

# Geometry Teacher Reports Gains with TI-Nspire™ Handhelds at Katy, TX ISD

Case Study 38

Teacher/Researcher – Annika Davis, Seven Lakes High School, Katy, TX



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<b>Teacher/Researcher</b>	Annika Davis
<b>Location</b>	Seven Lakes High School, Katy, TX
<b>Course</b>	Geometry
<b>Grade</b>	9-10
<b>Student Profile</b>	41 students in 2 academic classes in 2009-10, compared to 44 students in 2 academic classes 2008-9 Female: 23, Male: 18; White: 48, Hispanic: 26, African American: 17, Asian: 7 71% native English speaking, all but 2 students fluent at grade level Most students college-bound
<b>Technology</b>	TI-Nspire handhelds TI-Nspire Teacher Software Interactive Whiteboard

*This Geometry educator saw gains on quizzes and a chapter test in comparison to results from teaching the same unit the previous year without TI-Nspire technology.*

**Setting:** Katy ISD, in the Houston, TX metropolitan area, has an ethnically diverse, largely college-bound student population. Annika Davis' grade 9-10 Geometry classes are in 3<sup>rd</sup> and 4<sup>th</sup> periods, where her classroom is equipped with plentiful whiteboards and an interactive whiteboard, and desks face the front of the room. In 2009-10, she introduced TI-Nspire handhelds for her students to use.

Mrs. Davis is generally satisfied with the learning climate in her classes. "Overall, most of the students are cooperative. However, there is a lack of motivation. A few of the students are disruptive and need to be redirected quite a bit. In lessons during which the TI-Nspire handheld was used, behavior problems were barely experienced and students were motivated to work."

Mrs. Davis took the opportunity to test the effects of introducing learning activities with TI-Nspire technology into her Geometry class. She decided to compare student performance for one unit from the year before using TI-Nspire handhelds to the first year of using it. She was careful not to make any other changes in her teaching.

**Curriculum & Teaching:** The curriculum is based on the 2007 edition of McDougal Littell's *Geometry* by Larson, Boswell, Kanold and Stiff. Ms. Davis chose Chapter 8 for her comparison.

Mrs. Davis' teaching style includes large-group instruction and dividing the class into teams when appropriate. She reports that students used the handhelds on a daily basis to compute and check answers, and to compare their answers with other students.

On a weekly basis, the students used the technology to generate examples of new concepts or to make predictions, discuss problem-solving strategies, and to take quizzes or tests. She also reports that her questioning style included weekly use of both procedural questions (about how to get the answer) and reasoning questions.

Every week included representations of geometric figures, verbal representations, and multiple representations. She and her students occasionally created documents on the handhelds.

Mrs. Davis says she feels comfortable with using the handheld, and so do her students. "My students understand most geometry functions. They can create a new document (geometry page), add constructions, and save it in a "My Documents" folder". She says most students achieved this level of proficiency in about eight weeks of use.

As an example of how she uses TI-Nspire technology, Mrs. Davis states, "There are a lot of angle relationships in geometry. For example, the measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles.

"To visualize this theorem, I had students construct a triangle and then measure the three mentioned angles. On the side, I had them write the equation  $a = b + c$  and then evaluate the expression using the two remote interior angles as  $b$  and  $c$ . The students realized that the sum of the measures of the two angles was equal to the measure of the one exterior angle. As the students manipulated the size and shape of the triangle, they were able to express the theorem in their own words.

"The activity went very well in class, and, what is more, the activity gave meaning to the theorem. It made the students *want* to figure out why the relationship between the angles actually existed.

"On some occasions, my students used the same document over a period of time exceeding just one class period. It was very helpful that they could "save as." This way, they could use their own document again the next day and continue working where they had left off the previous day.

"A few times, students did not use "save as" and altered the original document. The next student who was going to work with the document realized that they had an altered document. They had to download the original document from my computer, which resulted in a loss of instructional time. I am still trying to figure out the best way for students to save their work without altering the original document or another student's work."

**Assessment Results:** Mrs. Davis reports, "The instruments used in the study were chapter tests and quizzes supplied by the textbook and adjusted by the 2008-09 team of Geometry teachers.

"Before the teaching unit, the 2008-09 team of Geometry teachers collaborated to set clear student goals to be accomplished by the end of the teaching unit. The goals were in line with the TEKS (Texas Essential Knowledge and Skills) and with the objectives supplied by the district.

"In accordance with the previously set goals, the team of teachers worked together before the teaching unit and adjusted the tests and quizzes supplied by their textbook to ensure validity and reliability

"To minimize cheating, in every class two different test forms were administered in a way that next to, behind, and in front of every student, a test was completed different from his or her own."

Chapter test results are summarized here:

### CHAPTER 8 TEST RESULTS

#### Before TI-Nspire

Mean	81.54545
Standard Error	2.454115
Median	84
Mode	78
Standard Deviation	16.27876
Range	69

#### With TI-Nspire

Mean	95.95122
Standard Error	1.557418
Median	99
Mode	100
Standard Deviation	9.97234
Range	47

Results for the two quizzes also showed positive results.

**Observations:** Mrs. Davis reports that “it becomes evident from student reactions to the TI-Nspire handhelds that their use triggers considerable motivation on the students’ part. Even though Mrs. Davis’ students are very comfortable and used to the calculators by now, they still react with phrases like “Oh! That is so cool” and “I wonder what will happen if” as they are working with the software and activities loaded onto the calculators.

“Also, once I have handed out an activity and the students begin working on it, one could literally hear a pin drop in the classroom since the students become completely absorbed by the activity. When questions arise during the activities, the students help each other more than ever, and ask each other and the teacher more questions than they ever ask during regular class.

The greater motivation on the students’ part when using the TI-Nspire handheld causes, in return, a greater motivation on the teacher’s part. For the teacher, it is significantly satisfying to see the students work hard and I get excited about geometry while they are independently discovering crucial geometric concepts. A teacher can tell when some of the weaker students finally “get it” and their faces light up. I am extremely satisfied with the work atmosphere in my classroom as the students are completing TI-Nspire activities.

“Another advantage of using the TI-Nspire handhelds was the ease of differentiating during class time without the students being aware of the differentiation. I just added an extension to the TI-Nspire activity knowing that many students would not have enough time to complete the extension. The students who pick up new concepts quickly worked through the extension and were challenged to apply the knowledge acquired during the course of the activity. Those students who ran out of time and could not complete the extension were reassured that it was okay to not have gotten to the extension.”

Her students were not the only ones who gained a better understanding of geometric concepts by integrating the TI-Nspire into the classroom. Mrs. Davis realized that using TI-Nspire activities improved her understanding of the subject matter as well. “I noticed that when I completed the TI-Nspire activities, I got a better and deeper understanding of the subject matter as well. So did one of my teaching colleagues, who has taught Geometry for over 10 years. All in all, I am a happier teacher.”

Mrs. Davis reports that both her professional development and the online resources for TI-Nspire technology helped her master the technology and effective teaching with it. "I received enough training through the district (I was part of the TI-Nspire cadre) to help me apply the TI-Nspire handhelds in my classes. Once I had been introduced to the TI websites and learned how to download documents onto the handhelds and got to experiment with them, I realized that using TI-Nspire technology in my Geometry classes would be greatly beneficial to my students and to me.

"The Geometry applications on the TI-Nspire handheld make the learning of geometry very visual. Students can manipulate geometry drawings and learn by discovery. Easy access to hands-on learning through a class set of handhelds makes cumbersome trips to the computer lab unnecessary.

"The abundance of documents available on the TI websites is a huge advantage. It is not necessary to create documents of your own. Typing in a topic in the search field makes it easy to find materials on any given topic.

"It was very helpful to be able to use the TI-Nspire Teacher Software at home to check out the available documents to evaluate which ones would be appropriate for my classes."

Mrs. Davis concludes, "I would highly recommend switching to TI-Nspire technology. It is easily accessible and there is an abundance of readily available teaching materials provided by TI that make Geometry easy and fun to learn."

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