

DoDEA Grant Kick-off Conference

Mobile Math and Science

Shawn Gross

DoDEA Grant Kick-off Conference

Agenda

- Background/Needs Assessment
- Project K-Nect
- Onslow Connect
- Research and Evaluation
- Experimenting with Mobile Learning

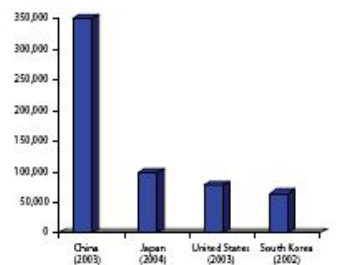
Math and Science Skills Deficit

- The average science score of U.S. students in eighth grade lagged behind those in 16 of 30 countries in the Organization for Economic Cooperation and Development*
- U.S. students in eighth grade were further behind in math, trailing counterparts in 23 countries*
- Employment in science and engineering will increase about 70% faster than the rate for all occupations (*BLS, 2006*), and unemployment is very low for experienced engineers (1.3%) and computer scientists (2.7%) as compared to the national average (4.4%) (*BLS, 2006*).

Math and Science Education

U.S. students are falling behind in math and science, and the foreign competition is increasing. U.S. students rank 24th in the world in math literacy by the time they get to high school (*PISA, 2003*). While from 1995 to 2005 the percentage of U.S. high school students interested in majoring in engineering dropped by nearly 35% (*ACT, 2005*), China is graduating more than four times as many engineers as the United States (*NAS, 2006*). It is predicted that by 2010, more than 90% of all scientists and engineers will live in Asia (*Rice Univ., 2003*).

Engineering Graduates, Selected Countries



Sources: NAS, NCES, NSF (most recent data available)

*Source: Program for International Student Assessment

2006 Research Methodology

- Research initiated with US Department of Education, Office of Education Technology, to investigate how technology can be maximized to increase student achievement in STEM (Science, Technology, Engineering and Mathematics)
- Interviewed students in the DC Metropolitan area in grades 9-12 from DC, Arlington, Montgomery County and Fairfax
- Students were asked a series of questions concerning why they felt so disengaged in Science and Math

Why do you dislike math and science?

- The subject matter is abstract
- I do not understand how I will use this in the real world
- The delivery methods for instruction cause me to “power down” my brain
- Instructional resources are not engaging

How can technology help?

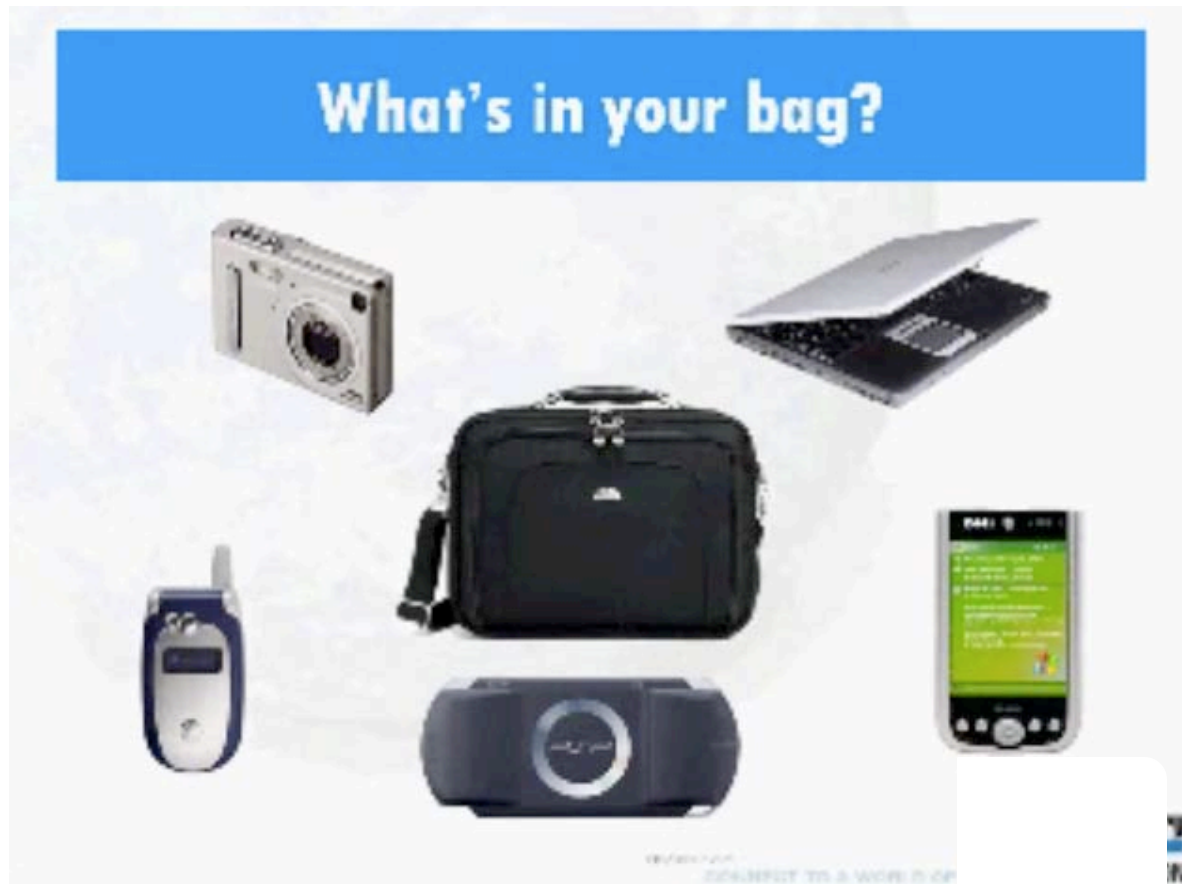
- I would like access to manipulatives and more use of multimedia in these subjects
- I want to see the cause and effect relationships that exist through multimedia
- I want to have access to a support network of students, teachers and tutors anytime, anywhere.
- I want to be able to utilize social networking technologies (instant messaging and blogging)

Do you have device preferences?

90% OF STUDENTS INTERVIEWED PREFERRED
MOBILE DEVICES



mLearning is ubiquitous access



mLearning is connectivity



- Wireless internet
- Take photos
- Display multimedia
- Send / Receive email

(varies by model)

- Access to the internet
- Take photos
- Record video
- Display multimedia
- Send text / Images

(varies by model)

DISCOVER
DISCOVERY
EDUCATION

CONNECT TO A WORLD OF LEARNING

mLearning is personalization



PlayStation



- Wireless internet
- Play high quality video
- Read eBooks
- Listen to audio
- Read blogs
- WiFi capable
 - Opera browser available in Europe, coming soon to US
- Built in microphone
- Touch screen
- Plays video (with add on)

Dell Mini 10 Motorola Droid X Blackberry Tablet
iPad Nintendo DSi
Window 7 Tablet Sony PSP

All you need is an

Macbook Pro Lenovo Thinkpad
iPhone
HTC Evo Android Tablet
Windows 7 Phone iTouch

Mobile Learning Devices

TABLETS



SMARTPHONES



MEDIA/GAME PLAYERS



NETBOOKS/LAPTOPS





WHAT IS PROJECT K-NECT?



Short Term Goals

- To develop, implement and test an integrated system that will deliver supplemental digital instructional content and foster peer to peer collaboration through mobile devices to increase mathematic achievement for 9th grade students in the State of North Carolina.
- To test the efficacy and viability of mobile devices as digital assets that can be utilized as both a social communications tool and educational resource for students in US secondary education institutions.
- To foster the design of a system that enables safe closed social, educational communications between students, teachers and parents.
- To empower students with 21st century skills through secondary education institutions
- To determine if mobile devices can be utilized as a mechanism for reducing the disparity between those who are and are not connected with particular attention on rural areas within the State.

Long Term Goals

- Increase students' levels of interest in mathematics by allowing them to leverage their current lifestyle technologies and enabling them to access dynamic, engaging and meaningful educational content in order to address the nations math and science skills deficit.
- Motivate U.S. students and adults, using a variety of incentives, to study and enter science, technology, engineering and mathematics careers, with a special effort geared to those in currently underrepresented groups.
- Gain acceptance and adoption of parents, teachers and administrators that mobile devices can be used as educational resources to support students' efforts to increase academic performance in secondary education institutions.

Project K-Nect Overview

K-Nect Teacher Portal



Administration of Problem sets
eContent Management System
Monitoring & Reporting System
System Administration of Devices
Virtual Hard Drive
Assessment System

K-Nect Student System



Access to comprehensive problem sets
eContent Repository
Instant Messaging
Blogs
Assessment
Virtual Hard Drive

Problem Based Learning

- A particular emphasis of the design of the Problem of the Week (PoW) environment is rich problem-solving contexts which allow learners to draw on their range of math knowledge skills in problem solving.
- This places the emphasis on thinking about the context of the problem rather than simply drawing on an algorithm for problem solution.
- The design also involves explaining the solution strategy, a practice that leads the learner to reflect on choices and to revise.

Problem Set Design

- Project K-Nect's curriculum is based on Drexel University's Math Forum.
- curriculum is research-based with emphasis on problem solving and scaffolding.
- The repository of 18 math problems is aligned with state standards and can be easily assigned by teachers into students' devices.
- The focus is to engage the students in the application of problem-solving strategies as tools for thinking about and solving problems.
- The curricular foundation is animated problem-based learning, which has the capability to be relevant to youth today and reflect multiculturalism.

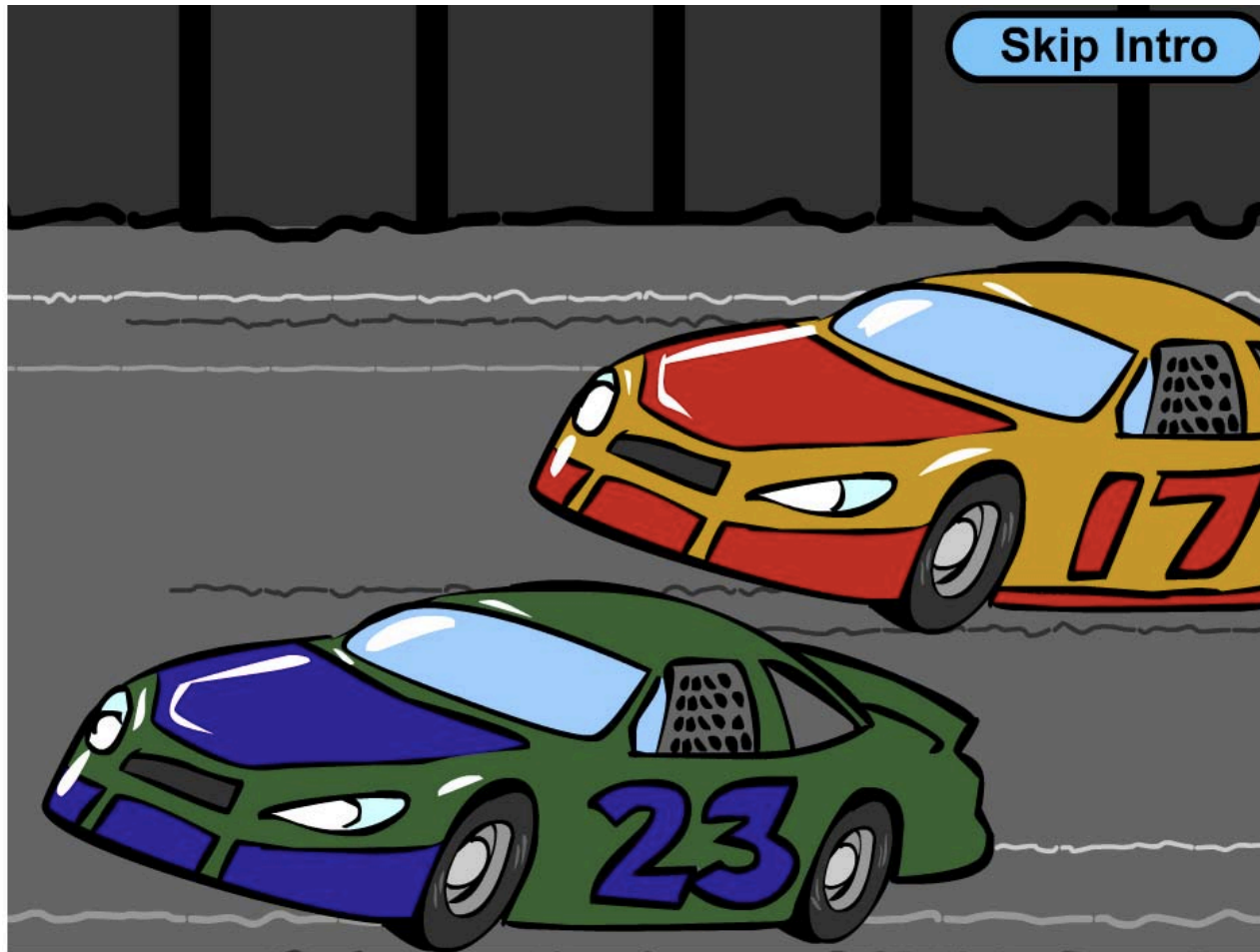
Problem Set Orientation

- Problem sets include the following:
 - a multimedia review of the lesson plan unit
 - video describing the utilization of the problem solving strategy;
 - presentation of the problem
 - applying the problem solving strategy
 - multimedia simulations providing the student with an audio/visual view of the problem
- The problems will have content that stems from real-world situations and will be represented using visual effects, e.g. animation, simulation, pictorial, graphical, tabular along with oral and verbal representations.
- Problems contain content of interest to students in grade 9, age 14-15 years, such as NASCAR racing; music; and sports.

Problem Solving Progression

- 1. Structured Guess and Check:** reading comprehension and pattern recognition.
- 2. Use Tables/Charts:** Organize problem information and data to make patterns and relationships visible.
- 3. Generate Expressions and Equations:** Use symbols to summarize and manipulate quantitative relationships.

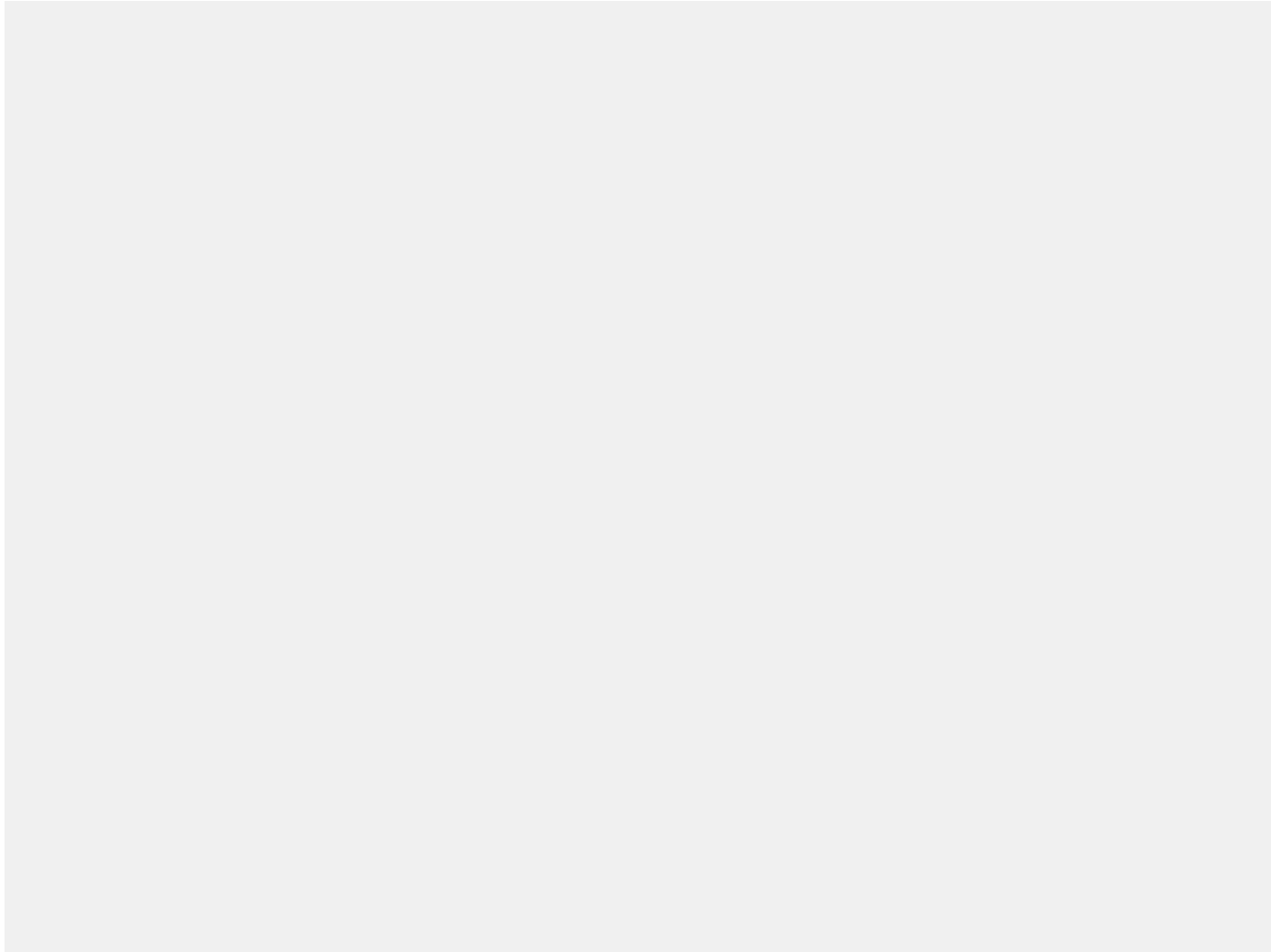
Problem Set Sample



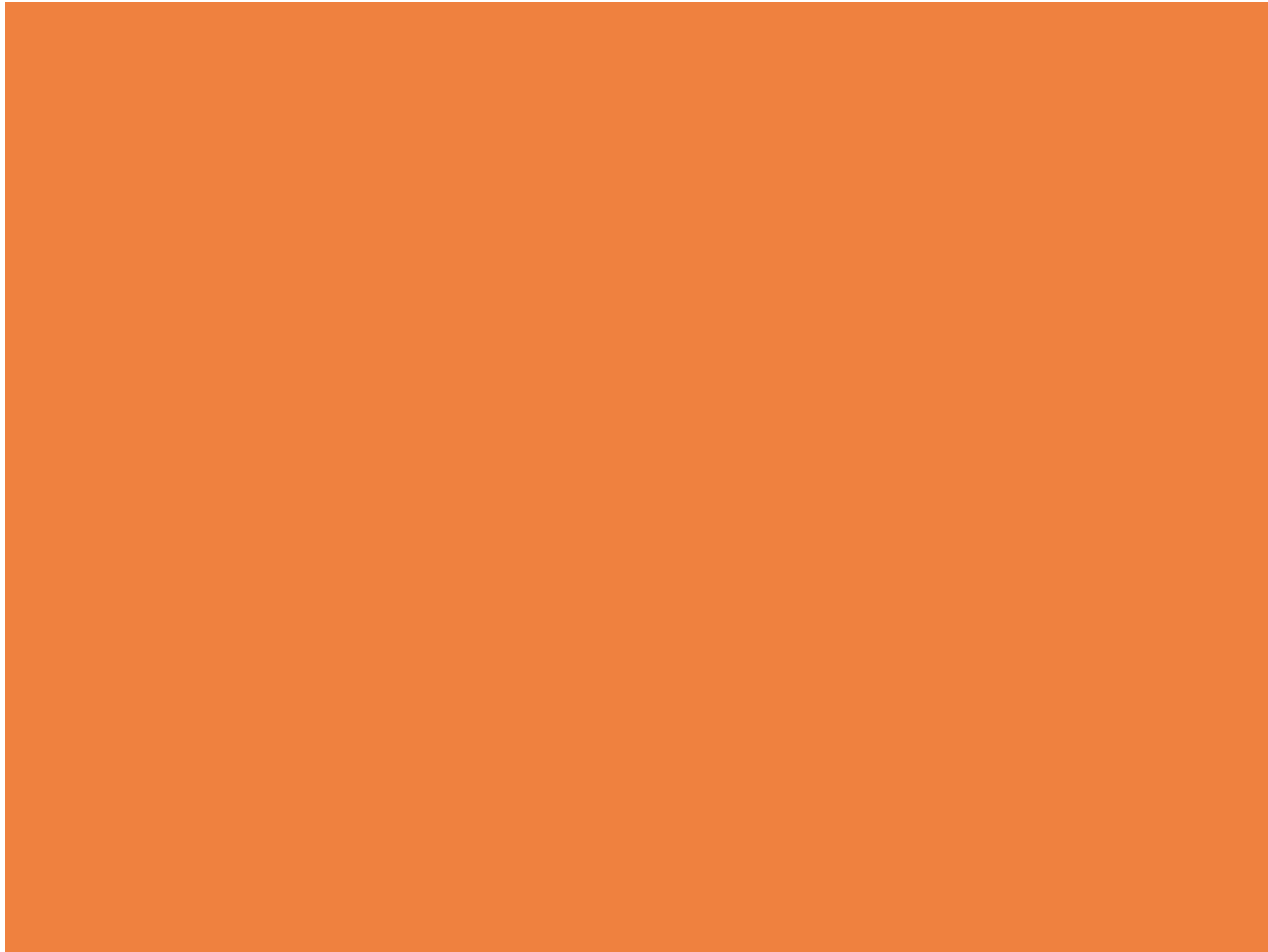
Examples of Blogs - Video



Examples of Blogs - Video



Examples of Blogs - Video



Onslow Connect Overview

- 2.5 million dollars awarded by Department of Defense Education Activity (DoDEA) from October 1, 2009-September 30, 2012
- Will support the most comprehensive math technology program in the nation and a model counseling program for highly transient students
- S2S Transition Program
- Honors the partnership that exists between the school system and the military installations served

Mobile Math Program Overview


- All 7 high schools are participants within the program in Onslow County, NC.
- Program targets 9th grade algebra I students and teachers
- 9th grade algebra I students and teachers will be provided with Netbooks
- Southwest, Richlands and Dixon began the project implementation in January-February 2010
- The program is funded through September 30, 2012





2010 Research Report

Full report can be downloaded at www.tomorrow.org , just click on the Project K-Nect evaluation report link on the homepage.

 *Project K-Nect Evaluation Report* 
July 2010

Students leverage the power of mobile devices through the Project K-Nect Mobile Learning Initiative in Onslow County
Prepared by Project Tomorrow® for Digital Millennial Consulting (July 2010)

"The smart phone is like a teacher in my pocket." – Project K-Nect Student
"I can't go back to the way I taught before Project K-Nect." Project K-Nect Teacher

Project K-Nect, developed by Digital Millennial Consulting and funded in part through Qualcomm's Wireless Reach initiative, is designed to increase student achievement in math and close the digital disconnect for students in Onslow County Schools in North Carolina. The Project K-Nect pilot started in spring 2008 with a group of high school students in Algebra I represented by three school districts across the State of North Carolina with two schools represented from Onslow County. Since then many of the same students, as well as new students, use the smart phones as they progress through their sequence of courses in Geometry, Algebra II, pre-Calc and AP Calculus.

As part of the Project K-Nect classes, students are given smart phones with 24/7 Internet access which they can use at home or school. Students have full access to both the Project K-Nect curriculum, as well as the smart phone features including instant messaging, video and photo capabilities, calculators and Internet access. This report highlights the results of the program evaluation completed by Project Tomorrow, a national education nonprofit organization, during the 2009-2010 school year on behalf of Digital Millennial Consulting. The report highlights the benefits to both teachers and students of incorporating mobile devices in the classroom and the power these devices have to transform both teaching and learning for our students.

Mobile devices have the power to change the way teachers think about their teaching.
"I can't go back to the way I taught before Project K-Nect." Project K-Nect Teacher

Through interviews, the teachers reveal that mobile devices and the problem-based learning approach encouraged through Project K-Nect transformed the way they taught math. The teachers report they now rely more on **facilitation** and less on direct instruction, encourage **students to talk with and teach each other**, and create **relevance** for students by creating assignments that help them see math in their world outside of the classroom. Teachers also report that some of the instructional strategies used with the smart phones were **transferable to other devices**. For example, when smart phones were not available in a particular class, the teacher asked students to complete their assignments using standard cell phones and flip cameras. Teachers also reveal that their change in practice occurred over time as they saw the direct impact on their students' participation in class and End of Course assessment results.

© 2010, Project Tomorrow Page 1

Research Results - 2007

Quantitative

- 4 out of the 4 cohort Project K-Nect Algebra I classes outperformed the other Algebra classes taught by the same teachers on the NC End of Course Exam (EOC) for Algebra I
- All 4 cohort Project K-Nect classes outperformed the other Algebra classes taught by the same teachers with their final grades
- 2 of the 4 teachers reported that students achieved at least a 10% gain in Algebra I over their peers as a result of the program
- The aggregate gain of all 4 cohorts between the pre-test and post-test administered by the research team was 20%

Qualitative

- Students' report using the phone for at least an hour everyday to complete their Algebra work
- Students reported increased parental support with their instruction in Algebra.
- Students reported increased communication and collaboration with their teachers
- Students reported increased communication and collaboration with their peers regarding questions they had regarding their homework assignments
- Students felt supported by the project team and their teacher for communicating via the device for remote support
- Students reported a better understanding of the mathematics because of real world applications associated with the curriculum
- Students indicated that because they had continuous access to mathematical resources on the mobile device, their instructional time dedicated to Algebra significantly increased

Research Results – 2008/9 (Algebra I)

Southwest High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Algebra I	S. Kliewer*	91%	Spring 2009
Algebra I	Teacher A	76%	Spring 2009
Algebra I	Teacher B	60%	Spring 2009

Dixon High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Algebra I	H. Spring*	93%	Spring 2009
Algebra I	Teacher A	79%	Spring 2009
Algebra I	Algebra B	71%	Spring 2009
Algebra	Teacher C	67%	Spring 2009

Southern School of Engineering – Durham

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Algebra I	E. Moffitt*	71%	Spring 2009
Algebra I	Teacher A	48%	Spring 2009
Algebra I	Teacher A	0%	Spring 2009

Research Results – 2008/9 (Geometry)

Southwest High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Geometry	S. Kliewer*	90%	Fall 2008
Geometry	Teacher A	74%	Fall 2009

Dixon High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Geometry	H.Spring*	65%	Fall 2008
Geometry	Teacher A	40%	Fall 2008
Geometry (H)**	Teacher B	70%	Fall 2008

**H= Honors

Research Results – 2008/9 (Algebra II)

Southwest High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Algebra II	<u>E. Kliewer*</u>	83%	Spring 2009
Algebra II	Teacher A	71%	Spring 2009
Algebra II	Teacher A	33%	Spring 2009

Dixon High School – Onslow County

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Algebra II	<u>H.Spring*</u>	81%	Spring 2009
Algebra II (H)**	Teacher A	75%	Spring 2009
Algebra II	Teacher B	50%	Spring 2009
Algebra II	Teacher C	30%	

**H= Honors

Research Results – 2008/9 (Biology)

Southern School of Engineering – Durham

Class	Teacher	EOC Proficiency Levels	Period of Evaluation
Biology	N. Joyner*	88%	Spring 2009
Biology	Teacher A	55%	Spring 2009
Biology	Teacher A	50%	Spring 2009

Now What?

- Invite students to bring their mobile learning devices in class
- Sign up for polleverywhere and generate warm up questions and brainstorming discussions
- Sign up for drop.io to create a project based communication and collaboration site
- Check out www.cellphonesinlearning.com
- Get the book, “At-Risk Student”
- Develop project based learning plans
- Talk to your student and solicit their feedback
- Visit www.onslowconnect.org for PD resources on project based learning
- Get this presentation by sending me an email at shawngross@projectknect.org (uploaded onto slideshare)



Contact Details

Shawn Gross

Mobile: : 202-215-7448

Skype ID: Shawn Gross

Twitter: #knected

Email: shawngross@projectknect.org

<http://www.projectknect.org>

<http://projectknect.blogspot.com>

<http://www.youtube.com/user/DigitalMillennial>

