

Developmental Algebra Program Shows Gains with TI-Nspire™ Technology

Case Study 21

Faculty/Researcher – Alicia Collins
Mesa Community College
Maricopa Community College System
Chandler, AZ



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Teacher/Researcher	Alicia Collins
Location	Mesa Community College Maricopa Community College System, Mesa, AZ
Course	Intermediate Algebra
Grade/Level	Developmental Mathematics
User(s) Profile	1 Teacher/Professor, 40 Students
Technology	TI-Nspire Learning Handhelds, TI-Nspire Computer Software (student version) and TI-Nspire Computer Software – Teacher Edition

Background: The Mesa Community College (MCC) Web site makes clear its commitment to its students, instructional quality and its community:

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Student success is the number one priority of Mesa Community College. For over 40 years, MCC has provided outstanding transfer, career and service programs to the East Valley area of Phoenix, AZ. Our nationally recognized student outcomes assessment program testifies to the faculty's commitment to more than 27,000 students who attend annually. MCC's Center for Teaching and Learning further energizes residential and adjunct faculty to excel in the classroom and in professional development.

For many of those students, developmental math opens the door to college success. Alicia Collins is committed to helping her students walk through that door, and she seeks out opportunities to improve her teaching. TI-Nspire technology caught her attention as a tool that could enhance instruction and student math comprehension.

Ms. Collins' Intermediate Algebra population is approximately 45 percent male, 70 percent white, 10 percent Hispanic and 10 percent Native American with more than 75 percent of students fluent in English.

Curriculum & Teaching: The Intermediate Algebra course uses an MCC custom edition of Robert F. Blitzer's *Intermediate Algebra* textbook. Students were placed in the class using a placement test such as the ASSET, though Ms. Collins comments that the placement exam is under revision.

The classroom is equipped with TI-Nspire handhelds for each student, an overhead projector with TI-Nspire ViewScreen™ panel, TI-Nspire computer software (for student use) and TI-Nspire Computer Software – Teacher Edition.

TI-Nspire documents (class assignments and homework) are distributed to student handhelds using TI Connect-to-Class™ Teacher Software. Ms. Collins rates her familiarity with TI-Nspire technology as high. During one fall semester, she saw a large increase in familiarity with the technology among her students.

Ms. Collins obtains TI-Nspire activities from a variety of sources. She estimates that she creates about 55 percent or more of her activities and she downloads about 20 percent from a TI Web site. Approximately 20 percent of the time, she looks for ideas from colleagues, past graphing activities and textbooks.

Ms. Collins' 45-minute mathematics class meets five days per week. She estimates that 25 percent of class sessions used TI-Nspire technology. During that time, TI-Nspire technology was used for her own demonstration/presentation purposes and by students for hands-on activities using pre-made TI-Nspire documents.

Assessment Method: Course grades are based on tests (55 percent), homework (15 percent) and projects (10 percent), with 20 percent earned by other means. The course does not use pre-testing beyond the placement test.

Results: Ms. Collins found that the TI-Nspire software and handhelds were easy to learn. She commented that she found herself "often wanting more, forgetting that this was a calculator." As a TI-84 Plus graphing calculator user, she found some differences required time in getting familiar, such as using the TI-Nspire keyboard and TI-Nspire documents and the pages within each document's problem.

She was particularly excited by the dynamic mathematics environment of TI-Nspire technology.

The ability to show math in motion is in my opinion the most powerful aspect of the software and the handheld. The software made it easy to create and allowed me to present the mathematics in a much more dynamic way. Our quadratic activity was presented in a way using the software that is simply not possible with other handhelds. I also loved the ease of finding measurements. Finding the slope of a line, length of a line, area of objects and angle were all used throughout my Intermediate Algebra class to discover formulas.

She found TI-Nspire technology's ability to display multiple representations of a problem on a single screen useful, as well.

I thought (TI-Nspire Computer Software – Teacher Edition) was most effective when I was showing inverse functions. I entered points into the table and inserted a graph of the points (which was very cool) then switched the x and y values and created another graph. We then discussed the properties of the inverse function ... it was by far a much better display than previous calculators, [because] the students retained the connection between the two.

She found that TI-Nspire technology was more useful than the average graphing calculator.

In the past, I didn't use the calculator until toward the end of the class and as a tool for learning. This semester, we used (TI-Nspire) software almost daily to show math in action, solidifying mathematical concepts and then performing the paper/pencil tasks. One (example) would be using the remainder theorem and showing that $f(2) = 1$ is the same as a remainder of 1 when dividing and it corresponds to the point on the graph (2, 1). We discovered this graphically prior to performing the algebraic operation. Another (example is in) the section on complex numbers, (where) the students discovered the rules using TI-Nspire technology prior to me formally stating the rules.

Ms. Collins believes that she saw evidence of better understanding among her students, even though she did not see it in test scores. She comments that she is "slowly modifying my test to examine these areas rather than just the mechanics of the math." She states:

I think that many students were able to make a visual connection with the graphing and the action that created the graph. (For example,) I feel that their understanding of inverse functions was heightened. When referring to inverse functions ...the students scored the same on the exam as in previous years, but I felt they left with a better understanding of the concept and will retain the information. When I taught inverse functions using TI-Nspire technology, we plotted points of a function then switched the x and y axes and watched the points move and visually examined the new function while discussing the range and domain. In the past, the students memorized the steps: change $f(x)$ to y, switch x and y, solve for y, replace y with $f^{-1}(x)$. With this TI-Nspire activity, the students still had to memorize steps but I feel they [had a] better understanding of the meaning behind them. Students who were engaged in the activity had a deeper understanding but since I didn't test "big picture" comprehension in the past, it is tough to make a mathematical comparison.