The Confidence Level of the Technology Use in Learning Mathematics from Class Teacher Students' Point of View and its Relation to Certain Variables

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Abstract

This study aimed to examine the confidence level of the technology use in learning mathematics from class teacher students' point of view and its relation to certain variables. The sample of the study consisted of (124) class teacher students, from the faculty of educational sciences and arts at UNRWA in Jordan. The sample of the study opposed to "attitudes to technology in mathematics learning questionnaire", and data was analyzed using SPSS program to answer the research questions. Results of the study revealed that the confidence level when using computers was high; meanwhile the confidence level when learning mathematics or when using technology in learning mathematics was middle. Results of the study also revealed that there were no statistically significant differences between the confidence level of the groups according to students' academic year or gender, except for in the domain "confidence when learning mathematics", were the significant differences in favor of male students in comparison with female students.

Keywords: Confidence level, Technology, Mathematics learning, Class teacher.

Introduction

Technology integration in mathematics classrooms for learning and teaching is an important thing to the field of education, not only because today's society is becoming more and more advanced and reliant upon technology, but also because schools are beginning to accept and absorb technology as an essential part of their curricula (Ozel, Yetkiner & Capraro, 2008, p. 80). Center for Technology in Learning (CTL, 2007) stated that: "Both the opportunity to teach math better and to teach better math should be considered in school technology plans and teacher professional development".

The challenge in applying technology in the instruction is to identify teacher preparation programs that lead toward the development of the technology pedagogical content knowledge (TPCK) for teaching mathematics. Grossman (1989 & 1991) developed four components for thinking about the pedagogical content knowledge (PCK); Niess (2005) extended these components to clarify (TPCK) development for teacher preparation programs:

a) An overarching conception of what it means to teach a particular subject such as mathematics integrating technology in the learning;
b) Knowledge of instructional strategies and representations for teaching particular mathematical topics with technology;
c) Knowledge of students' understandings, thinking, and learning with technology in a subject such as mathematics;
d) Knowledge of curriculum and curriculum materials that integrates technology with learning mathematics.

Technology is generally perceived among educators as a vital tool for effective instruction in secondary mathematics classrooms (Franz & Hopper, 2007), and the integration of technology in the learning and teaching of mathematics became a very critical issue (Adamides & Nicolaou, 2004, p. 139).

When using technology teachers aim to initiate students into the process of modeling as a path to the development of various mathematical applications (Hamilton, 2008), but in rural classrooms issues of poverty, low expectations, closed communities, and poor facilities are just some of the challenges (Bush, 2005).

There are many positive effects of technology integration in mathematics, such as: improving attitudes toward learning, increasing student achievement and conceptual understanding, and engagement with mathematics. However, the most important thing in the subject is to know how well the technology is used in the integration process of technology and mathematics (Lowther, Ross & Morrison, 2003; Guerrero, Walker & Dugdale, 2004). In a survey of 3,560 public school teachers conducted by the National Center for Education Statistics (NCES, 1999), only 20% of teachers reported that they felt very well prepared to integrate educational technology into their teaching methods.

Teachers who use technology wisely can extend the knowledge of every student, from the student who is gifted to the student who needs a different medium in which to learn (Smith, 2013, p. 25). When teachers plan to teach mathematics, it is useful to help students learn an abstract idea, by providing them with more realistic visualizations. For example, it is easier to see how the variable m in $f(x) = mx + c$ represents a rate of change when the function is graphed and students can explore the connection between m and the gradient (slope) of the line (Roschelle et al., 2007).

If the technology is used well in the classroom environment, it will offer many advantages affect on students achievement, such as individualizing instruction, providing intermediate feedback, and offering games that motivate substantial mathematical thinking (Seefldt, Galper & Stevenson-Garcia, 2012, p. 25). Some problems in mathematics are too hard to be posed in a pencils only classroom; so they require students to experiment with certain objects to see how they respond. Some require visual representations—graphs, diagrams, geometric figures, moving images—that respond to students' questions, answers, or commands (Goldenberg, 2000). Olkun et al. (2005) suggest that in schools, it seems more effective to integrate mathematical content and technology in a manner that enables students to do playful mathematical discoveries; they found that students who did not have computers at home initially had lower geometry scores.

The National Council of Teachers of Mathematics (NCTM, 2000) places great emphasis on the use of technology in mathematics education. Technology is one of the six principles fundamental to school mathematics programs as outlined by NCTM's Principles and Standards: "technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning. Teachers' attitudes play an important role in using technology in teaching and learning mathematics" (p. 24).

The International Society for Technology in Education (ISTE, 1999) published the 'National Educational Technology Standards (NETS)', which is a set of guidelines for the successful use of technology in education. If teachers use technology in their instruction, they shall assess their implementation by referring to NETS, detailed in the Rationale for Technology in Education. Researchers have found that when technology makes abstract ideas tangible, teachers can more easily: build upon students' prior knowledge and skills, emphasize the connections among mathematical concepts, connect abstractions to real-world settings, address common misunderstandings, and introduce more advanced ideas (Bransford, Brown, & Cocking, 1999; Roschelle et al., 2000).

Harold (1998) conducted the relationship between educational technology and student achievement in mathematics; data were drawn from the 1996 National Assessment of Educational Progress (NAEP) in mathematics, consisting of national samples of 6,227 fourth graders and 7,146 eighth graders. The study found that the greatest inequities in computer use are not in how often they are used, but in the ways in which they are used, and computers may serve as important tools for improving student proficiency in mathematics and the overall learning environment of the school. Souter (2002) conducted an action research study aimed to compare the effects of technology enhanced algebra instruction and traditional algebra instruction in terms of student academic achievement, student motivation, and student attitude towards algebra. The study included four teachers and 92 ninth-grade students in five algebra classes. The results revealed that students in technology-enhanced classes had higher achievement scores, were more motivated, and had a more positive attitude than those in traditional algebra classrooms. The researcher recommended that schools should increase the use of technology and the amount of technology integration into secondary algebra classrooms. Lin (2008) conducted a study explored the efficacy of web-based workshops in topics in elementary school mathematics in fostering teachers' confidence and competence in using instructional technology.

The subjects of this study were undergraduate students from the preservice elementary education program, and the results of the study revealed that most of the participants felt confident and comfortable using web-based resources in teaching mathematics. In addition, most of them felt that they were prepared to teach mathematics with technology. Newman et al. (2008) conducted a research to determine the effectiveness of the Alabama Math, Science, and Technology Initiative (AMSTI), which aims to improve mathematics and science achievement in the state's K-12 schools. An important finding of the research is the positive and statistically significant effect of AMSTI on mathematics achievement as measured by the SAT 10 mathematics problem solving assessment administered by the state to students in grades 4-8.

O'Malley et al. (2013) conducted a study to examine the effect of the use of a basic math skill application on an iPad to increase basic math fluency; the study was conducted with 10 students with moderate to severe cognitive disabilities enrolled in a special education school. Findings suggest the iPad is an effective instructional tool to use in academic interventions with students with moderate to severe disabilities. Briefly, the foregoing researches emphasized the role of technology in learning and teaching mathematics, and its effect on students' achievement and their attitudes and beliefs toward learning mathematics.

Research Problem

The current study aims to examine the confidence level of the technology use in learning mathematics from class teacher students' point of view, specifically, this study tried to answer the following questions:

1) What is the confidence level of the technology use in learning mathematics from class teacher students' point of view?
2) Is there any statistically significant difference between means of the confidence level of the technology use in learning mathematics from class teacher students' point of view, according to their academic year?
3) Is there any statistically significant difference between means of the confidence level of the technology use in learning mathematics from class teacher students' point of view, according to their gender?

Research Importance

- The current research has an importance related to the theoretical and practical benefits of its results, which may reflect on teachers' beliefs about using technology in the instruction process.
- The integration of technology and mathematics may enhance students' understanding through modeling the concept or the skill, and this may reflect on students' attitudes toward learning mathematics.
- The use of technology in teaching mathematics enables the teacher to assess students' understanding through the technology itself, which is an alternative assessment method.

Limitations of the Study

- The interpretation of the results depends on the validity and reliability of the instrument that used in the study, though the researcher verified these psychometric characteristics.
- The study was applied to the class teacher students in the faculty of educational sciences and arts, which followed to UNRWA institutions at Jordan, and this makes the generalization of results specific to the study population or a similar community.

Procedural Definitions

- **Technology use in learning mathematics**: the process of implementing the use of different types of technology, such as: computers and calculators in the planning of the mathematics lesson and the execution in the classroom.
- **Confidence level**: the degree of agreement that the give it to the technology use in mathematics. It is measured by student – teacher mark on the items of the questionnaire.
- **Class teacher students**: student in the faculty of educational sciences and arts, studying 4 academic years to be prepared as class teachers for the lower elementary stage in schools.

Methodology and Procedures

Study Sample

The population of the study consisted of all class teacher students in the faculty of educational sciences and arts, which followed to UNRWA institutions at Jordan, in the scholastic year 2012/2013. The sample of the study consisted of (124) students, distributed according to the academic year and gender as shown in table (1)

Table (1): The Distribution of the Study Sample According to the academic year and gender

Gender	Students' Academic year			Total
	Second	Third	Fourth	
Male	12	8	5	25
Female	41	32	26	99
Total	53	40	31	124

Instrument of the Study

"Attitudes to technology in mathematics learning" questionnaire developed by (Fogarty, Cretchley, Harman, Ellerton & Konki, 2001) was applied in the current study. The questionnaire consisted of 34 items divided to three domains:

1) **Confidence when learning mathematics**: this is consisted of 11 items.
2) **Confidence when using computers**: this is consisted of 12 items.
3) **Confidence when using technology in learning mathematics**: this is consisted of 11 items.

All of the items in the three domains of the original questionnaire which were negatively worded items were converted to positively worded items. A Likert-style response format (out of 5 marks) was used, with the following range: 5 (Strongly agree), 4 (Agree), 3 (Neutral), 2 (Disagree), to 1 (Strongly disagree).

The cut points of the confidence level of the technology use in learning mathematics were:

- If the mean greater than or equal 3.67, the confidence level is high.
- If the mean less than 3.67 and greater than 2.33, the confidence level is middle.
- If the mean less than or equal 2.33, the confidence level is low.

(Fogarty et al., 2001) verified of the reliability and validity of the scale. The questionnaire was administered to 289 students, and the factor analysis of the data demonstrated high internal consistency. A repeat administration confirmed the earlier psychometric findings as well as establishing good test-retest reliability.

After the completion of the workout of the scale, and for affirmation purposes, it was given to a panel of (3) judges, who are professional in methods of teaching mathematics and measurement and evaluation and educational technology, to give notes about the validity of the items. Their remarks were taken into consideration. To establish the reliability of the scale, it was applied to (25) students from the population of the study, but from outside of the sample. And by using test-retest, it was found that the reliability coefficient for the overall test was (0.81) which is an accepted value for the research purposes.

Study Procedures

- A scale was developed to measure the confidence level of using technology in mathematics learning, to be applied to the sample of the study.
- After the verification of the reliability and validity of the scale, it was applied to the sample of the study by the researcher himself.
- The results were analyzed by using SPSS program to answer the questions of the study.

Methodology and Study Variables

The research followed the descriptive method, and it had the following variables:

1. The basic variable: the confidence level of the technology use in learning mathematics.
2. The secondary variables:

    a) Students' academic year.
    b) Students' gender.

Statistical Treatment

To answer the questions of the study, the following statistics were made: Means of the students' responses to each item of the scale were computed to answer the first question. ANOVA was used to compare between the means of the students' responses according to students' academic year. T-test was used to compare between the means of the students' responses according to students' gender.

Study Results

Results of question (1): What is the confidence level of the technology use in learning mathematics from class teacher students' point of view?

To answer the first question, means of the students' responses to each item of the scale were computed. Table (2) shows the means and confidence levels of the items of the domain: Confidence when learning mathematics.

Table (2). Means of the items of the domain: Confidence when learning mathematics

No.	Item	Mean	Conf. level
1	I have less trouble learning mathematics than other subjects.	3.51	middle
2	When I have difficulties with mathematics, I know I can handle them.	3.74	high
3	I have a mathematical mind.	3.39	middle
4	It takes me shorter to understand mathematics than the average person.	3.47	middle
5	I feel myself able to learn mathematics.	3.84	high
6	I enjoy trying to solve new mathematics problems.	3.61	middle
7	I have never found mathematics frightening.	3.33	middle
8	I find many mathematics problems interesting and challenging.	3.43	middle
9	I understand how some people seem to enjoy spending so much time on mathematics problems.	3.48	middle
10	I have never been very excited about mathematics.	3.40	middle
11	I don't find mathematics confusing.	3.54	middle
Total		3.52	middle

Results in table (2) revealed that most of the items and the total domain have middle confidence level when learning mathematics. Results in table (2) also revealed that the item "I feel myself able to learn mathematics" had the highest mean between the items in the domain; meanwhile the item "I have never found mathematics frightening" had the lowest mean of the items.

Table (3) shows the means and confidence levels of the items of the domain: Confidence when using computers.

Table (3). Means of the items of the domain: Confidence when using computers

No.	Item	Mean	Conf. level
1	I have less trouble learning how to use a computer than I do learning other things.	3.31	middle
2	When I have difficulties using a computer I know I can handle them.	3.73	high
3	I am what I would call a computer person.	3.46	middle
4	It takes me much shorter to understand how to use computers than the average person.	3.33	middle
5	I feel myself able to learn how to use computers.	3.99	high
6	I enjoy trying new things on a computer.	3.84	high
7	I have never found to use computers frightening.	4.15	high
8	I find many aspects of using computers interesting and challenging.	4.00	high
9	I understand how some people can seem to enjoy spending so much time using computers.	3.92	high
10	I have never been very excited about using computers.	3.93	high
11	I don't find using computers confusing.	3.81	high
12	It's ordinary that I'm not good enough with computers to be able to use them to learn mathematics.	2.82	middle
Total		3.69	high

Results in table (3) revealed that most of the items and the total domain have high confidence level when using computers. Results in table (3) also revealed that the item "I have never found to use computers frightening" had the highest mean between the items in the domain; meanwhile the item "It's ordinary that I'm not good enough with computers to be able to use them to learn mathematics" had the lowest mean of the items.

Table (4) shows the means and confidence levels of the items of the domain: Confidence when using technology in learning mathematics.

Table (4). Means of the items of the domain: Confidence when using technology in learning mathematics

No.	Item	Mean	Conf. level
1	Computing power makes it easier to explore mathematical ideas.	3.81	high
2	I feel I need computers to use them to learn mathematics.	3.69	high
3	Computers and graphics calculators are good tools for my learning of mathematics.	3.88	high
4	I think using technology is worthwhile for learning mathematics.	3.60	middle
5	I think using technology economizes time in the learning of mathematics.	3.80	high
6	I prefer to do all the calculations and graphing using a computer or graphics calculator.	3.59	middle
7	Using technology for the calculations makes it easier for me to do more realistic applications.	3.50	middle
8	I like the idea of exploring mathematical methods and ideas using technology.	3.57	middle
9	I want to get better at using computers to help me with mathematics.	4.03	high
10	The symbols and language of mathematics are bad enough already without the addition of technology.	2.90	middle
11	Having technology to do routine work makes me more likely to try different methods and approaches.	3.55	middle
Total		3.63	middle

Results in table (4) revealed that majority of the items and the total domain has a middle confidence level when learning mathematics. Results in table (4) also revealed that the item "I want to get better at using computers to help me with mathematics" had the highest mean between the items in the domain; meanwhile the item "The symbols and language of mathematics are bad enough already without the addition of technology" had the lowest mean of the items. Results in question (1) revealed that the confidence level when using computers is higher than it when learning mathematics or when using technology in learning mathematics, despite that all the three confidence levels were middle or high, and these results seem to be logical, since learning mathematics in an isolate way has mostly an abstract nature; meanwhile using computers has an applicable nature and most of the work is practical, which gives the student more confidence in practicing the use of computers than the confidence he may earn when learning mathematics abstractly.

Results of question (2): Is there any statistically significant difference between means of the confidence level of the technology use in learning mathematics from class teacher students' point of view, according to their academic year?

Table (5). Descriptive statistics of the three domains according to the student's academic year

Domain	year	N	Mean	Std. Deviation
Confidence when learning mathematics	Second	53	3.57	0.65
	Third	40	3.42	0.75
	Fourth	31	3.56	0.81
Confidence when using computers	Second	53	3.63	0.68
	Third	40	3.73	0.68
	Fourth	31	3.73	0.60
Confidence when using technology in learning mathematics	Second	53	3.51	0.68
	Third	40	3.76	0.72
	Fourth	31	3.67	0.61
Total	Second	53	3.57	0.43
	Third	40	3.64	0.53
	Fourth	31	3.66	0.48

To answer the second question, means and standard deviation of the students' responses to each domain of the scale according to their academic year, were computed. Table (5) shows the descriptive statistics of the domains according to students' academic year.

Table (5) revealed that there were apparent differences between the means of the groups, according to students' academic year. To examine the significance of these differences, the ANOVA test was administered. The results are shown in table (6).

Table (6). ANOVA test results to compare between the means of the groups according to the student's academic year variable

Domain	Source	Sum of Squares	df	Mean Square	F	Sig.
Confidence when learning mathematics	Between Groups	0.568	2	0.284	0.543	0.582
	Within Groups	63.331	121	0 .523		
	Total	63.899	123			
Confidence when using computers	Between Groups	0.282	2	0.141	0.324	0.724
	Within Groups	52.645	121	0.435		
	Total	52.927	123			
Confidence when using technology in learning mathematics	Between Groups	1.491	2	0.746	1.637	0.199
	Within Groups	55.102	121	0.455		
	Total	56.593	123			
Total	Between Groups	0.174	2	0.087	0.381	0.684
	Within Groups	27.582	121	0.228		
	Total	27.755	123			

Table (6) revealed that there were no statistically significant differences between the means of the groups according to students' academic year, in the three domains and the total scale, since the significant level greater than (0.05). This result may be ordinary, since the students in all academic year levels in the faculty of educational sciences and arts have a courses specialist in technology –especially in computer– about the appointment of computer and technology in the learning process, and the student spend a yearly periodic time in schools during his study in the university to become a qualified teacher when he graduates, so he must use technology in his period of training in the school.

Results of question (3): Is there any statistically significant difference between means of the confidence level of the technology use in learning mathematics from class teacher students' point of view, according to their gender?

To answer the third question, means and standard deviation of the students' responses to each domain of the scale according to their gender and T- test, were computed. Table (7) shows the T- test results to compare between the means of the groups according to the student's gender.

Table (7). T- Test results to compare between the means of the groups according to the student's gender variable

Domain	Gender	N	Mean	Std. Deviation	T	Sig.
Confidence when learning mathematics	Male	25	3.82	0.57	2.351*	0.020
	Female	99	3.45	0.74		
Confidence when using computers	Male	25	3.65	0.70	0.311	0.757
	Female	99	3.70	0.65		
Confidence when using technology in learning mathematics	Male	25	3.65	0.72	0.187	0.852
	Female	99	3.62	0.67		
Total	Male	25	3.71	0.53	1.067	0.288
	Female	99	3.59	0.46		

* Indicant on the significant level (α=0.05)

Table (7) revealed that there were statistically significant differences between the means of the groups according to students' gender in the domain "Confidence when learning mathematics", since the significant level less than (0.05), table (7) shows that the differences were in favor of male students in comparison with female students.

This result can be logical, since male students have less anxiety than female students, especially in this age; also the abstract and the commutative nature of mathematics make it difficult so the male students will have most confidence level than female students in learning mathematics. Table (7) also revealed that there were no statistically significant differences between the means of the groups according to students' gender in the domains: "Confidence when using computers" and "Confidence when using technology in learning mathematics", and the total scale, since the significant level greater than (0.05).

This result can be interpreted through clarifying that using computers alone or using technology in learning mathematics, give the opportunity for the student to do and practice during his learning, which reflects on his ability to understand in a better situation, because the student can make connections between the ideas that are required to understand what he learned. So the confidence level when using computer and technology in learning mathematics can be equivalent among students who learn through the same situations and environments.

Conclusion and Recommendations

Technology can enhance student's learning and knowledge in mathematics, it can make the abstract concepts more actual and concrete, so these concepts can be easily related to make generalizations and practice skills, and this reflects on student's ability to solve problems. The use of technology gives the student a brilliant feeling that he can learn and do mathematics easily, because the student to acquire the information through his subjective efforts; which have a strong effect on his confidence of himself in addition to the confidence of his ability to learn
It is recommended to use the technology to enhance students' learning of mathematics. For future work in this area, researchers might conduct other studies to examine the effect of technology on enhancing students' achievement, or to examine the relationship between using technology in mathematics learning and other variables such as critical thinking, intelligence or giftedness.

References

Adamides, M. & Nicolaou, K. (2004). Technology in Mathematics Education. *Science Education International*, 15 (2), 139-151.

Bransford, J.; Brown, A. & Cocking, R. (1999). *How people learn: Brain, mind, experience and school*. Washington, DC: National Academy Press.

Bush, W. (2005). Improving research on mathematics learning and teaching in rural contexts. *Journal of Research in Rural Education*, 20 (8).

CTL (Center for Technology in Learning), (2007). *Why should a teacher use technology in his or her mathematics classroom?*. Texas Instruments by the Center for Technology in Learning, SRI International.

Franz, D. & Hopper, P. (2007). Technology in Mathematics: Issues in Educating Teacher Candidates for Rural Math Classrooms. *IUMPST:* The Journal, Vol. 3 (Technology)

Fogarty, G.; Cretchley, P.; Harman, C.; Ellerton, N. & Konki, N. (2001) Validation of a questionnaire to measure mathematics confidence, computer confidence, and attitudes to the use of technology for learning mathematics. *Mathematics Education Research Journal*, 13 (2), 154-160

Goldenberg, P. (2000). *Thinking (And Talking) About Technology in Math Classrooms*. Issues in Mathematics Education, Education Development Center, Inc.

Grossman, P. (1989). A study in contrast: Sources of pedagogical content knowledge for secondary English. *Journal of Teachers Education*, 40 (5), 24-31.

Grossman, P. (1991). Overcoming the apprenticeship of observation in teacher education coursework. *Teaching and Teacher Education*, 7, 245-257.

Guerrero, S.; Walker, N. & Dugdale, S. (2004). Technology in support of middle grade mathematics: What have we learned? *Journal of Computers in Mathematics and Science Teaching*, 23 (1), 5-20.

Hamilton, C. (2008). *Mathematics and Technology*. Springer Science+Business Media, LLC.

Harold, W. (1998). *Does It Compute? The Relationship between Educational Technology and Student Achievement in Mathematics*. Educational Testing Service, Princeton, NJ. Policy Information Center, ED425191.

ISTE (International Standards for Technology Education Standards), (1999). *National educational technology standards*. Retrieved in 20/8/2013 from http://www.iste.org/

Lin, C. (2008). Beliefs about Using Technology in the Mathematics Classroom: Interviews with Pre-service Elementary Teachers. *Eurasia Journal of Mathematics, Science & Technology Education*, 4 (2), 135-142

Lowther, D.; Ross, S. & Morrison, G. (2003). When each one has one: The influences on teaching strategies and student achievement of using laptops in the classroom. *Educational Technology Research and Development*, 51(3), 23-44.

NCES (National Center for Education Statistics), (1999). *Teacher quality: A report on the preparation and qualification of public school teachers* (NCES 1999-080). Washington, DC: US Department of Education.

NCTM (National Council of Teachers of Mathematics), (2000). *NCTM Principles and standards for school mathematics*. Reston, VA: Author.

Newman, D.; Finney, P.; Bell, S.; Turner, H.; Jaciw, A.; Zacamy, J. & Gould, L. (2012). *Evaluation of the Effectiveness of the Alabama Math, Science, and Technology Initiative (AMSTI)*. National Center for Education Evaluation and Regional Assistance, ED529587.

Niess, M. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge, *Teaching and Teacher Education*, 21, 509-523.

Olkun, S.; Altun, A. & Smith, G. (2005). Computers and 2D geometric learning of Turkish fourth and fifth graders. *British Journal of Educational Technology*, 36 (2), 317-326.

O'Malley, P.; Jenkins, S.; Wesley, B.; Donehower, C.; Rabuck, D. & Lewis, M. (2013). Effectiveness of Using iPads to Build Math Fluency. *Paper presented at 2013 Council for Exceptional Children Annual Meeting* in San Antonio, Texas.

Ozel, S.; Yetkiner, Z. & Capraro, R. (2008). Technology in K-12 Mathematics Classrooms. *Short reports*, 108 (2), 80-85.

Roschelle, J.; Pea, R.; Hoadley, C.; Gordin, D. & Means, B. (2000). Changing how and what children learn in school with computer-based technologies. *The Future of Children*, 10 (2), 76-101.

Roschelle, J.; Tatar, D.; Shechtman, N.; Hegedus, S.; Hopkins, B.; Knudsen, J. & Stroter, A. (2007). *Can a Technology-enhanced Curriculum Improve Student Learning of Important Mathematics?* (SimCalc Technical Report 1). Menlo Park, CA: SRI International. Available at: http://math.sri.com/publications/index.html.

Seefldt, C.; Galper, A. & Stevenson-Garcia, J. (2012). *Active Experiences for Active Children*. Pearson Education, Inc., 3rd Ed.

Smith, S. (2013). *Early Childhood Mathematics*. Pearson Education, Inc., 5th Ed.

Souter, M. (2002). Integrating technology into the mathematics classroom: An action research study. *Action Research Exchange*, 1 (1).