

# TI-Nspire™ CAS Helps Honors Geometry Students Build Deeper Understanding

## Case Study 9

Teacher/Researcher – Annmarie Gagnon, TechBoston Academy, Boston, MA



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Teacher/Researcher	Anmarie Gagnon
Location	TechBoston Academy, Boston, MA
Course	Honors Geometry
Grade	10
Student Profile	20 students
Technology	TI-Nspire CAS technology with projector, The Geometer's Sketchpad®, Excel®, and other calculators

*Ms. Gagnon finds TI-Nspire CAS manipulation and calculation capabilities to be easier to use than other geometry software. Both she and her students were familiar with the representation modes of most use in Geometry within a week of use.*

**Setting:** TechBoston Academy (TBA) is a Boston Public Schools pilot high school that opened in September 2002, designed to integrate technology throughout the college preparatory curriculum. In addition to taking advanced information technology courses, TBA students learn to use technology as a tool to assist them in all academic courses. With the help of an academic advisor, TBA students design an individualized plan of study that takes into account their specific talents and interests. Community service and internships at local companies are requirements for graduation. This allows students to cultivate necessary business and social skills. Students benefit from working on individual and group projects with high-tech mentors from the Boston area. The school has 73 students in classes of 20 or less, and all students have laptop computers.

**Curriculum & Teaching:** Like all the classes at TechBoston Academy, Ms. Gagnon's Honors Geometry class is small (20 students). The class meets daily for one-hour periods. She uses the 2005 edition of Glencoe Geometry. She breaks the class into small groups, and estimates that she was able to cover about 95% of the intended curriculum.

During the course, grades are based on short (8-10 item) quizzes and tests, including open response questions that Ms. Gagnon writes, as well as questions provided by the Boston Public Schools (BPS) Math Office, and taken from past MCAS tests. The course final exam is provided by the BPS Math Office. Quizzes, projects and tests account for 50% of the course grade, an E-Portfolio counts for 10%, and homework and class work each count for 20%.

### Results:

Ms. Gagnon observes that students' use of TI-Nspire CAS technology for generating examples of new concepts, making predictions, or discussing problem solving activity started off as only a weekly activity, but by the end of the course, these activities are a daily practice. By contrast, students' use of TI-Nspire CAS technology to compute or check answers declines over the course of the year, and becomes rare. Throughout the year, students use TI-Nspire CAS handhelds daily to compare answers with other students. The device also is used during the weekly quizzes and tests.

As the year has progressed, Ms. Gagnon notes that she had less of a need to ask questions surrounding operating the handheld or getting the right answer to problems. Asking about reasons for different answers declined from daily to weekly, but her focus on problem-solving strategy and reasoning/justification questions has remained a daily practice throughout the year. "My lessons on the TI-Nspire CAS handhelds have been review-based and/or discovery. TI-Nspire CAS allows students to manipulate a drawing and observe changes in shape and measurements," Ms. Gagnon observes.

Since this is a geometry course, Ms. Gagnon reports that the Graphs & Geometry capabilities of TI-Nspire™ CAS handhelds are of use weekly throughout the year. Multiple representations also find weekly use, when appropriate.<sup>2</sup> She comments that she has wanted the ability to link a table, equation and graph together.

She finds the document-based structure of the TI-Nspire CAS technology to be a great time-saver in class, and she creates and distributes documents to her students weekly. “Unfortunately, my students do not take their TI-Nspire CAS [units] home.” Ms. Gagnon reports. “Thus the ‘save’ functionality has been used to continue work started on a previous day. This has allowed a lesson to continue seamlessly. Students were also able to go back to their drawings /calculations after the class discussed its findings to see where they themselves were correct or incorrect in their actions.”

Ms. Gagnon comments that TI-Nspire CAS technology is equally convenient to pull out and perform a quick operation, or a longer lesson. Students can work through the activities at their own pace. She finds TI-Nspire CAS manipulation and calculation capabilities to be easier to use than other geometry software. Both she and her students were familiar with the representation modes of most use in Geometry within a week of use (though she notes that she still has some things to learn).

Ms. Gagnon cautions that students who are unfamiliar with the functionality of the device can be frustrated and the experience can impede learning. She advocates visualizing and building understanding of content through multiple media, such as the ability to plot points on grid paper to create a linear graph and to graph the line on the TI-Nspire CAS handheld while being able to rotate/move the line to observe changes in the equation of the line.

She strongly recommends professional development for her colleagues, including practicing some lessons. She says that teachers need to understand the connections between multiple views, and she notes that occasionally functionality was not as she expected.<sup>3</sup> “Let the students play and they will show you functionality!” she advises.

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<sup>1</sup> This section is downloaded from the school Web site, [www.techboston.org](http://www.techboston.org), and other sources.

<sup>2</sup> This was a pilot project using pre-production devices, which arrived in November. Unfortunately, the instructor reports that the timing was off; units which would have benefited most from multiple representations had already been covered.

<sup>3</sup> This pilot test was conducted with pre-production software; functionality and user interface enhancements have been added to production units on the basis of pilot testing.

The Geometer’s Sketchpad is a registered trademark of KCP Technologies. Excel is a registered trademark of Microsoft Corporation.