Evaluating the Effectiveness of simSchool on Increasing Preservice Teachers' Understanding of the Educational Needs of Diverse Learners: A Study across Three Midwestern Universities

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Abstract: This sequential mixed-method study focused on the use of the Simulation Based Learning (SBL) tool, simSchool, as a supplement to coursework and field experiences, to explore the impact on preservice teachers' understanding of the educational needs of diverse learners. The study was conducted across three Midwestern Universities. Twenty-one simulated classroom modules were created representing six different classroom settings designed to focus on four diversity areas: socioeconomic issues, ethnicities, exceptionalities, and English as second language (ESL) students. The analysis of the qualitative data, as well as the data embedded within the simSchool software, suggested that the use of simSchool did increase preservice teachers' understanding of the educational needs of diverse learners. The findings also indicate that these results were replicated across the three Midwestern universities.

Introduction

The literature suggests four ways that preservice teachers may be trained in order to meet the demands of diverse learners: (a) class/course on diversity, (b) reflection, (c) study abroad, and (d) practicums/field experience (Garmon, 2004; Lin & Lucey, 2010; McCabe, 2011; Milner, 2006; Sparks & Butt, 2000). However, challenges exist with each of these four training experiences. For example, when evaluating the effectiveness of practicums/field experiences, the main problem is finding enough placement locations so that the preservice teachers can interact with all of the different types of diverse learners. This study examined alternatives and supplements to courses, reflections, and field experiences by evaluating the use of Simulation Based Learning (SBL) to enhance the experiences of preservice teachers in understanding the educational needs of diverse learners in the terms used by the Council for the Accreditation of Educator Preparation (CAEP) in the accreditation of universities training preservice teachers to teach in the PK-12 environments. The four areas of diversity covered in this study are: (a) socioeconomic, (b) exceptionalities, (c) ethnicities, and (d) English as a Second Language Learners (ESL).

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) 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. Aldrich (2004) stated that simulations were considered representations of real-life experiences, and, although they could not completely replace the real classroom experience, they could enhance real-life experiences; for example, they could be replayed over and over by the preservice teacher. Badiee (2012) pointed out that the use of simulations could provide authentic and relevant scenarios that simulate various behavior, academic level, personality, 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.

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) reported that the analysis of the data from the study indicated that preservice teachers had a gain in teaching skills and instructional self-efficacy after completing the simSchool simulation of an inclusion classroom. 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).

Purpose of the Study

The purpose of this mixed-method study was to evaluate the effectiveness of simSchool on increasing preservice teachers' understanding of the educational needs of diverse learners. Many studies on the use of simSchool in teacher preparation programs have been documented as outlined in the introduction. However, the researchers believe this is the first simSchool study to be conducted across multiple universities. This study was conducted across three Midwestern universities during the fall 2015 and spring 2016 terms. The participants in this study were undergraduate students in the teacher preparation programs at each university. The students participated in this study either as part of a course or as a stand along course.

Research Questions

This mixed-method study evaluated the use of simulation based technology (SBL) to enhance the experiences of preservice teachers to enhance their understanding of the educational needs of diverse learners. Four sub-questions were used to further understand how SBL could be used to increase the preservice teachers' understanding of various types of diverse learners.

1. What impact did SBL have on the preservice teachers' understanding of students who speak English as a second language (ESL)?
2. What impact did SBL have on the preservice teachers' understanding of learners of different ethnicities?
3. What impact did SBL have on the preservice teachers' understanding of learners with exceptionalities?
4. What impact did SBL have on the preservice teachers' understanding of socioeconomically challenged learners?

In order to gain additional insight into how preservice teachers perceived the use of SBL learning as a means to increase their understanding of the educational needs of various types of diverse learners, four qualitative questions were designed:

1. What were the perceptions of preservice teachers' use of SBL as an intervention for increasing the understanding of the educational needs of students who speak English as a second language (ESL)?
2. What were the perceptions of preservice teachers' use of SBL as an intervention for increasing the understanding of the educational needs of learners of different ethnicities?
3. What were the perceptions of preservice teachers' use of SBL as an intervention for increasing the understanding of the educational needs of learners with exceptionalities?
4. What were the perceptions of preservice teachers' use of SBL as an intervention for increasing the understanding of the educational needs of socioeconomically challenged learners?

Intervention Design

SimSchool is a simulated classroom where the preservice teachers 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). Six simulated classrooms were designed:

- Language Learning Lab (five simulated students identified as English as a second language learners)
- Gifted Learning Lab (five students of roughly equal academic capability, with different individual needs)
- Study Skills Intervention (five students with IEPs outlining significant learning, social, and/or emotional challenges)
- Anywhere Elementary Classroom 1 High SES; (five highly diverse students, 80% of which qualify for free or reduced lunch)
- Anywhere Elementary Classroom 2 Low SES; (within the top 20% socioeconomic band at the school, assigned to a small group learning lab)
- Anywhere High School (a class of 17 students designed to represent a common class configuration with a distribution of ethnicities, roughly 30% of students having an IEP outlining exceptionality, 25% of the students identified as being English language learners)

Data Collection

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 educational needs of diverse learners. The data collected from the simSchool classroom simulations concentrating on the areas of teacher achievement, conversation trends, and a circumplex graph and charts from the classroom simulations were obtained in tabulated form.

Quantitative data were collected in the form of surveys. The Multicultural Awareness Questionnaire (MAQ) designed by Barry & Lechner (1995) was used to collect pre and post data to determine the effectiveness of simSchool on enhancing preservice teachers' multicultural awareness. The simSchool Survey Questionnaire (SSRQ) developed

by Badiee (2012) was modified by the addition of five open-ended questions and used to evaluate participants' views and perceptions of the SBL tool, simSchool. The students enrolled in the teacher education programs at the Midwestern Universities completed a confidential survey designed to measure preservice teachers' understanding of the needs of diverse learners at the beginning of their diversity field experience before any training had been completed on simSchool and again after their completion of the 21 classroom simulation modules on simSchool. This allowed for pre analysis and post analysis of their understanding of the needs of diverse learners as well as an analysis of simSchool as a tool for helping preservice teachers' understanding of the educational needs of diverse learners.

Qualitative data were collected using an online questionnaire. In order to evaluate the effectiveness of the use of simulation technology in aiding preservice teachers in understanding the educational needs of diverse learners, a post questionnaire was given to the preservice teachers after they finished the 21 simSchool modules. The simSchool Reflection Questionnaire (SSRQ) consisted of five open-ended reflection questions designed to obtain participant feedback on the five qualitative research questions.

Quantitative Analysis

The quantitative data from the MAQ pre and post surveys for this study were analyzed using the statistical package in Microsoft Excel. The data were sorted by age, gender, ethnicity, class status, certification area, prior multicultural experience, and computer skill level of the participants. Data were analyzed to determine if there were significant changes in participant multicultural awareness from pre and post surveys. A paired *t*-test was used to evaluate the results of the MAQ pre- and post-survey data. All statistical analysis was computed using an alpha level of 0.05. The quantitative data collected from the SSSQ post survey were analyzed using the statistical package in Microsoft Excel. Data were also collected from the simSchool simulations. The data collected from the simSchool simulations centered on the area of teacher effectiveness as calculated and reported in the simulation feedback reports.

Qualitative Analysis

The construct of the qualitative part of this study was designed to gain an insight into the perception of preservice teachers' use of SBL as a means of understanding the educational needs of diverse learners. The qualitative data for this study were analyzed after reading the participants' responses to the open-ended questions of the SSSQ. The responses to the questions were coded and summarized using the QRS qualitative software package, NVivo10, for emerging themes and final conclusions. The SSRQ post reflection questions were analyzed. The responses to the SSRQ reflection questions were coded and summarized by reading and highlighting for emerging themes and establishing findings. After the analysis of the simSchool quantitative and qualitative data, the results were reviewed, and conclusions about research questions were constructed.

Findings

The finding from this study were compared to the finding of the original study as outlined in Collum (2015). Data were collected from four sources: the MAQ pre and post survey, the SSSQ post survey, the SSRQ post survey, and the simSchool modules.

Quantitative Findings: The MAQ pre and post-data analysis is provided in Table 1. The MAQ survey is divided into six clusters. Cluster 2 is the one used to evaluate the effectiveness of simSchool. Cluster 2 focuses on preservice teachers' belief that their professional courses are preparing them to deal with the multicultural approaches to education. For the original study (MWO) the pre and post-analysis yielded a *p*-value of 0.055 with an N=34 for cluster 2. The data from the pre and post-analysis for the combined three Midwestern universities (MWC) yielded a *p*-value of <0.0000, thus showing a statistical improvement at an alpha value of 0.01.

The finding from the Teacher Effectiveness data obtained from the simSchool modules for each classroom simulation is provided in Figure 1. Five of the classroom simulations were taught three times each by the participants. The final classroom simulation, Anywhere High School, which contained 17 simStudents was taught five times. The teacher effectiveness data plots from the teacher effectiveness in most cases demonstrate that the trends for most of

the modules were replicated between the MWO and the MWC studies. This has significance impact on the value of simSchool as a tool for increasing preservice teachers understanding of the educational needs of diverse learners.

Qualitative Findings:

Data collected from the SSSQ post survey is presented in Tables 2 and 3. The questions in Table 2 were various questions for rating simSchool with regards to its effect on preservice teachers' in various areas. The Likert scale ranged from "decreased greatly" (1) to "increased greatly" (7). The frequency for the responses for "somewhat increased", "increased", and "increase greatly" were summed and the data from the MWO study was compared to the data from the MWC study. The questions in Table 3 were various questions for with regards to other areas using a Likert scale of "strongly disagree" (1) to "strongly agree" (7). The frequency for the responses for "somewhat agree", "agree", and "strongly agree" were summed and the data from the MWO study was compared to the data from the MWC study. As found with the quantitative data the data from the SSSQ survey also indicates that the combined Midwestern (MWC) appeared to replicate the original study (MWO).

Data from the SSRQ survey, which consisted of opened ended reflection questions are given in Table 4. This data was designed to collect preservice perceptions focusing on the qualitative sub research questions as well as the primary qualitative research questions. In looking at the responses from "did simSchool help preservice teachers with the understanding of the educational needs of diverse learners", 81 (59.6%) of the participants in the MWC combined study responded that simSchool did help them understand the needs of diverse learners. This compares to 21 (61.8%) of the participants from the MWO study. When looking at the "Did help" vs the "Did Not Help" frequency percentages one might wonder how if simSchool really did help. That is why the analysis of the participants' responses were so enlightening.

Perhaps some of the most powerful data supporting the use of the SBL tool, simSchool, for increasing preservice teachers' understanding of the needs of diverse learners were identified in the qualitative results of the SSSQ and SSRQ. Examples of the participants' responses from each university are provided below:

MW1-P13 :>>>> helped in training me to understand the needs of ESL students because I needed to pay attention to their profiles and where their strengths and weaknesses were. Once I found strengths and weaknesses, I could choose tasks that they would be successful with.

MW1-P02 :>>>> towards the end of the modules, I had many different types of learners in my classroom and they needed different things than the other students. This allowed me to interact with many different types of learners like I would in an actual classroom.

MW1-P12 :>>>> because it gave an opportunity to work with these types of students and to understand what they each need to excel.

MW1-P20 :>>>> there was a great variety of diverse learners with each module and because of this I believe the simSchool did help. It was interesting to see the variety of learners and skills that they present. Some needed more time, but were okay with the same tasks as the rest of the class. Others needed easier or harder tasks. SimSchool has helped with this task of what tasks work well with diverse learners such as gifted students, special education students, and more.

MW2-P02:>>>>I think that the reports given after I competed each module reflected the attention that I gave to a group of students which in return made me more aware of how I approach my students in the classroom and hallways now.

MW2-P30 :>>>> because I am from a town where there is not much diversity and I wouldn't have been exposed to that otherwise more than likely.

MW2-P25:>>>>I learned that different students respond differently to different tasks, so it's important to have several options available in order for all of them to be engaged and learning. Also, there is an order by which tasks should be approached, starting with review and working their way up to more difficult tasks.

MW2-P23 :>>>> SimSchool helped me to realize that with comes diversity, comes diverse teaching methods and instructional strategies. The needs of some students may be more extreme than others, so educators need to be prepared for this in their classrooms.

MW2-P05 :>>>> I do think that sim school gave us simulators an idea of diverse learners. There will be those in our classroom who can follow along with the rules and standards just fine and there will be those who struggle to meet the standards. We will face students whose behaviors intervene with their learning, and we will have students who are ESL or ELL. This whole simulation process presented this idea.

MW3-P02 :>>>> I understand the needs of diverse learners from SimSchool because this simulation provided a wide variety of classrooms and students of which all had different abilities and skill levels.

MW3-P08 :>>>> I believe simSchool did an excellent job at training me to understand the needs of diverse learners, they constantly used diverse students in the classroom to challenge and teach me. It was very effective.

MW3-P06 :>>>> I think it has helped me realize that I will face diversity in my own classroom. I have also learned how to implement strategies to help with ESL's.

From these responses it is evident that for these students that simSchool increased their understanding of the educational needs of diverse learners. From the open ended responses the following common themes were identified.

Did Help	Did Not Help
Amount of Diversity in a Classroom	**Not a Real Classroom**
Type of Diversities in the Classroom	**Not Enough Interaction**
Use of Differentiation	**Not Realistic Enough**
Spending Equal Time with All Students	
Realize I AM Not Trained in Diversity	
Convenience of simSchool	
Protection to Students	
Diversity Training Aspect of simSchool	

Implication of Study

There are five implications from the research study. First, the use of the simSchool may help to meet requirements of accredited organizations for the training of preservice teachers in the understanding of diverse learners. Using the simulation helped assure that all preservice teachers develop an understanding of different types of diverse learners and an understanding of the educational needs of each type of diverse learners. Second, using simSchool may be a means to help universities with teacher certification programs in the preparation of preservice teachers' understanding of diverse learners when placement of preservice teachers at schools with diverse students is limited or unavailable. This allows a way for preservice teachers to develop an understanding of all types of diverse learners when a field experience does not have a diverse population. Third, simSchool may be used as a supplement to field experiences and course work in training preservice teachers in understanding the needs of diverse learners. Using simSchool as a supplement to well-designed courses and field experiences may add value to a preservice teachers' understanding of the educational needs of diverse learners. Fourth, simSchool is a means of simulating a real classroom or simulating a particular student in order to try out different strategies to increase teacher effectiveness, thus leading to a possible increase in student achievement. The simulation allows a teacher to try multiple strategies using simulation that would not harm real students. Fifth, simSchool is a way of providing training to in-service teachers on the understanding of the educational needs of diverse learners. This use is supported by creating

simClasses representing diverse learners and allowing in-service teachers to teach these simulated classrooms in order to develop a greater understanding of diverse learners.

Conclusion

The purpose of this study was to evaluate the use of the SBL tool, simSchool, as a mean to enhance preservice teachers' understanding of the educational needs of diverse learners by replicating the Midwestern university original study across three Midwestern universities. After the analysis of the quantitative and qualitative data, the researchers determined that results of the study supported the use of simSchool as an aid to increasing preservice teachers' understanding of the educational needs of diverse learners were replicated across the three Midwestern universities. The researchers also conclude that additional studies need to be collected not only at the three current Midwestern universities but other universities. At the time of this submission, an additional 4 – 5 year study referred to as Multi-University simSchool Project (MUSP) among 12 universities across the United States and Puerto Rico began in the fall of 2016.

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Table 1: Cluster 2 - preservice teachers' beliefs that their professional courses are preparing them to deal with multicultural approaches to education

		Mean						
University	**Cluster**	**Pre**	**Post**	**n**	***t*-value**	**cv**	***p*-value**	
MWC+	**2**	**24.500**	**21.990**	**126**	**-3.9539**	**-1.6571**	**<0.0000**	****
MWO++	**2**	**25.765**	**23.559**	**34**	**-1.6430**	**-1.6920**	**0.0550**	

MWC^{+} - All 3 Midwestern Universities Combined Data

MWO^{++} - One Midwestern University Original Study

*** Significant at Alpha 0.05, ** Significant at Alpha 0.01**

Table 2: Please rate SimSchool with regard to its effect on you in the following areas:

Likert Scale	Likert Scale Value	Skill in dealing with diverse learners.		Knowledge about diverse learners.		Confidence in dealing with diverse learners.		Understanding of diverse learners.		Providing techniques when dealing with diverse learners.		As training to you as a preservice teacher in the understanding of diverse learners.	
		N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)
Decreased Greatly	1	12	8.4	8	5.6	7	4.9	7	4.9	7	4.9	8	5.6
Decreased	2	3	2.1	4	2.8	3	2.1	1	0.7	1	0.7	3	2.1
Somewhat Decreased	3	7	4.9	3	2.1	5	3.5	4	2.8	7	4.9	2	1.4
Neither Increased or Decreased	4	53	37.1	50	35.0	65	45.5	55	38.5	68	47.6	63	44.1
Somewhat Increased	5	42	29.4	42	29.4	35	24.5	42	29.4	30	21.0	34	23.8
Increased	6	21	14.7	29	20.3	20	14.0	25	17.5	23	16.1	22	15.4
Increased Greatly	7	5	3.5	7	4.9	8	5.6	9	6.3	7	4.9	11	7.7
		143	100.0	143	100.0	143	100.0	143	100.0	143	100.0	143	100.0
MWC Total Likert Scales 5 - 7	5 - 7	68	47.6	78	54.5	63	44.1	76	53.1	60	42.0	67	46.9
MWO - Total Likert 5 - 7	5 - 7	19	55.9	19	55.9	16	47.0	17	50.0	14	41.1	19	55.8

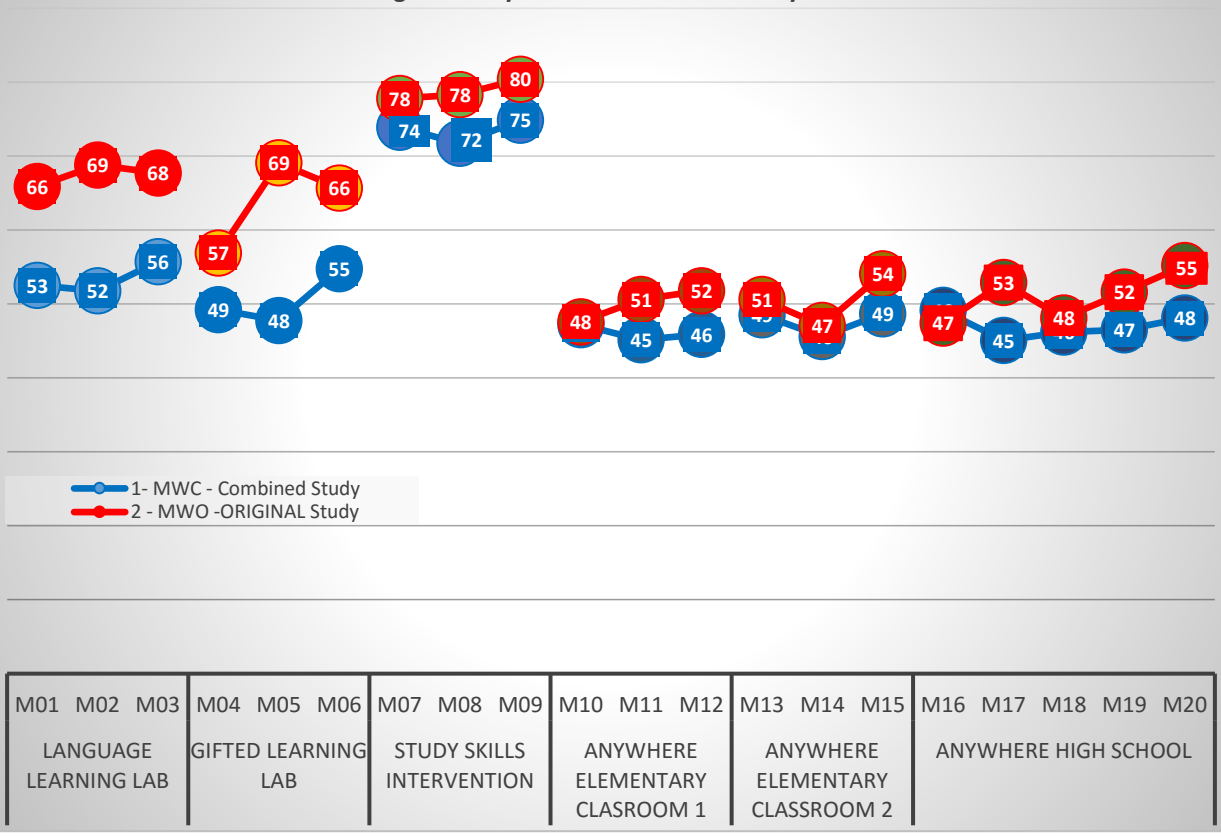
Table 3: Please rate SimSchool with regard to its effect on you in the following areas:									
Likert Scale	Likert Scale Value	It has increased my awareness of diversity.		It has increased my understanding of diverse learners.		It has served as training for me as a preservice teacher in the understanding of diverse learners.		It may serve as a an alternative to field experiences in my training as a preservice teacher in the understanding of diverse learners.	
		N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)
Strongly disagree	1	23	16.1	21	14.7	27	18.9	40	28.0
Disagree	2	17	11.9	14	9.8	19	13.3	21	14.7
Somewhat Disagree	3	9	6.3	9	6.3	12	8.4	14	9.8
Neither Agree or Disagree	4	21	14.7	25	17.5	23	16.1	23	16.1
Somewhat Agree	5	31	21.7	32	22.4	31	21.7	24	16.8
Agree	6	29	20.3	28	19.6	21	14.7	12	8.4
Strongly Agree	7	13	9.1	14	9.8	10	7.0	9	6.3
		143	100.0	143	100.0	143	100.0	143	100.0
MWC Total Likert Scales 5 - 7	5 - 7	73	51.0	74	51.7	54	37.8	45	31.5
MWO - Total Likert 5 - 7	5 - 7	15	44.1	14	41.2	12	35.3	15	44.1

Table 4: Comparison of SSRQ Survey Data Analysis for MWO vs MWC											
Theme	ESL		Ethnicities		Exceptionalities		Socioeconomic		Diverse Learners Overall		Total Responses
	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	N	Frequency (%)	
Did Help											
MWC	**36**	**26.5**	**69**	**50.7**	**77**	**56.6**	**35**	**25.7**	**81**	**59.6**	136
MWO	**9**	**26.5**	**14**	**41.2**	**20**	**58.8**	**9**	**26.5**	**21**	**61.8**	34
Did Not Help											
MWC	**100**	**73.5**	**67**	**49.3**	**59**	**43.4**	**101**	**74.3**	**55**	**40.4**	136
MWO	**25**	**73.5**	**20**	**58.8**	**14**	**41.2**	**25**	**73.5**	**13**	**38.2**	34

MWC - All three midwestern universities conbined data

MWO - One midwesern university original study

Figure 1: Teacher Efffectiveness Data from simSchool Modules (%)
MWU - Original Study & MWU Combined Study



M01 M02 M03	M04 M05 M06	M07 M08 M09	M10 M11 M12	M13 M14 M15	M16 M17 M18 M19 M20
LANGUAGE LEARNING LAB	GIFTED LEARNING LAB	STUDY SKILLS INTERVENTION	ANYWHERE ELEMENTARY CLASROOM 1	ANYWHERE ELEMENTARY CLASSROOM 2	ANYWHERE HIGH SCHOOL