CLASSROOM MENTAL MODELS AND TECHNOLOGY EXPERIENCES

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Abstract

This study explored teacher candidates' self-created images depicting their teaching and future classroom. Associations between early technology experiences were also explored. The study used survey data related to early technology experiences and a modified version of the Draw a Science Teacher Teaching-Checklist (DASTT-C). Survey results from participants' early technology experiences showed that participants reported far more experience using technology as elementary students than secondary students. Findings also suggested that there was not a statistically significant mean difference between the pre and post self-created images. However, mean scores from pre- to post-scores do suggest that following course participation the preservice teacher candidates seemed to transition from a traditional teacher-centered classroom towards a more student-centered environment with the integration of technology.

Keywords: mental models, DASTT-C, preconceived beliefs, technology

Teacher candidates come to their education program with preconceived beliefs about the role of educational technology; beliefs which were established during their experience as EC-12 students (Ertmer, 2005). Sinclair, Szabo, Redmond-Sanogo, and Sennette (2013) suggest that some preservice teachers entered the education field because they had wonderful teachers who made learning fun while others entered because they had negative experiences and wanted to make a positive change for students. Ertmer (2005) points out that teachers' early experiences with technology, "can shape teacher subsequent encounters for years to come, despite great efforts to persuade them differently" (p. 30). Honest self-evaluation of one's mental images helps to determine the reasoning behind what one teaches, how one teaches, and why one teaches (Schlechty, 2009; Moore, & Whitfield, 2008). In order for teacher educators to better understand teacher candidates' beliefs about technology integration, there is a need to investigate the mental models of teaching and learning that candidates bring to their teacher training (Kearney & Hyle, 2004). If teacher candidates themselves do not recognize and examine their beliefs about teaching with technology, they may perpetuate the teacher-centered methods they experienced as students (Ertmer, 2005).

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Research suggests that teachers who do perpetuate these traditional, teacher-centered methods use technology for low-level activities; those teachers with constructivist beliefs tend to use technology to support higher-level, student-centered learning (Judson, 2006; Roehrig, Kruse, & Kern, 2007). Park and Ertmer (2007) concluded that in order to change teacher technology integration practices, it is important that teachers embrace a more student-centered pedagogy. Although studies have been conducted to understand the impact of effective technology integration and teacher beliefs (Anderson & Maninger, 2007; Rehmat & Bailey, 2014), there is much less research on specific technology-integrated pedagogical strategies such as an educational technology course and the potential of the educational technology course to help teacher candidates shift from a traditional instructional approach to a more constructivist, student-centered approach. The following questions guided this study:

1. Is there a statistically significant mean difference between how teachers perceive their classroom prior to taking an educational technology course and how they perceive their classroom following course participation?
2. What were participants' prior experiences with technology during their EC-12 experience?

Literature Review

Research supports the view that teacher candidates enter their education programs with preconceived beliefs about their role as a teacher as well as the behaviors of their future students. They often possess mental images of their future classrooms that are limited to their own personal experiences (Thomas & Pedersen, 2003). Altering, adapting, or expanding these beliefs is a challenge faced by education programs (Chiodo & Brown, 2007). Modeling appropriate teaching and learning environments with opportunities to reflect on their own perceptions can be an effective means for helping teacher candidates address the gaps in their beliefs and the practices that are included in their education programs (Ambusaidi & Al-Balushi, 2012).

Mental Models

According to Thomas, Pedersen, and Finson (2001) "perceptions of ability and capability depend heavily on one's prior conceptualizations about oneself" (p. 296). These perceptions form internal, mental models of interaction (Norman, 1983). According to Norman (1983), mental models provide the following: (1) a belief system, reflecting beliefs acquired through observation, instruction, or inference; (2) observability, providing correspondence between the mental model and the physical world; and (3) predictability, allowing a person to understand and anticipate the behavior of a physical system. Drawings can be used as a good source of information when used to represent one's mental models. Yilmaz, Turkmen, Pedersen, and Cavas (2007) reported, "preservice teachers' personal theories and

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experiences were most influential in how they represented (through drawings) their perception of science teaching" (p. 11). Furthermore, the preservice teachers stated, "their images of science teaching are what they think science teaching should be, shaped by experiences throughout their life" (Yilmaz, et al., p. 11). Minogue (2010) states "drawings allow one to consider the setting, the arrangement of objects in physical space, and interactions in their depiction of a mental image" (p. 769). Furthermore, drawings represent vivid images of interior understandings that can be captured rather quickly (Hancock & Gallard, 2004).

Preservice Teacher Beliefs about Teaching and Learning

Beliefs can be defined in many ways. According to Pajares (1992) and Tobin, Tippins, and Gallard (1994), beliefs include attitudes, confidence, motivation, self-concept, and self-esteem. Clark (1988) identifies teachers' beliefs as preconceptions and implicit theories. Clark noted that these beliefs seemed to be "eclectic aggregations of cause-effect propositions from many sources, rules of thumb, generalizations drawn from personal experience, beliefs, values, biases, and prejudices" (p. 5). For the purpose of this study, belief will be defined by Hancock and Gallard's (2004) definition as "an understanding held by an individual that guides that individual's intensions for action" (p. 281).

Research has found that teacher education programs play an important role in the development of preservice teachers' beliefs regarding teaching and learning (Hancock & Gallard, 2004; Northfield, 1998). Research has also found that methods courses have been shown to be effective in the development of beliefs (Osisioma & Moscovivi, 2008) as those courses are designed to influence beliefs and teaching practices during preservice training (Connor & Scharmann, 1996). Tobin's (1993) research on science teachers' beliefs in various settings concluded "learning about teaching science is best accomplished by direct experience of the teacher-learner in conjunction with opportunities to reflect critically on experience and emergent problems" (p. 242). Hancock and Gallard's (2004) study seeking to understand the impact of field experiences on beliefs developed by preservice science teachers found field experiences both reinforced and challenged beliefs held by preservice science teachers. Ucar (2012) found that beliefs of preservice teachers changed over the duration of an elementary science teacher-training program.

Draw a Science Teacher Test Checklist (DASTT-C)

The Draw a Science Teacher Test Checklist (DASTT-C) can be traced back to the Draw-a-Man Test (Goodenough, 1926), a measure of intelligence, the Draw-A-Scientist-Test (Chambers, 1983), an open-ended projective test to provide information regarding children's illustrations of scientists, the Draw-A-Scientist-Test Checklist (Finson, Beaver, & Cramond, 1995), and the Draw-A-Science-Teacher-

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Test Checklist (Thomas et al., 2001). The DASTT-C instrument directs a preservice teacher to "draw a picture of yourself as a science teacher at work" and write a brief explanation of the drawing. The prompts are intended for participants to explain and clarify their drawn images. "The drawings are scored according to a 13-item dichotomous checklist (present or not present) that focuses on three aspects of the teaching-learning process: the teacher, the student, and the learning environment" (Thomas & Pedersen, 2003, p. 319).

Thomas, Pedersen, and Finson (2001) conducted a study to investigate what mental image's elementary preservice students had of themselves as science teachers as well as validate a revised version of the DASTT-C instrument. The purpose of the study was to determine if participation in a science methods course had an effect on preservice teachers' images of themselves as science teachers (Thomas et al., 2001). Twenty-seven elementary education majors participated in the study. The DASTT-C was administered to the preservice teachers during the first meeting of their science methods course. Three different aspects of the teaching-learning process were looked at: the teacher, the student, and the environment. In addition, this study also included a narrative data component and participant interviews. The researchers found that participation in a science methods course had an effect on preservice teachers' images of themselves as science teachers, with changes representing a shift from teacher-centered instruction to more student-centered inquiry-based instruction (Thomas et al., 2001).

To extend Thomas, Pedersen, and Finson's 2001 study, Thomas and Pederson (2003) conducted an additional mixed methods study to determine what images preservice teachers have of themselves as elementary science teachers, what defines the learning experiences of these preservice teachers, and how preservice teachers modify their ideas about themselves as science teachers by the end of a methods course semester. One hundred fifty elementary preservice teachers enrolled in a beginning elementary science methods course participated in the study. The DASTT-C was administered to the preservice teachers on the first day of class of their science methods course. Participants were also asked to fill out a brief, personal history form designed to elicit information about science courses completed and evaluative comments related to prior science learning experiences (Thomas & Pedersen, 2003). Six of the 150 participants completed the DASTT-C a second time at the end of the semester. Additionally, these six participants recorded interviews discussing and comparing their pre-course and post-course drawings. Results indicated that teachers entered methods courses with a fixed image of themselves as science teachers (Thomas & Pedersen, 2003). The majority of these preservice teachers had a teacher-centered view of science teaching at the beginning of the science methods course. However, preservice teacher images were reinforced and modified during the methods course.

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In a study conducted by Markic, Valanides, and Eilks (2005) science student teachers' view of a typical situation in a science classroom were evaluated by using a modified version of the DASTT-C. The purpose of the study was to evaluate science student teachers' ideas and beliefs about science teaching and to investigate the potential of the modified version of the DASTT-C to distinguish among different groups of freshman students concerning their beliefs and images. One hundred and four freshmen science student teachers participated in the study. Each participant was asked to draw a picture of themselves while teaching science and answer questions on some component of the students' and the teachers' activities as well as the learning environment. Researchers found that chemistry and physics secondary student teachers have a quiet teacher-centered and conventional view on science teaching and learning, whereas biology and primary science student teachers have a more open, student-centered and constructivist view (Markic et al., 2005).

Minogue (2010) conducted a quasi-replication study of Thomas and Pederson's (2003) study to document the use of the Draw-a-Science-Teacher-Test (DASTT-C) as a diagnostic tool for both preservice teacher beliefs about science teaching and science methods course effectiveness. Fifty preservice elementary education teachers participated in the study. Participants were asked to complete the DASTT-C instrument during the first and last meeting of a semester-long science methods course. As in the previous studies three different aspects of the teaching-learning process were examined. Results indicated that there were statistically significant shifts in participants' mental models of science teaching and learning (Minogue, 2010). These changes represented a shift from teacher-centered instruction to more student-centered inquiry-based instruction. As in the previous study conducted by Thomas and Pedersen (2003), the researchers attributed the shift from a teacher-centered to a student-centered instructional approach to participation in the science methods course. This study improved upon Thomas and Pedersen's (2003) study by "employing a non-parametric test of statistical significance that allowed for the direct comparison of categorical data that resulted from the scoring of the teachers' pre-course post-course drawings" (Minoque, 2010, p. 770).

Similarly, Ucar (2012) conducted a cross-sectional study using the Draw a Scientist Test (DAST), Draw a Science Teacher Test (DASTT), and Student Views about Science (SVAS) instruments. The purpose of the study was to document preservice teachers' views on science, scientists, and science teaching. In addition, the relationship between these views and the courses offered over several years in an elementary science teacher-training program were documented. One hundred forty-five preservice elementary science teachers wanting to teach general science in grades six through eight participated in the study. Results indicated that the elementary science teacher training program influenced preservice science teachers' views about science, scientists, and science teaching, with participants' views of science

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teaching changing from teacher-centered to student-centered (Ucar, 2012). The researchers attributed the shift in views to the elementary science teacher-training program. This finding is consistent with previous studies. However, it should be noted that previous studies investigated the change after semester-long method courses, whereas this particular study investigated changes during a four-year training program.

Tatar, Feyzioglu, Buldur, and Akpinar (2012) conducted a study using the DASTT-C instrument to explore preservice science teachers' mental models of science teaching. Additionally, the study investigated whether there is a significant correlation between preservice science teachers' gender and grade levels in terms of mental models. Three hundred preservice science teachers from Turkey participated in the study. Results indicated that the majority of preservice teachers' mental models of science teaching predominately fell into a conceptual teaching style (Tatar et al., 2012). The researchers found no significant difference between male and female participants. However, it should be noted that there was a significant difference between grade levels with regards to the preservice teachers' mental models of science teaching.

Methods

Participants

A random selection from a convenience sample was selected to participate in the study. Participants consisted of undergraduate preservice teacher candidates (n = 50) enrolled in four sections of an educational technology course at a public university in the southeast United States. The same instructor taught all four sections. Participants ranged in age from 18 to 54 with the majority of them being female (90%).

Instrumentation

Participants completed a survey assessing past experiences with technology during their EC-12 education. This survey was based on the CDW-G 21st-Century Classroom Assessment Tool (2010). Survey questions included the participants' use of technology and how that technology was used in their schools. Participants were also administered a modified version of the Draw a Science Teacher Teaching-Checklist (DASTT-C) instrument which asks participants to "Draw a picture of your future classroom including teacher and students" and is followed by the prompt "What is the teacher doing? What are the students doing?" The prompts are intended for participants to explain and clarify their drawn images. "The drawings are scored according to a 13-item dichotomous checklist (present or not present) that focuses on three aspects of the teaching-learning process: the teacher, the student, and the learning

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environment" (Thomas & Pedersen, 2003, p. 319). Total checklist scores can range from 0 to 13 (the higher the score, the more teacher-centered the image).

Data Collection and Analysis

Data were collected during a 15-week educational technology course. During the first week of the course, participants were asked to complete an online survey in Survey Monkey. The survey was open for a two-week period of time for participants to take in order to assess participants' prior experiences with technology during their EC-12 education. The early technology experiences survey was included to determine the source of participants' images of technology or how they perceived their own EC-12 technology experiences. The survey is based on the CDW-G 21st-Century Classroom Assessment Tool (2010).

Participants were asked to complete the Draw-A-Teacher activity during the third week of the educational technology course and then again during the last week of the course. The Draw-A-Teacher activity is an assignment, which asks participants to "Draw a picture of your future classroom including teacher and students" and is followed by the prompt "What is the teacher doing? What are the students doing?". The prompts are intended for participants to explain and clarify their drawn images.

The pre- and post-course self-created images were scored using the modified version of the DASTT-C. The survey data and DASTT-C checklist data was imported into SPSS 22.0 from an Excel document for further analysis. Data were analyzed using descriptive statistics and two-tailed paired t-tests to assess the differences in pre and post participant self-created images in regards to their future classroom.

Results

In the first unit of study for the course, participants completed a survey assessing past experiences with educational technology in their elementary and secondary education as well as demographic data. This survey was based on the CDW-G 21st-Century Classroom Assessment Tool (2010). The following demographic information was collected: gender, ethnicity, age, certification level, and certification content area. The participants were self-designated and consisted of five (10%) males and forty-five (90%) females. In regards to ethnicity, the participants fell into five groups. Eighteen (36%) identified as white, twenty-four (48%) identified as Hispanic, four (8%) identified as Asian or Pacific Islander, three (6%) identified as African American, and one (2%) preferred not to answer. Participants ranged in age from 18-55 years of age, with thirty-two (64%) of the fifty participants ranging in age from 18-24, fourteen ranging in age from 25-34 (28%), two ranging in age from 35-44 (4%), and two ranging in age

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from 45-55 (4%). In regards to participants' certification level, three (6%) were not education majors, thirty-one (62%) were seeking an EC-6th certification level, four (8%) were seeking a 4th-8th certification level, and twelve (24%) were seeking an 8th-12th certification level. In regards to the certification content area being sought, one (2%) was not an education major, twenty-seven (54%) were seeking certification as a generalist, two (4%) were seeking bilingual certification, five (10%) were seeking an ESL certification, three (6%) were seeking math certification, two (4%) were seeking science certification, three (6%) were seeking social studies certification, four (8%) were seeking language arts certification, two (4%) were seeking art certification, and one (2%) was seeking early childhood, non-certification.

Survey results regarding questions of participants' use of technology and how that technology was used during their elementary education showed that participants reported far more experience using technology as elementary students than secondary students (Table 1). Thirty-seven (74%) participants reported yes to being encouraged to use technology every day as an elementary student, nine (18%) reported no to being encouraged to use technology every day as an elementary student, and four (8%) reported not knowing if they were encouraged to use technology every day as an elementary student.

Forty-one (82%) participants reported technology was used in nearly every class during elementary school, six (12%) reported technology was not used in nearly every class during elementary school, and three (6%) reported not knowing if technology was used in nearly every class during elementary school. Thirty-seven (74%) participants reported teachers regularly used technology to teach during elementary school, twelve (24%) reported teachers did not regularly use technology to teach during elementary school, and one (2%) reported not knowing if teachers regularly used technology to teach during elementary school. Forty-six (92%) participants reported teachers regularly assigned class work and/or homework that required the use of technology during elementary school, two (4%) reported teachers did not regularly assign class work and/or homework that required the use of technology during elementary school, and two (4%) reported not knowing if teachers regularly assigned class work and/or homework that required the use of technology during elementary school. Twenty-eight (56%) participants reported having the opportunity to learn new technology applications during elementary school, fifteen (30%) reported not having the opportunity to learn new technology applications during elementary school, and seven (14%) reported not knowing if they had the opportunity to learn new technology applications during elementary school.

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Table 1

Survey Results Regarding Questions of Participants' Use of Technology and how it was Used During Elementary School

	Frequency (*n*)	Percentage (%)
Encouraged to Use Technology		
Yes	37	74.0
No	9	18.0
I Don't Know	4	8.0
Technology Use in Class		
Was Used	41	82.0
Was Not Used	6	12.0
Don't Know	3	6.0
Teachers Regularly Used Technology To Teach		
Did	37	74.0
Did Not	12	24.0
Don't Know	1	2.0
Classwork and/or Homework Required Technology Use		
Yes	46	92.0
No	2	4.0
I Don't Know	2	4.0
Opportunity to Learn New Technology Applications		
Yes	28	56.0
No	15	30.0
I Don't Know	7	14.0

Survey results regarding questions of participants' use of technology and how that technology was used during their secondary education showed that participants reported far less experience using technology as secondary students than elementary students (Table 2). Twenty-three (46%) participants reported yes to being encouraged to use technology every day as a secondary student, twenty-five (50%) reported no to being encouraged to use technology every day as a secondary student, and two (4%) reported not knowing if they were encouraged to use technology every day as a secondary student.

Twenty-three (46%) participants reported technology was used in nearly every class during secondary school, twenty-five (50%) reported technology was not used in nearly every class during secondary school, and two (4%) reported not knowing if technology was used in nearly every class during secondary school. Sixteen (32%) participants reported teachers regularly used technology to teach during secondary school, thirty-three (66%) reported teachers did not regularly use technology to teach during

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secondary school, and one (2%) reported not knowing if teachers regularly used technology to teach during secondary school. Twenty (40%) participants reported teachers regularly assigned class work and/or homework that required the use of technology during secondary school, twenty-seven (54%) reported teachers did not regularly assign class work and/or homework that required the use of technology during secondary school, and three (6%) reported not knowing if teachers regularly assigned class work and/or homework that required the use of technology during secondary school. Fourteen (28%) participants reported having the opportunity to learn new technology applications during secondary school, 34 (68%) reported not having the opportunity to learn new technology applications during secondary school, and two (4%) reported not knowing if they had the opportunity to learn new technology applications during secondary school.

Table 2

Survey Results Regarding Questions of Participants' Use of Technology and how it was Used During Secondary School

	Frequency (*n*)	Percentage (%)
Encouraged to Use Technology		
Yes	23	46.0
No	25	50.0
I Don't Know	2	4.0
Technology Use in Class		
Was Used	23	46.0
Was Not Used	25	50.0
Don't Know	2	4.0
Teachers Regularly Used Technology To Teach		
Did	16	32.0
Did Not	33	66.0
Don't Know	1	2.0
Classwork and/or Homework Required Technology Use		
Yes	20	40.0
No	27	54.0
I Don't Know	3	6.0
Opportunity to Learn New Technology Applications		
Yes	14	28.0
No	34	68.0
I Don't Know	2	4.0

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Participants were asked to draw pre and post pictures depicting their future classroom, including the teacher and students, using a drawing tool such as Microsoft Paint or Paint.net. To assess whether there was a statistically significant mean difference between the pre and post self-created images of the participants in regards to their future classroom, a two-tailed paired t-test was conducted. Table 3 provides the numerical results. Findings suggested that there was not a statistically significant mean difference between the pre and post self-created image scores, $t(49) = 1.620$, $p = .112$. However, mean scores from pre- to post-scores do suggest that following course participation the preservice teacher candidates seemed to transition from a traditional teacher centered classroom towards a more student-centered environment with the integration of technology.

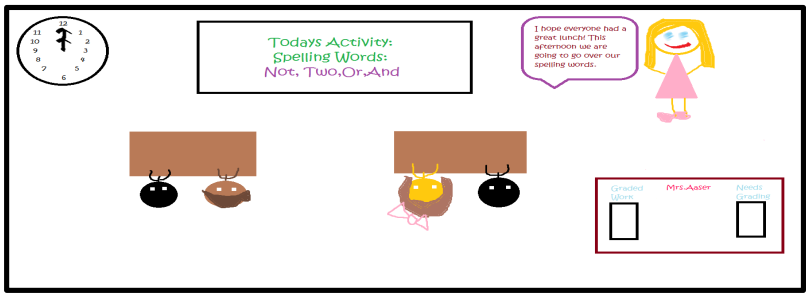
Table 3

Paired t-test Results for Draw-A-Teacher Activity

	Mean	Standard Deviation	Mean Difference	*t*-value	df	*p*-value
Pre-Scores	8.34	2.30	0.60	1.620	49	.112
Post-Scores	7.74	2.28				

Each drawing was scored in categories according to a scale that ranged from teacher-centered to mix to student-centered. The ratings of the participants' pre-course drawings depicted 30% teacher-centered, 62% mixed, and 8% student-centered. Figure 1 is a typical example of the teacher-centered classroom. The teacher is standing at the front of the classroom using the whiteboard to display information to her students.

Figure 1. Teacher-Centered Classroom



Post-course drawings depicted a slight change with post-course ratings of 24% teacher-centered, 56% mixed, and 20% student-centered. Figure 2 is a typical example of a mixed teacher- and student-centered classroom. The teacher is still standing in the front of the classroom giving instructions. However, the students are working in collaborative groups.

Figure 2. Mixed Teacher- and Student-Centered Classroom

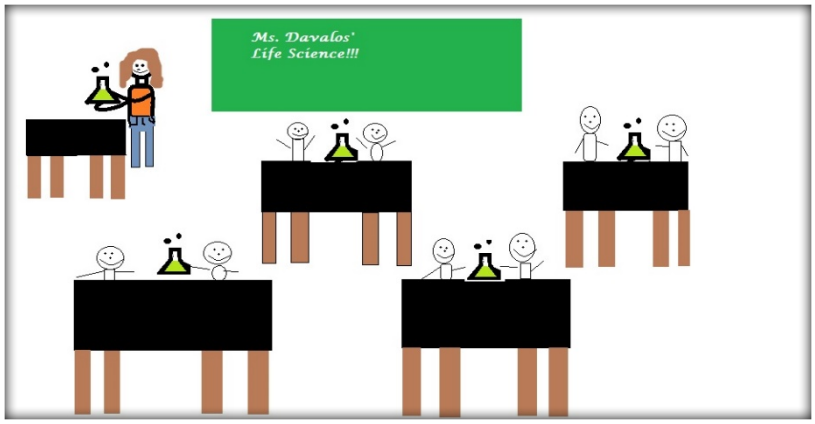


Figure 3. Student-Centered Classroom

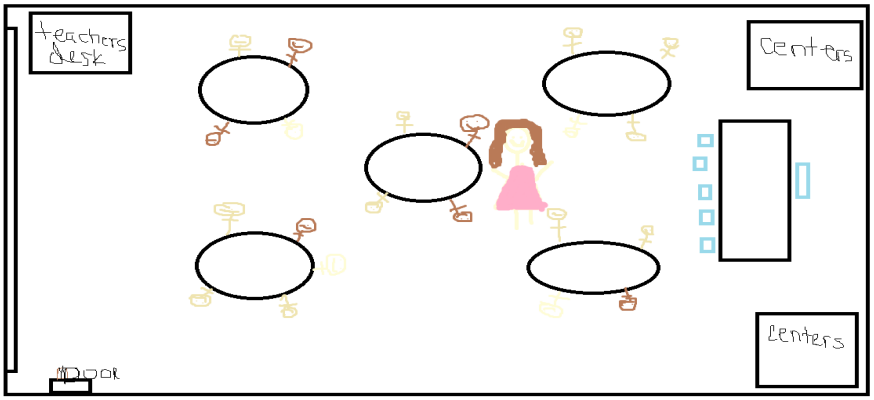


Figure 3. A typical example of a student-centered classroom. The teacher is standing in the middle of the room while students are receiving information from the teacher and working in collaborative groups.

Discussion

The intention of this research was to explore teacher candidates' self-created images depicting their teaching and future classroom and associations between early technology experiences at a public university in the southeast United States. Previous experiences with technology in elementary and

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secondary education influence participants' mental models of their future classroom and those experiences play a critical role in their future classroom and technology integration. Modeling appropriate teaching and learning environments with opportunities to reflect on teachers' own perceptions can be an effective means for helping teacher candidates address the gaps in their beliefs and the practices that are included in their education programs (Ambusaidi & Al-Balushi, 2012.

Results of this study showed that participants reported far more experience using technology as elementary students than secondary students. In addition, results of this study suggest that there was not a statistically significant mean difference between the pre and post self-created image scores. However, following course participation the preservice teacher candidates seemed to transition from a traditional teacher-centered classroom towards a more student-centered environment as suggested by the mean scores. These findings are consistent with previous research that participation in methods courses has an effect on preservice teachers' image of themselves as teachers, with changes representing a shift from teacher-centered instruction to student-centered instruction (Thomas et al., 2001; Markic et al., 2005; Minogue, 2010; Ucar, 2012).

Conclusion

Based on the findings of this study the following conclusions are offered. As indicated in this study there was not a statistically significant mean difference between the pre and post self-created image scores. However, mean scores from pre- to post-scores do suggest that following course participation the preservice teacher candidates seemed to transition from a traditional teacher-centered classroom towards a more student-centered environment with the integration of technology. It is apparent from the literature that participation in methods courses has an effect on preservice teachers' image of themselves as teachers, with changes representing a shift from teacher-centered instruction to student-centered instruction (Thomas et al., 2001; Markic et al., 2005; Minogue, 2005; Ucar, 2012). However, research about teacher beliefs and mental models of preservice teachers has been limited largely to science teaching. Few studies have been conducted to examine preservice teachers' beliefs and ideas with regard to the role of technology in teaching and learning. Based on these findings it is concluded participation in a student-centered educational technology course had an effect on participants' images of themselves as teachers and it should be noted that these findings are consistent with earlier studies (Thomas et al., 2001; Markic et al., 2005).

As part of this study, participants were asked questions regarding participants' use of technology and how that technology was used during their elementary and secondary education. The data analysis revealed that participants reported far more experience using technology as elementary students than

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secondary students. Based on these findings it is concluded that participants of the study possessed mental images of their future classrooms that were limited to their own personal experiences during their elementary and secondary education in pre-course images and these findings are also consistent with prior research. Research supports the view that teacher candidates enter their education programs with preconceived beliefs about their role as a teacher as well as preconceived beliefs about the behaviors of their future students. Teacher candidates often possess mental images of their future classrooms that are limited to their own personal experiences (Thomas & Pedersen, 2003). Altering, adapting, or expanding these beliefs is a challenge faced by education programs (Chiodo & Brown, 2007).

Limitations and Recommendations

There were several limitations that may have affected the study. One of the limitations to the study was a small sample size, which may not be a good representation of the actual preservice teacher candidate population. The current research study was also limited by a sample that represented only one university. It would be useful to determine if other preservice teacher candidates throughout other universities share similar experiences. Another limiting factor to the current study was its limitation of the sample to solely those preservice teacher candidates who were currently enrolled in face-to-face course sections. The study may have yielded different results had the study included preservice teacher candidates enrolled in both online and face-to-face course sections.

Recommendations for future research include the need for additional studies that are comprised of both preservice teacher candidates who are enrolled in both online and face-to-face course sections as it could yield richer data comparing and contrasting their perceptions. Future research could include a longitudinal study to examine use of the DASTT-C to gain sense of the perceptions preservice teachers have of themselves teaching with technology after methods courses and student teaching. In conclusion, this study suggests that preservice teacher candidates' drawings can serve several purposes. Uncovering the images of teachers, students, and technology that preservice teacher candidates hold can be a step toward helping them acknowledge and reconsider their beliefs (Dolloff, 1999). It can also give preservice teacher educators an opportunity to realize, challenge and assess those beliefs and why it is important for studies such as these to continue.

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