



Action Research #10

Pre-Service Teachers' Attitudes Toward Graphing Calculators in Math and Science

Pre-service teachers' perspectives strongly depended on the intensity and length of experience they had with the use of educational technology. More experience and practice provides pre-service teachers with a better understanding of the benefits of technology for their future students as well as for their own learning. However, the effect of integrating graphing calculator technology into methods classes – focusing on the pre-service teachers' confidence in the use of this technology – was different for secondary and elementary education participants. The secondary pre-service teachers had more experience with graphing calculators and higher confidence levels prior to taking methods courses. Use of this technology in the methods courses improved their confidence even more. However, for pre-service elementary teachers this technology was new and their confidence was somewhat independent to their perspectives. Many perceived this technology as very useful, but they were not as confident in using it.

The need exists for methods courses to address the pedagogy issues of using graphing calculators. There needs to be a teacher candidate forum to examine their pedagogical perspectives on using graphing calculators in teaching, explore when and how to use graphing calculators in the classroom, and to provide opportunities to practice teaching with graphing calculators.

A recent study by Lyublinskaya, Donoghue and Zhou (2006) tracked the effects of such training on elementary and secondary pre-service teachers in methods classes for math and science. All students were divided into two groups. The first group consisted of undergraduate and graduate students preparing to teach secondary science and math, and who were enrolled in math and science methods courses. The second group consisted of undergraduate students preparing to teach in the elementary schools and who were enrolled in science methods courses. The purpose of integrating graphing calculator based technology into teaching methods courses was to model strategies for integrating this technology into learning and teaching, with the intention of changing pre-service teachers' attitudes towards the use of technology in their future classrooms. The following research question guided the study:

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How were pre-service teachers' (1) knowledge and comfort with the use of graphing calculator technology and (2) perspectives of using graphing calculator technology influenced by the integration of this technology into the methods course?

Instruments. A pre-service teachers' attitude survey was developed. It consisted of three parts. The first part addressed pre-service teachers' attitude towards their experience with graphing calculators. The second part dealt with their comfort level in using graphing calculators for their own learning. The third part addressed their skills and attitudes to using graphing calculators as a teaching tool. The survey was administered at the beginning and end of the methods courses.

1. Secondary Education Group

Participants. A total of 24 unduplicated students were enrolled in the studied secondary education courses. Approximately 58% were preparing to teach mathematics, 13% were preparing to teach science, and 29% were majoring in English and Social Studies. Data for the English and Social Studies students were not included in the analysis.

Results: Only 12% of students reported lack of confidence and experience at the basic skills level. However, at the intermediate level, this number increased to 53%. At the advanced level, as many as 88% of students did not have confidence and experience using graphing calculators and data collection instruments. Pre-/post-comparisons showed gains in perceived experience from the beginning to the end of the course. However, the number of students who felt nervous about the prospect of using graphing calculators increased. On a comfort level index, only one item showed a pre-/post-gain which reached significance. Similarly, in self-estimation of ability to teach, only one subscale item showed a significant gain over the course.

In the final reflections, many pre-service teachers wrote about new features of calculators they have learned in their respective courses. Pre-service teachers' reflections at the end of the semester also demonstrated deeper connections between classroom practice and the use of calculator technology as an instructional tool. Many pre-service teachers made connections between the use of graphing calculators and addressing the needs of students with different learning styles. The majority of pre-service teachers indicated their interest in using graphing calculators with students due to the hands-on and engaging nature of activities that could be done with this technology. Overall 82% of students (pre-service teachers) who completed the final reflection indicated that they are more inclined to use graphing calculators in teaching than before taking the class. Only 18% of students (pre-service teachers) indicated that they have the same inclination as before.

2. Elementary Education Group

Participants: A total of 25 students in a day session and 13 in an evening session. All were enrolled in the undergraduate teaching program.

Results: Differences in the programs precluded combination of data for the day and evening sessions. Note that graphing calculator technology was used more intensively in the evening session. The small numbers in each group substantially reduced the statistical power of the pre-/post-comparisons.

For the day session, pre-/post-survey comparisons showed more teacher candidates reported confidence with the use of graphing calculator technology both for teaching and for their own learning. Particularly, the percentage who felt not confident with the use of graphing calculator technology dropped by more than half. However, the t-test results did not reveal any significant difference for teacher candidates' confidence before and after the class. While not significant, a substantial confidence level increase in using graphing calculators for the candidates' own learning may be noted. The participants' responses about an interest in using graphing calculators and probeware (data collection) were very similar to their perceived importance of the technology itself. T-test results again showed no significant difference between the pre- and post surveys regarding participants' responses to whether the use of graphing calculators and probeware were interesting to them and their future students. However, participants' responses to whether the use of probeware was interesting to their future students demonstrated a fair sized difference in the post survey.

For the evening session, the same fraction of participants (50%) in the pre- and post-surveys thought they were confident in using graphing calculators for their own learning and future teaching. However, the percentage of participants who felt they were not confident in using graphing calculators increased after completion of the course. After the course, more evening participants thought the use of graphing calculators and probeware were interesting to both themselves and future students. Once again, the t-test results revealed a significant pre- and post-difference in participants' responses to whether the use of graphing calculators was interesting to their own learning and productivity and whether the use of probeware was interesting to their future students. In addition, significant pre- and post-difference was found in participants' responses to whether the use of probeware was interesting to their own learning and productivity. A not significant but noticeable difference was found in participants' responses to whether the use of graphing calculators was interesting to their future students.

This study concludes that the perspectives and attitudes of pre-service teachers in their methods courses strongly depend on the intensity and length of experience they have with use of graphing calculators and calculator based data collection devices (probeware). The study also concludes that participants' confidence in the use of technology is somewhat independent of their perspective.

Reference

Lyublinskaya, I., Donoghue, E., Zhou, G. (2006) Pre-service Teachers' Attitudes Technologies In Learning And Teaching Mathematics And Science. Presented to the International T³™ Conference, Chicago, IL, March 9, 2006.