Extended Thesis Abstracts

Teaching with Technology in Elementary Mathematics

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Brenda Mescher graduated from Ball State majoring in Elementary Education with a Mathematics concentration. She received an Honors Undergraduate fellowship to support the research for her honors thesis. Her lesson "What Do You Think?" won a prize in a Texas Instruments pre-service activity contest. Her honors thesis advisor was Dr. Sheryl Stump.

"Technology: opening minds with a new set of keys." I strongly believe that this quote from an unknown author explains the present use of technology very accurately. The use of technology in classrooms, especially in elementary schools, has come a long way over the past fifteen years. When I look back on my own elementary school days back in the eighties, computers were extremely limited and calculators were nearly unheard of in the classroom! Today, however, there are endless opportunities with computers and calculator technology. Within elementary classrooms, you really can open students' minds and send them in new directions with unlimited expectations. When I first came across the quote, it fit perfectly with my senior honors thesis idea.

Teaching with technology is a major marvel in today's classrooms, yet it can also be quite onerous. We are fortunate that it has been on the rise over the past years, and especially on the move in elementary classrooms. In fact, the National Council of Teachers of Mathematics' *Principles and Standards for School Mathematics* [1] states "some mathematics becomes *more important* because technology *requires it*," "some mathematics becomes *less important* because technology *replaces* it," and "some mathematics becomes *possible* because technology *allows* it." These are especially important to keep in mind when lessons are developed. Technology is able to enhance lessons and develop children's minds if used correctly. Ball State's teaching programs offer outstanding opportunities to develop technology skills to be incorporated while teaching. These can be found during required classes, concentration classes,

and also during additional independent study. My personal goal throughout my senior thesis was to research the actual use of technology through literature, conferences, and surveys sent to a selection of three school districts and to a variety of teachers, including pre-service teachers, elementary and secondary teachers, and college professors. I then applied all of the information that I learned and developed a packet of lessons, one for each of the seventeen NCTM sub-standards. Also included in the packet was a personal article called "Technology Turnaround" regarding my experiences, research, my educational aims, and goals for the future. I then distributed these to all twenty-five of the teachers who were a part of my research in order to spread my ideas and information, in hopes of getting them to be more apt to use technology in their classrooms.

Throughout my project, I defined the use of technology as using calculators and computers, including both software and Internet applications. All of my lessons included a title, the standard that applied, materials needed, detailed directions, references, and also extension activities. In addition, any necessary worksheets or patterns were also attached, including posters of Texas Instruments equipment being used. The lessons that I developed varied from using calculators to explore remainders to collecting and graphing data. I used Internet capabilities to explore multiplication and reading graphs. Computer software was used for exploring triangle properties with *Geometer's Sketchpad* and organizing data with *Fathom*. The lessons that I included were focused on grades three to five. However, given the extensions at the end of the lessons, they could easily be adapted to higher-grade levels or for students' personal explorations. Throughout all the lessons, I especially wanted to point out that technology is capable of enhancing the achievement levels of all students, including students from a mixture of educational backgrounds, physical abilities, and socioeconomic levels. The modifications associated with technology and motivation of using technology can be beneficial to all students.

It is important to always seek additional resources and information outside of class work that may allow you to bring ideas into a classroom. I found that was a huge benefit to my thesis. I found myself attending conferences, researching a variety of literature and resources, and submitting one of my lessons to a Texas Instruments pre-service activity contest. In the summer of 2003, I was honored with receiving the grand prize in their contest for one of my lessons, entitled "What Do You Think?"

An excerpt of this lesson appears in Appendix A, and the accompanying student worksheet appears in Appendix B. This lesson incorporates the use of the Internet and TI-83 graphing calculators. The calculators allow students to get to the information more quickly than the paper and pencil graphing that would have taken place in the past and to display the data directly on the screen. The graphing calculators permit students to take the time to explore data. Not only is it a time saver to have the capabilities available in the classroom, but it also makes it easy to add more data or change the graph to explore it further. The most important thing to remember about the technology use is simply that it is involved in the lesson. By adding it to the lesson as a necessary material, students are given the opportunity to become more familiar

with using calculators and develop technology skills that, of course, are always beneficial for their education. The extension activities link this lesson to other content areas, providing the opportunity for students to integrate mathematics with science, reading, nutrition, and more.

As I have come to conclude, technology is very important to use and develop with children. It can be a tremendous tool for your classroom. Personally, I have made the promise to myself that I will continue to gain more insight on the use of technology at all times. I know that I am a life long learner and will constantly seek any resources that will benefit a classroom of children. As I keep in mind my personal goals and expectations, they will always include the use of technology, unlike the expectations that I received when I was in elementary school. I would be more than happy to share more information with you on my research as well as copies of any additional lessons. After all, isn't the following true? "Technology: opening minds with a new set of keys."

References

[1] National Council of Teachers of Mathematics. Principles and Standards for School Mathematics. National Council of Teachers of Mathematics, Reston, VA (2000).

Appendix A: Excerpt from the lesson plan

Standard [NCTM Data Analysis and Probability]

- Develop and evaluate inferences and predictions that are based on data.
- Grades 3-5: Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

Introduction

Students may take a poll from classmates, friends, or family to create their own data and complete a study on their own for pieces of candy eaten in one week and the number of cavities. Alternatively, Internet resources may be used to collect data. For the graphing segment of this lesson, data is provided for the students to work with.

Extension Activities

This lesson could be part of an interdisciplinary unit. In addition to this math lesson, students could do science experiments to find the amount of sugar contained in certain pieces of candy. Nutrition and fitness lessons could be done, to determine ways of balancing diets and finding the best care for body and teeth. Students may be asked to complete additional investigation on the topic and form their own conclusions, which would provide researching skills, such as reading, expressing studies, and displaying the information.

Appendix B: Student worksheet

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What Do You Think?

Name: _____

Use a TI-83 to enter the following set of data into a table.

Pieces of candy eaten during week	Number of cavities
2	0
20	2
24	7
12	5
0	3
8	1

To enter this data:

(a) Begin by clearing any prior lists by using STAT 4: ClrList and then 2nd and any lists that has data (ex: L1, L2)

(b) Enter new data by using STAT1: Edit then push Enter and select appropriate list. (Use list 1 for "Pieces of candy eaten during week" and list 2 for "Number of cavities").

(c) Enter all digits in both lists, pushing enter after each digit. Be sure the numbers line up from list 1 and list 2 (for example, the first line of list 1 should read 2 and the first line of list 2 should read 0).

(d) Press GRAPH to view the graph of the data. (The graph can be viewed closer by using the ZOOM feature of the calculator).

Use the table and the graph to answer the following questions.

1. Make a sketch of the graph.

2. By looking at the table and the graph, what justifications can you make about this topic? Why do you make these justifications?

3. Do you think any further investigation needs to be done in this study? Give reasons to support your answer.

4. If you answered yes to question 3, what further information would you want to know or what additional studies would you complete?

5. After reading this graph and looking at the data, one student made the conclusion that "it is obvious that the more pieces of candy you eat, the more cavities you will have." Do you agree with this conclusion? Why or why not?

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