Differentiated Instruction: How simSchool was used in a Two Graduate Courses

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Abstract: In the high stakes testing environments of Pre-K-12 environments, the opportunities for preservice as well as in-service teachers to participate in field experiences to hone professional skills like differentiation of instruction are narrowing. The simSchool component was implemented in a Graduate Education course, and data were collected over two terms. Using a mixed methods framework, this study examined the perceptions of study participants with respect to use of simSchool and differentiated instruction, as well as the use of personality inventories to establish learning preferences in support of differentiation. A paired *t*-test was used to determine the relationship between student responses on pre- and post-surveys. The *p*-value was 0.0170, thus showing significance at an alpha of 0.05. This study addresses the efficacy of simSchool, a virtual learning environment, in preparing teachers for success in teaching diverse learners using differentiated instruction.

Introduction

There are many advantages associated with SBL, simulation-based learning, in general and especially in education. Collum (2015) conducted a study using the simulation-based learning tool, simSchool, as a means of increasing preservice teachers' understanding of diverse learners and concluded that simSchool did enhance preservice teachers' understanding of the educational needs of diverse learners. Collum (2015) recognized the need for additional studies using simSchool which should be conducted at multi-universities. Badiee (2012) identified four advantages to SBL: (a) classroom decision-making, (b) practice through repeating, getting feedback, and advice, (c) self-efficacy in classroom teaching, and (d) collaborations and social interactions. Danielson (1996) stated that a typical teacher made up to 3,000 important decisions during the day, many of which had impact on the various types of learners in the classroom. According to Brookfield (1995), student teachers as well as novice teachers needed to see the consequences of the complex decisions that teachers make in different situations encountered in the learning environment of the classroom. Badiee (2012) stated that simulations might be able to assist in seeing the consequences of the complex decisions teachers made in the classroom, in particular, how these decisions affected student behavior, student engagement, and student achievement.

Badiee (2012) stated that simulations could be designed to incorporate feedback and advice and provide the opportunity for the preservice teacher to pause or repeat a lesson as a means for the preservice teacher to explore alternative decisions. Ferry et al. (2004) pointed out that SBL allowed preservice teachers to repeatedly practice their teaching skills without negative impact on students. Badiee (2012) pointed out that the use of simulations could provide authentic and relevant scenarios that simulate various behaviors, academic levels, personalities, and diversity

of learners in the classroom. Fischler (2006) explained that SBL had great potential in education by allowing preservice teachers to act within virtual environments, immediately applying theory to realistic yet controlled settings.

Gibson (2012) explained simSchool as a classroom simulation that supports the rapid accumulation of a teacher's experience in analyzing student differences, adapting instruction to individual learner needs, gathering data about the impacts of instruction, and seeing the results of his/her teaching. According to Kruse and Gibson (2011), simSchool allows the user to create a wide variety of classroom environments by: (a) defining parameters of race, gender, and academic ability, (b) choosing which students the user wants to work with, and (c) identifying the goals for the classroom set-up. Kruse and Gibson (2011) provided the following advantages of using a virtual environment for practicing a wide variety of teaching skills:

- low stakes – no child is harmed by experiments;
- ability to work with a wide diversity of virtual students, including special needs' populations;
- flexibility to play, experiment, create, and explore different strategies;
- freedom from financial, time, and administrative constraints of physical classrooms and field work; this is "virtual" field work with real educational benefit; and
- scalable and conducive to a distributed student user population.

Baek (2009) stated that simSchool presents a powerful way for preservice teachers to connect learning about teaching with practice. Baek (2009) pointed out that simSchool allowed preservice teachers to test out pedagogical ideas to see what combination of strategies can help all students learn.

Deale and Pastore (2014) reported that, when combined with user testing, simSchool provides a valid model of a simulated environment for preservice teachers to practice instructional activities. Stavroulia, Makri-Botsari, Psycharis, and Kekkeris (2014) conducted a study at the School of Pedagogical and Technological Education in Athens, Greece, to investigate the effects of simSchool on preservice teachers' classroom management skills. Stavroulia et al. (2014) reported that simSchool not only improved the participants' pedagogical and teaching skills but, in addition, enhanced the participants' classroom and behavior management skills while it increased their self-efficacy and self-esteem. Stavroulia et al. (2014) summarized that the simSchool simulation helped the participants learn and analyze the characteristics and the different needs of their students and adjust their instruction in order to motivate and improve student performance. Hopper, Knezek, and Christensen (2013) conducted a study to determine if preservice teachers could gain in both experience and confidence when using simSchool. Hopper et al. (2013) findings indicated that simSchool provided the preservice teachers experience that simulated a real classroom and offered them additional ways to practice and improve teaching skills, and confirmed that a simulated teaching environment can enhance preservice teaching experience levels, thus preparing them for the demands of the classroom. Bush, Hall, Scott-Simmons, and Saulson (2012) studied student perceptions of simSchool and its effect on the self-efficacy of preservice and in-service teachers, and reported that preservice teachers found the simulation to be an appealing training tool as well as a virtual environment that allowed them to try different techniques without the fear of hurting real students. Bush et al. (2012) stated that simSchool appeared to add value to the teacher education programs.

In their work, Foley and McAllister (2005) provided an overview of the web-based simulation, simSchool, which provides a realistic framework that allows for students to contextualize curricular decisions, differentiate instruction, and reflect on their practice.. Foley and McAllister (2005) report that one of the most challenging and difficult aspects of the simSchool simulation was the complexity of diversity and reported that the participants were often shocked by the degree of diversity in their simulated classroom that included racial, cultural, linguistic, and special needs. Foley and McAllister (2005) reported that the simSchool simulations could aid preservice teachers in working with students with diverse linguistic and cultural backgrounds. Foley, McAllister, and Sanogo (2003) elaborated that simSchool simulations helped preservice teachers in six ways: recognize the complex task and nature of diverse classrooms; require students to synthesize and apply their cumulative knowledge to the simulation; introduce students to the tensions between the ethos of the school and the goal of meeting students' individual needs; build a community of learners; foster culturally responsive practice; and create multiple opportunities for students to interact and apply theoretical problem-based inquiry learning to web-simulated classes and school.

Gibson, Christensen, Tyler-Wood, and Knezek (2011) conducted a study on the use of simSchool to simulate an inclusion classroom with students with various disabilities. Gibson et al. (2011) concluded that there was a potential for simSchool to help train teachers for inclusion classrooms due to simSchool's capacity to model a wide range of student characteristics within the classroom.

Bush and Hall (2013) pointed out that preservice teachers could gain a deeper appreciation of many diversities found in an educational classroom, from gender, ethnicity, and special needs breakdowns to varying levels of intelligence, by creating a simSchool module. Bush and Hall (2013) explained that, at a time when physical field experiences are under scrutiny by accreditation organizations, the importance of using a viable supplement like

simSchool in teacher education is clear. During its last accreditation review, the University of North Texas received approval by NCATE (now CAEP) for the use of simSchool for up to 10 of the 40-plus required hours that preservice teachers must spend observing classrooms before they begin formal student-teaching (Sawchuk, 2011; Christensen et al., 2011).

The Study

This mixed-method study evaluated the use of the simulation based technology (SBL) tool, simSchool, as an aid to enhance teachers' understanding of the use of differentiated instruction within classes consisting of diverse learners. The primary quantitative research question used for this study was "What impact did SBL have on teachers' understanding of differentiated instruction for diverse learners?" In order to gain additional insight into how teachers perceived the use of SBL as a means to increase their understanding of differentiated instruction for diverse learners, the following qualitative question was used: "What were the perceptions of teachers' use of SBL as a tool for increasing their understanding of differentiated instruction for diverse learners?"

simSchool is a simulated classroom where educators can develop pedagogical expertise by recreating the complexities of classroom decisions through mathematical representations of how people learn and what teachers do when thinking (Christensen et al., 2011). The simSchool cognitive model was developed around the OCEAN or Big Five Model of personality (McCrae & Costa, 1996; Srivastava, 2006). OCEAN is an acronym for openness, conscientiousness, extroversion, agreeableness and neuroticism. simStudents are created using the VAK model, which represents three learning styles of students (visual, auditory, and kinesthetic). Two other components used to create a simStudent are academics and language proficiency. For this study, a simSchool module was created entitled "Personality and Teaching in simSchool". The module was divided into four sessions. Session 1, student summaries and feedback analysis, was designed to help students learn how student summaries reflect personality traits, learning preferences and academics, and also how to analyze the performance outcome of a simulation. Session 2, improving student achievement, was designed to teach preservice teachers how tasks are related to individual personal traits and learning preferences and how this understanding can improve student performance. Session 3, teaching your simSelf, was designed so that students would be able to see what it would be like to teach themselves. Each student completed the Big Five Personality inventory found at www.personalitytest.org.uk in an effort to obtain their own OCEAN characteristics. Each student also completed the Barsch Leaning Style survey found at http://valenciacollege.edu/east/academicsuccess/spa/BarschLearningStyles.cfm#results in order to determine their VAK learning preferences. The students then used this data to create themselves as simStudents to be used in session three. Session four, relationship of personality traits and teaching, was developed to teach preservice teachers to understand the relationship between learning and personality traits and also between teaching and personality traits. Each session contained a series of action items that each participant had to complete. The participants documented their results of all action items and submitted them as a final PDF document to review.

The study consisted of an explanatory sequential mixed-methods design that consisted of first collecting quantitative data followed by the collection of qualitative data to help explain or elaborate on the quantitative data. The qualitative data explored participants' perceptions about the use of simSchool as a means of increasing their understanding of the use of differentiated instruction for diverse learners. The participants in this study were graduate students seeking Master's degrees in Education and were enrolled in the Differentiation of Instruction class during the summer session.

The instructors in these classes learned the architecture of simSchool, and then proceeded to instruct their virtual classes for 5 weeks. During that time, study participants collected data on their interactions with their virtual students. Additionally, they all engaged in online discussions with the other study participants reflecting on the challenges and the successes they were experiencing, and collaborating to hone their differentiation skills in their respective classes.

Quantitative data were collected in the form of surveys. The participants were given a pre and post survey designed to evaluate their understanding of differentiated instruction. The quantitative data were analyzed using paired t-test. Five open-ended questions were developed and added to the pre-survey to create the post-survey designed to capture the teachers' perceptions about the use of simSchool as a tool for enhancing their understanding of differentiated instruction.

Findings

Data were collected over two terms from a graduate course entitled Differentiated Instruction. Data were collected from three sources: quantitative pre-survey, quantitative post-survey, and qualitative post questionnaire. The pre-and post-course data from the surveys were analyzed for the study participants (N=10) using a one-tailed paired t-test. The t-value for a one-tailed test was -2.488, and the cv was -1.833. The p-value was 0.0173 indicating a statistical significance at an alpha level of 0.05. This supported our hypothesis that the SBL tool, simSchool, would enhance teachers' understanding of the use of differentiated instruction for diverse learners.

After reviewing the data from the open-ended questions, students perceived that the use of simSchool enhanced their understanding of the use of differentiated instruction. Below are some of the responses to the open ended questions:

P1 - The use of simSchool has affected my perception of differentiated instruction by encouraging me to allow for different activities to be happening at the same time in my classroom. That students need differentiation and as the teacher I need to build my classroom community to support this change. I need to look closer at the personality traits of my students and use this information on a daily basis.

P2 - It reminded me of the importance and encouraged me to reflect on my current teaching staff's understanding and use of differentiation.

P3 - simSchool has really made me aware of the various learning styles in one classroom; its not just visual, auditory, or kinesthetic but several other personality traits that play a role in learning.
P3S - simSchool demonstrated that differentiated instruction is an essential skill that teachers need to acquire early in their careers to become effective with instruction.

P4S - It helped me to see my strengths and weaknesses and enabled me to reflect on my teaching in the classroom. I became more aware of my actions and did my best to "correct" what I was doing in simSchool in my classroom.

P1 - The insight I gained from the simSchool sessions about the importance of personality traits as a teacher is that a teacher must build an understanding of the individual student's traits and utilize these traits when designing lessons.

P2 - The insights I gained from the simSchool sessions about personality traits as a learner is that traits can greatly impacts one's learning and reaction to activities. When assigning tasks the teacher my consider the student's traits and determine if it is in the best interest of the student for learning to happen.

P4- simSchool helped affirm my belief in the importance of using personality traits to differentiate instruction and interaction with students. I was able to see the direct impact through the sim students.

P1S- As a teacher I looked at traits I never thought of before when thinking about giving assignments. I had to read and reread the profiles many times to make sure I was analyzing the students correctly. That is the most important part, taking the time to really get to know the students in ways you never thought to do before. This proved to be very helpful in assigning tasks and trying to hold conversations with the students. I plan to take what I learned as a teacher in the sim classroom and put it in play in my own room to see if I can make more of a difference this year than in years past.

P02-Working in special education for the past nine years, I have always been involved with diverse learners. The SimSchool project allowed me to manipulate lessons in a practice environment in order to better understand how to change lessons to meet student needs.

P3S - Knowing the personality traits of your students can assist teachers in tailoring instruction to keep students engaged and specifically meeting their needs.

P06-I liked learning about the five traits. I had used various learning styles inventories but had not considered some traits such as openness before. This set of traits helped me to see as a teacher some other variables that should be considered when determining appropriate differentiation approaches.

P7-The insights that I gained from the simSchool project on understanding the needs of diverse learners is reviewing the data to build knowledge about what strategies work or do not work for a specific student. Some students might have a few similar traits however the combination of traits for a student is the real determining factor. I understand, more now, that it takes more work to truly have differentiated instruction in the classroom, but the results in student achievement and learning are amazing.

Recommendations and Implications

Although both the quantitative and qualitative findings support the hypothesis that the SBL tool, simSchool, can enhance teachers' understanding of the use of differentiated instruction for diverse learners, it must be noted that additional research needs to be conducted with different populations and with larger populations. The implications of this study have far reaching effects in the educational community.

- simSchool could be used as a training tool for preservice teachers in the use of differentiated instruction for diverse learners.
- simSchool could be used as a training tool by in-service teachers to increase their understanding of the use of differentiated instruction for diverse learners.
- simSchool could be used by administrators as source of professional development for in-service teachers' training on differentiated instruction for diverse learners.
- simSchool could be used by universities with teacher education programs to evaluate both preservice and in-service teachers' understanding of differentiated instruction.
- simSchool could possibly be used by accreditation organizations as a means of evaluating both preservice and in-service teachers understanding of the use of differentiated instruction for diverse learners.

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