Journal of Global Education and Research
ISSN 2577-509X (online) ISSN 2577-5081 (print)

Volume 5 | Issue 1 Article 2

June 2021

Using avatars to address teacher self-efficacy

Chancey Bosch
Oral Roberts University, cbosch@oru.edu

Trevor Ellis
Oral Roberts University, tellis@oru.edu

Recommended Citation

Bosch, C., & Ellis, T. (2021). Using avatars to address teacher self-efficacy. *Journal of Global Education and Research, 5*(1), 15-35. https://www.doi.org/10.5038/2577-509X.5.1.1069

Using avatars to address teacher self-efficacy

Authors

Corresponding Author

Chancey Bosch, 8508 S 7th St, Broken Arrow, OK 74012

Abstract

Technology-enhanced learning continues to provide opportunities for increased interventions in educational programing. For teacher education programs, novelty pales in comparison to providing meaningful instruction and enduring outcomes. The use of avatars has provided integration of research evidence that increases intended behaviors; however, research is lacking on teacher self-efficacy change via an avatar experience. The purpose of this study is to examine the relationship between teacher self-efficacy and avatar use in a teacher education program. A relational study using both parametric and non-parametric designs for four different samples indicated a significant relationship between avatar intervention and teacher self-efficacy in classroom management, instructional strategies, and student engagement. The sample from a student teaching course, which had a limited number of participants, provided mixed results. More studies need to include experimental designs and isolation of variabilities in the avatar model.

Keywords

avatars, technology, self-efficacy, teacher preparation, education

Revisions

Submission date: Feb. 20, 2019; 1st Revision: Jul. 9, 2019; 2nd Revision: Aug. 30, 2019; 3rd Revision: Nov. 14, 2019; 4th Revision: Jun. 30, 2020; 5th Revision: Aug. 4, 2020; Acceptance: Aug. 4, 2020

Using Avatars to Address Teacher Self-Efficacy

Chancey Bosch[1] and Trevor Ellis[2]

The College of Education
Oral Roberts University, United States
[1]cbosch@oru.edu
[2]tellis@oru.edu

Abstract

Technology-enhanced learning continues to provide opportunities for increased interventions in educational programing. For teacher education programs, novelty pales in comparison to providing meaningful instruction and enduring outcomes. The use of avatars has provided integration of research evidence that increases intended behaviors; however, research is lacking on teacher self-efficacy change via an avatar experience. The purpose of this study is to examine the relationship between teacher self-efficacy and avatar use in a teacher education program. A relational study using both parametric and non-parametric designs for four different samples indicated a significant relationship between avatar intervention and teacher self-efficacy in classroom management, instructional strategies, and student engagement. The sample from a student teaching course, which had a limited number of participants, provided mixed results. More studies need to include experimental designs and isolation of variabilities in the avatar model.

Keywords: avatars, technology, self-efficacy, teacher preparation, education

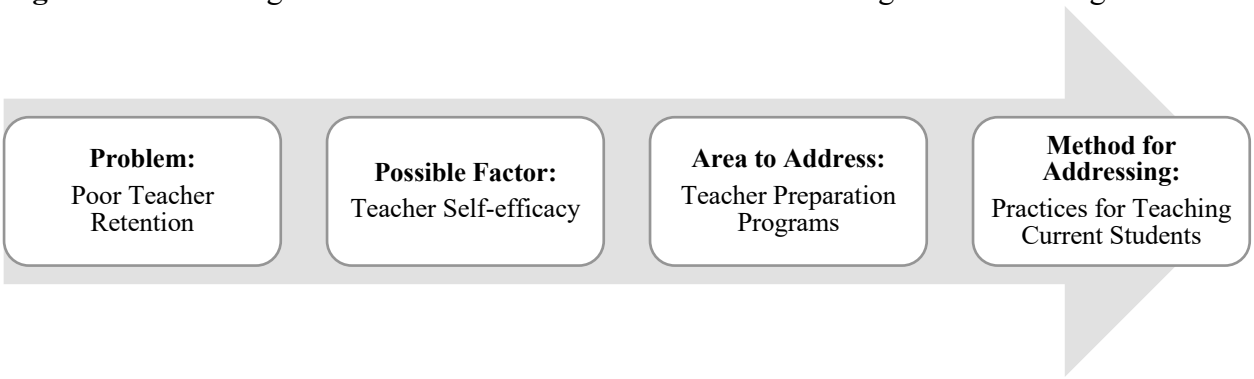
Introduction

In Bandura's (1977, 1997) pioneering work in social cognitive theory, self-efficacy is defined as "a motivational construct based on self-perception of competence rather than actual level of competence" (Bandura, 1997, p. 3). In other words, self-efficacy is self-confidence. Bandura reported a person's self-efficacy as significant in successfully achieving life goals and overcoming obstacles, such as smoking cessation and academic achievement (Bandura, 1997). In the United States, teacher retention rates are at an all-time low, with the average teacher staying in the profession for only 5 years (National Commission on Teaching & America's Future, 2016). In teacher education, research on teacher self-efficacy factors (Coladarci, 1992), self-efficacy in teacher development (Martin, 2012), and self-efficacy in teacher mentor programs (George, 2016) has been examined. This research examines the development of teacher self-efficacy in pre-service teachers to address the issue of staying power in education.

Although not existing as a linear phenomenon, Figure 1 illustrates how this study connects current pre-service teacher candidates to teacher retention. The literature includes various issues, such as poor retention in public education (Gallant & Riley, 2014; National Commission on Teaching & America's Future, 2016; U.S. Department of Education [USDOE], 2015), the role of teacher self-efficacy (Viel-Ruma et al., 2010; Ware & Kitsantas, 2007), the role of teacher methods programs

(DeAngelis et al., 2013; Fry, 2009; Yost, 2006), and the alignment of teaching methods to students living in a digital age (Bennett & Maton, 2010; Fry, 2009; Kivunja, 2014; Lei, 2009).

Figure 1: Connecting Poor Teacher Retention to Methods of Training Pre-Service Digital Natives



Note. This study examines poor teacher retention through one method of teaching a current generation of digital natives.

Today's generation of *digital natives*, as coined by Marc Prensky (2001), have grown up with the Internet, computers, social networks, and a multitude of apps. Research on teacher professional development (Darling-Hammond, 2000, 2006), integration of technology in pedagogy (Strudler, 1991; Strudler & Wetzel, 1999; Voogt et al., 2013), and technology in teacher preparation programs (Albion & Ertmer, 2002; Wang et al., 2004) provides the foundation for using technology in education, and specifically, teacher education. Virtual applications in pre-service teacher preparation are consistent with this research.

This study examined an intersection of teacher self-efficacy and virtual learning applications; specifically, the use of avatars in a professional education program. The study defines an avatar using Mursion's approach, which is "powered by a blend of artificial intelligence and live human interaction" (Mursion, n.d., para. 1). This Mursion approach results in an avatar training experience with a combination of virtual reality and human interaction. The experience requires an internet connection, a video screen for the participant to see the virtual reality, a web camera for the anonymous and hidden avatar operator to see and respond to the participant, and two-way audio capabilities for both the participant and the avatar operator to communicate with each other. Figure 2 shows the student avatars from the view of a participant engaged in the experience.

Figure 2: Middle School Avatar Experience

Note. Participant View. From *Middle School Environment* by Mursion, 2018, retrieved from https://www.mursion.com/.

Purpose of the Study

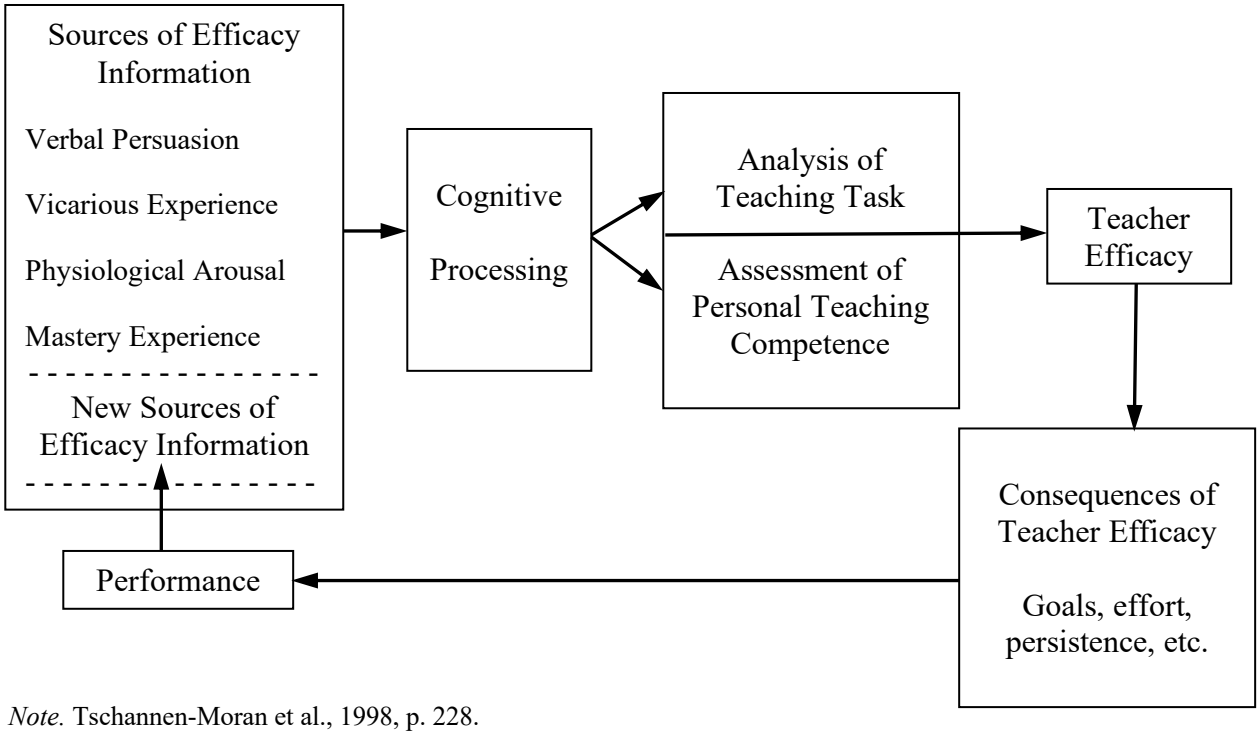
The purpose of this study was to examine the relationship between pre-service avatar training and teacher confidence. A quantitative correlational design was used to measure paired-samples of teacher confidence before and after avatar training. Teacher confidence, as measured by the Teacher Self-efficacy Survey (TSES), was the dependent variable, and the avatar training experience was the independent variable.

Literature Review

Teacher-Efficacy

Teacher-efficacy is defined as a "teacher's belief in his or her capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al., 1998, p. 233). The authors claim that teacher-efficacy is cyclical in nature, where it is highly likely that greater efficacy will lead to better performance; while lower efficacy will lead to less effort and a lack of persistence needed to accomplish difficult tasks. Figure 3 shows the cycle of teacher efficacy and it's relation to direct consequences for the profession.

Figure 3: The Cyclical Nature of Teacher-Efficacy



Note. Tschannen-Moran et al., 1998, p. 228.

Historically, two major approaches measure teacher-efficacy. The first is grounded in Rotter et al.'s (1972) social learning theory, established by the RAND organization in the 1970s. This approach measures how strongly a teacher believes he or she can "orchestrate the necessary actions to perform a given task" (Tschannen-Moran et al., 1998, p. 210). The second approach is grounded in Bandura's social cognitive theory (Bandura, 1977), measuring outcome expectancy, which is

what the individual expects to achieve by completing the task with his or her level of competence (Bandura, 1995).

Teachers' professional identities can be conceptualized and measured in a variety of ways. In the European context, a broad agenda includes homogenizing teacher identities to enable teacher mobility between the nations (European Commission, 2005). Czerniawski (2011) notes this can be challenging as there are opposing forces at work in different nations. In Norway and Germany, teacher identities are highly constructed through trusting and accountable relationships with parents; whereas in England, teacher identities are formed through hierarchical management and performance monitoring systems. As a result, teacher-efficacy looks different in each context. In the Netherlands, Beijaard and his colleagues (2000) defined a teacher's professional identity by a teacher's subject matter, and their didactical and pedagogical expertise. Their study with experienced secondary school teachers measured the professional identity transformation between a pre-service teacher candidate and a veteran teacher. They found most teachers, regardless of context, experience, and biography, developed their identity from being an expert in their subject matter, as well as a didactical and pedagogical expert.

The authors of this study were in a U.S. educational context and used Tschannen-Moran & Hoy's model to measure teacher-efficacy. Tschannen-Moran & Hoy's model combines both Rotter's social learning theory and Bandura's social cognitive theory through a four-subscale, 24-item tool. The tool relies on Bandura's teacher self-efficacy scale by using fewer subscales that accurately measure the types of tasks constituting a teacher's professional responsibilities (Tschannen-Moran & Hoy, 2001). The scale can "assess a broad range of capabilities that teachers consider important to good teaching, without being so specific as to render it useless for comparisons of teachers across context, levels, and subjects" (Tschannen-Moran & Hoy, 2001, p. 802). This is relevant in measuring pre-service teacher-efficacy because the tool measures both the teacher's perceived ability and the specific task and context. It is imperative the specific task is evaluated for pre-service teachers, as "the analysis of the task will be more salient in shaping efficacy beliefs when teachers lack experience or when tasks are novel" (Tschannen-Moran et al., 1998, p. 233). Teacher education programs have a complex task as efficacy beliefs are established during this time, and once established, "they appear to be somewhat resistant to change" (Tschannen-Moran & Hoy, 1998, p. 235).

The goal in teacher education programs is to prepare teacher candidates to be successful classroom educators – those with a high degree of teacher-efficacy; however, the route to certification through traditional teacher preparation programs conflicts with the teacher candidate's pre-existing expectations of what a teacher is, what they do, how they do it, and why they do it (Feiman-Nemser, 2012). As Tshcannen-Moran and Hoy point out, pre-service teachers go through a decline in teacher-efficacy once they enter the classroom. Pre-service teachers "are confronted with the realities and complexities of the teaching task" and must come to terms with their ability to manage a variety of agendas, and may end up being too friendly and losing control of the class or becoming too strict and not liking their "teacher self" (Tschannen-Moran et al., 1998, p. 235). This complexity in teacher education programs, or contradiction between experience and expectation, is why it is imperative to accurately measure and strengthen teacher-efficacy during teacher education programs (Tschannen-Moran & Hoy, 2001).

Avatar History

Simulation use has traditionally been used for high-risk life and death training in aviation, medicine, and the military. In 1959, NASA astronauts spent one third or more of their time training in high fidelity simulators and astronauts who made lunar landings spent over half their training time in simulators (Tomayko, 1988). In relation to Moore's Law, simulation training has become economically viable for other sectors, including education training.

In the late 1980's, computer simulations were used in pre-service teacher education at the University of Virginia Curry School of Education. Using *The Curry Simulation*, human operators provided voices for four animated students on a computer screen. Meanwhile, students saw graphic and text prompts on a computer screen that provided cues to help them respond to the disruptive behavior of computer-animated students. Research reported a decrease of inappropriate teacher responses to misbehaviors by the animated students (Strang et al., 1986).

At about the same time, educational researcher and futurist Dede (1989) began to publish insights on the influence advancement in information technology would have on education. By the early 2000's, a wave of research and reviews had been released on virtual learning and education pedagogy (Dickey, 2003), innovative educational experiences (Dickey, 2005), and integrating virtual learning into the curriculum (Barab & Luehmann, 2003; Dede, 2000). While the use of virtual learning applications in education increased, new delivery methods were implemented, specifically; the concept of gamification (Steinkuehler et al., 2012). Early applications included Active Worlds Educational Universe, Adobe Atmosphere, and Quest2Learn (Dickey, 2005; Tekinbas et al., 2010). By 2009, Quest2Learn would become more than an application or curriculum; it would become an experimental school in New York.

SimSchool and Second Life–First Generation Virtual Worlds

Two popular *first-generation* virtual worlds for pre-service teaching include SimSchool and Second Life. Funded by the U.S. Department of Education's Preparing Tomorrow's Teachers to Teach with Technology program, SimSchool provides the user a first-person, single player game as a classroom teacher. Pre-service teachers using SimSchool demonstrated an "increase [in] Instructional Self-Efficacy (confidence in one's competence) and Learning Locus of Control (the teacher's sense of responsibility for learning results), and Self-Estimates of Teaching Skills, Experience and Confidence" (Meritt et al., 2013, p. 413).

Second Life is an immersive real-time virtual world created by Linden Lab where players interact with each other using avatars. Students have the opportunity to learn and play in a pro-social and collaborative forum where they find comfort and safety in their new *skin*. As with other virtual worlds, within Second Life, participants experience "a strong feeling of presence in this world, a sense of embodiment which invites a phenomenological consideration" (Burn, 2009, p. 139). Therefore, it provides a legitimate platform to use for teaching. For example, Britta Pollmuller used the Second Life Teen grid (Schome Park) to provide an evening class in *machinima*. Machinima can be defined as "animation made from the 3-D environments and animated characters of computer games or virtual immersive worlds" (Burn, 2009, p. 134). Ms. Pollmuller creatively used Schome Park as her classroom and the class' film set. The virtual world offers 'role protection' where students are protected from real-life consequences. Therefore, virtual worlds

such as Second Life, and others like it, have increasing potential for pre-service teacher training in the future.

TeachLivE™ and Mursion–A Second Generation Virtual World

TeachLivE™, a product of cooperation between the University of Central Florida and the Bill and Melinda Gates Foundation, is considered a *second generation* virtual reality experience. Developed, researched, and eventually commercialized by Mursion, a for-profit enterprise, this second generation virtual reality training application is used by approximately 65 universities, including the College of Education at Oral Roberts University, and is a partner with Educational Testing Service for the National Observation Teaching Exam (Dieker et al., 2016). The education applications include virtual classrooms, parent/teacher conferences, and administrative meetings where a Mursion simulation specialist controls student or parent avatars. The avatars have personalities consistent with real-life students and parents. The user is provided multiple training options with varied objectives, targeted responses, and levels of difficulty. Furthermore, the virtual experience is a *safe* environment that eliminates harm to P-12 students and their parents, as well as minimizing psychological and emotional harm to the user.

Methods

This study was designed to add to research on teacher self-efficacy interventions at Oral Roberts University's College of Education. In this prior research, an institutional grant funded a teacher self-efficacy investigation. The investigation used Tschannen-Moran and his colleagues (1998) Teacher Self-Efficacy Survey (TSES), a pre- and post-test design, and a specific treatment (an induction model), to examine teacher self-efficacy (George, 2016). The findings reported a positive difference in teacher self-efficacy in 72% of novice teachers participating in the teacher induction program. However, the difference was not statistically significant. Therefore, as the induction program continues, more interventions, including the use of avatars, are being used and investigated.

Empirical Model

This quantitative, correlational design used both parametric and non-parametric statistical measurements to examine the teacher education program population. This type of study is important because it begins a process for establishing correlation. The first step in establishing correlation between variables is to establish relationship (Fitzgerald et al., 2004; Johnson, 2000). The relationship between teacher self-efficacy and virtual learning in professional education programs is not evident in the literature. Therefore, the study design and research questions examine the relationship between variables. Specific measurements were paired with samples that met the assumptions of each respective design (Creswell & Creswell, 2017; Higgins, 2003; Rey & Neuhauser, 2011; Wilcoxon, 1945). A parametric correlation, paired-samples *t*-test, was used for the comprehensive data, and the Wilcoxon Signed-rank test, a non-parametric correlation, was used for the individual course data. Both models used paired samples to measure the statistical association between variables (Vogt, 2007). The dependent variable was teacher self-efficacy, as measured by the TSES, and the independent variable was the avatar experience. Each of the following research questions were asked, examined, and answered for three samples: a classroom management course, a student teaching course, and a foundations in education course.

Avatar Experience Model

All four of Bandura's (1997) sources of efficacy beliefs—mastery experiences, vicarious experiences, verbal persuasion, and physiological states—are present in the treatment phase of this study. The seven phases of the avatar experience, or study treatment, included: (a) preparation, (b) information, (c) session orientation, (d) avatar session one, (e) initial feedback, (f) avatar session two, and (g) final feedback.

The first phase of the avatar experience included regular classroom content instruction in one of three different professional education courses; Classroom Management, Student Teaching, and Foundations in Education. The planning of the avatar experience intentionally was scheduled after related content instruction and required the faculty of record to provide student feedback. This provided the teacher candidate with the content knowledge necessary to meet the performance objectives within the avatar scenario, as well as, provided the faculty member opportunity to develop a relationship conducive to successful verbal persuasion (Bandura, 1997).

The second phase of the avatar experience was the information phase. The researchers and permission forms provided information about the study. Teacher candidates could be exempt from the study without giving any reason. Next, the Ohio State Self-Efficacy Survey (OSTES) was administered (Tschannen-Moran & Hoy, 2001). The OSTES, later called the TSES, is a 24-question Likert scale survey that measures efficacy for instructional strategies (validity correlation of .84 ($p < .01$, 2-tailed), classroom management (.79) and student engagement (.85). A perceived limitation of this tool is that it provides a quantitative measurement of a qualitative dimension that is based upon self-perception.

This limitation is expansive when investigated. Two things are highlighted. First, the quantitative scale used is a Likert-type item, which reduces possible dynamic measurements to a static scale (Chimi & Russell, 2009). This can limit the ability to infer and generalize meaning. Second, although qualitative studies are regularly used to provide rich meaning to initial quantitative studies, the choice by the researchers to use a quantitative approach limits the findings to an objective assumption (Christiaensen, 2003). Therefore, findings may eliminate the possibility of subjective aspects.

In the final step of the information phase, a short description of the avatar scenario was provided by Mursion, the avatar provider, and administered to the participants. Discussion of the avatar scenario was controlled by limiting information and directions to the reading of the document. This included information teacher candidates needed to know about the experience, such as the objective and expectations, but void of information on how the avatar works internally and how the avatar chooses to respond (see Appendices A, B, C). This is consistent with TeachLive's research on maintaining realism in the experience (Dieker et al., 2017).

The third phase of the avatar experience was the session orientation. The session required small groups of seven, which were self-selected by the teacher candidates prior to the avatar session. This was done to support positive physiological and emotive experiences, which increase expectation of success and result in increased self-efficacy (Bandura, 1977; Bandura, 1997). Furthermore, the group design facilitated vicarious experiences for teacher candidates to view peer success, which increases self-efficacy through the mediation of ideal models (Bandura, 1995).

The fourth phase of the avatar experience was the initial five-minute session. In this session, the teacher candidate stood in a room in front of a large television and webcam. The webcam allowed the Mursion avatar operator to see and respond to the teacher candidate. The screen provided the avatar view for the teacher candidate, which included a classroom of five students, differentiated by gender, ethnicity, aesthetics, voice, personality, and behavior. The avatar experience, operated in real time by an anonymous simulation specialist, interacted with the teacher candidate through a complex and systematic if/then protocol used by Mursion. For example, if the teacher candidate used strategies consistent with classroom management best practices, the operator would program the avatar to respond positively, with smiles, compliance, and friendly comments. Similarly, the use of an inappropriate strategy by the teacher candidate would result in an increased or additional negative behavior by the avatar, such as non-compliance, disrespect, or disengagement. During this five-minute session, the candidate's professor maintained distance, provided no feedback, but had the freedom to immediately end the avatar experience with the use of a code word to the Mursion operator.

The fifth phase of the avatar experience began immediately following the five-minute session. The teacher candidate was brought back to a private area in the room and coached. The faculty member was required to provide positive and supportive statements and then suggest one or two specific strategies or action items for the second avatar session. According to Bandura (1995), individuals may develop self-efficacy as they are verbally reassured "they possess the capabilities to master given activities [and] are likely to mobilize greater effort and sustain it than if they harbor self-doubts and dwell on personal deficiencies when problems arise" (p. 4). This was consistent with research that showed simple immediate feedback, followed by an immediate opportunity to implement the feedback provided increased performance (Dieker et al., 2017).

The sixth phase of the avatar experience is similar to the initial session. The scenario was the same, the operator was the same, but the avatar prompts and responses were unique as they were a response to the new actions of the teacher candidate. In this second experience, the candidate was not only familiar with the feeling of the avatar experience, but also encouraged and focused on a specific strategy for improvement. This design facilitated an opportunity for teacher candidates to "experience and view themselves successfully completing a task" (Martin, 2012, p. 29), which is authentic evidence (Bandura, 1997).

The seventh phase of the avatar experience was the final feedback provided from the professor. Immediately following the second five-minute session, a similar follow-up conference was held. The professor gave specific feedback on how the candidate responded to the strategy or action item discussed in the first one-to-one conference as well as any other pertinent observations. After everyone in the seven-person group completed all seven phases, the candidates were given the TSES post-test.

Research Questions

The purpose of the study was to examine the relationship between the avatar experience and teacher confidence, measured by self-reported teacher self-efficacy. The research questions were designed to investigate the relationship as a precedent for correlation between teacher self-efficacy and the use of avatars in a teacher education program. The avatar experience was implemented over three distinct groups using the same method of delivery and protocol. This allowed the data

to be examined four times, once per group and once combining all groups. Although this allowed multiple iterations of questions, the same four primary questions directed this study.

Q1: Is there a relationship between overall teacher candidate self-efficacy and the avatar experience model?

- H_1: There is a significant relationship between overall teacher candidate self-efficacy and the avatar experience.
- H_0: There is not a significant relationship between overall teacher candidate self-efficacy and the avatar experience.

Q2: Is there a relationship between teacher candidate self-efficacy in classroom management and the avatar experience model?

- H_1: There is a significant relationship between teacher candidate self-efficacy in classroom management and the avatar experience.
- H_0: There is not a significant relationship between teacher candidate self-efficacy in classroom management and the avatar experience.

Q3: Is there a relationship between teacher candidate self-efficacy in student engagement and the avatar experience model?

- H_1: There is a significant relationship between teacher candidate self-efficacy in student engagement and the avatar experience.
- H_0: There is not a significant relationship between teacher candidate self-efficacy in student engagement and the avatar experience.

Q4: Is there a relationship between teacher candidate self-efficacy in instructional strategies and the avatar experience model?

- H_1: There is a significant relationship between teacher candidate self-efficacy in instructional strategies and the avatar experience.
- H_0: There is not a significant relationship between teacher candidate self-efficacy in instructional strategies and the avatar experience.

Sample

The population for the quantitative correlational study included all teacher candidates at a Midwestern private university. The purposive sample included 26 elementary education majors enrolled in a classroom management course, 15 undeclared majors enrolled in a foundations in education course, 3 secondary education majors enrolled in a student teaching course, and a comprehensive sample from all participants. This sampling provided a systematic coverage of teacher candidates from first-year students to seniors. Demographic questions were added to the student survey and provided descriptive statistics. Table 1 shows the age and gender differences for the samples. The age range accurately reflects the placement of the courses in the professional education course sequence. Similarly, the gender skew is consistent with the U.S. Bureau of Labor Statistics (2020) national trends in early childhood and elementary education.

Data Collection and Analysis

Teacher confidence data was collected using the TSES long form, a 24-question survey developed by Tschannen-Moran and Hoy (2001). The TSES was completed in a pre- and post-test manner, administered immediately before and after the avatar experience. Each candidate was read an overview of the avatar experience, the research purpose, and given an option to be excluded from the study but remain in the avatar training. Completed TSES forms were collected from study participants at the conclusion of the experience. Participant names were coded numerically for confidentiality and paired sample matching. The corresponding data, scores from the TSES, were added to a Microsoft Excel database, which was then password protected. All copies of the TSES were shredded in compliance with the Institutional Review Board procedures. Results were not shared with students. Specific analysis followed the empirical model including both descriptive statistics using general formulas within Microsoft Excel and inferential statistics using the Statistical Package for the Social Sciences (SPSS).

Table 1: Sample Demographics

Demographic	Classroom Management Course *N = 26*	Foundations in Education Course *N = 15*	Student Teaching Course *N = 3*	Total *N = 44*
Gender: Male	0	5	1	7
Gender: Female	26	10	2	36
Age: Under 21	2	12	0	14
Age: 21-25	22	2	3	28
Age: 26-30	1	0	0	1
Age: 31 and over	1	0	0	1
African American/Black	3	0	0	3
Caucasian/White	16	9	3	28
Native American	0	1	0	1
Asian/Asian American/Pacific Islander	1	2	0	3
Hispanic/Latino/Spanish Origin	4	4	0	8
Two or More	2	0	0	2

Note. The foundations in education course is designed to be a first-year course, whereas the other two courses are late in the final year of the program.

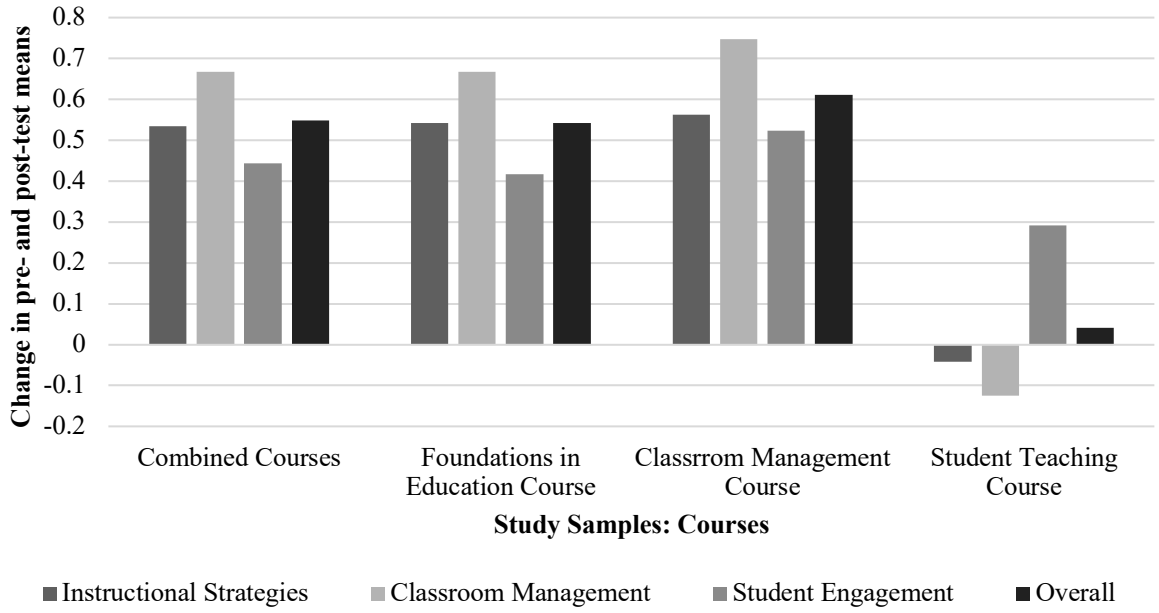
Findings

Descriptive statistics provided an initial view of teacher self-efficacy scores, which reflected increases in teacher self-efficacy for three of the four samples; combined courses, foundations in education course, classroom management course, and student teaching course. Figure 4 shows the comparison of changes in teacher self-efficacy scores across all dependent variables for each sample. Overall, three major observations are made from the chart. First, the chart demonstrates gains in teacher confidence for all three TSES subsets for the combined courses, the foundations in education course, and the classroom management course. Second, the TSES subset, Classroom Management, had the highest increase across three of the four samples. Last, although the combined course changes reflect increases, the sample for the student teaching course reflects mixed results, including negative changes. However, significance testing was needed to further examine each sample and respective research questions.

Combined Samples

Research question 1-4 were addressed for the combined courses sample using paired data, multiple *t*-tests, and SPSS. The combined courses sample size, 44, was large enough to use a parametric test to measure the statistical association for overall teacher self-efficacy and each TSES subset: classroom management, student engagement, and instructional strategies. Table 2 shows significant differences far below $p < .05$ for each of the dependent variables for the combined sample. Findings indicated a significant difference between overall self-efficacy pre-test (M = 6.07, SD = 1.04) and post-test (M = 6.68, SD = 1.06) scores; $t(43) = 6.158$, $p = .000$. These results verified the null hypothesis, suggesting a relationship between overall teacher self-efficacy and the avatar experience.

Figure 4: Changes in Teacher Self-efficacy Scores



Note. Sample size for the student teaching course was low (3).

Data was also analyzed for the TES subsets of classroom management, student engagement, and instructional strategies. For classroom management, findings indicated there was a significant difference between overall self-efficacy pre-test (M = 5.88, SD = 1.21) and post-test (M = 6.68, SD = 1.17) scores; $t(43) = 6.609$, $p = .000$. For student engagement, findings indicated there was a significant difference between overall self-efficacy pre-test (M = 6.12, SD = 1.02) and post-test (M = 6.64, SD = 1.10) scores; $t(43) = 5.239$, $p = .000$. And for instructional strategies, findings indicated there was a significant difference between overall self-efficacy pre-test (M = 6.21, SD = 1.13) and post-test (M = 6.74, SD = 1.08) scores; $t(43) = 4.051$, $p = .000$. The results from all three TES subsets verified their respective null hypotheses, suggesting a relationship between the avatar experience and teacher self-efficacy in classroom management, student engagement, and instructional strategies.

Table 2: Teacher Self-Efficacy Score Differences for Combined Courses Sample

Sample		Mean	Std. Dev.	Std. Error Mean	95% CI of the Diff. Upper Tail	t	df	Sig. (1-tailed)
Pair 1	Overall	.617	.664	.100	.819	6.16	43	.0000001
Pair 2	Classroom Mgt.	.780	.801	.121	1.04	6.61	43	.00000002
Pair 3	Student Eng.	.534	.874	.132	.800	4.05	43	.0001
Pair 4	Instructional Str.	.517	.655	.099	.716	5.24	43	.000002

Note. The combined course sample includes participants from all three courses.

Table 3 shows the results of the Pearson correlation, which indicated there was a significant positive association between teacher self-efficacy and the avatar experience for the combined courses sample, ($r(43) = .80$, $p < .001$). Furthermore, strong correlations existed for two of the TSES subsets: classroom management and student engagement.

Table 3: Post-Test to Pre-Test Correlations for Combined Course Sample

Sample		N	Correlation	Sig.
Pair 1	Overall	44	.800	.0000000001
Pair 2	Classroom Management	44	.774	.0000000007
Pair 3	Instructional Strategies	44	.687	.0000002
Pair 4	Student Engagement	44	.812	.0000000000

Note. Strong Correlations for the overall change and TSES Subset *Student Engagement*

Foundations in Education Course

Research question 1-4 were addressed for the Foundations in Education course sample using paired data, multiple *t*-tests, and SPSS. The sample size ($N = 15$) for the foundations in education course sample required the use of a non-parametric test, the Wilcoxon signed-rank test, to measure the statistical association for overall teacher self-efficacy and each TES subset; classroom management, student engagement, and instructional strategies. Table 4 provides the results of the Wilcoxon signed-rank test, which showed that an avatar experience with two five-minute sessions did elicit a statistically significant change in overall teacher self-efficacy ($Z = 2.677$, $p = .007$), self-efficacy in classroom management ($Z = 2.730$, $p = .006$), self-efficacy in student engagement ($Z = 2.162$, $p = .031$), and self-efficacy in instructional strategies ($Z = 2.142$, $p = .032$).

Table 4: Wilcoxon Signed-Rank Test Statistics for Foundations in Education Course

Test	Overall Pre – Post	Inst. Strat. Pre – Post	Class Mgt. Pre - Post	Stud. Eng. Pre - Post
Z	2.677	2.142	2.730	2.162
Asymp. Sig. (2-tailed)	.007	.032	.006	.031

Note. Classroom Management is the area of least experience for students enrolled in the foundations course, yet it experiences the highest gains in self-efficacy.

The results from the TSES for the overall and the three subsets rejected their respective null hypotheses, suggesting a relationship between the avatar experience and teacher self-efficacy in classroom management, student engagement, and instructional strategies for students in the foundations in education course.

Classroom Management Course

Research question 1-4 were addressed for the Classroom Management course sample using paired data, multiple *t*-tests, and SPSS. The sample size ($N = 26$) for the classroom management course required the use of a non-parametric test, the Wilcoxon signed-rank test, to measure the statistical

association for overall teacher self-efficacy and each TES subset; classroom management, student engagement, and instructional strategies. Table 5 provides the results of the Wilcoxon signed-rank test, which showed that an avatar experience with two five-minute sessions did elicit a statistically significant change in overall teacher self-efficacy ($Z = 3.887$, $p < .001$), self-efficacy in classroom management ($Z = 4.093$, $p < .001$), self-efficacy in student engagement ($Z = 3.869$, $p < .001$), and self-efficacy in instructional strategies ($Z = 2.975$, $p = .003$).

Table 5: Wilcoxon Signed-Rank Test Statistics for Classroom Management Course

Test	Overall Pre - Post	Inst. Strat. Pre - Post	Class Mgt. Pre - Post	Stud. Eng. Pre - Post
Z	3.887	2.975	4.093	3.689
Asymp. Sig. (2-tailed)	.000	.003	.000	.000

Note. The overall and all four subsets were highly significant.

The results from the TSES for the overall and the three subsets rejected their respective null hypothesis, suggesting a relationship between the avatar experience and teacher self-efficacy in classroom management, student engagement, and instructional strategies for students in the classroom management course.

Student Teaching Course

Research question 1-4 were addressed for the student teaching course sample using paired data, multiple *t*-tests, and SPSS. The sample size, 3, for the student teaching course required the use of a non-parametric test, the Wilcoxon signed-rank test, to measure the statistical association for overall teacher self-efficacy and each TES subset; classroom management, student engagement, and instructional strategies. Table 6 provides the results of the Wilcoxon signed-rank test, which showed that an avatar experience with two five-minute sessions did not elicit a statistically significant change in overall teacher self-efficacy ($Z = -5.35$, $p = .593$), self-efficacy in classroom management ($Z = .272$, $p = .785$), self-efficacy in student engagement ($Z = 1.069$, $p = .285$), and self-efficacy in instructional strategies ($Z = .447$, $p = .655$).

Table 6: Wilcoxon Signed-Rank Test Statistics for Student Teaching Course

Test	Overall Pre - Post	Inst. Strat. Pre - Post	Class Mgt. Pre - Post	Stud. Eng. Pre - Post
Z	.535	.447	.272	1.069
Asymp. Sig. (2-tailed)	.593	.655	.785	.285

Note. The sample size ($N = 3$) is too small to provide significant data. However, the Wilcoxon results support the observation in the descriptive stats.

The results from the TSES for the overall and the three subsets verified the null hypothesis, suggesting no significant relationship between the avatar experience and teacher self-efficacy in classroom management, student engagement, and instructional strategies for students in the student teaching course.

Discussion and Conclusions

Conclusions

The four research questions were answered with a similar outcome. The null hypothesis was rejected and a statistically significant relationship reported between the avatar experience model

and overall teacher candidate self-efficacy (Question 1), teacher self-efficacy in classroom management (Question 2), teacher self-efficacy in student engagement (Question 3), and teacher self-efficacy in instructional strategies (Question 4) in three of the four samples. The combined sample, the foundations in education course for first-year students and the classroom management course for Seniors indicated a statistically significant relationship. However, the student teaching course did not. These findings highlight three points of discussion. First, there was no difference in the samples with teacher candidates who were first-year students or Seniors. This may indicate variables connected to the duration of the program, such as course work, pre-clinical classroom experience, and maturation, but did not influence the effect of the avatar intervention. Second, the student teacher sample contained variables that may have created the variation with the other samples. This may include increased changes in classroom experience that include factors associated with student teaching: immersion in the classroom, role in the classroom, accountability for the classroom, or a more realistic perception of teacher self-efficacy. Third, the sample size for the student teaching course limited any findings, regardless of relationship.

Theoretical Implications

There are multiple theoretical implications of the relationship found in this study. First, these findings present evidence for the relationship between teacher reported self-efficacy and the avatar experience. Relationship is the first requirement for establishing correlation (Fitzgerald et al., 2004). Further studies should build on the foundation of correlational relationship to answer the question, *Can the avatar program help increase teacher self-efficacy in teacher education programs?* This means, next steps should move beyond relationship and begin to study causation.

Second, self-efficacy continues to be a constant construct by which to measure program outcomes. This study followed the assumption of the ability to influence self-efficacy through programing, thus adding to a body of knowledge that uses self-efficacy as a dependent variable. Continued research should take into consideration this assumption and continue to examine the validity of these types of studies. If self-efficacy related studies continue to support a conclusion of relationship that contradicts reality, the construct itself should be examined.

Third, technology-enhanced learning tools assume a pedagogical superiority. Although this study tested this assumption, it is important to examine not only the tool, but also the pedagogy in which it was used. This study found a relationship between the avatars and teacher self-efficacy, but further studies should also examine the method in which the avatars were used. There may be a procedural influence hidden by the theoretical assumption of this study.

Practical Implications

Specifically, this study addressed a role of teacher education programs in the current teacher retention issue (Gallant & Riley, 2014; National Commission on Teaching & America's Future, 2016). The avatar experience is a response by a teacher education program to the literature showing evidence of not only a shortage of teachers (USDOE, 2015) and a low retention rate (USDOE, 2015), but also to the role of teacher self-efficacy in areas associated with teacher staying power (Poulou, 2007; Tschannen-Moran et al., 1998). These findings are consistent with the progression of research in teacher education that has systematically integrated technology in curriculum, pedagogy, and teacher professional development (Albion & Ertmer, 2002; Darling-Hammond,

2000, 2006; Strudler, 1991; Strudler & Wetzel, 1999; Voogt et al., 2013; Wang et al., 2004). This research is different because it addresses a specific technology platform, avatars, as further integration of technology in education.

This study suggests that pre-service teacher training programs should seriously consider investing in avatar training. The realistic, non-threatening training provides teacher candidates with practical experience that is not available through other means. Unlike a regular classroom, the simulation specialist can target the development of a skillset with the avatars that a regular class of students does not provide. The ability to schedule the training at various times, scenarios, and levels of intensity are other benefits of this instructional tool that may lead to its widespread adoption.

Limitations and Future Research

Limitations of results include issues with participant self-reporting, specific commercial application, and study confounding variables. Limitations with study design, which relied heavily on one measurement tool for teacher self-efficacy and the inherent issue of participant self-awareness and accurate reporting associated with survey methods, are addressed in the review. However, it is important to discuss the implications of this limitation. Additional studies need to be done to examine how teacher self-efficacy continues to change in demographic and generational populations, how teacher self-efficacy is influenced by technology, and how teacher programs monitor and respond to social and emotional issues of teacher candidates.

Other limitations include confounding variables in the teacher education program. The teacher education program in the study is in a small, private, mid-western university. The program has over 200 teacher candidates and serves 15 programs in P-12. The program is experientially designed, ranging from 80 to 150 hours of pre-clinical experience before student teaching. Integration of technology at the program level is new and has comprehensive challenges that include faculty proficiency, program-wide implementation, and teacher candidate familiarity. These challenges have unknown implications and suggest the need for future studies by multiple teacher education programs.

The principle researchers were present for all phases of the study except classroom instruction. Use of anonymous and optional quantitative data, elimination of personal identifiers, and stated intentions at the beginning of the study helped control bias (Creswell & Clark, 2017). Limitations of the study included a lack of avatar experience by the researchers, faculty members, and teacher candidates. There were no experiential expectations of the Mursion avatar experience. Delimitations of the study included the placement of the avatar experience in the course schedule, the inclusion of a known facilitator, and the role of one of the researchers as an administrator of the teacher education program. Although bracketed, these delimitations are worth noting and may influence an implicit expectation on the participants for increased teacher self-efficacy.

This study builds on research of teacher self-efficacy as a measurement of intervention effectiveness, which was inconclusive, reporting gains in self-efficacy, but not at a significant level (George, 2016). Further study needs to include:

- Replication studies
- Variation studies to include a larger and more diverse participant sample

- Variation studies to include changes in the avatar experience model
- True experimental studies

The choice to implement and study a specific commercial avatar platform has far-reaching implications. Mursion was chosen because of its purposeful design for education and the existing amount of literature, which is based on substance and duration. (Dieker et al., 2014; Dieker et al., 2016; Dieker et al., 2017; Eisenreich & Harshman, 2014; Yates, 2016). However, any single application of a method does not provide appropriate evidence for the entire method. Therefore, it is difficult to suggest that all avatar programs will have similar findings. Furthermore, the working assumption, but outside the scope of this study, is a follow-up question, *How do various technology applications change teacher self-efficacy and staying power?* Commercial development and subsequent research in this area is limited. Further studies should include various commercial avatar programs.

Overall, this study provides evidence for continued use of avatars as a teacher development tool. To address the issues in education, quality classroom teachers need to be developed, supported, and retained. Technology-enhanced learning opportunities need to be more than novelty practices. Specifically, the avatar experience has the capacity to not only increase task management and behaviors, but also the soft skills necessary for a sustainable and successful career in education.

References

Albion, P. R., & Ertmer, P. A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends*, *46*(5), 34-38. https://doi.org/10.1007/BF02818306

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1995). Exercise of personal and collective efficacy in changing societies. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 1-45). Cambridge University Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman.

Barab, S. A., & Luehmann, A. L. (2003). Building sustainable science curriculum: Acknowledging and accommodating local adaptation. *Science Education*, *87*(4), 454-467. https://doi.org/10.1002/sce.10083

Beijaard, D., Verloop, N., & Vermunt, J. D. (2000). Teachers' perceptions of professional identity: An exploratory study from a personal knowledge perspective. *Teaching and Teacher Education*, *16*(7), 749–764. https://doi.org/ 10.1016/S0742-051X(00)00023-8

Bennett, S., & Maton, K. (2010). Beyond the 'digital natives' debate: Towards a more nuanced understanding of students' technology experiences. *Journal of Computer Assisted Learning*, *26*(5), 321-331. https://doi.org/10.1111/j.1365-2729.2010.00360.x

Burn, A. (2009). Machinima, second life and the pedagogy of animation. In C. Landshear, & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 133-153). Peter Lang.

Chimi, C. J., & Russell, D. L. (2009). The Likert scale: A proposal for improvement using quasi-continuous variables. *Proceedings of the Information Systems Education Conference, 26,* 1-10. http://proc.edsig.org/2009/4333/ISECON.2009.Chimi.pdf

Christiaensen, L. (2003). The qual-quant debate within its epistemological context: Some practical implications. In R. Kanbur (Ed.), *Qualitative and quantitative poverty appraisal: Complementarities, tensions, and the way forward* (pp. 70-74). Cornell University.

Coladarci, T. (1992). Teachers' sense of efficacy and commitment to teaching. *The Journal of Experimental Education*, *60*(4), 323-337. https://doi.org/10.1080/00220973.1992.9943869

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Czerniawski, G. (2011). Emerging teachers-emerging identities: Trust and accountability in the construction of newly qualified teachers in Norway, Germany, and England. *European Journal of Teacher Education*, *34*(4), 431–447. https://doi.org/ 10.1080/02619768.2011.587114

Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education Policy Analysis Archives*, *8*(1), 1-44. http://dx.doi.org/10.14507/epaa.v8n1.2000

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education*, *57*(3), 300–314. https://doi.org/10.1177/0022487105285962

DeAngelis, K. J., Wall, A. F., & Che, J. (2013). The impact of preservice preparation and early career support on novice teachers' career intentions and decisions. *Journal of Teacher Education*, *64*(4), 338-355. https://doi.org/10.1177/0022487113488945

Dede, C. (1989). The evolution of information technology: Implications for curriculum. *Educational Leadership*, *47*(1), 23-26.

Dede, C. (2000). Emerging influences of information technology on school curriculum. *Journal of Curriculum Studies*, *32*(2), 281-303. https://doi.org/10.1080/002202700182763

Dickey, M. D. (2003). Teaching in 3D: Pedagogical affordances and constraints of 3D virtual worlds for synchronous distance learning. *Distance Education*, *24*(1), 105-121. https://doi.org/10.1080/01587910303047

Dickey, M. D. (2005). Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments. *Interactive Learning Environments*, *13*(1-2), 121-137. https://doi.org/10.1080/10494820500173714

Dieker, L. A., Hughes C. E., & Hynes, M. C. (2016). *Bill & Melinda Gates Foundation final report.* University of Central Florida Foundation, College of Education and Human Performance & College of Electrical Engineering & Computer Science. http://teachlive.org/wp-content/uploads/2016/09/Gates-Foundation-Final-Report8_27_2016.pdf

Dieker, L. A., Rodriguez, J. A., Lignugaris-Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). The potential of simulated environments in teacher education: Current and future possibilities. *Teacher Education and Special Education*, *37*(1), 21-33. https://doi.org/10.1177/0888406413512683

Dieker, L. A., Hughes, C. E., Hynes, M. C., & Straub, C. (2017). Using simulated virtual environments to improve teacher performance. *School University Partnerships (Journal of the National Association for Professional Development Schools): Special Issue: Technology to Enhance PDS, 10*(3), 62-81. https://napds.org/wp-content/uploads/2017/07/Using-Simulated-Virtual-Environments-to-Improve-Teacher-Performance-.pdf

Eisenreich, H., & Harshman, K. (2014). The influence of TeachLivE on anxiety levels in preservice and in-service mathematics teachers. In C. Straub, L. Dieker, M. Hynes, & C. Hughes (Eds.), *Proceedings from Ludic Convergence* (pp. 19-22). Teachlive. http://teachlive.org/wp-content/uploads/2014/12/2014-Teachlive-Conference-Proceedings.pdf

European Commission. (2005). *Common European principals for teacher competences and qualifications.* http://www.pef.uni-lj.si/bologna/dokumenti/eu-common-principles.pdf

Feiman-Nemser, S. (2012). *Teachers as learners.* Harvard Education Press.

Fitzgerald, S. M., Rumrill Jr, P. D., & Schenker, J. D. (2004). Correlational designs in rehabilitation research. *Journal of Vocational Rehabilitation*, *20*(2), 143-150.

Fry, S. W. (2009). Characteristics and experiences that contribute to novice elementary teachers' success and efficacy. *Teacher Education Quarterly*, *36*(2), 95-110. https://files.eric.ed.gov/fulltext/EJ857478.pdf

Gallant, A., & Riley, P. (2014). Early career teacher attrition: New thoughts on an intractable problem. *Teacher Development*, *18*(4), 562-580. https://doi.org/10.1080/13664530.2014.945129

George, J. A. (2016). *The effect of a University-led Induction Program on the self-efficacy beliefs of alumni novice teachers* (Publication No. 1027223614) [Doctoral dissertation, Oral Roberts University]. Oral Roberts University Library Network.

Higgins, J. J. (2003). *Introduction to modern nonparametric statistics*. Cengage Learning.

Johnson, B. (2000). *It's (beyond) time to drop the terms causal-comparative and correlational research in educational research methods textbooks* (ED445010). ERIC. https://files.eric.ed.gov/fulltext/ED445010.pdf

Kivunja, C. (2014). Theoretical perspectives of how digital natives learn. *International Journal of Higher Education*, *3*(1), 94-109. https://doi.org/10.5430/ijhe.v3n1p94

Lei, J. (2009). Digital natives as preservice teachers: What technology preparation is needed? *Journal of Computing in Teacher Education*, *25*(3), 87-97. https://doi.org/10.1080/10402454.2009.10784615

Martin, C. (2012). *A study of factors that contribute to pre-service teachers' sense of efficacy for literacy instruction* (Publication No. 3507356) [Doctoral dissertation, Oral Roberts University]. ProQuest Dissertations and Theses Global.

Meritt, J., Gibson, D., Christensen, R., & Knezek, G. (2013). *Interactive technologies for teacher training: Comparing performance and assessment in Second Life and SimSchool* (ED562221). ERIC. https://files.eric.ed.gov/fulltext/ED562221.pdf

Mursion. (n.d.). *What is Mursion training simulation software?* https://www.mursion.com/

National Commission on Teaching & America's Future. (2016). What matters now: A new compact for teaching and learning – The evidence base. *Author*. https://files.eric.ed.gov/fulltext/ED572506.pdf

Poulou, M. (2007). Personal teaching efficacy and its sources: Student teachers' perceptions. *Educational Psychology*, *27*(2), 191-218. https://doi.org/10.1080/01443410601066693

Prensky, M. (2001). Digital natives, digital immigrants. *NCB University Press, 9*(5), 1-6. https://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Rey, D., & Neuhäuser, M. (2011). Wilcoxon-signed-rank test. In *International encyclopedia of statistical science* (pp. 1658-1659). Springer.

Rotter, J. B., Chance, J. E., & Phares, E. J. (1972). *Applications of a social learning theory of personality.* Holt, Rinehart & Winston.

Steinkuehler, C., Squire, K., & Barab, S. (Eds.). (2012). *Games, learning, and society: Learning and meaning in the digital age*. Cambridge University Press. https://doi.org/*10*.1017/CBO9781139031127

Strang, H. R., Murphy, D. M., Kauffman, J. M., Badt, K. S., & Loper, A. B. (1986). Training classroom management skills via a microcomputer-based simulation. *Teacher Education and Special Education, 9*(2), 55-62. https://doi.org/10.1177/088840648600900202

Strudler, N. B. (1991). Education faculty as change agents: Strategies for integrating computers into teacher education programs. *Journal of Computing in Teacher Education*, *8*(2), 5-8. https://doi.org/10.1016/0883-0355(92)90042-5

Strudler, N., & Wetzel, K. (1999). Lessons from exemplary colleges of education: Factors affecting technology integration in preservice programs. *Educational Technology Research and Development*, *47*(4), 63-81. https://doi.org/10.1007/BF02299598

Tekinbas, K. S., Torres, R., Wolozin, L., Rufo-Tepper, R., & Shapiro, A. (2010). *Quest to learn: Developing the school for digital kids*. MIT Press.

Tomayko, J. E. (1988). *Computers in spaceflight: The NASA experience*. NASA.

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783–805. https://doi.org/10.1016/S0742-051X(01)00036-1

Tschannen-Moran, M., & Hoy, A. W. (2007). The differential antecedents of self-efficacy beliefs of novice and experienced teachers. *Teaching and Teacher Education, 23*(6), 944–956. https://doi.org/10.1016/j.tate.2006.05.003

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, 68(2), 202-248. https://doi.org/10.2307/1170754

U.S. Bureau of Labor Statistics. (2020, January 22). *Labor force statistics from the current population survey*. https://www.bls.gov/cps/cpsaat11.htm

U.S. Department of Education. (2015). Enrollment in teacher preparation programs: Teachers are primarily prepared in traditional programs. *Higher Education Act Title II Reporting System* https://title2.ed.gov/Public/44077_Title_II_Issue_Brief_Enrollment_V4a.pdf

Viel-Ruma, K., Houchins, D., Jolivette, K., & Benson, G. (2010). Efficacy beliefs of special educators: The relationships among collective efficacy, teacher self-efficacy, and job satisfaction. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 33*(3), 225-233. https://doi.org/10.1177%2F0888406409360129

Vogt, P. W. (2007). *Quantitative research methods for professionals.* Allyn and Bacon.

Voogt, J., Knezek, G., Cox, M., Knezek, D., & ten Brummelhuis, A. (2013). Under which conditions does ICT have a positive effect on teaching and learning? A Call to Action. *Journal of Computer Assisted Learning*, *29*(1), 4-14. https://doi.org/10.1111/j.1365-2729.2011.00453.x

Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing preservice teachers' self-efficacy beliefs for technology integration. *Journal of Research on Technology in Education*, *36*(3), 231-250. https://doi.org/10.1080/15391523.2004.10782414

Ware, H., & Kitsantas, A. (2007). Teacher and collective efficacy beliefs as predictors of professional commitment. *The Journal of Educational Research*, *100*(5), 303-310. https://doi.org/10.3200/JOER.100.5.303-310
Wilcoxon, F. (1945). Individual comparisons by ranking methods. *Biometrics Bulletin*, *1*(6), 80-83.
Yates, R. R. (2016). *Integration of the TeachLive™ within higher education* (Publication No. 10248337) [Doctoral dissertation, Texas Woman's University]. Texas Woman's University Repository.
Yost, D. S. (2006). Reflection and self-efficacy: Enhancing the retention of qualified teachers from a teacher education perspective. *Teacher Education Quarterly*, *33*(4), 59-76. https://doi.org/10.2307/23478871

Acknowledgements

We thank the leadership and support of Oral Roberts University including the president Dr. William Wilson, the provost Dr. Kathleen Reid-Martinez, facility staff, and research donors. Specifically, we thank the leadership, guidance, and support of the College of Education Dean, Dr. Kim Boyd, College of Education faculty, and the College of Education Technology Director, Gerry Landers.

Appendix A. Upper Elementary Scenario: Behavior Management

Mina *Will* *Jayla* *Emily* *Carlos*

Upper Elementary Scenario Behavior Management

You are a substitute teacher stepping in to teach this upper elementary classroom for the first time. Your objective to introduce yourself, meet the class, establish rapport and learn a little bit more about each individual. This is an introduction scenario, so the students will be at a low behavioral level.

Appendix B. The Parent-Teacher Conference

MURSION

SCENARIO

The Parent-Teacher Conference

You are a teacher of Jasmine, an 8th grader who usually has excellent scores in math. Lately, her math grades have been low. Her mother, Linda Walker, has scheduled a conference to discuss her academic progress.

Your objectives are to:

- Practice active listening to understand Linda's concerns;
- Jointly identify potential contributing factors to Jasmine's change in academic performance; and
- Jointly identify next steps.

Appendix C. Classroom Management: Gain Attention & Establish Expectations for Group Work

Classroom Management
Gain Attention & Establish Expectations for Group Work

MURSION

Sim. Specialist Guide

Synopsis

In this simulation the learner will gain the avatars' attention by using a consistent learning signal from a designated location in the classroom. Next, the learner will have the opportunity to work with the students to establish group expectations for behavior during small group work.

Learner Challenge

The bell has just rung to signal that class has started, and your middle school students are still engaged in conversation or personal activities. Your objective is to teach a lesson. To support overall learning in the classroom, you will utilize specific classroom management strategies, such as establishing a consistent attention signal for transitions to learning activities, establishing norms for working together in small groups.

Objective

Use Attention Getting Signal
Establish Expectations

Avatars

Middle School
Grades 6-8

Learner Audience

- Pre-service Teachers
- Teacher Candidates
- Novice Teachers