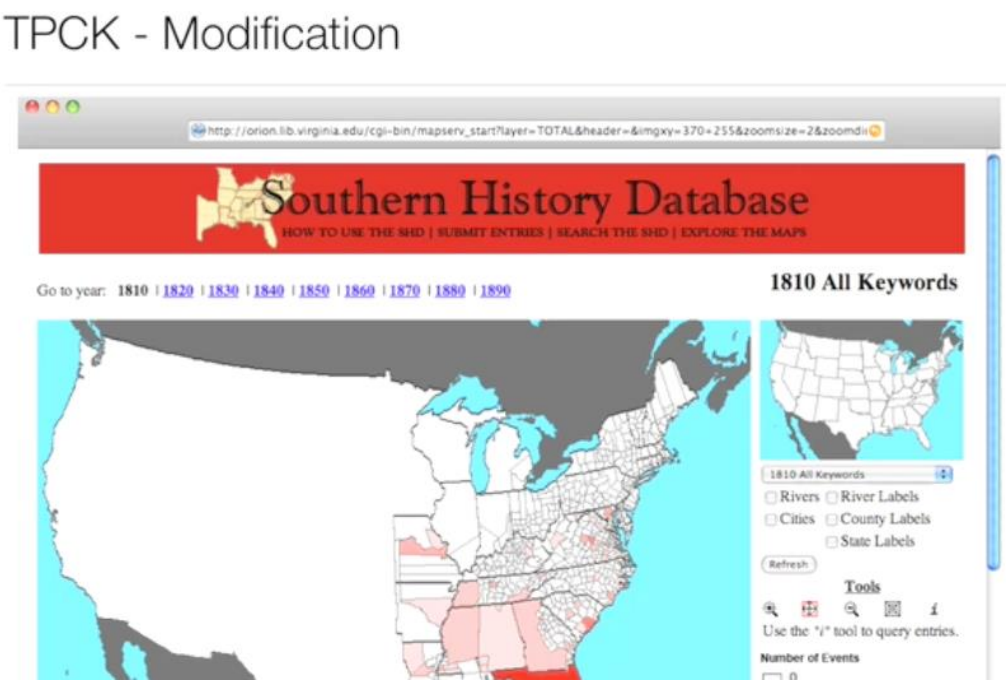

Figure 9. Technological, Pedagogical, Content, Knowledge-Modification (Puentedura, 2008).

An example of the highest level of the SAMR model (Puentedura, 2006), redefinition comes from creating a Wikipedia page. By creating a Wikipedia page, students are able to create knowledge collectively with the added functionality of allowing experts in the field to critique and modify the content knowledge. The functionality of the software allows for a pedagogical shift that emphasizes higher order thinking skills. Also, the software allows for successful technology integration into the classroom while expanding teachers' pedagogical knowledge, PK. A screen shot of the software used at the redefinition level is in Figure 10.

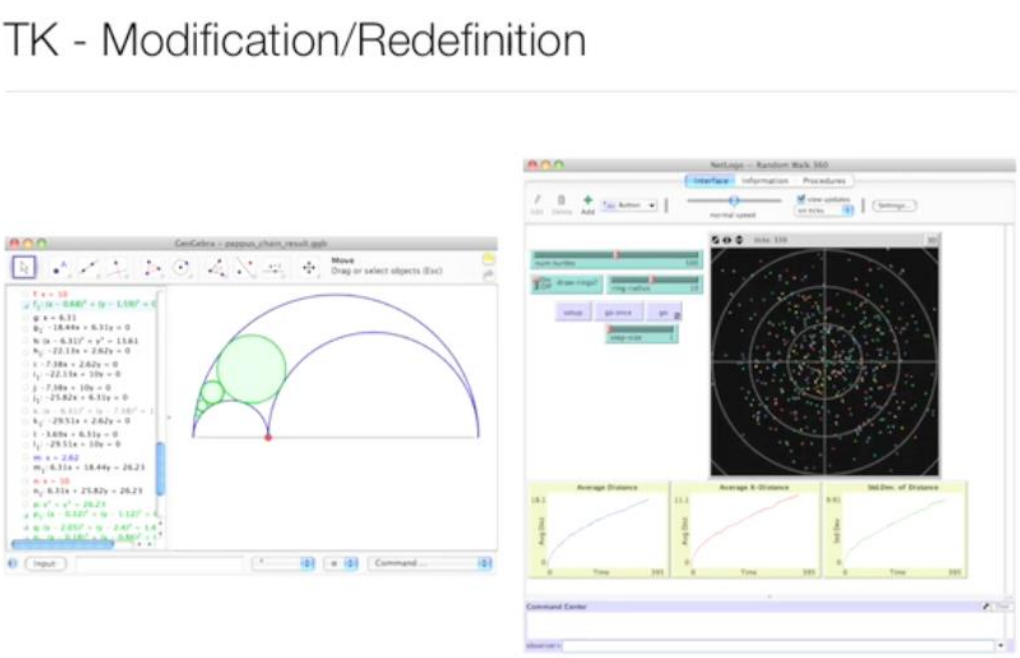

Figure 10. Technological Knowledge-Modification/Redefinition (Puentedura, 2008).

Overall, the SAMR model (Puentedura, 2006) and TPACK framework closely relate to and complement each other. As educators move up the SAMR model (Puentedura, 2006), they expand to the different circles of knowledge within TPACK. Figure 11 displays this relationship.

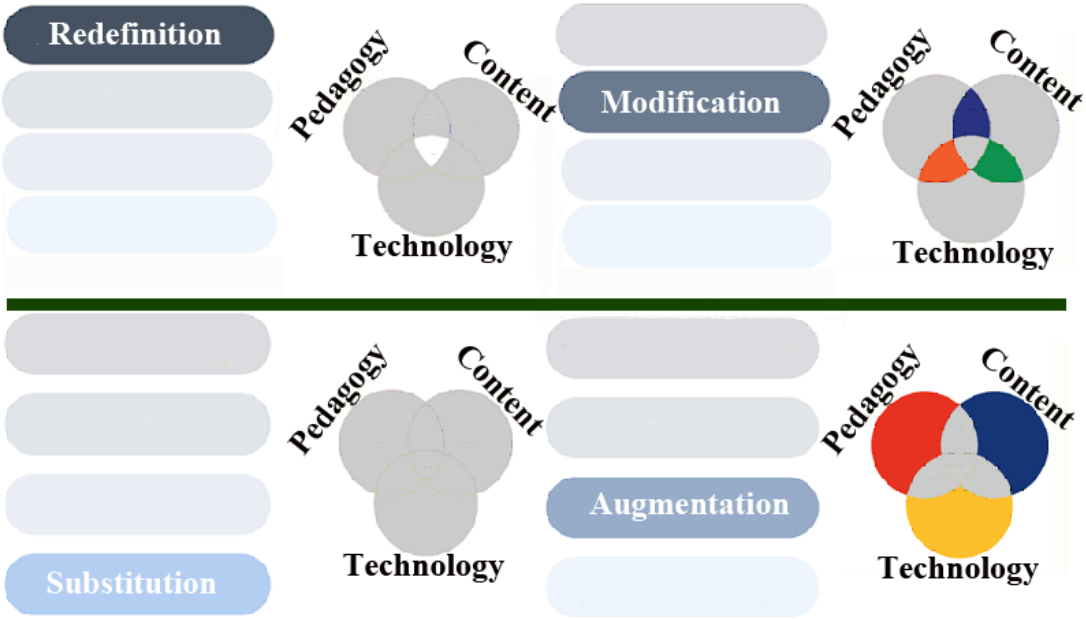

Figure 11, Substitution, Augmentation, Modification, Redefinition (SAMR) Model and Technological, Pedagogical, Content, Knowledge (TPCK) (Puentedura, 2008).

Figure 11, demonstrates that, when teachers integrate technology at the substitution level, no adjustments to their technological, pedagogical, or content knowledge, or TPACK, are required. At this level, teachers are simply replacing a traditional tool, such as, paper and pen, for its digital counterpart, a word-processing program. However, when you move up the SAMR model (Puentedura, 2006), teachers start to expand their TPACK through the functionality the digital tool provides. Using the spell check option in a word processing program adds instant feedback a lesson, making it more responsive to student needs. Moving up to the modification level, the expansion of the inner frameworks of TPACK start to strengthen. This occurs because the lesson is planned around the digital tool and the software allows learners to reach outside the classroom. As previously mentioned, the website Southern History Database allows students and teachers to be active participants in creating historical knowledge outside the walls of the classroom and accessed by others outside the school community. At the top

level of the SAMR model (Puentedura, 2006), redefinition, students are a community of experts that create, analyze, and communicate knowledge online and across the globe. Allowing students to be global citizens and creators of knowledge changes the way teachers plan lessons. No longer is the lesson teacher-centered, contained in the classroom, but moves into the global community.

Common Language for Technology Integration

One assumption of this study was that the SAMR model (Puentedura, 2006) would create a common language between administrators and teachers. When discussing technology integration, two barriers of integration have been extensively covered: first-order barriers (Ertmer, 1999; O'Mahony, 2003; Pelgrum, 2001; Wachira & Keengwe, 2011) and second-order barriers (Dexter & Anderson, 2002; Ertmer, 1999, 2001; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). First-order barriers were explained by Ertmer (1999), as obstacles that were extrinsic to educators. For example, these barriers would be several types of resources such as equipment, time, professional development, technical support, or reliable equipment (Ertmer, 1999; Wachira & Keengwe, 2011). A second-order barrier included school-level factors such as a teachers' belief and attitude toward technology integration and their beliefs and attitudes towards change (Blackwell et. al., 2013; Ertmer, 1999; Kerr, 1996). This study looked at a second-order barrier of teachers' beliefs for technology integration and the positive influence administrative support provides (Gurfidan & Koc, 2016) through a shared vision of technology integration (Donnelly & Kyei-Blankson, 2015).

One aspect of successful technology integration is administration support (Inan & Lowther, 2010); it was crucial for principals to consider how teachers integrate

technology into the classroom (Dunham 2012). Starkey (2010) stated, “school policies and structures should align with the school’s articulated values about the place of digital technologies in teaching and learning processes and pedagogical practices” (p. 1437). The importance of principals taking the lead in integrating technology has been emphasized in standards, such as: Interstate School Leaders Licensure Consortium (ISLLC) standards, National Educational Technology Standards for Administrators (NET-S-A), and Technology Standards for School Administrators (TSSA Collaborative). Principals could start successfully integrating technology through a technology plan and to support teachers’ efforts (Green, 2009). Studies have shown (Fullan, 2001; Sergiovanni, 2006; Shattuck, 2005) that principals with a vision for technology integration shared by the staff would be successful. This shared vision include the principal becoming a leader in modeling (Shattuck, 2005), promoting technology integration (Mouza, 2003) and creating functional change (Brooks-Young, 2002; Fishman, Gomez, & Soloway, 1999; Haughey, 2006; Kearsley & Lynch, 1994).

One method of creating a shared vision included the use of technology integration models. Technology integration models were created to help identify the role of technology in the classroom (Barron et al., 2003). In 1995, Christopher Moersch (1995) set out to assist districts and school environments integrate technology by developing a model called Levels of Technology Implementation (LoTi). The purpose was to “create a conceptual framework that measures levels of technology implementation, or LoTi, so that we can assist school districts in restructuring their staff’s curricula to include concept/process-based instruction, authentic uses of technology, and qualitative assessment” (Moersch, 1995, p. 41).

Another framework developed with the same intensions as Moersch (1995) was the Technology Integration Matrix (TIM; Welsh, Winkelman, & Harmes, 2016). The TIMs framework was developed by the Florida Department of Education and the Florida Center for Instructional Technology to be a comprehensive framework for assessing technology integration in a learning environment (Welsh, Harmes, & Winkelman, 2011). The TIMs model was designed with two prongs: technology and pedagogy with a focus on a lesson or a lesson within a unit (Welsh, Winkelman, & Harmes, 2016). Ultimately, the framework helped teachers use technology to expand their teaching, leading to higher levels of students' cognitive development (Welsh, Winkelman, & Harmes, 2016)

This list of technology integration models is not extensive, but illustrates the need for describing and evaluating how technology is used in the classroom (Welsh, Winkelman, & Harmes, 2016). There were other theoretical models, like the Diffusion of innovations Theory (Rogers, 1995), the Levels of Use nested within Concerns Based Adoption Model (CBAM; Hall, 2010; Hall, Loucks, Rutherford, & Newlove, 1975), and the SAMR model (Pendetura, 2006). However, a common aspect these models is they promote a positive influence on the school environment (Donnelly & Kyei-Blankson, 2015; Dunham, 2012) and part of their success was promoted by the school administrator (Ertmer et al., 2012; Gurfidan & Koc, 2016; Shattuck, 2005).

Research Fits into the Literature

There has been a lack of research conducted on the SAMR model (Hamilton et al., 2016). This qualitative study hoped to fill a gap in the literature by providing educators' perspectives on using the SAMR model (Puentedura, 2006) for technology integration. This study also filled a gap in the literature on how teachers' perspectives

aligned with district administrations' perspectives using the SAMR model (Puentedura) for technology integration.

Summary

This phenomenology research study explored the perception of the SAMR Model (Puentedura, 2006) as a technology integration guide. The SAMR model (Puentedura, 2006) was created to address issues with identification of technology use in the classroom and helping teachers make effective use of digital tools. This model has been theorized to help in the learning process by creating a greater learning experience, particularly at the higher levels. This model has also been theorized to expand teachers' TPACK framework (Koehler & Mishra, 2009) to more effectively use technological tools.

The SAMR model (Puentedura, 2006) has been used in academia to assess educator's use of technology (Curran, 2015; Rowe, 2014).

Jude et al. (2014) assumed that the use of the SAMR model (Puentedura, 2006) in the public-school system would create a common language among teachers and administrators. Creating a common language between administrators and teachers would address second-order barriers for technology integration (Blackwell et. al., 2013; Ertmer, 1999; Kerr, 1996). Having administrator support fostered the use of technology in the classroom (Inan & Lowther, 2010).

There was a gap in the literature on educators' perception of the SAMR model (Hamilton et al., 2016). This research filled that gap and provided teachers' perspectives on the SAMR model while finding common views between teachers and administrators.

CHAPTER III

METHODOLOGY

Introduction

Across the country, school districts have been searching for ways to effectively integrate technology into the classroom (Herro et al. 2013; Wang et al., 2012; Wood et al., 2011). Technology integration research has been conducted across subject areas (Adamy, 1999; Campbell & Abd-Hamid, 2013; Dawson et al., 2013; Dolenc & Aberšek, 2015; McGrail, 2007; McNabb, 2005; Reiss & Millar, 2014; Yim et al., 2014), and various models have detailed theories regarding the potential of learning with technology (Angeli & Valanides, 2014; Basawapatna, Repenning, Koh, & Savignano, 2014; Puentedura, 2006).

One model that is used to help teachers integrate technology and has been adopted by schools around the country, is the Substitution, Augmentation, Modification, Redefinition (SAMR) Model (Become a SAMuRai Teacher, 2014; Brandywine Heights Area School District, 2015; SAMR Model, n.d.). Puentedura (2006) claimed incorporating technology positively affects student learning outcomes. This line of thinking has been in direct contrast to past research on media and learning (Clark, 2001) that indicates no or little influence of the technology on learning. Researchers have found that digital tools have had no direct influence on student achievement (Alexander, 2009; Clark, 2001; Maleck, et al., 2001; Tatli, & Ayas, 2013; Trundle, & Bell, 2010) and question where or what does integrating technology influence. Other research

indicated that technology integration models have helped teachers use technology to increase student productivity (Tsai, 2015), use an effective teaching-learning process (Gulbahar, 2007), and prepare and teach students for 21st-century skills (Lowther, Inan, Strahl, & Ross, 2012). Effective technology integration models have helped teachers design lessons that use technology towards these ends (Graham, et al., 2009). The purpose of this qualitative study was to explore educators' perceptions of the SAMR model as a method of integrating technology into classrooms along Colorado's Front Range.

This chapter introduces the research questions that were used to guide this study. Next, the methodology of the study is discussed, followed by the methods, the study, the theoretical framework, epistemology, and concluding with the summary.

Research Questions

Q1 What are educators' perceptions of the Subsitution, Augmentation, Modification, Redefinition (SAMR) Model?

Q2 How does the Substitution, Augmentation, Modification, Redefinition (SAMR) model transform educators' practices?

Q3 From the perception of the participants in this study, how effectively aligned are administrators' views to the teachers' views when using the Substitution, Augmentation, Modification, Redefinition (SAMR) model for effective technology integration?

Method

Merriam (2009) stated, "all qualitative research is interested in how meaning is constructed; how people make sense of their lives and their world" (p. 24). This study utilized observed data to interpret the phenomena of technology integration in a natural setting (Creswell, 2013; Lichtman, 2006). Merriam (2009) saw such phenomenology as "a focus on the experience itself and how experiencing something is transformed into

consciousness" (p. 24). This definition was consistent with Schwandt's (2007) and Creswell's (2013) view that researchers reconstructed the world by noting normal, day-to-day human experience. To this end, data collection involved interviews and an online survey, with a range of purposefully-sampled educators to explore perspectives on the Substitution, Augmentation, Modification, Redefinition (SAMR) model of technology integration. This evidence was used to reconstruct the lived-experience and better understand the phenomenon in question.

Phenomenology

Viewing research through a theoretical lens has helped researchers refine and develop their approach (Crotty, 1998). Phenomenological studies rely on the theoretical lens and have helped to provide detail to the human experience as it relates to the world around them (deMarrais & Lapan, 2004; Lichtman, 2006). Understanding a person's view of the world is necessary to construct their meaning of the world (Creswell, 2012; Crotty, 1998). Crotty (1998) stated, "if we lay aside, as best we can, the prevailing understandings of those phenomena and revisit our immediate experience of them, possibilities for new meaning emerge for us as we witness" (p. 78). Phenomenology allows researchers to interact with the world and make sense of what is going on through the perspective of those who live it (Crotty, 1998). This study followed a phenomenological method and sought to construct educators' perceptions about the SAMR model phenomenon (Puentedura, 2006) as a technology integration model.

Participants

According to Starks and Trinidad (2007), a typical sample size of participants for a phenomenological narrative study should range between 1 and 10 participants who have

had experience with the subject being studied. This study selected six teachers and three administrators, totaling nine participants. Nine participants fell within Starks and Trinidad's (2007) recommendation. Participants from multiple levels of the educational systems helped give a comprehensive perspective of the phenomenon (Puentedura, 2006) and allowed for saturation of data to best understand the phenomenon.

Participants for this study were selected using purposeful sampling and criterion-based selection. Criterion-based selection involves creating a list of characteristics participants must possess (Creswell, 2013; deMarrais & Lapan, 2004). All participants were purposefully selected because they were educators. Colorado Department of Education (2014) defined an educator as "a person, such as a principal, assistant principal, administrator, teacher, specialized service professional or other school or school system employee who is involved in educating learners" (p. 326). Initially, participants were selected if they met this definition. Participants included educators who were employed teachers and administrators in the Front Range of Colorado's Rocky Mountain Region. Secondly, educators needed to be associated with a school environment that was recently or currently implementing the SAMR model for technology integration.

Teachers

A second level of criteria specific to the educator-participants who were teachers insured breadth of participants' knowledge about the phenomenon based the following criteria:

- Grade level
- Subject

- Position
- Along the Front Range of the Rocky Mountain Region of Colorado

The intent was to limit overlap in these areas to ensure the most comprehensive perspective about the phenomenon. Purposeful sampling was used for this selection. Purposeful sampling is the selection of information-rich participants for further, in-depth study (Coyne, 1997). Participants included three middle school teachers and three high school teachers. Selected participants were monitored to ensure only teachers of different subjects and grade levels were selected as final participants.

Administrators

School administrators have played many roles in the complex school environment. As a result of their holistic view of the school environment, administrators may view technology integration differently than teachers. Their perspective may support or hinder technology integration both school wide and in the classroom.

Selection-based criteria was used to find participants. To ensure multiple views, administrative participants included one principal, one assistant principal, and one district coordinator. The following criteria guided the selection criteria of administrators for this research:

- Administrative Job
- Familiar with the SAMR model

Selection Process

The criteria-selection was used to ensure participants' knowledge and experience fit into purpose of this study. The flow chart in Figure 12 shows the process for selecting teacher participants or this study.

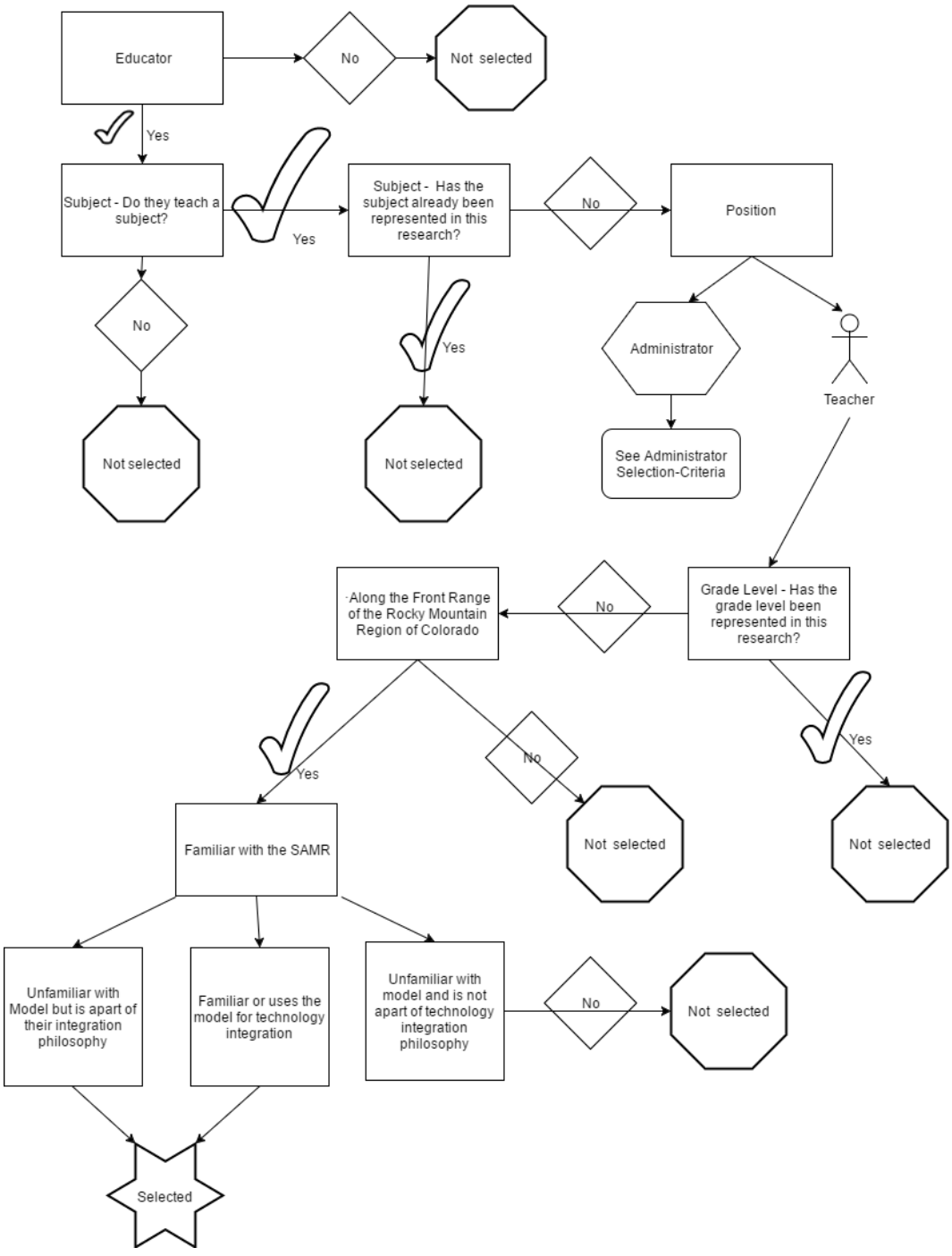

Figure 12. Selection-criteria flow chart.

Research Site

The site for this research was along the Front Range in Colorado located in Boulder County. The estimated population of Boulder county as of July 1, 2015, was 319,000, with 68% of the population falling between the ages of 19 and 64 (U.S. Census Bureau, n.d.). Boulder County was 90.6% white, 4.6% Asian, 1.2% black or African American, .9% American Indian, and .1% Native Hawaiian (U.S. Census Bureau, n.d.). The county has two school districts with approximately 62,000 students at 109 schools (Boulder Valley School District, n.d.; St. Vrain Valley School District, n.d.). Both districts within the county have adapted the SAMR model (Puentedura, 2006) as a guide to technology integration (Become a SAMuRai Teacher, 2014; Google Apps and the SAMR Framework Infographic--e-Learning Infographics, n.d.).

Data Collection

Online Exploratory Survey

The use of an exploratory survey, in Table 3, was used before the interviews to supplement the data. The questionnaire was offered online at the participants' leisure; it involved both structured and open-ended questions. The online survey was used to increase the validity of the interviews. The online survey collected descriptive data, such as, gender, age, practicing status, and years in education. Table 3 shows the questions in the online survey as they relate to the research questions proposed in this research.

Table 3

Online Questions in Relation to Research Questions

Interview Question	Research Question
What is your overall opinion of the SAMR model?	1 & 3
When thinking of the bottom half of the model (enhancement) and the top half of the model (transformation), what are your thoughts on the learning process as you move from the bottom to the top?	1, 2, & 3
Describe how time spent on lesson design changes from the bottom half of the model to the top half of the model?	1 & 2
What are your thoughts of the amount of time spent when creating a lesson at the substitution level versus the redefinition level?	1, 2, & 3
The SAMR model ranks integration into four levels, please give an example when it is appropriate to use the substitution level and when it is appropriate to integrate technology at the redefinition level?	1, 2, & 3
Do you think when integrating technology, teachers should always strive for the redefinition level? Explain.	1, 2, & 3
What are some interests and/or concerns you have about the SAMR model for integrating technology?	1, 2, & 3
Discuss the change in student learning between each level of the SAMR model.	1, 2, & 3
What is your perception of the change in student motivation as you design lessons at each level?	1 & 2
What is your opinion on the time commitment creating lessons at the redefinition level?	1, 2, & 3
Do you believe student learning outcomes would justify the time required to design lessons at the redefinition level?	1, 2, & 3

Interview

The interviews (Table 4) were semi-structured, following Merriam et al.'s (2015) format for conducting interviews to gain a deep, thorough insight into using the SAMR model (Puentedura, 2006) for technology integration. The semi-structured interviews allowed probing questions for additional information. Because of the difficulty in predicting participant answers, probing allowed the researcher to gain more useful information from the interview (Creswell, 2012; deMarrais & Lapan, 2004; Merriam, 2009). Included in Table 4 is a list of the questions that were used to interview teacher participants and how these questions are aligned with the research questions.

Data Collection Procedures

Data were collected through carefully planned teacher interviews, designed to find and understand their perspective of the SAMR model (Puentedura, 2006) of technology integration. Interviews with administrators at different job levels were conducted to give a macro understanding of the SAMR model for technology integration and to see if the views of administrators aligned with classroom teachers. The teachers selected for interviews include six teachers from two school districts, across seven grade levels, and various content areas. Each volunteering participant was asked to participate in an online questionnaire and a personal interview. The purpose of the questionnaire were to gain a broader view of the interview responses and capture data before the participant interacted with the interviewer (deMarrais & Lapan, 2004). Table 3 aligns the online questionnaire prompts with the research questions for this study.

Table 4

Representative Semi-structured Interview Questions in relation to Research Questions

Interview Question	Research Question
Describe your educational position.	Demographics, context
Talk about your experience using technology in your current role.	1 & 3
When thinking of the SAMR model, describe the level you feel most comfortable integrating technology.	1, 2, & 3
Tell me about an instructional experience where you used technology.	1, 2, & 3
Describe what a lesson looks like at the modification or redefinition level.	1 & 2
What is your opinion of the SAMR model as it relates to your experience with technology and learning?	1, 2, & 3
In a learning environment, describe the levels of the SAMR model you most commonly use when integrating technology.	1, 2, & 3
How do you make decisions concerning the level of technology integration?	1, 2, & 3
When integrating technology, explain how the educational environment changes when technology is used in an environment where technology was not previously integrated.	1, 2, & 3

Participants were introduced to the topic of the SAMR model during the questionnaire in relationship to this study. Since this occurred prior to the interview, it was assumed that participants' attention to information about the model and technology integration was heightened. This attention impacted the interview questions in that participants were already alerted to the focus of the study's content. Interviews were semi-structured and open ended. Questions were often presented in broad terms leaving

the interviewer opportunity to further the conversation with intermittent prompts or follow up questions. Consequently because of this structure and the continuous analysis process, describe in a later section, the questions asked of each participant differed slightly. Table 4 presents the main semi-structured questions asked and provides a list of these representative questions aligned to the research questions of the study.

To gain further understanding of the phenomenon, this study also included interviews with three district administrators. District administrators may have a larger-scale perspective on technology integration, both at the school and district level. Administrators' perceptions were collected using the same questionnaire and semi-structured interview processes to ensure trustworthiness in the data collection and depth of the educator's perspective and develop a comprehensive understanding of the phenomenon. The two perspectives were used in juxtaposition specifically to answer research question 3 and to understand if they aligned with the perceptions of teachers on using the SAMR model (Puentedura, 2006) as a technology integration model.

Potential participants were identified through past working relationships with the researcher or through Linked In profiles. Once a potential candidate was identified, they were screened by the criteria-selection charted in Figure 12. Participants, who met the requirements for selection, were contacted through multiple forms of electronic communication medium and asked for their voluntary participation. The participants were briefed on the purpose and process of the interview and the focus of the research. The participants were given a copy of the consent form (Appendix A). Before the interview took place, the researcher sent the participant a link to an online survey to complete. Sometime before the interview took place, the researcher scanned the online

survey answers for topics that would lead to probing questions. If the participant agreed to meet for an interview, a convenient location was established. At the beginning of the interview, participants were given a copy of their consent form for their records and were reminded that their participation was voluntary and could be withdrawn at any time, for any reason. The length of the interviews lasted between 30 minutes and an hour. Interviews took place at various locations that included coffee houses, participant's house, restaurants, and the researcher's home. Data collection of the online survey was done on the internet.

Data Analysis

The data collected through interviews and questionnaires were analyzed through the phenomenological strategy of emergent analysis (Schwandt, 2007). An emergent analysis allowed the researcher the flexibility to code as the data were collected (Creswell, 2012; Schwandt, 2007) and after the process of collection (Glaser & Strauss, 1967). As the data were collected, it was repeatedly reviewed, coded, categorized, and sorted into concepts (Lichtman, 2006). Through the process of open-coding, the researcher repeatedly reviewed, coded, categorized, and sorted data into concepts to find additional themes and sub-themes until exhaustion. Any similar open codes were collapsed through an axial coding process (Creswell, 2012) to establish the final themes presented in the study.

Theoretical Frameworks: Technology Integration

This study looked at the phenomenon through the lens of the technology integration defined by Technological, Pedagogical, Content Knowledge (TPACK) framework (Koehler & Mishra, 2009). The TPACK framework is centered around three

core knowledge-areas needed to become an effective teacher (Koehler & Mishra, 2009). Because TPACK is arranged in a Venn diagram, the representation creates seven distinct teacher knowledge categories describing the types of knowledge a working teacher who is integrating technology into teaching and learning would access. The TPACK framework helps educators understand the intersection of technology and other areas of teaching (Harris & Hofer, 2011). The general understanding of the frameworks' representation is that the closer the three areas were in relation to each other, thus the more overlap in the Venn diagram, the more effective the teacher was in the classroom. Figure 13 shows the TPACK framework. The details of the TPACK framework about technology integration and teacher knowledge provides insight in the perceptions about the SAMR model (Puentedura, 2006) as a guide for technology. It helps the researcher frame the vision of technology integration and understand the perceptions of the participants about the phenomenon.

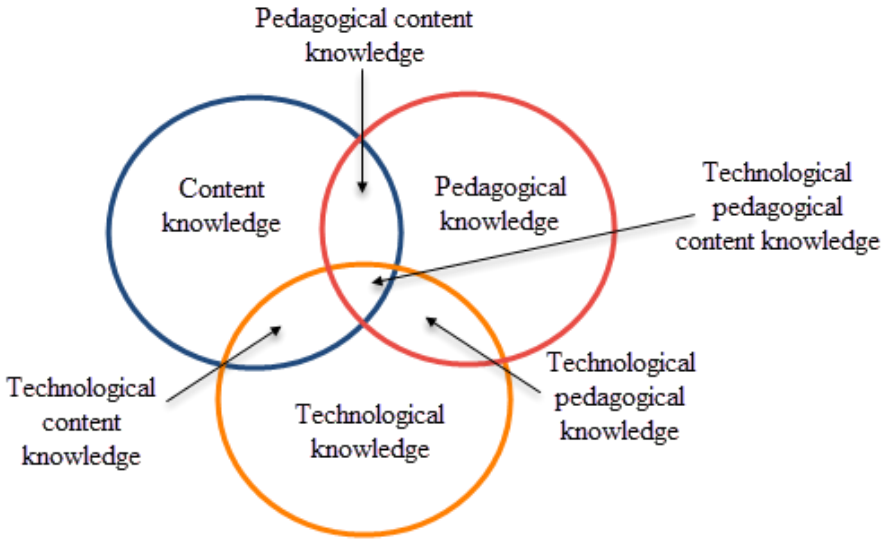

Figure 13. Technological, Pedagogical, Content Knowledge Framework. *Note*. Figure from Koehler and Mishra (2009, p. 15) article *What is Technological Pedagogical Content Knowledge.*

The Study

Schools are a profitable market for technology integration in the United States (Keengwe et al., 2008; Nagel, 2014), however, over the past decade, teachers have been slow to adopt technology into the classroom in meaningful ways (Laferriere et al., 2013; Lavicza, 2010; Wachira & Keengwe, 2011). Though the results were mixed, Clark (2001) suggested technology itself does not provide a positive outcome. Some research on technology integration had demonstrated a positive effect on student outcomes (Nuffer & Duke, 2013; Van der Molen & Van der Voort, 1997) and motivation (Lawlor, Marshall, & Tangney, 2016; Shroff & Vogel, 2009). Initiating questions about the indirect impact of technology integration on students' learning outcomes.

One reason educators have been slow to integrate technology was the lack of definitive technology integration model (Keengwe et al., 2008) and models to guide technology integration (Johnson & Liu, 2000). Models for integration have shown to

assist educators create a learning environment that meets the needs of 21st-century learners (Lowther et al., 2012).

The SAMR model (Puentedura, 2006) was one such model. Educators' perception of the SAMR model was the singular focus of this research. The SAMR model focuses on the intersection of pedagogy and technology by providing concrete examples of digital tools and their uses. Do concrete examples of technology integration help teachers to find a wider range of uses for digital tools? Does it help them do so more efficiently? What do teachers and administrators think of the SAMR model as an integration model? Do perceptions of administrators on the SAMR model align with teachers'?

My interest in the SAMR model as an integration model has led me to conduct this research. It gave me the opportunity to explore educators' opinions, feelings, and concerns about technology integration. My hope was to create a better understanding of educators' perceptions of the SAMR model and make recommendations that might improve the integration of technology into classrooms.

Researcher's Stance

I taught technology and social studies in public school for 10 years. During this time, I was passionate about integrating technology into the classroom and helped teachers, schools, and districts integrate technology. I met teachers who were motivated to integrate technology and educators who were not. What piqued my interest in helping others and myself to integrate technology were frameworks that assisted teachers in successfully integrating technology. Of many, the SAMR model struck me as the most interesting because it identified integration and provided examples at four levels of digital tool integration and implied pedagogical practices for integrating at the different levels.

This model appeared uniquely prescriptive and easy to understand. These experiences have led me to investigate others' perceptions of the SAMR model as a guide for integrating technology.

Trustworthiness

Interview questions for this study were designed and written following the guidelines set by Merriam (2009). These guidelines included questions on experience and behavior, opinion and values, feeling, knowledge, sensory, and background/demographic questions (Merriam). Table 5 links the representative semi-structured interview questions to the guidelines set by Merriam.

The use of two instruments, interviews and surveys were utilized when collecting data to increase validity (Fraenkel & Wallen, 1996). Probing questions were employed to gain a deeper understanding of the responses given by the participants (Merriam, 2009), and the semi-structured format allowed the researcher to ask follow up questions and/or ask for clarification. To increase the reliability of recorded data and interpretations of the interviews, a member-checking process was utilized (Creswell, 2012; Merriam, 2009) to check transcripts and interpretation. Member checking involves presenting the transcription and themes that emerged from it's analysis to the interviewee to ensure accuracy (Creswell, 2012; Merriam, 2009). I did this with each participant after the interview had been transcribed and initial analysis completed for that interview. Using member checking reduced misinterpretation of the information collected and ensured that the themes and interpretations were inline with the interviewee's thoughts about the topic (Merriam, 2009).

Table 5

Semi-structured Interview Questions in Relation to Suggestions Provided by Merriam

Guideline	Question
Background	Describe your role in the Education or the classroom.
Background	Talk about your experience using technology in your current role.
Background/Knowledge	When thinking of the SAMR model, describe the level you feel most comfortable integrating technology.
Experience and Behavior	Tell me about an instructional experience where you used technology.
Opinion and Values	Tell me your opinion of the SAMR model as it relates to your experience with technology and learning.
Knowledge	In a learning environment, describe the levels of the SAMR model you most commonly integrate technology.
Knowledge	Describe what a lesson looks like at the modification or redefinition level.
Feeling	How do you make decisions concerning the level of technology integration?
Sensory	When integrating technology, explain how the educational environment change when technology is used to an environment where technology is not integrated.

During the study, I also worked with an external auditor to provide improved validity to add another layer of trustworthiness to the study. Creswell (2013) stated "as distinct from a peer debriefed, this auditor is not familiar with the researcher or the project and can provide an objective assessment of the project throughout the process of

research or at the conclusion of the study" (p. 202). The auditor reviewed data and analysis and indicated similar understanding of the phenomenon. This practice enhances the validity of the findings of this study. The use of triangulation was used to further increase validity by drawing on multiple sources to support themes and data collected (Creswell, 2012). The multiple sources used in this study were the interviews and survey, administrators' perspective on technology integration as juxtaposition to teachers, and the previously established literature about related topics and processes.

Ethical Considerations

When conducting qualitative research, bias is a continual concern (Crotty, 1998). Every effort was made to ensure accuracy when coding the data as previously explained regarding trustworthiness. The researcher stayed aware of his own affinity for technology integration and understandings of the SAMR model through personal reflection to help keep his personal ideas separate from the data of the study. All data and names of participants were kept private to protect the identities and opinions of the participants involved. The online exploratory survey did not collect any personally identifiable information. However, a log was kept throughout the study to ensure accuracy and for audit purposes. Consent forms were given, signed, collected and copies handed out to participants to ensure proper consensus.

Constraints

The main constraint of this study was the sample size and purposeful sampling of the participants. This was by design to ensure the limited number of participants could contribute knowledge to understanding the phenomenon. This limits the findings to the parameters of the study and does not allow for generalizability to other integration

models of technology or other settings easily. This research was being conducted in one county in the whole of the United States. The local culture may not extend to other areas of the United States. Another constraint of this study was the use of criteria-selection sampling of educators in only two school districts, again to ensure participants were potentially knowledgeable about the phenomenon. The focus of this research was to study the perception of educators on using the SAMR model (Puentedura, 2006) for technology integration. Last, there was little research analyzing other aspects of the SAMR models used in the classroom or educational setting (Hamilton et al., 2016). Thus, there as little literature to confirm or counter finding presented in this study.

Epistemology

This research was aligned with the Interpretivism epistemology, where this study sought to understand the social reality (Crotty, 1998). Crotty (1998) explained Interpretivism as looking "for culturally derived and historically situated interpretations of the social life-world" (p. 67). This was further explained by Schwandt (2007), "that the meaning of human action is inherent in that action, and that the task of the inquirer is to unearth that meaning" (p. 160). The perceptions of educators on the SAMR model (Puentedura, 2006) as a technology integration model were constructed by the participant educators and administrators of this study. The role of the researchers was to "unearth that meaning" (Schwandt, 2007, p. 160) and report the findings.

Summary

This phenomenology research study explored the perception of the SAMR model (Puentedura, 2006) as a technology integration guide. Educators from the Front Range of Colorado were interviewed and participated in a survey to gain additional insight into

their perceptions of technology integration. Greater knowledge of the SAMR model (Puentedura) as a technology integration model could help fill the gap in the literature and assist teachers' technology use in the classroom. This study was to examine educators' perceptions of the SAMR model (Puentedura). The underlining assumptions of this study included that the descriptive nature of the SAMR model (Puentedura) assists teachers. Identifying tools and pedagogical changes from level-to-level would help teachers transform their practice. And, the last assumption was that the model established common language for integration that supported administrators' promotion of the process of integration and communication with teachers.

CHAPTER IV

RESULTS

Introduction

Chapter IV covers the data regarding educators' perception of the SAMR model (Puentedura, 2006) collected during the one-to-one interviews and online survey. This chapter is organized by themes that emerged through the data collection and analysis processes. Some sections describing themes also include sub-themes of related content. Background, purpose of the study, and a brief description of each participant are presented to establish context prior to the findings. Themes representing the findings of the study include: positive view of the SAMR model, common language, correct use of the model, most comfortable level, most common level, educators' meaning of the SAMR levels, motivation and engagement, SAMR model and educator practices, shared views of administrators and teachers, descriptive nature of the SAMR model helps educators create effective lessons, common language between administrators and teachers, and purposeful integration. Sub-themes that may be present within these themes are noted with sub-headings within the sections. The chapter concludes with a summary.

Background

The participants selected for interviews were public educators in grades six through twelve, from two school districts along the Front Range of the Rocky Mountains. To gain a range of perceptions of the SAMR model's (Puentedura, 2006) utility for technology integration, middle school teachers, high school, and district administrators

were interviewed. Selected teachers represented different content areas. Teachers of middle school social studies, language arts and computer science were selected, as were high school teachers of social studies math, and physical education. However, due to the growing responsibilities of Front Range educators, four of the six classroom teachers taught subjects in addition to their preferred content area. Administrators' perspectives about educators' use of digital tools in the classroom were collected in order to gain a unique perspective of the SAMR model and contribute to a fuller understanding of the phenomenon. Administrators selected for this study include an assist principal who was the leader in the schools' one-to-one iPad initiative, a district instructional technology coordinator, and a social studies coordinator. Participants' experience in the field of education ranged from 10 years to 28 years in the profession; ages ranged from mid-20s to late 50s. Participants had experience with the SAMR model (Puentedura), including district training, and each claimed to integrate technology in their classroom.

Purpose of Study

In recent years, the expenditure on classroom technology in the United States increased to billions of dollars (Nagel, 2014). However, the adoption and integration of digital tools into learning environments has been slow (Laferriere et al., 2013). Technology integration models and frameworks that facilitate the process of technology integration have emerged in the literature in attempts to hasten the process and meaningfulness of technology integration (Angeli & Valanides, 2014). One of these models was the SAMR model, created by Ruben Puentedura (2006). This study's focus was to discover educators' perception about the SAMR model (Puentedura, 2006) to support integrating technology into the classroom.

Participants

The participants consisted of three administrators and six teachers. Pseudonyms were used to protect their identities. Quotes were modified to maintain readability by the addition of punctuation that was not present from the original transcription. In such cases, all attempts were made to preserve the meaning of the participants' quotes.

Administrators

Amy. Amy has been an educator in various places throughout the world. Her journey with technology integration started with teaching science through iPads™ and Google Apps™ in Columbia South America. At the time of this study, Amy was an instructional technology coordinator at the district level. As an administrator, she supported other administrators in technology integration, conduct professional development at the school level, and built understanding of developing K-12 instructional practices.

Frank. Frank served as a high school assistant principal. In this role, he supported curriculum and instruction development, provided leadership in the schools' one-to-one iPad™ integration, and supported teachers as they incorporated iPads™ into practice. He started his career as a middle school social studies teacher at a time when email and iMovie™ relatively new. At the time of this study, his major focus was helping teachers convert traditional media to digital form, integrating Google Classroom™, and Schoology™.

Jill. Jill described her background in education as "diverse". At the start of her career, she taught both middle and high school social studies and language arts. Her career included working at public schools, parochial schools, and even a one-year stint

teaching online. This journey landed her as a social studies coordinator and secondary literature coordinator. Part of her role as a coordinator was to support teachers in integrating iPads™ into the classroom. Her most recent technology integration endeavor was supporting teachers' use of formative assessment through integration of Kahoot™ and Socrative™ software.

Teachers

Mike. Mike taught social studies teacher for over 20 years. During his time as a social studies teacher, he also taught middle school geography and film making. In regard to classroom technology, he claimed to have seen a shift from overhead projectors with transparences to PowerPoint™ presentations and SMARTboard™ lectures. At the time of this study, he had integrated Edmodo™ for classroom discussions and utilized the digital library for handouts, lectures, and supplemental learning. When he taught documentary film making, he integrated various types of technology, such as video cameras and video editing software from iMovie™ and Final Cut Pro™, and Wevideo™ online collaborative movie editing software.

Bob. Bob was a 28-year veteran of the education profession. He had taught various grade levels, ranging from third grade to eighth grade in science, social studies, and language arts. When I spoke to Bob, he had completed a year teaching sixth grade language arts and social studies. Over his 28 years in the profession, he had seen the availability of technology change in the classroom. As an example of the most dramatic change, he pointed to a district-wide one-to-one iPad™ initiative. The availability of the iPads™ inspired him to convert most of his regular handouts, assignments, and classroom interactives to digital form. He did so using Schoology™, a learning management system.

After he adopted the paperless classroom concept, he claimed to prefer it over making copies and managing paper assignments.

Brandy. Brandy start teaching over 21 years. She has been a middle school technology teacher, a special education teacher, and also spent a time as a district coordinator. Her focus was to differentiate lessons with technology in order to engage students based on their own interest. She has used Dragonspeak™ with her middle school technology students to explore hearing and speaking programs.

Steve. Steve taught at the high school for 11-years as a 11th and 12th grade social studies teacher. He also served on the iPad™ readiness committee planning the district's one-to-one iPad™ initiative. At the start of his teaching career, he routinely used PowerPoint™ but, as he strived for newer technologies and pedagogies, he was led to online discussions in Schoology™. He considered himself at the forefront of technology integration as he has continually experimented with new methods and new digital tools.

Kate. Kate's background in education included traveling around the world. Her experiences took her to Mexico, Nicaragua, South Africa, Ecuador, Peru, Bolivia, teaching Algebra, pre-calculus, geometry, Spanish, global studies, journalism, and physical education. A few years ago, she has found a home along the Front Range of the Colorado Rocky Mountains teaching middle school and high school students in computer science, math, and Spanish. As a computer science and math teacher, she used technology to diversify her lessons and meet the needs of her students. Her most recent technology integration effort involved the use of a math application called Bootstrap™, a program that integrated algebra concepts into computer science through game creation.

Jody. Jody was the youngest teacher participant in this study. She was in her mid-20s and had five years of teaching experience. She had taught physical education (PE) and health for the past three years. Before her current teaching assignment, she was an elementary school teacher. She suggested the major focus for technology was to help students through video evidence and peer-to-peer online discussion using Schoology™. She worked at a school that featured a one-to-one iPad™ initiative where students were each assigned their own iPad™.

Educators' Perceptions of the Substitution, Augmentation, Modification, Redefinition Model

Many themes and sub-themes emerged in coding Research Question 1 (What are educators' perceptions of the Substitution, Augmentation, Modification, Redefinition [SAMR] model?). These themes included: positive view of the SAMR model, mixed feelings, concerns with the SAMR model, common language, common use of the model, levels of comfort, most comfortable level, comfortable with hesitation, most common level, educators' meaning of the SAMR levels, motivation and engagement, and motivation and engagement is reliant on pedagogy not technology, de-motivating effect of technology integration. Sub-themes are indicated by sub-headers within the theme section.

[Positive] View of the Substitution, Augmentation, Modification, Redefinition Model

In general, eight of the nine educators generally found the SAMR model positive for technology integration. Mike's summed this up in his online survey.

> The SAMR model seems like an excellent tool for teachers reflecting on their practice, specifically, as it relates to the integration of technology within their classrooms. Many teachers use technology as a substitute or to augment, but rarely does it seem to result in meaningful use. It often feels like it's used just for the sake of using it, or because students find it more entertaining to do so. A tool like SAMR will help teachers see the difference and evaluate their use of it more carefully, and encourage use for transformational experiences. (April 16, 2017)

Kate echoed this feeling of using the model as a tool to change a teacher practice to achieve a higher level of integration.

> I feel that as I get toward modification and redefinition, I am able to create more authentic assignments for students. This allows for a higher level of student engagement and natural practice with 21st century skills (Online Survey, February 22, 2017)

Bob expressed that the model could assist new teachers with a technology integration pathway to using digital tools in the classroom and guide them to higher levels within the model.

> I think it is a viable tool that can give a teacher is particularly new to using technology in the classroom. It gives them a vision of where they can go. I mean it gives them something concrete that they can kind of go "Okay, I can see where I can go with my curriculum and as far as integrating technology into it." (Interview, February 17, 2017)

Bob also mentioned that SAMR "…can be a useful tool for self-evaluation and for discussion related to the enhancement of learning with technology" (Online Survey, March 25, 2017). He felt the tools were viable for integration and evaluation of its use, particularly for teachers that were new to adopting technology.

Jody found the model valuable for guiding educators' growing utilization of technology. She added that better utilization of digital tools would lead to better learning outcomes for students.

> I feel that the SAMR model is extremely valuable for my school. We are so focused on student-based learning and technology this year. This model gives teachers at all levels opportunities to grow and challenge students. (Online Survey, April 25, 2017)

Brandy expressed her opinion of the model as “it flows with . . . learning” (Interview, March 7, 2017). She felt that, as learning progresses, teachers could choose to change how they integrate technology to meet the student needs.

Mixed feelings. A counter-voice emerged as a subtheme within the positive thoughts about the SAMR model. One participant in the study, Amy, had mixed feels about the model. She expressed that it was great for guidance but felt it put unnecessary stress on teachers. She suggested such demands may actually make teachers resistant to integrating technology, ultimately pushing them away from the idea. This pushed back on the favorable tone of this theme and warranted including it in the data. She expressed her mixed feelings.

> Overall, I have mixed opinions about the SAMR model. I think it adds value and purpose to a teachers’ thought process in how . . . they [use] technology in their classroom. For many, it's a philosophical and instructional shift in how they teach. I also think it puts a lot of pressure on teachers to always try and go "above the line" and that pressure can have the reverse effect, preventing them from trying. I think it's a succinct way of describing the possibilities of pedagogy and integration of technology. (Online Survey, March 12, 2017)

Concerns with the Substitution, Augmentation, Modification, Redefinition Model. Also despite the positive accolades for the SAMR model, an opposing sub-theme in this study emerged to voice concern with the SAMR model (Puentedura, 2006). These concerns included losing focus on the lesson, feeling unprepared to integrate technology, integrating technology at the wrong level for the lesson, not enough time to prepare lessons, feelings of stagnation at one level, adds pressure to the already high demands of the profession, and managing technology in the classroom.

> Steve had a specific quote that summed up his issues with the SAMR model.
>
> I like this phrase . . . for education, the SAMR [is] like fire and water; a good servant but a bad master. If the teacher is constantly adhering to SAMR [model], I think they're going to lose …focus. But, I think [the] SAMR [model] should be this idea of; what better can I do? How can I continue to go up the latter? (Interview, April 4, 2017)

He thought the best benefit of the SAMR model was to measure growth. Teachers should not focus on the type of technology they want to integrate, but how they were going to grow as a teacher. He thought that the SAMR model could put pressure on teachers to try and reach the top level all the time. He compared the levels as grades, anything less than Modification was failing at technology integration and teaching.

> I think the problem with SAMR is that . . . all teachers need to progress towards an R. And I think its human nature to see what's the best I can be. If [it is]. . . an S [substitution] or an A [augmentation], that's below 50%, [and] an veritable "F." I think that teachers feel an inherent failure if they don't get to an "M" or an "R." I also think that they don't really know what an "R" . . . truly looks like. I'm not sure if I do either. The best "R" that we've ever discussed was this idea of having a conversation with kids in Pakistan. With SAMR . . . there is little to no specificity above the line and there's a lot of feeling of failure if you don't go above the line. (Interview, April 4, 2017)

Amy also expressed this feeling of pressure to move up to the higher levels of the model. She worried that every lesson should be integrated at the redefinition level. Amy stated: "it . . . boxes people in, they feel a lot of pressure" (Interview, March 3, 2017). Jill also reiterated this pressure of striving to consistently integrate technology at the redefinition level.

> My biggest concern is that teachers see redefinition as the ultimate goal. Yes, it is good to have students create and do tasks that [they] could not do without technology. [However], that is not the "end all be all." (Online Survey, March 30, 2017)

Mike found that teachers stayed at the same level to achieve district evaluation standards and to alleviate pressure.

> I feel like teachers are super comfortable hanging in that lower end of that scale. [It] . . . fulfills their evaluation criteria. There's that little checkbox on a teacher evaluation that says “uses . . . technology in the classroom”. (Interview, April 16, 2017)

Amy agreed that this pressure to move up the ladder had led to teachers rethinking the model to reduce the pressure.

> A lot of people have turned it, sideways. So, it’s a swimming pool. There [are] lanes instead of up and down; which I . . . think helps. I just think so much of it has to do with . . . the delivery of SAMR and how you speak about it. You want to be striving for this. Which happens a lot. (Interview, March 30, 2017)

Brandy had seen, over her extensive career, that teachers may need additional support and training to use the SAMR model properly. She stated my “concern that today’s teachers are not sufficiently prepared” (Online Survey, March 5, 2017). Bob expressed his concern that teachers may integrate technology at the wrong level for the goals of the lessons.

> I think that a classroom can become completely technology-based where redefinition would not always be appropriate. It is not appropriate when learning new material, with new vocabulary, or new skills. Redefinition is more appropriate in the application of learned material. (Online Survey, 2017)

Jody suggested that training could help with technology. Mike felt teachers needed training to effectively integrate technology to make it more meaningful.

> I think more training would be necessary. It would . . . be a starting point because a lot of people don't know, just like they don't know in a regular educational setting. Just like in a more traditional approach, not everyone understands how to go from a more concrete to more abstract thinking. Or lesson based approach; some people are very comfortable . . . taking the worksheets from the textbook or the workbook, . . . copy them, . . . give them to kids, and they move on. They've delivered the content, right? So, those people may need some training on how to make those experiences more meaningful. (Interview, April 16, 2017)

Brandy, Bob, and Jody saw each level having a purpose that could meet different lesson objectives. As a result, they felt that not all lessons should be taught at the redefinition

level. When learning vocabulary, for example, lower levels of integration would be more appropriate, that there was no need to "open up" the lesson, per the redefinition level.

Using the appropriate level of technology integration was the biggest concern for Kate. She worried there might not be enough planning time for teachers to develop projects. She was also concerned that the lack of planning time could limit the amount of scaffolding integrated into the lesson.

Jody's echoed Kate's concern with the amount of planning time. She felt that there would was not enough support to teachers to appropriately integrate technology. This was a critical issue for technology integration and was supported by the literature (Ertmer, 1999).

Common Language

Another theme that emerged was the creation of a common language among educators. Previous statements concerning the SAMR model indicated it helped improve teachers' craft. Frank extended this sediment by stating, "it's a model that provides common, convenient language that allows professionals to discuss their craft more effectively" (Online Survey, April 27, 2017). Jill added that she liked the model; "I like it. I think it is a good way to create a common language between educators and even students" (Online Survey, March 30, 2017). Throughout the study, only the two administrators mentioned the SAMR model created a common language. This could be attributed to how teachers and administrators view the SAMR model differently. Administrators saw the SAMR model as a means to communicate about lesson design, whereas teachers saw the model as a tool to improve their teaching.

Correct Use of the Model

Some participants in this study found the SAMR model to be useful, but held reservations about its proper use. Steve suggested it was a "guiding force" but used the adage "good servant, bad master." He continued, "I think SAMR is . . . only possible with a complete revolution of the structure of a school" (Online Survey, April 12, 2017). Bob echoed concerns about the proper use of the SAMR model when evaluating teachers and their success in the classroom:

> I believe it [the SAMR model] provides a useful measuring stick for integrating technology. [However], I can see where it could be misused by [a] teacher or [the] administration. It becomes "the" measuring stick by which student learning and teacher effectiveness is measured. Because people have [a] varying degree of comfort with technology, everyone is not going to integrate [it] at the same rate. That doesn't necessarily reflect on their success as a teacher, or the degree of learning that goes on in their classroom. (Online Survey, March 25, 2017)

Levels of Comfort

Most comfortable level. The level of integration educators found most comfortable proved to vary among the participants and included all four levels of the SAMR model. Two participants stated they were comfortable amongst all levels.

Only Jody felt the most comfortable with the redefinition level, stating; "At this point in my career, [the] redefinition is [where] I feel most comfortable" (Interview, April 25, 2017). However, her comfort could be attributed to having been around technology as a student and because her teacher training included using technology.

> I don't have years of experience not using technology. I mean, it came out of [being]. . . a UNC graduate. We had a class on how you implement technology in PE. I feel like . . . redefinition [level] is where I feel the most comfortable. Due to the fact, that I only have five years of experience. Not . . . 20 years and then having to completely change all of my curriculum . . . through technology. I love to look at a traditional lesson and add technology and go "wow that's completely different and has so much more meaning." (Interview, April 25, 2017)

Two participants in the study found themselves comfortable integrating technology at the modification level. Brandy summed this up as follows:

> I feel really comfortable . . . knowing my audience. I love the redefinition level. Working with them in the modification level, helping them getting involved in learning. I think that's [redefinition level] where the best learning occurs. (Interview, March 7, 2017)

Steve felt most comfortable with the modification level. However, in his experience, he felt students and educators, in general, were most comfortable integrating technology at lower levels, such as the substitution and augmentation levels.

> For me its [the] modification [level]. To me that's [where] I'm the most comfortable. I will say that's not how kids are most comfortable and that's not how most schools are most comfortable. . . . I'm most comfortable with however I don't think that education is . . . most [comfortable]. (Interview, April 14, 2017)

Two participants found themselves comfortable integrating at the augmentation level. For Frank, adding functionality to a traditional lesson was how he felt the most comfortable when integrating technology. In the one-on-one interview, Frank stated:

> I spend a lot of space in [at] the augmentation [level]. I think if all you're doing is just substitution, you're not really getting that much benefit. For me, my own level is probably [at the] augmentation [level]. Instead of . . . a sheet they're working off of, it could be digital with live links that go to different places or for collecting information around the building. I guess form my own expertise, I'm kind of an "A" sometimes an "M." I don't claim to really have enough expertise to get to "R." But I have experts in my building who can. (Interview, March 1, 2017)

Kate found herself integrating technology at the augmentation level when teaching algebra. In the one-to-one interview, she mentioned; "For algebra, I'm much more at [the] augmentation level than [in] some of my other classes" (Interview, February 22, 2017). In her other classes, such as computer science, she integrated technology at the modification level or the redefinition level. For example, in her computer science class, she was teaching students to collaboratively code android phone applications. "I mean . . .

this is not my algebra class, but . . . my high school computer class is programming android phones using App Inventor*"* (Interview, February 22, 2017). Mike was the most comfortable with the substitution level because he described it as the easiest.

> Comfortable is an interesting way to put [it]. I mean the substitution level is the most comfortable place, because it doesn't require the teacher to spend much time [doing] much of anything. I just can look for a lesson that does the same thing a traditional lesson will do, and give it to kids. [The digital] format [is] more engaging to them. It's more fun or . . . entertaining because they're so used to having some sort of stimulus. (Interview, April 16, 2017)

Mike went on to explain that, as a teacher, he did not appreciate integrating technology at the substitution level because it tended to be less meaningful to the students. Mike also found value at the upper ends of the model because he felt the time spent creating meaningful lessons was worth his teacher-planning time. In short, Mike was comfortable at the substation level because it was easy. However, he would rather have spent time integrating technology at the higher levels to make learning more fun and engaging.

> Towards the upper level, I'm significantly more comfortable. The time . . . I would spend planning on it [is worth the time they spend engaging in it]. I . . . feel like what they're doing is meaningful, . . . that their experiences in some ways [is] transformative. They're going to come away from having thought about the material and engage with the material in ways that you wouldn't at a lower level[s]. Also making it more engaging so you no longer have to hear the cries of: "why do we have to do this" or "this is boring" or "this is a waste of time". I'm more comfortable that at that level because it feels authentic, it feels meaningful. I don't like to produce lessons that are just busy work. [It does not matter] whether [it is] busy work [with] a work sheet or busy work on a website. They both make me uncomfortable because they're just busy work. However, they're comfortable in the sense [they are] easy to do. I'm way more comfortable with [the upper levels] because I feel like I'm asking my students to do something meaningful not just wasting their time. (Interview, April 16, 2017)

Two educators stated they felt the comfortable with all levels of technology integration. Amy was comfortable at all levels, describing substitution as the "easiest" and the redefinition level as the "most fun".

> The easiest would be any type of substitution, because I feel like that's a natural thing that we do now. I'm very comfortable in all of the . . . levels. I think I have the most fun [at the] redefinition [level] because you're asking to choose to shift their practice and have a task be something . . . different. (Interview, March 30, 2017)

Bob was, in general, comfortable at all levels stating: "I'd say that I feel comfortable using technology all the way through the . . . redefinition level" (Interview, March 26, 2017). With his experience, using technology has given him the knowledge to use digital tools in various ways.

Comfortable with hesitation. Only one participant, Jill, felt uncomfortable at any level. This was due to her transition to a district-level administrator role and her lack of classroom experience with the SAMR model. She explained that if she was still in the classroom, her style would match the redefinition level because her teaching style was focused around student-created projects. However, she was trained in the SAMR model through district professional development and the districts' one-to-one technology adoption. She explained her comfort in the interview as:

> This is kind of weird to say, . . . I have no experience of using it [SAMR model] in the classroom. I actually think redefinition for me . . . when I was a teacher, . . . [I] was much more of an out of the box thinker. My lessons were a lot more out of the box. The idea of having students create things and then using technology with that, to me seems like that makes total sense. (Interview, March 30, 2017)

Overall, participants in this study found value when using the SAMR model integrating technology. The range of comfort did not seem to align to age or years of service. In this study, the most common comfort level was the redefinition level based on the type of teaching (student-centered, project-based, creative) that it fosters.

Most Common Level

When coding Research Question 1 into themes, a most common level of integration emerged. Participants agreed that educators in their schools most commonly integrated technology at the substitution and augmentation levels. Frank, an administrator, stated in an interview, the most common level of integration in his school was somewhere between augmentation and modification.

> I would say that probably building wide I see a lot of the "A" level. Where we have just [gone] beyond the substitution [level]. We have people digitally collaborating with each other. [Also], workflow is mostly digital in our building. [Digital tools is] how students' get their work, [and] that's how students turn it in. There is a lot of online collaboration. But I would say that we're predominantly "As" a little bit of "Ms." Some of us are still at the "S" level and I don't see a ton of redefinition happening. (March 1, 2017)

However, Steve felt the most common levels of integration found in daily practiced were the substitution level and augmentation level. He later stated that, with the districts' one-on-one initiative; it was the easiest.

> I mean any of the "S" and "A", every single day. The fact the kids have in iPad in their hands, they're basically substituting anything that I would have made a copy [of]. My copy budget and the global copy budget, in St. Vrain, has dropped. There's still science . . . lab books. I have a filing cabinet full of papers that I still use because kids still like the feel of the physical paper. However, I "S" and "A" every day. (Interview, April 14, 2017)

Bob supported Steve's assertion regarding the most common level for technology integration. Because of the districts' one-to-one initiative and the use of the website Schoology™, he could easily integrate technology at the substitution level. Furthermore, the technology he used allowed for students to link to the web, making his use of technology integration level consistent with the augmentation level. For Bob, available technology naturally allowed him to move up without much effort.

> The most common is substitution. I would say substitution . . . because we . . . would get all their assignments . . . online. I always used a website. I create a website and I had everything on there. I had . . . the objectives . . . the homework, and the daily agenda on there. Then I had links to everything that we were doing [to work] on the website. They would pull up the website every day and I displayed on the board too . . . I'd had to say is substitution and augmentation. I mean . . . those two levels. I guess the most common [substitution] . . . was automatic. We did . . . everything with their iPads. (Interview, March 26, 2017)

Mike's most commonly integrated technology was at the substitution level. He felt the use of PowerPoint™, video clips, and Google Docs™, replaced traditional methods of teaching. He also felt that, in the current teaching climate, educators were pressured into using technology. In turn, they tended to integrate technology in the most basic ways, e.g. substitution, to meet the demand.

> First of all, . . . I think about the way the use of technology is promoted in schools. I feel like most teachers tend to . . . focus on things that are more . . . substitution level. I think it's because they don't necessarily think about there being a variety of levels. I mean a lot of times, when you think about your lesson plans and you think about [the] type of activities [and] . . . what kind of . . . thinking is involved; what's really required of them seems like a traditional lesson planning. I feel like there's so much pressure to use technology in the classroom. Most teachers find themselves substituting. [In turn], they can say they're using technology. They feel that they're using technology. If I can pull out an iPad and pull up a quiz game for kids to play, I'm using technology in my classroom. I would say the most common [integration] has been things like the use of a smart board technology, PowerPoint, or even video clips, . . . YouTube playlists. (Interview, April 16, 2017)

Jill, a district administrator, saw substitution as the most common type of technology integration. Because of Schoology™, teachers could convert their worksheets to digital to post on the website.

> What I see most commonly, especially when teachers are first starting out, is the substitution Level. I put it all in Schoology™. My worksheets [that] . . . I normally would pull out for the students, . . . I'm going to put it [on] a digital platform. So, I would see that [is] more common. But I think what we see in the schools, at least at first, is substitution. Everything's in Schoology now. It's the same worksheet that I use for the last 20 years. (Interview, March 30, 2017)

Amy, a district administrator, voiced similar sentiments as Jill. However, because the teachers she worked with used Google Docs™, educators were integrating technology at higher levels of the SAMR model because of the added functionally. This added functionality included chat features and the option to share documents.

> The initial level of a Google tool is substitution. [When] you add in [a] feature . . . you're augmenting it. You could be doing it on paper, [or on a] spreadsheets, [or] forms, but you can share it with others. (Interview, March 30, 2017)

Overall, participants viewed the substitution level as the most common level of technology integration. This could have been due to the simplicity of integrating technology at the substitution level. With the addition of Google Docs™ and learning management systems, such as Schoology™, teachers could keep 20 years' worth of worksheets in one place, as participant Jill put it.

Educators' Meaning of the Substitution, Augmentation, Modification, Redefinition Levels

Another theme that emerged in this study was that levels of the SAMR model were susceptible to subjective interpretation. Teachers found the redefinition level a desirable level to integrate technology, however, they did not think all lessons should be designed at this level. Participants had different interpretations of each level as they pertained to their teaching practices and expectations.

Steve mentioned that the S, M, and A-levels enhanced the classroom but similar activities could be developed without technology.

> I don't know if they know how to achieve it [redefinition level] or even know what that end goal looks like at all. I even use . . . the phrase revolution but it's completely different. The way I understood "R" is that it would redefine what you're doing. "R" is physically, emotionally, structurally, impossible without technology. That's how I've understood "R." Where "A," "S/A" and "M" are where technology is enhancing or facilitating. You could still run a similar idea if

> you didn't have technology. That's why using the talking to Pakistani kids' example there's no way other than us getting in a plane and go there . . . I don't know if they know how to achieve it [redefinition level] or even know what that end goal looks like at all. (Interview, April 14, 2017)

He continued to talk about how innovation needed to achieve higher levels of integration was extremely difficult because of the highly-structured nature of his school system. "Public school has remained, almost entirely unchanged for about 120 years. Therefore, its rigidity makes true innovation very difficult" (Interview, April 14, 2017). In summary, Steve thought the levels S, A, and, from time to time, M were the easiest to implement. However, redefinition level was the hardest given the current school structure.

Bob thought that each level of the SAMR model had an appropriate use based on the content being taught. He added that not all lessons should be taught at the redefinition level, and, if the lesson required a more rote acquisition of knowledge, the substitution level was more appropriate. The redefinition level was reserved for synthesizing student background knowledge or summarizing knowledge.

> I think . . . a classroom can become completely technology-based where redefinition would not always be appropriate. It is not appropriate when learning new material with new vocabulary or new skills. Redefinition is more appropriate in the application of learned material. (Online Survey, March 25, 2017)

Bob also added that the model allowed teachers more flexibility to meet the needs of the students while closely matching lessons with student abilities. Bob stated; "It [technology] adds more flexibility and diversity to the learning process, which in turn, can provide more choice, greater possibility for learning, in ways that fit learning styles. In general, it [technology] can allow for more individualized learning" (Online Survey, March 25, 2017).

Ultimately, Bob felt that the higher levels of integration led to more engaging lessons, and allowed for the most effective use of technology. “[Technology] . . . really is the most fruitful and engaging when it’s used at the higher levels” (Interview, March 26, 2017).

Kate considered the levels of the SAMR model on the bases of efficiency and ease in integration. Her comment was rooted in the teachers’ goal for her students’ and the teachers’ goal for completing administrative tasks.

> The substitution level is great for students who need a tech accommodation [such as students who need speech-to-text to write an essay]. Augmentation can be used to automate grading with Google forms. The redefinition level is appropriate to re-imagine projects as authentic products that students create, such as creating an automatic feeder for the class pet using Arduino supplies. (Online Survey, February 22, 2017)

Mike felt the SAMR model was a great guide to integrating technology, but felt the age of the educator may have influence the amount of training required to understand and implement it. He reflected on practices of older teachers, suggesting those who began teaching using overhead projectors and chalkboards, would require extra training.

> I would imagine a newer teacher who's grown up with this technology at their fingertips may not need the same type of training. The SAMR model still gives them a really concrete way to look at . . . the purpose of the technology and what are they gaining from the use of the technology. They may not need a lot of help . . . thinking about or . . . developing the technology. It's just the actual thought process of; does this technology do what I want to do? What type of thinking? What type of learning? [What] do I want to come from it? I think that whether you're a new teacher who is well versed in all forms of technology or you’re an old veteran teacher who's used to working with a chalkboard and the overhead projector; [how do you adjust to the] latest . . . new fashion. I mean that [overhead projector] was a technological innovation that changed teaching because you could make your transparencies and you could teach from them for the rest of your life. You didn't have to rewrite the stuff on the chalkboard every day. So, I think . . . no matter where you are on the spectrum it [SAMR Model] gives you a chance to evaluate, like you would with any other lesson. What you're asking kids to do? What are they going to be able to do? If we're not encouraged to develop lessons . . . I think there needs to be some training. Just like there is with a regular

> educational training. How can you use technology in a way that you're not just substituting it for some more traditional paper and pen activity? I mean what's the point of spending all that money . . . when the teachers need to be trained; myself included, on how to take this myriad of technological resources that are available and make it something that delivers the highest level of educational program. Real, high-level thinking and synthesis, integration, and interpretation as opposed to . . . doing a word search. (Interview, April 16, 2017)

Frank saw the levels of the SAMR model as a guide for using technology in an innovative way and a measure for teachers' growth. He saw the bottom half of the model as quick and easy integration that aligned with more traditional approaches. The top half of the model was reserved for student-centered activities.

> "Substitution" would be normal text usage [e.g. reading from the screen instead of reading from a novel or textbook], with the primary benefit being convenience. Digitally collaborating with an audience outside of the school setting [local politicians, business professionals, etc.]. Project based learning opportunities would be a good example of an authentic redefinition opportunity. (Online Survey, February 17, 2017)

Frank felt teachers should strive for the higher levels to assist teacher's and students' growth.

> I know a lot . . . about SAMR and for a lot of us . . . the first step is . . . [the] substitution step. You know, if I'm used to . . . the old-school textbook, how can I go to a digital textbook? If I used to just pass out worksheets . . . how can I get a PDF [copy] in Schoology and distribute that way? Then use Schoology to turn it back in. If I'm already there, what's my next step after that? Can I have students digitally collaborating through Google or . . . invite people outside of the school to the collaboration process? It's really just trying to encourage anyone . . . on that spectrum to take it to the next level. It's kind of like classroom teaching. The goal is growth. And you're letting it go from a zero to 10, in a week. You need to go from zero to 2, and then to 4. (Interview, March 1, 2017)

Jody viewed the levels of the SAMR model in much the same way as Frank. She felt the levels related to student and teacher growth. To change the level of integration only required changing one aspect of a lesson plan.

> I feel that the learning process occurs with and through the students. As educators, we have to try new things and continue to grow each year, just like we expect our students to. There are many different lessons that I can easily change just one thing to make it to the top. (Online Survey, April 25, 2017)

Jill found the levels of the SAMR model to be hierarchical, but offered that the learning process was cyclical. Once the teacher decided on the learning objective, they could turn to the SAMR model to develop the lesson around the objectives. She felt the interplay between the SAMR model and identifying learning objectives was the most appropriate way to integrate technology. She emphasized that teachers should not limit their technology integration to one level; rather, they should integrate technology at the level that best fit the lesson objective, switching levels as needed.

> The SAMR model seems hierarchical whereas the teaching and learning process seems more cyclical. As being hierarchical as the SAMR model, it is similar to Bloom's taxonomy. It seems that the tasks are more complex the higher up you go on the SAMR model. I think that the SAMR [model] . . . seems to be . . . a continuum. The goal isn't that all teachers get to the . . . fourth stage. But you can . . . be at each different stage during different times of the day or different times of the year. However, when you think about the teaching and learning cycle; what [do] you want students to know and be able to do? How do you get them there? How do you assess that they're learning it? How do you go back and reteach if you need to? How do you extend if you need to? It's more . . . cyclical whereas . . . the SAMR model is much more of a continuum. Even though I don't think it's supposed to be that way, but in my mind, I think about all the little the charts that I've seen of the SAMR model, and [they] seem . . . a stair . . . model. And that . . . turns me off, because . . . you don't have to always be at redefinition. You can you can be at any level and go back and forth. But it still . . . seems to be this stair step . . . to the ultimate [level, which] is redefinition. Whereas teaching and learning is this cyclical cycle. (Interview, March 30, 2017)

Amy supported using multiple levels of technology integration to assist learning. She also felt the levels were not static but fluid.

> I think it's appropriate to use either [any level] at any time in a classroom. Anytime where students are working within a "redefinition moment or lesson" they are simultaneously substituting. They aren't handwriting a tweet or posting to an author, they are using a computer or tablet or phone. I think it would be appropriate for a student to substitute technology at any point they see it appropriate. If they work better and process information better by writing their notes on paper; great! If they work better and process information better by typing; great! I'm not sure I understand when it would be "appropriate" to integrate technology at the redefinition level because by design, when redefining, technology is a necessity. (Online Survey, March 12, 2017)

Amy related the level of SAMR model to a teachers' personal teaching philosophy. Educators who were teacher-centered taught at Bloom's lower levels and would face a greater challenge integrating technology at the higher levels. Teachers who were student-centered would require a minor change in teaching methods to successfully integrate technology at higher levels.

> One is changing your instructional practice and your approach. If you are already a teacher who is very into student driven work and differentiation, . . . you'll probably want to get a feel for how the devices work. What's the work flow? How do I get this from a student to me? Or, how do I grade a video versus how do I grade a piece of paper? But you've already started out in your instructional practice that way, it's not a large change. If you are only doing substitution and philosophy of instruction is very teacher driven, . . . changing [to] a student driven inquiry based global collaborative project, or lesson, [you are going to need a lot of] time to be . . . prepare. (Interview, March 30, 2017)

In summary, educators had differentiating views on the levels of the SAMR model. All educators saw the model as a tool for measuring growth and a guide for pedagogical change. They also saw the SAMR model as requiring a change in teaching philosophy that would ultimately lead to greater student success.

Motivation and Engagement

Motivation and engagement were repeatedly mentioned during the data collection process. The general notion was that any technology integration increased motivation and engagement. This perception was supported by the vast amount of literature on

technology increasing motivation (Lawlor et al., 2016; Shroff & Vogel, 2009). Simply put by Jody, "student motivation is much greater when we reach the redefinition level" (Interview, April 25, 2017). Bob summarized motivation and engagement by stating:

> Generally, student learning increases at the substitution and augmentation levels due the simple fact that most students are more engaged in the learning process with the use of technology. Learning can significantly increase at the modification and redefinition levels if the lesson design has . . . enough flexibility to account for varying ability-levels in students. (Online Survey, March 25, 2017)

Bob continued to elaborate on the topic of engagement in his one-on-one interviewing saying:

> I think it's [the] kids are generally more engaged. And the engagement factor goes way up [when] using technology. That's the biggest thing that you see. It's . . . allows for more feeling of ownership. Instead of . . . "this is the sheet that [you have] to do . . . and you have to do it this way." I feel like it allows for . . . natural individualization. If it's more open ended then kids can be more creative, they can be they can make more choices, and I think that ups the engagement piece. You know, you can allow . . . the kids . . . more ownership in what they're doing and have more choices. They get more engaged, they get more involved in it and learn more too. (Interview, March 26, 2017)

Mike saw technology, in general as motivating to students. Students were excited when a lesson required the use of a digital device. However, he saw the best use of digital tools was for a meaningful purpose.

> They always seem more motivated and more engaged. I would say that's the case . . . for some students, because they just want; they just love to play with the devices. But in that case, it's kind of a hook . . . maybe I can't hook them the same way that I used to. I used to . . . just ask a certain type of question, or make them curious about something, in turn they were getting engaged. Or, they were getting engaged simply because it's what was expected of them. But as the population changed, the culture changed. Kids seem harder to motivate and harder to engage. in US history. If the kid isn't interested in history, they may not become interested. However, for some reason, when you put the pad in front of them; they're excited. I mean they walk in there, . . . race over to the tower and grab themselves a Chromebook™. They can't wait to get the thing open and start playing with it. Typically, students are more motivated when challenged to go

> above and beyond simple tasks, when they feel the work is meaningful, real-world context or application. When the work feels meaningful you no longer hear the cries of "why do we have to do this" or " this is dumb" or "this is a waste of time. Instead they engage and create. (Interview, April 26, 2017)

Mike found technology integration gave an inherent purpose and drive to students. This increased lesson participation. He went on to elaborate on this increased motivation of the students saying:

> Putting it [Technology] into their hands [in] some sort of entertaining or engaging way doesn't necessarily teach them anything. It doesn't . . . promote higher level thinking. Well, if you really want them to use it in a meaningful way you might have to help them understand how they can do that. I mean truthfully, I feel like what instantly happens is there is this sense of motivation and engagement because the kids love the screen time now, in particular if they can use their own device. (Interview, April 16, 2017)

Frank agreed with Mike's opinion of motivation and felt that technology increased engagement. He also felt that those who were accustomed to traditional practices would need additional help.

> It very much depends on the student. Those who are naturally creative and intrinsically motivated will thrive at the higher levels. Those who are accustomed to detailed rubrics, protocols, and prescriptive learning may struggle at the higher levels, and will need support. (Online Interview, February 27, 2017)

He elaborated more on this topic saying the ability and flexibility of technology to open new opportunities was the driver to increase engagement and motivation.

> A certain type of student, I would say, . . . tend to be more engaged. Today we were just talking about flipped classrooms. [Because they] can take their iPad home; instead of going over content during the school day . . . we might . . . have them watch their homework on their iPad. Then come to class the next day ready to work with it in some capacity. So, I would say that it opens up opportunities for engagement. It opens up opportunities for creativity. It gives kids chance to collaborate with their classmates and with the outside world. Lot of positives. So, I'd put that on the plus side. (Interview, March 1, 2017)

Amy found, when technology was integrated at higher levels, students became more motivated and engaged. She claimed the increased motivation came from the

autonomy digital tools brought to a lesson. This allowed students the freedom to control their learning, pursuing meaningful interest.

> In general, I'd say that the higher "up" you go in SAMR, the more engaged and motivated students are because [of the] differentiation, more autonomy and inquiry. But just using collaborative Google Docs™ with students for a writing project can get kids super motivated and engaged as well, at the augmentation level. (Interview, March 30, 2017)

Motivation and engagement is reliant on pedagogy not technology. Jill saw motivation as dependent on the student and the lesson design. She believed the focus of the lesson should be on choice, not necessarily on the digital tool. She felt that lessons that emphasized both choice and solving real world problems greatly increased engagement.

> It depends on the student. We know that student engagement and motivation increases with choice. However, this could happen even at the substitution model. Some students are more interested and motivated by hands on activities that don't necessarily involve technology. Or they get really excited about working with people in the community solving real-life problems...not necessarily problems or solutions that involve technology. (Online Survey, March 30, 2017)

De-motivating effect of technology integration. Two teachers in this study claimed that integrating technology led to decreased motivation. Kate stated this happened because technology created an additional barrier to learning. If students struggled with technology use, they were faced with an additional learning barriers. Any frustration using a new digital tool added to the overall frustration of the student.

> I will tell you about [this] algebra [software] we started using; Bootstrap™. This program was supposed to be algebra one aligned. The kids were working individually on the program and I'm . . . getting them to work in partners. I ended up leaving it for this year; kind of abandoning it for this year because my algebra class is the struggling algebra kids. I thought this is going to be great for them . . . up their engagement. But my kids who struggle tend to really struggle with technology. It just makes it like "oh my God I just made another frustration barrier for them." (Interview, February 22, 2017)

Kate elaborated on how struggling with the digital tool added to the overall frustration.

> They are like, "I don't know where that symbol is!" I'm like, "on your keyboard" Like, this [software] was supposed to make them get it. "Oh, this is awesome I am making this thing and it's like my product." and I have some kind of ownership of it, as opposed to, "we're doing page 72 and . . . turn it in." And I was like "we could have a day where we all show our games that we made." And there was more of a public product. It ended up them hating it. And they got really frustrated. (Interview, February 22, 2017)

Kate's intention, like other teachers in this study, was using technology to motivate students. She allowed them autonomy, created collaboration opportunities, and ownership of their leaning. Instead, students often found learning how to use innovative technology presented too much of a barrier. Students ended up quitting or shutting down. I asked Kate what she thought was causing this reaction.

> Mark: Where do you think that frustration stems from? I mean, . . . where do you think that hate, that frustration comes from?
>
> Kate: I think . . . there's a certain level of coping skills that they just haven't been taught and they want to be spoon fed. Because, it is the way they've been successful in the past. And they just want to be done. Right? So, I think that's just a hurdle to get past. I think when they actually get to use something that they do feel ownership in like it's totally worth it. (Interview, February 22, 2017)

Similarly, Bob, saw a frustration effect of technology integration when technology offered too many options. He stated in his online survey, "If, however, the lesson design does provide an enough flexibility, it stands the chance of increasing the frustration level of students and little or no learning will take place" (Online Survey, March 25, 2017). His perception was that the number of possibilities created with digital tools could also increase student frustration.

Substitution, Augmentation, Modification, Redefinition Model and Educators' Practices

When examining Research Question 2 (How does the Substitution, Augmentation, Modification, Redefinition [SAMR] model transform educators' practices?), two themes and two sub-themes emerged. These themes included practice and student achievement, and educator time spent on lessons. Two sub-themes under educator time spend on lessons were; time spent on lessons, and time not a problem. In general, teachers strived for the upper levels of the model. In general, teachers strived for the uppers levels of the model. They felt that, to achieve higher levels of the model, more time needed to be spent on lesson design.

Practice and Student Achievement

Teachers in this study felt higher levels of integration created more opportunities for learning. These opportunities, according to the participants, included differentiation, personal creativity, and collaborative learning.

Steve saw the SAMR model, as it related to student achievement; as a ladder to greater learning. In the online survey, Steve wrote: "As the student progresses up the ladder, the student uses technology to enhance their learning in ways never before possible" (April 12, 2017). Frank reinforced this sentiment by adding: "Higher up the model, ideally, would allow for more authentic learning opportunities that are more public to a larger audience" (Online Survey, February 27, 2017). Kate related the levels of the model to Bloom's Taxonomy for student achievement by saying: "Towards the top, students are more invested in learning and are leaders in their own learning. The top of this model almost forces students to be working toward the top of Bloom's

Taxonomy" (Online Survey, February 22, 2017). Kate, as a teacher, wanted students to create and take ownership of their learning.

Brandy similarly viewed the SAMR model as a step-by-step system to greater learning opportunities for students - technology inspired students to engage in new learning.

> So, there was all kinds of stuff going on . . . that you can set up for them . . . that moves up the SAMR model from the bottom. For example, the kid who got on DragonSpeak™ for the first time. It was like "oh my God this is so cool" I can write. (Interview, March 7, 2017)

Mike felt the top of the model was where the real value to education existed. He also saw the bottom half of the model as a little more than entertainment for students. His point was that, by substituting a digital lesson for a traditional lesson, you were not adding educational value: student may be more engaged because of the use of technology, but it does not increase learning. The bottom half of the model doesn't seem to warrant or encourage the use of technology beyond entertaining students or making lessons more appealing or easier. In terms of learning, technology integration doesn't offer much when considering how tech savvy kids are by the time they reach middle school. Mike did add that gaining students' interest and engagement were, in themselves, worthwhile goals. "As you move to the top of the model, then I see real value in using technology to enhance, create and share knowledge which is where the focus of learning should be, and what most activities should lead to. "(Online Survey, April 16, 2017)

Amy believed the upper levels of the SAMR model allowed greater opportunities for students to collaborate, creating authentic learning opportunities. The nature of integrating technology at the redefinition level provided learning opportunities that were impossible in a traditional classroom.

> For replacement, student learning will be the same as it was with the original task, just the skills will be different [handwriting vs. typing, drawing a picture on a piece of paper vs. drawing digitally]. In the augmentation level, the learning may be different. While teachers may have students collaborating on a piece of writing on paper, they may now be doing that in a collaborative program like Google Docs. The learning may or may not be different here depending on what the students were doing before. By moving up to modification, student learning is different because the task is different, and there is more room for differentiation and student driven tasks and a different skill set will be needed. Under redefinition, student learning will be different as the interactions with different people, ideas and questions may arise because the task is completely different than the original and there's more exposure to an authentic audience, field experts, social media, and higher student agency. (Online Survey, March 12, 2017)

When integrating technology in the classroom, teachers could use the SAMR model to evaluate their practice. Educators saw that, as they moved up the model, the focus changed from teacher-centered to student-centered. Steve observed this happening in these classes. “The learning process ‘evolves’ more into a student-centered curriculum and into more of a ‘creative expression.’ To me, that’s the benefit of the SAMR model” (Online Survey, April 12, 2017). Bob reinterred this effect of the SAMR model saying:

> An ideal example for substitution would be a facts-based assessment. An example or redefinition might be a project-based assessment where they might be given a choice of modalities by which they demonstrated their knowledge. (Online Survey, March 25, 2017)

Mike felt that the push to integrate technology at the higher levels would be a major pedagogical shift that teachers would be reluctant to embrace. His rationale for the lack of movement up the integration model was the lack of knowledge. He also suggested that teachers might not attempt a change in practice because the move to do so was not supported by the district.

> But I think more training would be necessary. It would just be a starting point because a lot of people don't know, just like they don't know in a regular educational setting. They take a more traditional approach not everyone understands how to go from a more concrete to more abstract thinking. Or lesson based approach, some people are very comfortable . . . taking the worksheet from

> the textbook or the workbook and . . . give them to kids. Then they move on. They've delivered the content. Those people may need some training on how to make those experiences more meaningful. I think the same would translate to technology just because you have a link to a great website doesn't mean you understand how you can use it to promote higher level thinking. Putting it into their hands and some sort of entertaining or engaging way, but doesn't necessarily teach them anything more. It doesn't . . . promote higher level thinking. I feel like teachers are super comfortable hanging in that lower end of the scale because it fulfills their evaluation criteria. There's that little checkbox on a teacher evaluation that says, "used technology in the classroom." Well, if you really want them to use it in a meaningful way you might have to help them understand how they can do that. (Interview, April 16, 2017)

He later added that the goal of every teacher was to move across the spectrum of learning from concrete to abstract.

> Even if it's to a small degree. I think all lessons, technologically based, or more traditional alike should move across the spectrum from more concrete thinking to more critical/abstract thinking in order to differentiate for different learning abilities, and to evaluate the skill level of students as they progress. The end goal of every lesson should be the highest level of thinking/creation as possible for each student. (Online Survey, April 16, 2017)

Mike summed up the SAMR model and student achievement by stating: "Quite simply, each level strives for a higher level of thinking, so as students move between each level they are moving from concrete to abstract thinking" (Online Survey, April 26, 2017). Mike's goal was to encourage students to move beyond learning basic facts and to become creators of knowledge.

In all, educators felt that integrating technology at a higher level promoted greater student achievement. The higher levels of integration created learning opportunities that were that were student-centered and further allowed students to collaborate in creating knowledge.

Educator Time Spent on Lesson Planning

Time spent on lessons. The final theme that emerged from this research was the issue of the increased amount of time spent integrating technology into lessons. The participants suggested the reason lessons took longer to plan was attributed to changes in teachers' pedagogy, limits in their ability to think creatively, and needing to account for students' background with the digital tool. The participants believed this especially true when creating lessons at the redefinition level. Participants stated that additional resources were needed to help teachers make the shift to fully integrating technology and that professional development opportunities, perhaps during the summer, could of great value.

Brandy summarized how the shift from a teacher-centered to a student-centered classroom using technology could require additional planning time.

> Well the second half [higher levels of the model] takes more time, . . . because you're having . . . students involved in how the lesson's going to grow. It's not you just sitting, planning a lesson that you're going to stand up and direct teach to the students. (Interview, March 7, 2017)

Amy agreed the shift in teacher's strategy could require extra time planning. Any lessons that were outside of a teacher's traditional approach could add time to lesson design. Kate bluntly stated that, "The substitution level requires less time to develop" (Online Survey, February 22, 2017). Bob elaborated on the time consumption:

> I believe it varies with the teacher. Some individuals are very creative and can seemingly easily or without too much difficulty and time apply that creativity to lesson design at this level. Others find it extremely difficult, time consuming, and can be the source of a lot of frustration and feelings of failure. Everyone is not capable of writing effective curriculum. (Online Survey, March 25, 2017)

Participants in this study agreed that technology was most commonly integrated at the substitution level. They believed the ease of swapping traditional tools for digital counterparts could be a significant contributor to the popularity of integrating technology at the substitution level.

Time not a problem. Conversely, two participants agreed that, if a teacher had a student-centered teaching philosophy, the amount of time spent on planning was minimal. Both Jody and Steve claimed they were project-based, student-centered teachers. Jody summarized this, stating: "I do not feel like I have spent a great deal of time moving to the top of the model. It only takes a few adjustments to lessons" (Online Survey, April 25, 2017). Steve added in the interview (April 14, 2017), that, "if the lessens were student-centered, the student was the one taking control of the learning and the teachers' role was in facilitation."

Shared Views of Administrators and Teachers

Three themes and two sub-themes emerged from Research Question 3 (From the perception of the participants in this study, how effectively aligned are administrators' views to the teachers' views when using the Subsitution, Augmentation, Modification, Redefinition [SAMR] model for effective technology integration?). The themes included greater learning at the higher levels of the SAMR model, classroom behavior, and planning time. Two sub-themes under classroom behavior emerged; on-task behavior, and on-task, less behavior problems.

Greater Learning at the Higher Levels of the Substitution, Augmentation, Modification, Redefinition Model

The consensus was that, when technology was integrated at a higher level, greater learning took place. Bob, a teacher, said as: “hopefully we have the growth mind set for our kids, our students, and hopefully we have a growth mind set for ourselves” (Interview, March 1, 2017). This growth mindset was agreed upon by the teachers in the study and summarized by Mike saying: “quite simply, each level strives for a higher level of thinking so, as student move between each level they are moving from concrete to abstract thinking” (Interview, April 16, 2017).

Classroom Behavior

On-task behavior. Both teachers and administrators identified the theme *on-task behavior*. It was related to the amount of time a student spent on homework, or classwork, as opposed to games, or social media. Teachers and administrators talked about new challenges that digital tools introduced. Mike talked about a problem most teachers in the study were having: student checking. Student checking involved students engaging in two or more applications while in an educational context (Goundar, 2014), for example, playing a video game and writing an essay. Mike stated:

> From that perspective, in terms of getting them to remain on task, I think that is a challenge. If you have a student who's not interested in the task that you've given them they've got a window to nine billion other things that they can simply click too. All it takes is clicking from one tab to the next as the teacher comes along. (Interview, April 16, 2017)

Mike continued to elaborate on this issue with technology and on task time by stating:

> The problem is it raises some other questions around classroom management. If you have students in there and you're at the front of the room and they're all sitting at a table and they've got their Chromebooks open and they're looking at it and they're typing away or whatever, I mean you don't necessarily know whether

> they're playing Asteroids or Snapchatting or Facebooking or whatever else they may be doing. Until you walk over and look at their screen. (Interview, April 16, 2017)

Bobs' view on the digital tool being a distraction was similar. He felt that it was impossible to keep kids on-task and to monitor their behavior online. The temptation of social media and websites was too much for students.

> Well the biggest thing . . . are they on-task doing what you expect them to do. Because there's so many websites; technology is a window to the world . . . and social media is such a big thing with kids. I think the biggest is classroom management. It [technology] is involved, and distracts easily. The kids can easily be distracted, they can easily go off and do something else when you're not watching. It's hard to control a lot of times it's hard to monitor that. Because you know you're helping one kid or a group of kids and you can't . . . look behind every screen all the time. You cannot; it's impossible. (Interview, March 26, 2017)

Administrators saw the same type of behavior with digital tools, offering the distraction frequently proved too tempting for students. Frank summarized the problem:

> So, they have this basic distraction device in their hands at all times. And it's way too easy to go over to Facebook. Way too easy to . . . play this game for just one minute. You know, so . . . students being distracted is number one (Interview, March 1, 2017)

Both teachers and administrators agreed that classroom management strategies were needed to control off-task behaviors using digital tools. All participants used some type of classroom management to control behavior. Strategies that were common amongst all participants were turning the device on its face as talked about by Frank.

> I do think that there are . . . tricks to the trade that you can use that are technology specific. One example, a sign in the room . . . iPad face down or iPad under desk. So, you're just . . . clear about when it is okay to have that iPad in your hand and when it's not. You know . . . I think it's both ways. I think there are some universals, then there are just tricks of the trade. (Interview, March 1, 2017)

Bob explained he used the same classroom management strategies recommended by his administrators. "Unless you're supposed to be using your iPad, you know, it's face down

on your desk. You're not allowed to have it in your hands; can't be face up either. It has to be on your desk. It can't be in your lap." (Interview, March 26, 2017)

Other teachers provided a different approach to address off-task behaviors, such as setting clear goals for use of the digital tool. Mike explained he gave clear instructions on when extra tabs on the Chrome™ browser could be opened.

> I will tell my students: "If you're opening other tabs it must be relevant to the work you're doing. Otherwise I don't want to see any other tabs." You know [for] a little Lewis and Clark research activity, you don't need to be on Facebook. You don't need to be on Instagram; these tabs shouldn't be open. (Interview, April 16, 2017)

Jody stated she had clear goals to reduce classroom management issues. Clear expectations reduced disruptions, and reviewing those expectations beforehand would help students stay on task. Jody suggested the maturity of the student could lead to off-task behavior.

> I think expectations always guide our students to try and be more mature. I can't just say as the teacher "OK this is the expectation, it's a learning tool and I treat it like a learning tool." If they have to practice that and they have to come up with their expectations for technology and their learning, you know, students really need to develop those expectations. [Educators] have to set those expectations. We have to have a conversation on, what does it look like to use technology in our classroom, gym, weight room and then stick to it; be consistent. Just like with any kind of classroom, it's really management. (Interview, April 25, 2017)

Both teachers and administrators agreed that classroom management was an issue when integrating technology. Both also agreed that, if a teacher had strong classroom management skills, the issue of off-task behavior would be reduced. Frank shared his thoughts on classroom management and technology.

> The people who struggle with managing technology are the people who struggle with classroom management to begin with. I would say it's much more of a classroom management issue. For the person who already kind of tenuous

> classroom management skills it just adds another challenge for them. . . . I thought that the people who were going to struggle the most were the people who were least proficient with technology. What I found is that the people who are struggling most are the ones who don't have the classroom management skills. And you know the teachers who are really struggling, especially with the distractibility piece, are those that never really developed great classroom management systems relationships. (Interview, March 1, 2017)

Amy, felt that, if a teacher had bad classroom management skills, technology only made it worst.

> More behavioral management. Then when you introduce technology all that it does is amplify. It's an amplifier. So, it either amplifies the strengths in the classroom or the weaknesses in the classroom. So, if you have poor classroom management before it's going to drastically be terrible. Because it amplifies how easy a student can be disengaged. If you have good classroom management good classroom practice. (Interview, March 30, 2017)

On-task with less behavior problems. Mike offered a unique look into classroom management and technology. He contended that technology may have its drawbacks, but it could also eliminate issues. Throughout his career, Mike saw students mask off-task behavior through various strategies. Some of these strategies included taking multiple trips to the pencil sharpener, districting a friend, multiple trips to the bathroom, and being overly social during a group project. He stated that, even with the issues technology brought to the classroom, it did eliminate some.

> Well. I don't think that technology makes a classroom harder to manage, if anything I would say it makes it easier to manage. If they're going to be off task it's going to be at their desk with their device. I'm not saying that that's a good thing for them to be doing but that's the reality. The kid who's going to get up and walk across or have a poke somebody with a pencil or make fifteen trips to the pencil sharpener or need to go to the bathroom three times in the same period. I mean I'm kind of exaggerating a little bit, but I mean, everybody knows those students, right? I mean they get up the same time every day and they want to go use the bathroom it isn't because they have to go the bathroom it's because they're bored. For some reason when the devices in front of them it's almost like, . . . it's a sedative. Pop the thing up and the kid will sit for forty-five minutes. I mean the

> time will just go by and they don't even realize it. They will say; "oh my god the period's over I got to go put my Chromebook away." So, I don't think it's more difficult to them as a classroom management piece. (Interview, April 16, 2017)

Steve also had experienced issues with off-task behavior exhibited by his students. He stated most of his off-task behaviors had been fixed through engaging lessons.

> It goes back to classroom management and there I would say that I have probably solved most of my classroom management skills since I've been teaching. I just was told respect goes along way. Respect solves eighty percent of my classroom management stuff. Not only do I value the students in their presence and they know that I'm creating authentic and engaging lessons. However, there might be kids that hate lessons and there's nothing I can do to engage them. On the whole, I think the way that I teach takes care of a lot of classroom problems. (Interview, April 14, 2017)

Planning Time

Throughout the interviews and online surveys, a theme emerged of increased planning time to integrate technology, especially at the transformative levels of the model. As previously covered in this chapter, participants felt that extra planning time was needed to integrate technology at the redefinition level. They conceded that the needed increased in planning time could possibly be attributed to teachers' lack of knowledge on how to integrate technology, changes to their pedagogy, or lack of creativity. Bob best summed up this sentiment.

> It can greatly impact lesson design because change in the design in anything requires thinking in ways that one may not be used to or be comfortable with. It may require research and training and of course that all takes time. Once new design is put into place, additional time often has to be built into a lesson on the part of the teacher as well as the students related to the familiarization with new technologies before those technologies can be used in learning. (Online Survey, March 25, 2017)

Kate bluntly put her concern for planning time as, "The main concern is getting enough teacher planning time to make good projects with appropriate scaffolding for students" (Online Survey, February 22, 2017). Jody found the extra time worth the outcome: "The

time commitment is more, but well worth it. Also, I find myself learning more valuable feedback from students and changing the lesson based on student perceptions of a redefinition level" (Online Survey, April 25, 2017).

In summary, both teachers and administrators agreed that integrating technology at the higher levels had positive effects on learning. Furthermore, they worried that technology could create issues with classroom management. Last, they both felt that planning for technology integration took more time.

Assumption Refuted

In addition to the findings related to the research questions, insights developed related to the initial assumptions of the study. This study assumed that the descriptive nature of the SAMR model could assist teachers to creating effective lessons. However, after the data collection, little evidence supported that the description of the levels made any difference. Educators did not discuss the SAMR model in terms of the description of the levels. Bob was the only participant who discussed the criteria in the levels and it pertained to teaching.

> Well the only way I can see it . . . as a tool . . . one of . . . many tools. And I think it is a viable tool that can give a teacher who are particularly teachers who are new to using integrating technology in the classroom. Ah it gives them a vision of where they can go. I mean it gives them something concrete that they can kind of go "okay" I can see where I have an idea about where I can go with my curriculum and as far as integrating technology into it. (Interview, March 26, 2017)

Throughout this study, the relationship of the SAMR model to growth perspective was more prevalent. Teachers suggested the SAMR's effect on student academic growth was important to them. In turn, the descriptive nature of the SAMR model did not assist

teachers in creating effective lessons. Only Bob found the description of the levels helpful.

The last assumption of this study was that the SAMR model could create common language for teachers and administrators. Common language between teachers and administrators increases support for digital tools among other technology integration models (Ertmer et al., 2012; Gurfidan & Koc, 2016; Shattuck, 2005). From the interviews and online survey, there was no identifiable common language found between administrators and teachers. However, the study did find common language between administrators. Frank highlighted this, saying: "It's a model that provides, common, convenient language that allows professionals to discuss their craft more effectively" (Online Survey, February 27, 2017). He later elaborated on this theme by saying that the SAMR model was a common language that both teachers and administrators could identify levels of integration.

> I think that's all it is a model. And when I say the word model, I just mean like a common language of understanding. So, for us, . . . I think that it's a benefit. I would never say that the SAMR is the holy grail of all things that is instructional technology. It's just a way to classify what we're doing at different levels sophistication. So, I'm a fan of it. Because we're way in our second year of being a one-to-one school and especially in year one it was useful to us, we're all in different places with technology. Here is one way to understand kind of that ascending order of sophistication and using it. So as long as we understand all it is a model that gives us common language. That's fine. And don't expect it to be anything more than that. You know just all it is just a common vocab that we use (Interview, March 1, 2017)

Jill agreed with the common language aspect of the SAMR model by saying: "I think it is a good way to create a common language between educators and even students" (Online Survey, March 30, 2017). She goes further.

> I think that's why our school district kind of was drawn to [SAMR]. All these teachers should know about SAMR model in [our] district. It's this common language that they can talk about and when principals are evaluating teachers there can be a discussion where . . . you're using substitution with Schoology™. That's great. Now what are some ways to kind of go beyond that. (Interview, March 3, 2017)

One reason for the lack of common language between teachers and administrators was a difference in how the SAMR model was used. Administrators used the SAMR model as a tool to create an understanding with the classroom teacher. However, common language was not a priority for teachers, who instead focused on creating lessons and learning to integrate technology at a higher level.

Too Much Screen Time

During the coding of the data for this research, a new theme emerged: too much screen time, which was significant but unrelated to the study questions. It seemed critical to include this as a finding because of its significance. This new theme included two sub-themes; *pulling back from technology* and *digital citizenship*. Participants in this study all had experienced integrating classroom technology. Whether experience was with a district's one-to-one initiative or with class use of Chromebooks, educators worried students were experiencing too much screen time. Steve's detailed explanation of too much screen time was:

> These kids have phones and everything is on their phones; their camera, there contacts, there texting . . . they're G.P.S. They have not known a world without technology their hands. Therefore, when you ask the question; How much do I need to do? I've had myself taking conscious just steps away from technology, which is odd. You would think more, but it's almost like now this school year is almost done, . . . I'm going to get into a lot more of this idea of a time and a place. I thought the kids were responsible enough, mature enough, to regulate their own usage. They're really not and so we have some teachers that did things called Digital Dungeon, where they put their devices in there. It's so draconian like. I'm like "you know what? I wouldn't use the word dungeon but there needs to be." (Interview, April 14, 2017)

Kate reinforced this theme of too much screen time and adding it was the teacher's responsibility to regulate the experience.

> My sixth graders come in [the classroom] in the morning, they use to always play this silly online snake game . . . or something. But just the other day, I was like "you know what we're not going to do this." I mean it's before school, before the morning bell, it's not like their wasting class time. "We're not going to have any computers out until after morning announcements." They just . . . sat back and watched them [morning announcements]. And they came in, sat on the chairs, and look at each other and talk. I'm like they probably need to do this more. They have a lot of screen to screen time and not enough hanging out time. So, I just want to make sure that as we talk about our kids and how much screen time they have and . . . as we are integrating technology we would be really thoughtful about it and have them understand how to exist interpersonally. (Interview, February 22, 2017)

Mike saw too much screen time as a paradox to the teaching profession. If all the students were working on a lesson with a computer, what was the role of the teacher? He explained how the classroom environment was less personal because students were fixated on their computer.

> Our school for example, like many, is considering going to a one-to-one model. The school is going to provide every single kid a Chromebook or a tablet of some kind. In a sense, are expected to use it every day. What I've seen in some classrooms, . . . are kids looking at screens. I mean screen time, kids love screen time. So, if I can take an old lesson and substitute it with something else . . . the kids like the lesson infinitely more. Even if it doesn't actually do anything more. I mean that's the kind of interesting thing though they'll sit and play with the Chromebook or iPad for hours uninterrupted. If I try to deliver the lesson a more traditional approach, even if that approach that involves them being collaborative and talking with each other and having some social interaction, it's not as interesting as the screen time. The part I struggle with is I'm not a big fan of kids having so much screen time I feel like I have so much free time outside of school that when they come to school maybe some, maybe we should be promoting other types of activities and thinking that don't involve screen time. (Interview, April 16, 2017)

Pulling Back from Technology

A sub-theme of too much screen time was that teachers were hesitant to use technology in order to counter the time spent viewing screens. Steve had found himself thinking about the issue of too much screen time. He summed up the distance teachers would go to limit screen time. He told of a co-worker who created a "digital dungeon" to give students a break from technology. During this dungeon, students were to put all technology away.

> These kids have phones and everything is on their phones; their camera, there contacts, there texting . . . they're G.P.S. They have not known a world without technology their hands. Therefore, when you ask the question; How much do I need to do? I've had myself taking conscious just steps away from technology, which is odd. You would think more, but I it's almost like now this school year is almost done, . . . I'm going to get into a lot more of this idea of a time and a place. I thought the kids were responsible enough, mature enough, to regulate their own usage. They're really not and so we have some teachers that did things called Digital Dungeon, where they put their devices in there. It's so draconian like. I wouldn't use the word dungeon but there needs to be." (Interview, April 14, 2017)

This idea of pulling away is also relevant to questions about decision-making regarding what level and how much integration. For these participants, the action to combat the fear of what too much screen time could do was to take away the screen.

Digital Citizenship

Another sub-theme was the idea of adding classroom etiquette to digital citizenship. Steve mentioned the idea of promoting proper use of digital tools as digital citizenship (Interview, April 14, 2017). In this case, he focused on the proper time and place to use technology. Digital citizenship was touched on by several participants was as a way to regulate technology used by students. It also contributes to the study in tandem to making decisions about the type of technology integration, amount, level and the decisions educators have to make regarding these issues. Mike furthered this idea during

his interview, explaining that part of the classroom management could be addressed by creating a better digital citizen.

> I don't know if the term digital citizenship here fits, but I feel like it kind of does. Where the management part can get tricky. The students have at their fingertips tools that they can use inappropriately. In a way that they may not have been able to in the past. You know, . . . draw a funny picture of their teacher in their notebook. However, that's entirely different than using their device to take a picture of their teacher put all kinds of distorted filters on it and then send it viral. To me that is a management issue because a lot of kids, at least the age I'm teaching, . . . they're very impulsive and they don't necessarily understand what's appropriate all the time. They don't stop to think about what they're doing is appropriate. So, whether they're filming their peers, filming their teacher, taking funny pictures, I think it does change classroom management because they can do some significant damage to a teacher, to their fellow students. Because they have something that ultimately can go viral. I do think you have to have an elevated sense of understanding of the tool that's in the kids' hands, how it can be used and your responsibility to teach them how to use the tool appropriately. (Interview, April 16, 2017)

Purposeful Integration

Throughout the interviews and online survey data, a theme emerged around purposeful integration that again is only weakly tied to a research question, but was significant to the participants, related to the study topic and thus warranted inclusion in the findings. Participants in this study offered that, when integrating technology, the idea of how to engage students in meaningful learning lead their lesson planning. Steve summarized this in his online survey response:

> Technology is an easy "substitution," but one might ask: WHY am I substituting technology? Is it just an easy replacement? I think that technology is best used when it enhances an experience. This, to me, is done better at the "higher" levels. (Online Survey, April 12, 2017)

Brandy agreed that, when integrating technology, teachers needed to have purpose to integration.

> You think “where do I want to go with this?” But the whole thing is your goal first. I like to always say “introduce technology but it has to be with a purpose.” It has to have a purpose and be adding in, not just because I want to check off “yes I did technology so I had them read something on a screen.” It needs to have some type of purpose behind it. Like something useful there, they’re using it with. (Interview, March 7, 2017)

Bob integrated technology with purpose by making best use of student time. With technology, he could deliver worksheets, papers, and articles to the students’ iPads. Technology also gave him the ability to change assignments and make quick accommodations for students who needed it.

> How do I make decisions concerning the level of technology integration? Well, I mean, how can we have these kids most efficiently make most efficient use of their time and our time using technology. Technology does make things more efficient. Because you know you don’t’ have to run off a bunch of worksheets or bunch of papers and articles . . . Well time not only that but, efficiency, . . . sometimes you have to modify lessons. You could modify it with technology which allows you to modify it in ways that you might not be able to do as easily as on paper. For kids who might need modification or accommodations . . . the iPads you can actually have an article read to the kids. . . So, there’s a lot of I think a lot of things that go into planning. (Interview, March 26, 2017)

Mike felt that substituting technology was good but it needed to be meaningful, dive deeper into the information, and use the power of technology to stimulate the learner.

> I used to have kids read Lewis extracts from Lewis and Clark journals I found on a National Geographic website. They had taken huge amounts of this information . . . so the kids . . . can explore along with Lewis and Clark . . . So, a lot of times my decision-making times around what I bump into, or something . . . looks great and it does something similar to a lesson I've done. In that way it's substitutional, but it feels meaningful . . . This is partly how I would choose it. Are there a variety of ways kids can interact with it? Like my lower end students. Maybe they are reading at a third or fourth grade level; can they still benefit? Maybe they benefit from having the journal entries? They may not be able to read the journal entries or understand them, but they give historical context and background education. Especially second language learners, if it's sitting in front of them and they're watching the journey across the map, . . . they can still identify them. So

> maybe it's for those kids. It's just the lower level thinking skills is what they're going to take away from it. It provides . . . opportunity for the higher end kids to do it. That's where . . . were my choice to use it comes in handy. It's something that's going to be useful for a variety of learners. (Interview, April 16, 2017)

Mike summarized his purposeful integration by saying that he placed lessons that required students to critically think and engage, rather than just assign them work or be passive participants.

> I value activities that require students to think and engage with material at a higher level. I prioritize those types of lessons and the time it takes to deliver them. The substitution level in many cases feels like "busy" work and I tend not to spend much time on those types of lessons. (Interview, April 16, 2017)

Related to this theme was a discussion about outcomes leading the decision making about integrating technology. When planning a lesson, educators found themselves focused on the lesson objectives, rather than the digital tool. Jill offered this opinion of how technology should fit in the lesson.

> If the learning outcomes were appropriate to the content and skills. We as educators should not ask students to do things in the name of technology. It is more important to develop the learning outcomes and then if technology can be used to make the lesson or project better, then that is great. Many times, collaborate and creation are part of the learning outcomes, so using more time in class that involves redefinition makes sense. (Online Survey, March 30, 2017)

This idea of focusing primarily on learning goals first came from Amy. When helping teachers integrate technology, she led the conversation by asking teachers about lesson goals and purpose. In other words, asked them about the student outcomes. From these questions, she worked with teachers to expand the lesson using technology, yet kept student outcomes in the forefront of the planning.

> When I meet with teachers; it's about what's your goal? What's your purpose? What do you want kids to learn? What do you want them how to do you want them to show you what they know? Then that's my opportunity to say, "have you thought about having your kids show you in this way? Have you thought about differentiating and how some kids do it this way? And allowing them the

> opportunity." But it's all driven by what they want their kids to do first. And what goals and you know what standards or what what's the purpose? And then I kind of try and open their experience; open their ideals to something bigger and more collaborative. Usually more differentiated. And there's so many things that they can do to show what they know, that don't include paper, pencil, or even a website or a blog. So, I try and get them to at least get to some . . . augmentation level. No, modification level. But it's definitely driven by their ideas first. And then I try and steer them towards integrating technology with more thought. (Interview, March 30, 2017)

Teachers described that having a clear purpose for a lesson was a key step to integrating technology. Knowing how technology could help the teacher achieve goals was a common starting point. Also, if the learning outcome was clear, then it was easier to be more creative with the technology integration and pedagogical practice.

Summary

Many themes and sub-themes emerged during this study to answer three research questions.

Q1 What are educators' perceptions of the Subsitution, Augmentation, Modification, Redefinition (SAMR) Model?

Q2 How does the Substitution, Augmentation, Modification, Redefinition (SAMR) model transform educators' practices?

Q3 From the perception of the participants in this study, how effectively aligned are administrators' views to the teachers' views when using the Substitution, Augmentation, Modification, Redefinition (SAMR) model for effective technology integration?

Educators' perceptions of the SAMR model were generally positive. In their experiences, they described technology as most commonly integrated at the substitution level. They found that the model encouraged them to consider novel uses for technology, especially at the redefinition level. Although the SAMR model encouraged teachers to higher levels of integration, this notion caused undue stress. Educators found that integrating technology created classroom management issues and behavior issues. Some educators

found trick to work around such problems while others “dealt” with the issues. Participants mentioned a need for more planning time when integrating technology above the substitution level. In Table 6 is a recap of the themes and sub-themes found during the data analyses.

Table 6

Themes and Sub-themes

Research Question		Theme	Sub-theme
Q1	What are educators' perceptions of the Subsitution, Augmentation, Modification, Redefinition (SAMR) Model?	• Positive View • Concerns with the SAMR model • Common Language • Correct Use of SAMR • Levels of Comfort • Most Common Level • Educators' Meaning of the SAMR Levels • Motivation and Engagement	• Mixed Feelings • Most Comfortable Level • Comfortable with Hesitation • Motivation and Engagement is Reliant on Pedagogy Not Technology, Demotivating Effect of Technology Integration
Q2	How does the Substitution, Augmentation, Modification, Redefinition (SAMR) model transform educators' practices?	• Practice and Student Achievement • Educator Time Spent on Lessons	• Time Spent on Lessons, Time Not a Problem
Q3	From the perception of the participants in this study, how effectively aligned are administrators' views to the teachers' views when using the Substitution, Augmentation, Modification, Redefinition (SAMR) model for effective technology integration?	• Greater Learning at the Higher Levels of the SAMR model • Classroom Behavior • Planning Time	• On-task Behavior, On-task with Less Behavior Problems
Not Applicable		• Assumptions Refuted • Too Much Screen Time • Purposeful Integration	• Pulling Back from Technology, Digital Citizenship

Note. SAMR means Substitution, Augmentation, Modification, Redefinition

CHAPTER V

DISCUSSION AND FUTURE RESEARCH

Conclusion

Despite the rapid increase of available technology, teachers have been slow to change their classrooms (Keengwe et al., 2008; Laferriere et al., 2013). In response, new models emerged to assist teachers use these new tools in the classroom (Angeli & Valanides, 2014; Puentedura, 2006). One such model, the Substitution, Augmentation, Modification, Redefinition (SAMR) model, was designed by Ruben Puentedura (2006) to help schools identify current levels of technology integration, while guiding future practice. Since the models' inception, Ruben Puentedura (2006, 2008, 2014) led several internet presentations, including podcast, linking the model to TPACK and Bloom (Puentedura, 2014). The model has also been used in research as a tool to identify levels of technology in the classroom (Aiyegbayo, 2015; Barton, 2014; Israelson, 2015). However, little research has been conducted on the SAMR model on educators' perceptions of the model (Hamilton et al., 2016).

The goal of this phenomenological study was to investigate educators' perceptions of the SAMR model. This study found that educators had a positive perception of the model that included commonly used and preferred levels of integration. Both administrators and classroom teachers agreed that integrating technology at the higher levels would increase student learning, caused issues with classroom management,

and required extra planning time. Similarly, educators preferred to integrate technology only if it suited an educational purpose, not simply for the sake of integrating technology.

Educators' Perception: Positive

In general, educators that participated in this study had a positive attitude about the SAMR model. Educators used the model reflect on their pedagogy. The SAMR model also inspired technology integration at higher levels to more create authentic, student-centered learning opportunities. Educators agreed the model provided a way to develop both their technology integration and teaching methods. This could be attributed to the model presenting levels of integration in a hierarchy. Although there was no evidence that greater learning gains take place when integrating technology at, say, the redefinition level, as opposed to the substitution level. Nevertheless, the hierarchical nature of the SAMR model encouraged participants to challenge their practice.

Having a positive perception of the SAMR model addressed a second-order barrier for technology integration; teachers' beliefs (Ertmer, 2005). The positive view of the model centered on the SAMR model promoting increasingly sophisticated technology integration and greater student achievement. Past research has shown a strong link between teachers' beliefs and their classroom practices (Bandura, 1986; Jimoyiannis & Komis, 2007; Pajares, 1992). Having a positive perception of the SAMR model could positively influence teachers' use of technology (Gurfidan & Koc, 2016).

Educators' Perception: Comfortable Level

Most educators were comfortable integrating technology at the higher levels of the SAMR model. Surprisingly, few educators mentioned they were most comfortable integrating technology only at the substitution level. Rather, educators saw the

substitution level as the quick, and effortless way to integrate technology. However, educators did not place much educational value on substitution – in strictly replacing traditional classroom materials with their digital counterparts. However, educators did not place much educational value on substitution – in strictly replacing traditional classroom materials with their digital counterparts. Educators were most comfortable using digital tools at the augmentation, modification, and redefinition levels. Their respective levels of comfort could be attributed to their individual teaching philosophy. Educators who were student-centered were more inclined to be comfortable using technology at the modification and redefinition levels. These educators used digital tools not just to replace their traditional methods, but for expanding lessons with access to the internet. This presented new opportunities for teachers to extend learning, opening new avenues of collaboration and creation. Participants in this study mentioned that traditional worksheets could be completed and submitted for evaluation through Schoology™. They also mentioned how they could use internet resources like online databases to evaluate data.

Knowing educators have different levels of comfort with regard to integrating technology could help overcome second-order barriers (Ertmer, 1999). One characteristic of second-order barrier is teachers' beliefs surrounding technology used in the classroom. By identifying an educators' comfort level with integrating technology, districts could target professional development to further teachers' Technological Knowledge (Koehler & Mishra, 2009). Expanding educator's TPACK could help them become more effective (Koehler & Mishra, 2009).

Educators' Perception: Common Level

This study found educators most commonly integrated technology at the substitution level. This finding was not surprising. Study participants worked in classrooms that had access to mobile labs or in district with one-to-one initiative. Participants suggested converting worksheets and other analog educational materials was easy, even expected by members of the school community. Jill and Amy stated that using the digital versions of existing materials was an acceptable use of technology. Mike noted that the SAMR model encouraged teachers to satisfy a "check box" on teacher evaluations.

Knowing the substitution level was the most common level of integration could help districts in several ways. First, teaching committees could reduce teacher workload by converting existing analog learning material to digital materials. This would reduce copying cost and other administrative expenditures. Steve mentioned his materials budget was reduced when he converted his analog materials to digital. Focusing on converting the analog to digital could reduce the number of administrative tasks on teacher workloads, freeing them up to focus on other tasks.

A second, and possibly more important, implication was that teachers struggle with integrating technology at the higher levels. This pointed to the need for further education and professional development with regard to technology integration. Team meetings, task forces, and mentoring could pave the way forward for future educators.

Educators' Perception: Purposeful Integration

Educators expressed the importance of identifying objectives and learning outcomes of a lesson before considering SAMR's levels of integration. This indicated

technology was of secondary importance in the planning process. Technology was more of a step to achieve an end goal. However, the redefinition level of the SAMR model by definition, creates a learning environment that would be impossible without technology (Puentedura, 2006). This raised the question of which teachers should do first? Should teachers figure out the learning objectives and outcomes, then pick the level of the SAMR model (Puentedura) that achieves these goals? Or, should they start out at the desired level of the SAMR model and plan the lesson around the digital tool? Brandy gave a clue to the answers, stating the model was a flow and teachers should plan and adapt as the learning takes place. Ultimately, she through teachers should move through the levels as needed. Jill suggested the model was more of a continuum. The levels of integration should increase incrementally during a lesson. These accounts of the SAMR model could suggested that the model was best considered part of a larger instructional design process.

A.S.S.U.R.E. (Heinich et al. 1999), an instructional design model, could help teachers plan, deliver, and evaluate technology lessons (Kim & Downey, 2016). Part of this process, the second "S." refers to selecting strategies, technology, media, and materials. Perhaps, the SAMR model (Puentedura, 2006) was best considered as part of the larger A.S.S.U.R.E. model (Heinich et al. 1999). The focus of the A.S.S.U.R.E. model was beginning the lesson planning process by identifying instructional objectives. This could help teachers select technology, if and when appropriate, to meet diverse learning needs. Instead of beginning lessons with the intention of integrating technology—e.g., a particular tool, or at a predetermined level of integration--for its own

sake, the SAMR model (Puentedura, 2006) was best thought of a continuum of technological uses that aligned with the teachers' primary concern: purposeful learning.

Substitution, Augmentation, Modification, Redefinition Model and Educator Practices

Participants in this study found the SAMR model promoted positive student learning experiences and created change in pedagogy. However, educators in this study also found integrating technology at a higher level on the SAMR model (Puentedura, 2006) took more time.

Educators felt using technology higher on the SAMR model promoted expanded learning opportunities because of the casual relationship with Bloom's Taxonomy (Puentedura, 2014). In summary, they stated that technology enabled students to take ownership of their work, create knowledge, collaborate with others, and be engaged in the learning process. These advantages encouraged teachers evaluating their practices in attempt to integrate technology in unique ways. Mike summed this up by saying that moving across the spectrum could be a goal of teachers. The SAMR model (Puentedura, 2006) is hierarchical in nature, suggesting that the top level is better for integration than the bottom. Also, the learning opportunities are different among the levels; this helps guide the teacher in expanding lesson objectives. The combination of hierarchical nature of the model and the expanded learning opportunities could explain why teachers expected greater student achievement with the upper levels of integration. This could be a driver for teachers to change their practice.

When integrating technology, teachers had to spend a greater amount of time planning lessons. The need for additional time could be attributed to the shift from a

teacher-centered lessons to a student-centered lesson. As noted in Chapter IV, the substitution level was the most common level of integration, due to ease of swapping traditional tools for digital tools. Higher levels of the SAMR model (Puentedura, 2006) force teachers to think differently about their practice and lesson delivery. Jody stated that teachers who were unaccustomed to using technology in the classroom would have to completely change their lesson delivery. This suggested that educators who lack expertise in using technology could experience an increased need for planning.

Views Between Administrators and Teachers

Administrators and teachers shared the view that off-task behavior was an issue with technology integration. They also agreed that integrating technology at the higher levels of required more planning time. They also agreed that integrating technology at the higher levels required more planning time, but improved students' learning outcomes.

Teachers and administrators both found that controlling behavior and monitoring students while working with their digital tool was difficult. Some teachers used classroom expectations to keep students on-task; other teachers used simple tricks like "iPad down, stickers up," to limited the amount of off-task behavior. Some teachers actively walked the room to monitor students. However, they all agreed there was no perfect solution. Some participants, such as Jody, suggested that teaching and practicing appropriate use could be added to the concept of digital citizenship. She suggested teaching students there was a time and a place for social media and games but, while in school, the appropriate use for digital technology was on school-related items.

Administrators and teachers also agreed integrating technology at the higher levels took more planning time. This planning time included scaffolding and time for the

teacher to become familiar with the technological tool. One participant suggested that more time during the summer would have to be used for planning. Schools and districts must consider the demand on teachers for integrating technology as well as identify methods to promote its effective use.

Finally, both agreed that the higher up the model educators integrated digital tools, the greater the learning outcome. Interestingly, this finding is not supported by any research. In fact, there is a great lack of research on the levels of the SAMR model and achievement. In addition, teachers expressed opinions that not all learning with technology should occur at the redefinition level. Bob suggested that the substitution level was appropriate for learning vocabulary and other basic knowledge. A theme in the data pointed to the importance of purposeful integration, rather than trying to achieve the highest possible level of integration. This issue is addressed further in the recommendations for the SAMR model.

Agreement between teacher and administrators is crucial to successful technology adoption (Hew & Brush, 2007). Data from this research shows that teachers and administrators shared the same view of the SAMR model (Puentedura, 2006). Having a shared view could lead to greater teacher adoption of technology (Hew & Brush, 2007) and place a higher value on technology use in the classroom.

Substitution, Augmentation, Modification, Redefinition Model Recommendations

Digital Citizenship

Participants identified problems with classroom management and on-task behaviors when using technology in the classroom. The existing literature suggested using clear expectations and rules to control the learning experience (Greenwood, Hops,

Delquardi, & Guild, 1974; Simonsen, Fairbanks, Briesch, Meyers, & Sugai, 2008). Steve found that engaging lessons have helped him minimize off-task behavior in his classroom. However, majority of the participants in this study technology's open-ended possibilities too tempting for students. Steve mentioned that technology and online games were additive. Participant suggested adding responsible classroom use to the concept of digital citizenship may help with the problem. A 2016 reading of the International Society for Technology in Education's (ISTE, 2016) definition of digital citizenship did not mention off-task behavior. A future revision of the SAMR model should include suggestions for classroom management at each level, including tips and strategies to keep students on task. These suggestions could help teachers solve classroom management issues that may arise when using technology.

Remove Hierarchy

Another suggestion for the SAMR model was to remove the levels of the model. Educators felt pressured to move higher on the SAMR ladder, believing the higher levels were inherently better. Steve stated that the model was like a grading system. Anything below the line was an "F." Amy, an administrator, suggested turning the model sideways and moving left and right depending on lesson objectives. The nature of the SAMR model was not to be hierarchal (Hilton, 2016). A suggestion to reduce stress is to create a box-like structure to the model, rather than its current ladder structure. As seen in Figure 14, moving the levels to form a box may reduce pressure to integrate technology at the higher levels. Since there was no literature on gains in student achievement per level, this would make sense. The levels could still retain their definition but would not emphasize one level of integration over another. A list of characteristics should be created to

differentiate the levels of the SAMR model. *Ruben's' blogs* (Puentedura, 2006, 2008, 2014), presented vague descriptions of every level, but those descriptions left out the key characteristics of each level to use them easily. The added characteristics would help better define each level, helping educators in this study make technology integration purposeful. This would help address participants' concerns of feeling pressured to integrate technology for its own sake.

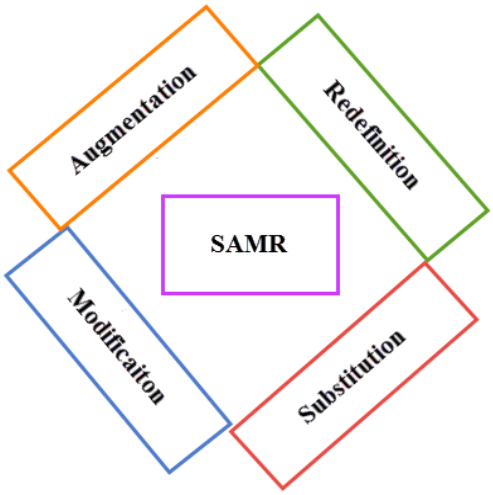

Figure 14. The new Substitution, Augmentation, Modification, Redefinition (SAMR) Model.

Substitution, Augmentation, Modification, Redefinition within an Instructional Design Model

An additional recommendation came from the purposeful integration theme that emerges from the findings, but lacked direct connection to the research questions. The SAMR model should be integrated into an instructional design (ID) model. As an example, the A.S.S.U.R.E. model (Heinich et al., 1999) was an instructional design model that described lesson creation into steps. A.S.S.U.R.E. stands for Analyze learners,

State objectives; Select methods (media and materials); Utilize technology, media and materials; Require learner participation; and Evaluate and revise. This ID model, includes a step for selecting media to deliver content in a lesson. An example is show in Figure 15. The SAMR model (Puentedura, 2006) would be a great fit to ID models, offering a way for educators to select tools to meet learning objectives and expand learning opportunities. This would address concerns participants in this study brought forth with regard to purposeful integration.

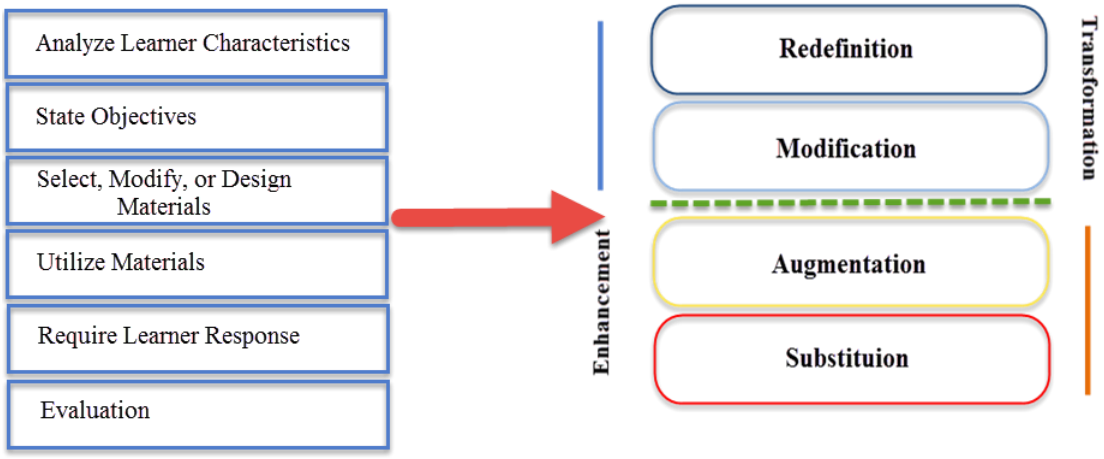

Figure 15. The Substitution, Augmentation, Modification, Redefinition (SAMR) Model within the A.S.S.U.R.E. Model. On the left is the A.S.S.U.R.E model and the SAMR model is on the right. *Note:* Information for the A.S.S.U.R.E model was taken from Heinich et al., (1999) and information for the SAMR model was taken from a discussion by Ruben Puentedura (2014).

The SAMR model (Puentedura, 2006) attempts to balance technology integration with pedagogy. However, this balance does not include the process of lessons design. This is significant, given the number of participants who stated that the purpose of a lesson was critical, and technology should not be integrated simply for its own sake. Embedding the SAMR model (Puentedura, 2006) solved the issue of purposeful

integration, because the A.S.S.U.R.E. model (Heinich et al., 1999) emphasized the lessons' objectives over the selection of classroom technology. The use of the SAMR Model (Puentedura, 2006) could assist educators in selecting the proper technology to meet lesson objectives and learner characteristics, found in the prior steps of the A.S.S.U.R.E. model (Heinich et al., 1999).

Recommendations for Future Research

Academic Gains Between Levels

A recommendation for future research on the SAMR model would be identifying the effect upon student achievement resulting from the use of technology at the model's various levels. The hierarchical structure of the model places added significance on the effectiveness technology integration at the higher levels. Even though the model was not intended to be a hierarchical (Hilton, 2016), participants felt pressured to integrate technology at the higher levels despite no actual research demonstrating that levels of integration affect learning differently. Educators agreed that moving up the level created better learning outcomes, but at the time of this study, there was no actual data to support this. Identifying learning gains at each level could help teachers balance time spent on lessons against time invested integrating technology. Also, knowing the academic gains at each level could assist districts in purchasing classroom technology. If integration at the redefinition level truly provides optimal learning gains, this could justify the money spent on educational technology.

Educators' Perception of a Box Substitution, Augmentation, Modification, Redefinition Model

A final recommendation for future research is to explore educators' perception of a box shaped SAMR model (Puentedura, 2006). This study found that the hierarchical nature created undue stress on teachers who believed they needed to move up the scale and/or needed to create lessons at the redefinition level. Using the model as a grading scale for integration practices contributed to this problem. Re-arranging the model to a box, as shown in Figure 14, would remove the model's hierarchal nature, potentially reducing pressure to integrate technology at the redefinition level for most lessons. Research is needed to find if the redesigned model would have a positive influence on reducing educators' stress.

Summary

This study ventured to find the perceptions of the SAMR model (Puentedura, 2006) for integrating technology. Nine educators along the Front Range of Colorado's Rocky Mountains found value in the SAMR model. They had their comfort levels, their common levels for integration, and their struggles and concerns. In general, educators would continue to use the model to refine their practice and improve learning opportunities for students. This research suggests the SAMR model (Puentedura, 2006) continue to grow, in order to provide a better resource to schools and district. Implementing the aforementioned suggestions, all of which are based entirely on the perceptions of educators, would mark a determined effort towards this end.

REFERENCES

Adamy, P. H. (1999). *An analysis of factors that influence technology integration by math teacher educators* (Doctoral dissertation). Retrieved from http://www.library.unco.edu

Aiyegbayo, O. (2015). How and why academics do and do not use iPads for academic teaching? Use and non-use of iPads for academic teaching. *British Journal of Educational Technology, 46*(6), 1324-1332. doi:10.1111/bjet.12202.

Alexander, R. C. (2009). *Fostering student engagement in history through student-created digital media: A qualitative and quantitative study of student engagement and learning outcomes in 6th-grade history instruction* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI 3400850)

Angeli, C., & Valanides, N. (2014). *Technological pedagogical content knowledge: Exploring, developing, and assessing TPCK.* New York, NY: Springer.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Basawapatna, A., Repenning, A., Koh, K. H., & Savignano, M. (2014). The consume-create spectrum: Balancing convenience and computational thinking in stem learning. *Proceeding of the 45th ACM technical symposium on Computer science education* (pp. 659-664). New York, NY: ACM.

Barron, A. E., Kemker, K., Harmes, C., & Kalaydjian, K. (2003). Large-scale research study on technology in K-12 schools: Technology integration as it relates to the national technology standards. *Journal of Research on Technology in Education, 35*(4), 489.

Barton, G. (2014). *Literacy in the arts: Retheorizing learning and teaching*. New York, NY: Springer. doi:10.1007/978-3-3-319-04846-8

Become a SAMuRai Teacher. (2014, Fall). Retrieved August 22, 2015, from https://classes.svvsd.org/course/view.php?id=2061

Blackwell, C. K., Lauricella, A. R., Wartella, E., Robb, M., & Schomburg, R. (2013). Adoption and use of technology in early education. *Computers & Education, 69*, 310. doi:10.1016/j.compedu.2013.07.024

Bloemsma, M. S. (2013). *Connecting with millennials: Student engagement, 21st-century skills, and how the iPad is transforming learning in the classroom* (Doctoral dissertation). Available from ProQuest Dissertations and Thesis database. (UMI No. 3566043)

Bloom, B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational Researcher, 13*(6), 4-16. doi:10.2307/1175554

Boulder Valley School District (BVSD). (n.d.). Retrieved on October 15, 2016, from http://www.bvsd.org

Brandywine Heights Area School District. (2015). *SAMR model.* Retrieved from http://www.bhasd.org/departments/technology/samr-model/

Brooks-Young, S. (2002). *Making technology standards work for you: A guide for school administrators.* Eugene, OR: International Society for Technology in Education.

Bulman, G., & Fairlie, R. W. (2016). Technology and education. *Handbook of the Economics of Education* (pp. 239-280). Retrieved from http://www.science direct.com/science/article/pii/B9780444634597000051

Clark, R. E. (2001). *Learning from media: Arguments, analysis, and evidence*. Greenwich, CT: Information Age Pub.

Campbell, T., & Abd-Hamid, N. H. (2013). Technology use in science instruction (TUSI): Aligning the integration of technology in science instruction in ways supportive of science education reform. *Journal of Science Education and Technology, 22*(4), 572-588. doi:10.1007/s10956-012-9415-7

Chen, Y., Liao, C., Chen, C., & Lee, C. (2011). The integration of synchronous communication technology into service learning for pre-service teachers' online tutoring of middle school students. *The Internet and Higher Education, 14*(1), 27-33. doi:10.1016/j.iheduc.2010.02.003

Chi, M. T. H., Siler, S. A., Jeong, H., Yamauchi, T., & Hausmann, R. G. (2001). Learning from human tutoring. *Cognitive Science, 25*(4), 471-533. doi:10.1016/S0364-0213(01)00044-1

Colorado Department of Education. (2014). *User's guide Colorado state model educator system.* Retrieved from https://www.cde.state.co.us/educatoreffectiveness/usersguide

Corrigan, J. A. (2012). The implementation of e-tutoring in secondary schools: A diffusion study. *Computers & Education, 59*(3), 925. doi:10.1016/j.compedu.2012.03.013

Coyne, I. T. (1997). Sampling in qualitative research. purposeful and theoretical sampling; merging or clear boundaries? *Journal of Advanced Nursing, 26*(3), 623-630. doi:10.10.46/j.1365-2648.1997.t01-25-00999.x

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks, CA: SAGE Publications.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process.* Thousand Oaks, CA: Sage Publications.

Cubukcuoglu, B. (2013). Factors enabling the use of technology in subject teaching. *International Journal of Education and Development using Information and Communication Technology, 9*(3), 50-60.

Curran, K. C. (2015). *A grounded theory study on barriers to educational technology integration in K-12 classrooms* (Unpublished dissertation). Robert Morris University, Pittsburgh, PA.

Dawson, K., Ritzhaupt, A., Liu, F., Rodriguez, P., & Frey, C. (2013). Using TPCK as a lens to study the practices of math and science teachers involved in a year-long technology integration initiative. *The Journal of Computers in Mathematics and Science Teaching, 32*(4), 395.

deMarrais, K., & Lapan, S. D. (Eds.). (2004). *Foundations for research: Methods of inquiry in education and the social sciences.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Dexter, S.L., & Anderson, R.E. (2002). *USA: A model of implementation effectiveness.* Retrieved from http://edtechcases.info/papers/multicase_ implementation.htm

Dolenc, K., & Aberšek, B. (2015). TECH8 intelligent and adaptive e-learning system: Integration into technology and science classrooms in lower secondary schools. *Computers & Education, 82*, 354-365. doi:10.1016/j.compedu.2014.12.010

Donnelly, H., & Kyei-Blankson, L. (2015). Administrator insights, evaluation, and support of new teacher use of educational technology. *Journal of Education and Training, 2*(1), 110-133.

Dunham, C. (2012). *Principals roles and responsibilities in technology integration in rural Georgia* (Doctoral dissertation). Retrieved from http://digital commons.georgiasouthern.edu/etd/786/?utm_source=digitalcommons.georgiasouthern.edu%2Fetd%2F786&utm_medium=PDF&utm_campaign=PDFCoverPages

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61. doi:10.1007/BF02299597

Ertmer, P. A. (2001). Vision Quest: Teachers development model for scaffolding technology integration. *Proceedings of Society for information Technology & Teacher Education International Conference,* 833-839.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39. doi:10.1007/BF02504683

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435. doi:10.1016/j.compedu.2012.02.001

Fraenkel, J. R., & Wallen, N. E. (1996). *How to design and evaluate research in education* (3rd ed.). New York, NY: McGraw-Hill, Inc.

Fishman, B., Gomez, L., & Soloway, E. (1999). *New technologies and challenge for school leadership* [White paper]. Retrieved from http://hi-ce.org/papers/2000/fostering/TechLeadWhitePaper.pdf

Fullan, M. (2001). *The new meaning of educational change* (3rd ed.). New York, NY: Teachers College Press.

Glaser, B. G., & Straus, A. L. (1967). *The Discovery of grounded theory: Strategies for qualitative research.* San Francisco, CA: Aldine de Gruyter.

Google Apps and the SAMR Framework Infographic--e-Learning Infographics. (n.d.). Retrieved August 22, 2015, from http://bvsd.org/IT/edtech/webresources/Pages/diigogoogle.aspx

Goundar, S. (2014). The distraction of technology in the classroom. *Journal of Education & Human Development, 3*(1), 234-2978. ISSN: 2334-296X

Graham, C. R., Burgoyne, N., Cantrell, P., Smith, L., St. Clair, L. S., & Harris, R. (2009). *TPACK development in science teaching: Measuring the TPACK confidence of inservice science teachers.* Boston, MA: Springer doi:10.1007/s11528-009-0328-0

Graham, C. R., Tripp, T., & Wentworth, N. (2009). Assessing and improving technology integration skills for preservice teachers using the teacher work sample. *Journal of Educational Computing Research, 41*(1), 39-62. doi:10.2190/EC.41.1.b

Green, R. J. (2009). *The four dimensions of principal leadership: A framework for leading 21st century schools.* Boston, MA. Allyn & Bacon Publishing.

Greenwood, C. R., Hops, H., Delquadri, J., & Guild, J. (1974). Group contingencies for group consequences in classroom management: A further analysis. *Journal of Applied Behavior Analysis, 7*(3), 413-425.

Grisham, D. L., & Wolsey, T. D. (2006). Recentering the middle school classroom as a vibrant learning community: Students, Literacy, and technology intersect. *Journal of Adolescent & Adult literacy, 49*(8), 648-660. doi:10.1598/JAAL. 49.8.2

Gulbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers & Education, 49*(4), 943-956. doi:10.1016/j.compedu.2005.12.002

Gurfidan, H., & Koc, M. (2016). The impact of school culture, technology leadership, and support services on teachers' technology integration: A structural equation modeling. *Egitim Ve Bilim, 41*(188), 99-116. doi:10.15390/EB.2016.6722

Hall, G. E. (2010). Technology's achilles heel: Achieving high-quality implementation. *Journal of Research on Technology in Education, 42*(3), 231. doi:10.1080/15391523.2010.10782550

Hall, G., Loucks, S., Rutherford, W., & Newlove, B. (1975). Levels of use of the innovation: A framework for analyzing innovation adoption. *Journal of Teacher Education, 26*(1), 52-56. doi:10.1177/002248717502600114.

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). *The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use.* New York, NY: Springer. doi:10.1007/s11528-016-0091-y

Harris, J., & Hofer, M. (2009). Instructional planning activities types as vehicles for curriculum-based TPACK development. In C. D. Maddux (Ed.), *Research highlights in technology and teacher education 2009* (pp. 99.-108). Chesapeake, VA: AACE.

Harris, J. B., & Hofer, M. J. (2011). Technological pedagogical content knowledge (TPACK) in action: A descriptive study of secondary teachers' curriculum-based, technology-related instructional planning. *Journal of Research on Technology in Education, 43*(3), 211. doi:10.1080/15391523.2011.10782570

Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education, 41*(4), 393. doi:10.1080/15391523.2009.10782536

Haughey, M. (2006). The impact of computers on the work of the principal: Changing discourses on talk, leadership and professionalism. *School Leadership and Management, 26*(1), 23-36.

Heinich, R., Molenda, M., Russel, J. D., & Smaldino, S. (1999). *Instructional media and technologies for learning* (6th ed.). Englewood Cliff, NJ: Merrill/Prentice Hall.

Herro, D., Kiger, D., & Owens, C. (2013). Mobile technology: Case-based suggestions for classroom integration and teacher educators. *Journal of Digital Learning in Teacher Education, 30*(1), 30.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252. doi:10.1007/s11423-006-9022-5

Hilton, J. T. (2016). A case study of the application of SAMR and TPACK for reflection on technology integration into two social studies classrooms. *The Social Studies, 107*(2), 68-73. doi:10.1080/00377996.2015.1124376

Inan, F. A., & Lowther, D. L. (2010). Laptops in the K-12 classrooms: Exploring factors impacting instructional use. *Computers & Education, 55*(3), 937-944. doi:10.1016/j.compedu.2010.04.004

International Society for Technology in Education (ISTE). 2016. *The 2016 ISTE standards for students*. Arlington, VA: ISTE. Retrieve from: http://www.iste.org/standards/standards/for-students

Israelson, M. H. (2015). The app map. *The Reading Teacher, 69*(3), 339-349. doi:10.1002/trtr.1414

Ivy, J. T. (2011). *Secondary mathematics teachers' perceptions of their integration of instructional technologies* (Doctoral dissertation). Retrieved from ProQuest LLC. (UMI: 3461290)

Jimoyiannis, A., & Komis, V. (2007). Examining teachers' beliefs about ICT in education: Implications of a teacher preparation programme. *Teacher Development, 11*(2), 149-173. doi:10.1080/13664530701414779

Johnson, D. L., & Liu, L. (2000): First steps toward a statistically generated information technology integration model. *Computers in the Schools, 16*(2), 3-12. doi:10.1300/J025v16n02_02

Jones, B. (2013, June 18). LAUSD spending $30 million to buy 30,000 iPads for students. *Los Angeles Daily News*. Retrieved October 14, 2015, from http://www.dailynews.com/general-news/20130618/lausd-spending-30-million-to-buy-30000-ipads-for-students

Jude, L., Kajura, M., & Birevu, M. (2014). Adoption of the SAMR model to asses ICT pedagogical adoption: A case of Makerere University. *International Journal of e-Education, e-Business, e-Management and e-Learning, 4*(2), 106. doi:10.7763/IJEEEE.2014.V4.312

Karatas, I. (2014). Changing pre-service mathematics teachers' beliefs about using computers for teaching and learning mathematics: The effect of three different models. *European Journal of Teacher Education, 37*(3), 390-405. doi:1080/02619768.2013.870993

Kearsley, G., & Lynch, W. (1994). *Educational technology: Leadership perspectives.* Englewood Cliffs, NJ: Educational Technology Publication.

Keengwe, J., Onchwari, G., & Wachira, P. (2008). Computer technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology, 17*(6), 560-565. doi:10.1007/s10956-008-9123-5

Kerr, S. T. (1996). Visions of sugarplums: The future of technology, education, and the schools. In S. T. Kerr (Ed.), *Technology and the future of schooling: Ninety-fifth yearbook of the National Society for the Study of Education* (part 2, pp. 1-27). Chicago, IL: University of Chicago Press.

Kim, D., & Downey, S. (2016). Examining the use of the ASSURE model by K-12 teachers. *Computers in the Schools, 33*(3), 153-168. doi:10.1080/073800569.2016.120.3208

Koehler, M., J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60-70.

Koh, J. H. L., Chai, C. S., & Tsai, C. C. (2010). Examining the technological pedagogical content knowledge of Singapore pre-service teachers with a large-scale survey. *Journal of Computer Assisted Learning, 26*(6), 563-573. doi:10.1111/j.1365-2729.2010.00372.x

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212-218. doi:10.1207/s15430421tip4104_2

Laferriere, T., Hamel, C., & Searson, M. (2013). Barriers to successful implementation of technology integration in educational settings: A case study. *Journal of Computer Assisted Learning, 29*(5), 463-475. doi:10.1111/jcal.12034

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to purse better questions and answers. *Review of Educational Research, 77*(4), 575-614. doi:10.3102/0034654307309921

Lawlor, J., Marshall, K., & Tangney, B. (2016). Bridge21--exploring the potential to foster intrinsic student motivation through a team-based, technology-mediated learning model. *Technology, Pedagogy and Education, 25*(2), 187-206. doi:10.1080/1475939X.2015.1023828

Lavicza, Z. (2010). Integrating technology into mathematics teaching at the university level. *Zdm, 42*(1), 105-119. doi:10.1007/s11858-009-0225-1

Lichtman, M. (2006). *Qualitative research in education: A user's guide.* Thousand Oaks, CA: Sage Publications.

Ligas, M. R. (2002). Evaluation of broward county alliance of quality schools project. *Journal of Education for Students Placed at Risk (JESPAR), 7*(2), 117-139. doi:10.1207/S15327671ESPR0702_2

Lowther, D. L., Inan, F. A., Strahl, J. D., & Ross, S. M. (2012). Do one-to-one initiatives bridge the way to 21st century knowledge and skills? *Journal of Educational Computing Research, 46*(1), 1-30. doi:10.2190/EC.46.1.a

Lu, R., & Overbaugh, R. C. (2009). School environment and technology implementation in K-12 classrooms. *Computers in the Schools, 26*(2), 89-106. doi:10.10.80/07380560902906096

Machado, C., & Laverick, D. (2015). Technology integration in K-12 classrooms: The impact of graduate coursework on teachers' knowledge and practice. *Journal of Technology and Teacher Education, 23*(1), 79.

Maleck, M., Fischer, M. R., Kammer, B., Zeiler, C., Mangel, E., Schenk, F., & Pfeifer, K. J. (2001). Do computers teach better? A media comparison study for case-based teaching in radiology. *Radiographics: A Review Publication of the Radiological Society of North America, Inc, 21*(4), 1025.

McGrail, E. (2007). Laptop technology and pedagogy in the english language arts classroom. *Journal of Technology and Teacher Education, 15*(1), 59.

McNabb, M. L. (2005). Raising the bar on technology research in english language arts. *Journal of Research on Technology in Education, 38*(1), 113.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation* (2nd ed.). San Francisco, CA: Jossey-Bass.

Merriam, S. B., Tisdell, E. J., & Ebooks Corporations. (2015). *Qualitative research: A guide to design and implementation* (4th ed.). San Francisco, CA: Jossey-Bass.

Mills, S. C., & Tincher, R. C. (2003). Be the technology: A developmental model for evaluating technology integration. *Journal of Research on Technology in Education, 35*(3), 382.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Moersch, C. (1995). *Levels of Technology implementation (LoTi): A framework for measuring Classroom Technology use.* Learning and Leading with Technology, Retrieved from http://loticonnection.com/pdf/LoTiFramework Nov95.pdf

Mouza, C. (2003, Winter). Learning to teach with new technology: Implications for professional development. *Journal of Research on Technology in Education, 35*(2), 272-289.

Nagel, D. (2014, June 11). *Spending on instructional tech to reach $19 billion within 5 years.* Retrieved from http://thejournal.com/articles/2014/06/11/spending-on-instructional-tech-to-reach-19-billion-within-5-years.aspx

Nuffer, W., & Duke, J. (2013). A comparison of live classroom instruction and internet-based lessons for a preparatory training course delivered to 4th year pharmacy students. *Journal of Science Education and Technology, 22*(4), 522-528. doi:10.1007/s10956-012-9411-y

O'Mahony, C. (2003). Getting the information and communications technology formula right: Access + ability = confident use. *Technology, Pedagogy, and Education, 12*(2), 295-311.

Ottenbreit-Leftwich, A. T., Glasewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: addressing professional and student needs. *Computers and Education 55*(3), 1321-1335. Retrieved from http://dx.doi.org/10.1016/j.compedu.2010.06.002

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*(3), 307-332. doi:10.2307/1170741

Pamuk, S., Ergun, M., Cakir, R., Yilmaz, H. B., & Ayas, C. (2015). Exploring relationships among TPACK components and development of the TPACK instrument. *Education and Information Technologies, 20*(2), 241. doi:10.1007/s10639-013-9278-4

Pedagogy. (2015). In *A Dictionary of Education* (2nd ed.). Retrieved from http://www.oxfordreference.com/view/10.1093/acref/9780199679393.001.0001/acref-9780199679393-e-747?rskey=fEjB2p&result=3

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a world-wide educational assessment. *Computers and Education, 37,* 163-178.

Puentedura, R. R. (2006). *Transformation, technology, and education*. Retrieved from http://hippasus.com/resources/tte/puentedura_tte.pdf

Puentedura, R. R. (Producer). (2008, December 22). *TPCK and SAMR: models for Enhancing technology integration* [Audio podcast]. Retrieved from http://itunes.apple.com

Puentedura, R. R. (2014, December, 11). *SAMR and TPCK: A hands-on approach.* Retrieved from http://www.hippasus.com/rrpweblog/archives/2014/12/11/SAMRandTPCK_HandsOnApproachClassroomPractice.pdf

Reiss, T., & Millar, K. (2014). Introduction to special section: Assessment of emerging science and technology: Integration opportunities and challenges. *Science and Public Policy*, *41*(3), 269-271. doi:10.1093/scipol/scu036

Roger, E. M. (1995). *Diffusion of innovations* (4th ed.). New York, NY: Free Press.

Rowe, C. M. (2014). *Teacher behavior in the digital age: A case study of secondary teachers' pedagogical transformation to a one-to-one environment* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3582610)

SAMR Model. (n.d.). Retrieved August 22, 2015, from http://www.bhasd.org/departments/technology/samr-model/

Schwandt, T. A. (2007). *The SAGE dictionary of qualitative inquiry* (3rd ed.). Los Angeles, CA: Sage Publications.

Sergiovanni, T. J. (2006). *The principalship: A reflective practice perspective.* Boston, MA: Pearson Education, Inc.

Shattuck, G. (2005). Understanding school leaders' role in teachers' adoption of technology integration classroom practices. In R. M. Branch, M. Orey, & S. A. Jones (Eds.). *Educational media and technology yearbook* (vol. 35, pp. 7-28). Westport, CT: Libraries Unlimited. doi:10.1007/978-1-4419-1516-0_2

Shroff, R. H., & Vogel, D. R. (2009). Assessing the factors deemed to support individual student intrinsic motivation in technology supported online and face-to-face discussions. *Journal of Information Technology Education, 8,* 59-085.

Shulman, L., S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14. doi:10.2307/1175860

Simonsen, B., Fairbanks, S., Briesch, A., Meyers, D., & Sugai, G. (2008). Evidence-based practices in classroom management: Considerations for research to Practice1. *Education & Treatment of Children, 31*(3), 351.

St. Vrain Valley School District (SVVSD). (n.d.). Retrieved on September, 20, 2016, from http://www.svvsd.org

Starkey, L. (2010). Supporting the digitally able beginning teacher. *Teaching and Teacher Education, 26,* 1429-1438.

Starks, H., & Trinidad, S. B. (2007). Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory. *Qualitative Health Research, 17*(10), 1372-1380.

Tatli, Z., & Ayas, A. (2013). Effect of a virtual chemistry laboratory on students' achievement. *Journal of Educational Technology & Society, 16*(1), 159-170.

Trundle, K. C., & Bell, R. L. (2010). The use of a computer simulation to promote conceptual change: A quasi-experimental study. *Computers & Education, 54*(4), 1078-1088. doi:10.1016/j.compedu.2009.10.012

Tsai, H. (2015). A senior teacher's implementation of technology integration. *International Education Studies, 8*(6), 151.

U.S. Census Bureau. (n.d.). *Quick facts: Boulder County, Colorado*. Washington, DC: Government Printing Office. Retrieved from http://www.census.gov/quickfacts/table/PST045215/08013

Van der Molen, J. H., & Van der Voort, T. H. A. (1997). Children's recall of television and print news: A media comparison study. *Journal of Educational Psychology, 89*(1), 82-91. doi:10.1037/0022-0663.89.1.82

Wachira, P., & Keengwe, J. (2011). Technology integration barriers: Urban school mathematics teachers perspectives. *Journal of Science Education and Technology, 20*(1), 17-25. doi:10.1007/s10956-9230-y

Walberg, H. J. (1984). *Improving the productivity of America's schools*. Washington, DC: National Education Association, Dept. of Supervision and Curriculum Development.

Wang, C., Ke, Y., Wu, J., & Hsu, W. (2012; 2011). Collaborative action research on technology integration for science learning. *Journal of Science Education and Technology, 21*(1), 125-132. doi:10.1007/s10956-011-9289-0

Welsh, J. L., Harmes, J. C., & Winkelman, R. (2011). Tech tips: Florida's technology integration matrix. *Principle Leadership, 12*(2), 69-71.

Welsh, J., Winkelman, R., Harmes, J. (2016). *A framework for defining and evaluating technology integration in the instruction of real-world skill.*

Whicker, R. E. (2012). *Framing complexity: Teachers and students use of technology in Alaska one to one laptop learning environments* (Doctoral dissertation). Retrieved from http://library.unco.edu/

Wood, A., White, A., Woodruff, C., Anderson, T., & Goldstein, S. (2011). Professional development to support TPACK technology integration: The initial learning trajectories of thirteen fifth- and sixth-grade educators. *Journal of Education, 191*(2), 3.

Yim, S., Warschauer, M., Zheng, B., & Lawrence, J. F. (2014). Cloud-based collaborative writing and the common core standards. *Journal of Adolescent & Adult Literacy, 58*(3), 243-254. doi:10.1002/jaal.345

APPENDIX A

CONSENT FORM FOR HUMAN PARTICIPANTS

UNIVERSITY of
NORTHERN COLORADO

CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Project Title:	Teachers' perception of the SAMR model for technology integration into the classroom.
Researcher:	Mark Savignano
Phone:	720-310-5672
e-mail:	Savi6512@Bears.unco.edu
Supervising Researcher:	Dr. Mia Williams
Phone:	970-351- 2414
e-mail:	Mia.Williams@unco.edu

Purpose and Description
The primary purpose of this study is to explore teachers 'perspective of the SAMR model for technology integration. Part of my research involves interviewing teachers on their perspectives. If you choose to participate in this study, I will ask you a few questions in a one-on-one interview. During this interview I will be recording your responses to ensure accuracy.

I, _____ volunteer to participate in a research project conducted by Mark Savignano from The University of Northern Colorado. I understand that the project is designed to gather information about the SAMR technology integration model. I will be one of approximately 13 people being interviewed for this research.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, there will be no consequences.

2. I understand that most interviewees will find the discussion interesting and thought-provoking. If, however, I feel uncomfortable in any way during the interview session, I have the right to decline to answer any question or to end the interview.

3. Participation involves being interviewed by Mark Savignano from Northern Colorado University. The interview will last approximately 30-45 minutes. Notes will be written during the interview. An audio tape of the interview and subsequent dialogue will be make. If I don't want to be taped, you will not be able to participate in the study.

4. I understand that the researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

5. Faculty and administrators from my campus will neither be present at the interview nor have access to raw notes or transcripts. This precaution will prevent my individual comments from having any negative repercussions.

6. I understand that this research study has been reviewed and approved by the Institutional Review Board (IRB) for Studies Involving Human Subjects.

If you have any concerns about your selection or treatment as a research participant, please contact Sherry May, IRB Administrator, in the Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-1910.

7. I have read and understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

8. There are no anticipated risks or direct benefits to you as a participant. You may feel nervous about answering the questions.

9. I have been given a copy of this consent form.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY OF
NORTHERN COLORADO

Institutional Review Board

DATE:	February 17, 2017
TO:	Mark Savignano, Phd
FROM:	University of Northern Colorado (UNCO) IRB
PROJECT TITLE:	[1016071-2] TEACHERS' PERCEPTION OF THE SAMR MODEL FOR USE WHEN INTEGRATING TECHNOLOGY INTO THE CLASSROOM
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVAL/VERIFICATION OF EXEMPT STATUS
DECISION DATE:	February 17, 2017
EXPIRATION DATE:	February 17, 2021

Thank you for your submission of Amendment/Modification materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.