

Case study

HP Prime Graphing Calculator

Teachers test HP Prime in advanced math classes



Industry

Education

Objective

Integrate calculators as an optimally effective teaching tool for advanced high school math classes

Approach

Test classroom use of HP Prime Wireless Classroom Graphing Calculator

IT matters

- Provide advanced graphing capabilities in a handheld device
- Interact through touch-enabled full-color screen, or keypad
- Push and pull content wirelessly, monitor and poll students

Education matters

- Foster student discovery, shared focus of attention
- Use class time to do math, not enter data points
- Unleash pedagogic value through advanced applications



“With HP Prime, you don’t have to conform to the way the calculator forces you to represent mathematical objects. That’s much better than what we’ve been doing for 30 years.”

– Mark Howell, AP Calculus teacher, Gonzaga College High School

In high schools throughout the United States, calculators provide an essential tool for teaching higher mathematics to advanced students. Recently, HP sat down with a group of leading math teachers to discuss their classroom use of the HP Prime Graphing Calculator. After one year of use, the teachers shared their findings that HP Prime’s innovative mathematical capabilities—combined with its classroom management features such as wireless content sharing—represent a breakthrough in pedagogic potential.

The HP Prime Graphing Calculator is a touch-enabled handheld device with a keypad, a full-color 3.5 inch diagonal screen, and a long-life, lithium-ion rechargeable battery. Designed for learning mathematics and solving problems, students in courses from Algebra through AP Statistics and Calculus reap the benefits of dynamic geometry, Advanced Graphing and Spreadsheet apps as well as the CAS. In combination with HP Prime Wireless Kit, the HP Prime Wireless Classroom features powerful classroom tools, including the ability to share content wirelessly, poll students, and monitor their progress. How all this translates into pedagogic effectiveness is best described by teachers.¹



Gonzaga College High School

Serving the mathematician, not the machine

Mark Howell teaches Advanced Placement (AP)[®] mathematics and computer science at Gonzaga College High School in Washington, D.C. He's won the Presidential Award from the District of Columbia for Excellence in Science and Mathematics Teaching; served on the AP Calculus Development Committee; and traveled worldwide to advance the use of technology in the teaching of mathematics. Howell has been using the HP Prime in his Advanced Precalculus classes. One of HP Prime's great advantages over previous calculators, he says, is that its advanced graphing capabilities allow users to write equations in a natural form, as they appear in textbooks, rather than having to follow a convoluted series of steps to set up calculations. "You don't have to adapt the way you think in order to accommodate the way the machine forces you to represent mathematical objects," Howell says. "I believe that's where the biggest educational potential lies. You can display equations that you're graphing in a form that reveals underlying mathematical connections. You couldn't do that before."

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With HP Prime, users can easily switch between symbolic, graphical, and numerical

table views with dedicated buttons. The device saves time and keystrokes with RPN and programmable functions, and can be turned into a testing tool in test-mode configuration that makes only pre-approved functions available. "It opens opportunities when you don't have to clear a hurdle to get to the essential work of learning," Howell says.

Howell also takes advantage of HP Prime's wireless connectivity. Some days he takes out a box full of modules that students pick up on their way into class. By the time he gets to his own desk, all the students are connected and he drags-and-drops the application they'll work on that day. "It's a big timesaver," he says. "What's more, it allows everybody to perform the exercise on their own machine. In the past, there was no hope of getting everybody to do it; they just had to sit back and watch me. Now they can be more active in their own discovery."

Prospect High School

Unleashing pedagogic potential

Michael Grasse, an AP Calculus teacher at Prospect High School near Chicago, IL used HP Prime with an Advanced class of Pre-Calculus students who will take AP Calculus BC next year. His students are tech savvy, he says, and like to spend hours with their calculators just to discover what the devices can do. He thinks about the same thing from a teaching point of view: "How am I going to make this machine represent things in ways that are pedagogically valuable?"

"Using HP Prime in class, my students say 'Show my screen; let me show you what I did.' There's a vibe that we're all working together on the same thing."

— Michael Grasse, AP Calculus teacher, Prospect High School

Math long has been taught through representations, Grasse says; students are called to the board, perhaps several at a time, to work on problems and then explain their solutions. HP Prime advances this ability by letting the teacher project student calculator screens to a classroom monitor, fostering interactive learning. "Using HP Prime in class, my students say 'Show my screen; let me show you what I did,'" he says. "There's a vibe that we're all working together on the same thing."

Customer at a glance

Application

Teaching advanced mathematics in high school

Hardware

- HP Prime Graphing Calculator
- HP Prime Wireless Kit



It allows you to explore. You can do all kinds of examples, generalize across them, and learn something.”

Looking forward: evolving application landscape

Paul Buckley is a colleague of Howell’s who teaches AP Statistics at Gonzaga College High School. The HP Prime today provides better graphics than previous calculators, he says, and its classroom management tools represent a significant step forward. The HP Prime Wireless Kit allows teachers to wirelessly view student Prime screens and share content between their PC and up to 60 HP Prime Calculators in a single classroom.

“I’ve used the connectivity kit to set up the wireless network, so I’ve been able to pass on data sets to all the kids,” Buckley says. “Before, I had to spend a lot of time having students enter all the data points. Now I can just cut and paste it into their application box and they can go right to doing real math.” HP has partnered with the publisher of the textbook Buckley uses to make all the data sets used in the textbook available in applications by chapter.

“In AP Statistics students must learn to gather, calculate and analyze data - a sophisticated process of reasoning and maturity,” says Buckley. “The HP Prime along with the Polling capabilities of the Connectivity Kit accentuates and accelerates that process by allowing for immediate gathering of data which is then summarized and disseminated to the students instantly so that they can then work on what the data is and is not saying, which in the end is the most crucial component of the course.”

Buckley looks to HP to extend HP Prime capabilities and educate teachers about them—particularly how HP Prime can help teachers meet Common Core standards. “There are two ways HP Prime is different,” Buckley says. “One is what it can do as a calculator, such as its graphics capabilities. The other differentiator is what HP Prime can do as a classroom tool, with content sharing that enables students to focus right away on discovery and then represent their thinking to the class. Together, these capabilities bring huge potential to support teachers as they engage students to think and learn.”

“In statistics, kids had to spend a lot of time entering data points. With HP Prime, I simply cut and paste data sets into their application box. Students go right to doing math.”

– Paul Buckley, AP Statistics teacher, Gonzaga College High School

Adds Howell at Gonzaga College High School: “We’ve just begun to think about all the different ways this is so much better than what we’ve been doing for the past 30 years.”

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¹ Customers received complimentary HP Prime Wireless Classroom technology including 30 HP Prime graphing calculators with a HP Prime Wireless Kit as part of an HP pilot program.

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