

ETF Funds
Spring 2013 Mathematics Education

This past Spring, Mathematics Education received funds that were used to purchase student licenses of three specific software programs: *The Geometer's Sketchpad*, *Fathom*, and *TinkerPlots*. These programs were used with students in three different courses in the Spring 2013:

- EMS 480: Teaching Mathematics with Technology,
- EMS 581: Advanced Applications of Technology in Mathematics Education, and
- EMS 514: Geometric Thinking.

Numbers of students enrolled in each course is shown in the following table:

Course	EMS 480	EMS 514	EMS 581	Total
Spring 2013 Enrollment	15	17	15	47

We anticipate using any remaining copies of the licenses in Summer 2013 and Fall 2013

Course	EMS 480/580
Summer 2013 Enrollment*	6
Fall 2013 Enrollment*	31

*Enrollment numbers may change

All three programs, *Sketchpad*, *Fathom*, and *TinkerPlots* are used in EMS 480, 580, and 581. Only *Sketchpad* was used in EMS 514.

One learning outcome for EMS 480 is that students will be able to use *Sketchpad*, *Fathom*, and *TinkerPlots* to solve mathematics problems. A final exam is given that tests students' ability to use those tools. In Fall 2012, students were required to purchase the software on their own or use the software in a computer lab on campus. In Spring 2013, each student in EMS 480 was provided free-of-charge copies of the software programs to install on their personal computers. Dotplots, created in *TinkerPlots*, displaying the distribution of final exam scores, medians, and means are shown in Figure 1.

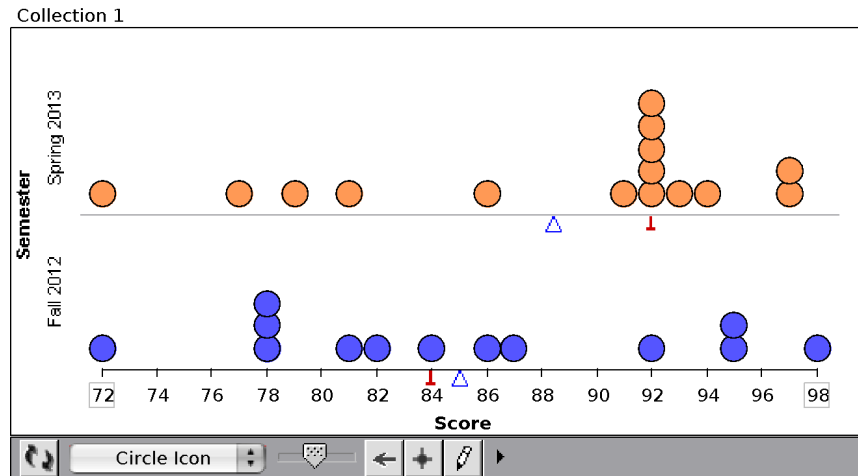


Figure 1.

Although the mean score for Spring13 (88.5) was higher than Fall12 (85), this difference was not significantly different. The distribution of scores indicate the number of students in the Spring semester who scored above 90 more than doubled when compared with those who scored above 90 in Fall12. Thus, access to their own copy of software may have helped some students in Spring 2013 to utilize the three software packages more and practice their skills.

In EMS 581, graduate students build on the skills and pedagogies learned in EMS480 to read research and apply research suggestions to design interactive tasks for students. The interactive tasks place the graduate students in the role of designer and require advanced knowledge of the capabilities within software packages. IN the past, students were required to use *Geometer's Sketchpad* to complete this assignment. To keep costs low for the course, *Sketchpad* was the only software that was highly suggested to purchase (though not all did) and one most likely they would have had the most prior experience using.

In Spring 2013, graduate students in EMS 581 received free student version copies of *TinkerPlots*, *Fathom* and *Sketchpad*. Thus, I slightly changed the assignment for the design of an interactive task to give students more choice of software and topics. Figure 2 below is a dotplot comparison and a t-test conducted in *Fathom* to compare the scores on this assignment from Fall 2011 and Spring 2013. The students in Spring 2013 significantly outperformed students from Fall 2011 on this assignment ($p=0.022$). In addition, while most students still chose *Sketchpad* to complete their task, three students chose *TinkerPlots* in Spring 2013. Since these

three students either were currently teaching statistics in high school or conducting their research on learning statistics, the new assignment and access to this software allowed them to design a task they could use for their teaching and research.

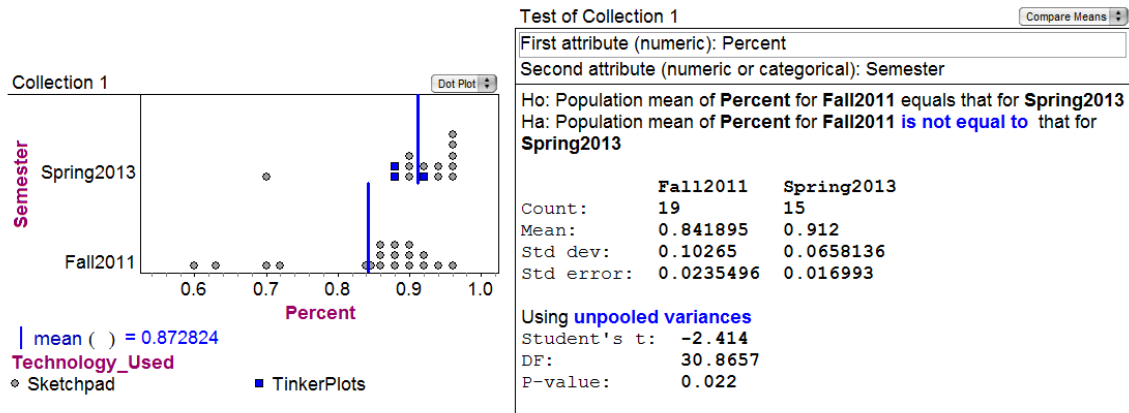


Figure 2.