



# **E-Rate Deployed Ubiquitously (EDU)**

## **2011 Pilot Program FINAL REPORT**

**Submitted by:**  
**Neil J. Schroeder, Directory of Technology**  
**Sioux City Community School District**  
**627 4<sup>th</sup> St.**  
**Sioux City, IA 51104**  
**712-279-6678**  
[schroen@live.siouxcityschools.com](mailto:schroen@live.siouxcityschools.com)

**18 October 2012**

<b>1. PROJECT BENEFITS .....</b>	<b>3</b>
<b>2. PROJECT COSTS.....</b>	<b>8</b>
<b>3. EFFECTIVENESS OF PROTECTIVE MEASURES.....</b>	<b>11</b>
<b>4. LESSONS LEARNED .....</b>	<b>14</b>

# 1. Project Benefits

- a. The EDU2011/Learning to Go supported wireless devices were part of ongoing Sioux City Community School District (SCCSD) efforts to raise student achievement through 1) Differentiating instruction for multiple learning types as well as differentiating time and location of learning, 2) Conducting standardized and more frequent formative and summative tests, 3) Developing 21<sup>st</sup> century skills for students while helping improve communication.

Total Student's using devices is provided in Section 2a. All student devices were used to meet curriculum objectives highlighted in this section.

Differing student course loads, schedules, teacher implementation and a variety of other factors led to different levels of daily use across the district. Total reported days of use off premise for district school work by students with EDU2011 devices were as follows:

1-2 Days	3-4 Days	5+ Days
25%	40%	35%

## **DIFFERNTIATED INSTRUCTION:**

The wireless devices were used to access the district's learning management system to participate in classes that added online components to traditional classroom instruction. This hybrid learning model provided teachers the opportunity to create classroom engagement and learning opportunities that could happen at a place and time of the student's choosing. Additionally, teachers have created content such as audio, videos, blogs, wikis, and other Web 2.0 technologies that help engage students. The use of netbooks with wireless access helps teachers target multiple learning modalities, offering more students a chance to learn through a method they are comfortable with. The richness and reach of the blended curriculum and anytime, anywhere access allow students to move at different paces through lessons without leaving anyone behind or bored in class.

These activities have seen many classes completely change their delivery. One example includes English II and English III. These are courses that require research papers, often a long and painful exercise for many students. As a result, many struggling students simply choose not do the paper. In some classes the percentage of students not turning the final paper in was as high as 50 percent. With the wireless devices teachers gave students a wider variety of ways to complete the paper making it more about the research project/process than just typing a paper. Students used a blog to self-reflect and added

video and other elements that were not possible before. Students collaborated online and provided feedback on each other's work. The device also made possible a wider and more relevant field of topics for students to work with. In the end teachers had every student participate and turn in the final project. While there are still wide variances in quality, the fact that at least every one participated and didn't "unplug" is a very positive step to help raise student achievement.

### **ASSESSMENT:**

The EDU2011 wireless laptops allowed for a complete reimagining of the way the school district conducts assessments, obtains data, and uses the results. The EDU2011 devices and access served as a catalyst for the district to standardize quarterly and semester tests across buildings. Tests in high school were administered through the wireless devices using the assessment module of the district's learning management system. Test results were instantaneously displayed to students and auto populated into the teachers' grade books. This process by itself proved valuable in eliminating non value added time for teachers spent scoring and entering grades. Additionally, students and parents were extremely happy to be provided with instant results for often very high stakes tests.

*Just for assessments* the 3,000 wireless devices were used by students over three quarters to take 304 separate course tests taught by 187 teachers in which they took nearly 40,000 over the year. This effort saved over 225 teacher hours in simply scoring tests. Teachers were able to reinvest that time into their students and instruction.

The results of these assessments are available through a comprehensive set of data reports. Teachers are able to quickly see what items were missed, what the misses were, and who missed what. This information has started to inform many subjects in ways not possible before due to the level of work and time required to collect and analyze the data. Entire departments are using the data to reshape their standards, their curriculum maps, and other items. This improves the overall quality and type of instruction for all students.

While it will take several years to fully realize results, another area with great potential in assessment is formative testing. Teachers have begun building formative assessments for high stakes standardized testing this spring. Students can then take an ungraded test anytime / anywhere that lets the teachers quickly see where they may need to focus more effort BEFORE the conduct of the test.

### **21<sup>st</sup> CENTURY SKILL DEVELOPMENT / COMMUNICATION:**

The district program also very directly supports efforts to develop 21<sup>st</sup> century skills in our students. All students are given an account in the district's Live@Edu Web 2.0 collaboration suite that includes email, online Microsoft Office, cloud storage, chat functionality, wiki/blog development, along with other features. This web based suite of applications when coupled with the wireless connectivity allows for acquisition and practice of technology based skills and also provides for unparalleled student

collaboration. Students can interact with each other in rich ways and participate in student centered group projects off site using their wireless connectivity.

These collaboration tools and wireless connectivity allow teachers to engage and support students in new ways. Some teachers have made out of school office hours where students can virtually chat and see help or clarification on problems. Many teachers and administrators use basic email functionality to expand the channels and time of communication with students. It also provides another avenue for turning in assignments. Teachers have changed from requiring assignments due in class to the end of the day via email. This has help increase turn in rates for various assignments.

Just having the wireless devices builds capacity in basic machine operation and “work related” software skills. Students learn how to properly use and compose word processing documents, spreadsheets, presentations, and even proper email use/etiquette. 91 percent of students self-reported improved 21<sup>st</sup> skills as a result of the learning to go connectivity and associated devices.

b) **ACHIEVEMENT:**

The table below summarizes various measures comparing the year before the learning to go grant with the data after the learning to go effort was initiated. Charts with more detail are available in Appendix A – Supporting Data. **While this project was only implemented for a single school year it does appear to have contributed to positive improvements in attendance, student discipline, student engagement, graduation rate, dropout rate, and some improvement in standardized test scores.** Due to the large scale and many possible variables involved it is not possible to say with 100 percent certainty that these outcomes were solely the result of the learning to go program. However it is likely that the learning to go program had a large impact on the results. Of note in standardized tests is that the district implementation spent a large percentage of support and development time with language arts teachers who then saw the largest gains in standardized test scores.

Objective	Measure
Improve attendance	Tardy students decreased by 2.0 percent. Other absences decreased 1.4 percent across the district.
Decrease discipline incidents	Total student discipline incidents decreased 19.1 percent across the district.
Increase student engagement	59 percent of classroom teachers report improved student engagement. 10 percent do not have enough time/data to know yet.
Improve quality of classroom work as measured in grades	Final grade distribution in core classes (math, science, language arts, social students) is very similar year over year.
Improve standardized test scores	Standardized reading scores improved 8.4 percent while math and science were not significantly improved.
Improve Graduation and Dropout Rate	The graduation rate increased 5.1 percentage points

	from the previous year. The district dropout rate declined from 6.3 percent to 4.8 percent during the same time.
--	--

c) The school district also surveyed Teachers, Parents, and Students. Each of the surveys was slightly different and administered in different forms to try to maximize participation. The following chart summarizes several key questions across each group. The parent group was broken out into English and Spanish speaking households. The n listed in parenthesis in the first question was the same across all sections. Other questions not included below focused more specifically on local professional development and technical concerns related to the project but not necessarily specific to the EDU2011 connectivity and devices.

Providing a Laptop is valuable for Instruction and Learning		
	Strongly Agree or Agree	Don't Know
Parents-English (n=554)	83%	8%
Parents-Spanish (n=108)	88%	10%
Students (n=398)	95.7%	.8%
Teachers (n=138)	75.2%	6.6%

Providing Internet Connectivity is valuable for Instruction and Learning		
	Strongly Agree or Agree	Don't Know
Parents-English	80%	7%
Parents-Spanish	81%	11%
Students	96.5%	.3%
Teachers	82.6%	5.8%

Providing an internet connected laptop improves student educational performance		
	Strongly Agree or Agree	Don't Know
Parents-English	70%	14%
Parents-Spanish	94%	5%
Students	78%	5.8%
Teachers	Now 40% / Future 75.2%	Now 20.8% / Future 16.2%

**Summary of Key Survey Questions**

The comments below are a small sample of open ended teacher comments to offer any feedback on what positives they have seen as a result of this project.

- Kids see more relevancy. Although it is hard for us to get used to, it is MUCH more relevant... and the these skills will be needed in the future.
- Higher student engagement when they are able to use the medium that so many of them are familiar with.
- Lap tops have been beneficial for some kids and have increased their engagement at school.
- I love being able to email information to my students.
- Communication. The ability to communicate through email with my students is wonderful. Less paper work, I can send them things I would normally have to print. Expansion of learning. With the technology right at their hands it makes it easier to expand learning with projects, websites, applets, etc.
- I love that there are no excuses for late work. Everything is time stamped whether placed in the dropbox or sent in via email. I like that students can contact me and submit work at any time of the day. My deadline for work is midnight, and I always laugh when it comes in at 11:59pm.
- I teach Spanish and have found some great sites to practice grammar & vocabulary. I can also have the

student's record their own voices (speaking Spanish) and they can practice pronunciation and I don't have to leave my room to go to a computer lab. I love all of the technology and my students tell me that I use it more than most teachers.

- Students being creative with assignments
- Writing research papers and getting sources is SO MUCH BETTER!
- Student access to online class materials and resources has been a huge plus for my classes. Plus they are able to collaborate in ways they have not been able to in the past via email and some social networking.
- I have seen students without the resources to have a computer in their home access a world of technology and knowledge that they had never previously dreamed. It is exciting to see a student use power point for the first time, or learn about places around the world using virtual touring. The list can really go on and on!
- It allows for greater use of technology, and I like the SkyDrive to be able to place materials for kids to use and access. They can find out what they missed if they have been gone, and is a place where data can be collected and shared.
- I have more students completing their work this year than ever before.

## 2. Project Costs

a.

The table below highlights total students and teachers by grade that are impacted through the EDU2011 project. While the initial focus was for 10-12 grade students the district had to make some allowance for 9<sup>th</sup> graders participating extensively in higher level classes. That is reflected by the device counts below. These students maintained their devices throughout the entire year.

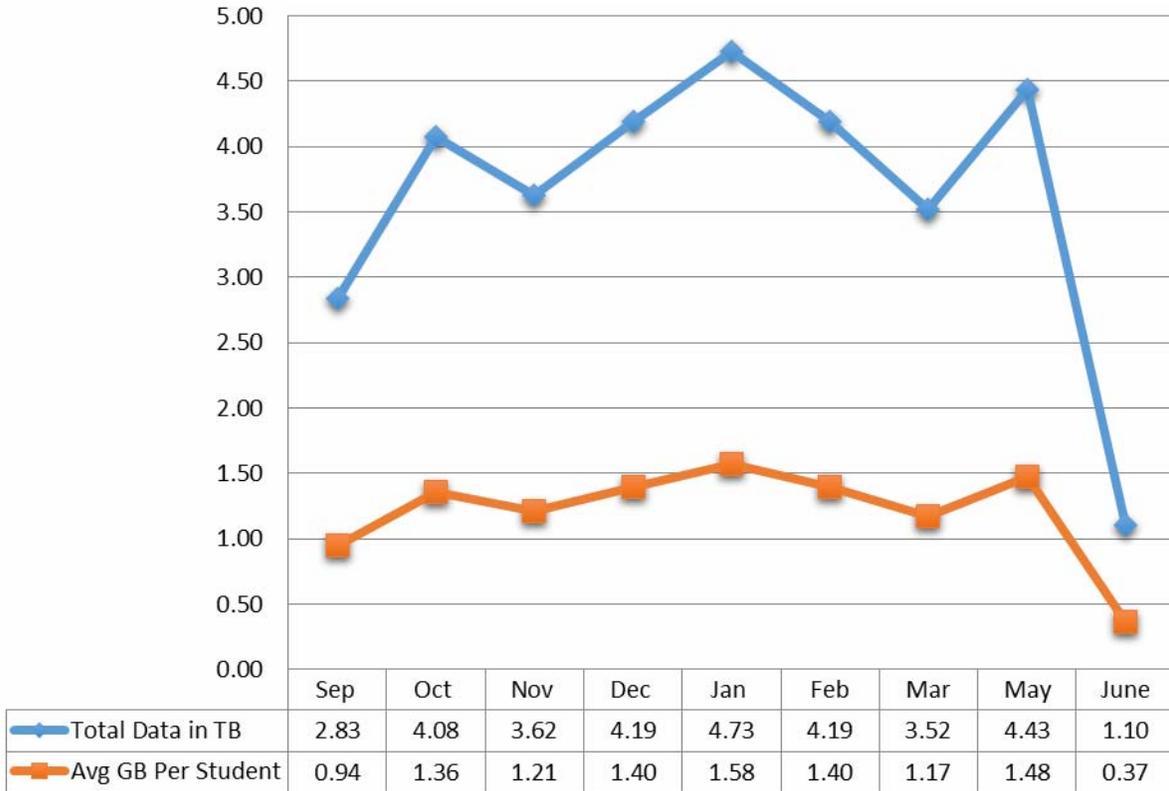
<b>Students Served By EDU2011 Devices</b>				
	<b>EHS</b>	<b>NHS</b>	<b>WHS</b>	<b>TOTALS</b>
<b>9</b>	81	94	76	251
<b>10</b>	315	307	321	943
<b>11</b>	325	296	284	905
<b>12</b>	319	279	303	901
<b>TOTALS</b>	<b>1040</b>	<b>976</b>	<b>984</b>	<b>3000</b>
<b>TEACHERS</b>	120	135	125	380

The cost for the EDU2011 service through Verizon Wireless is provided under the terms of the Western States Contracting Alliance (WSCA). Monthly 3G connectivity per device is \$42.99 of which 73 percent was paid through the EDU2011 program with the district paying the remaining 27 percent. Because the rate is a bulk negotiated contract there was no movement in the price. The district was able to negotiate device pricing, which with the volume purchased resulted in no costs for the device. The following table highlights the cost structure of the EDU2011 program.

	<b>Monthly Service Cost</b>	<b>Yearly Service Cost</b>	<b>Device Cost</b>
<i>Total Per Student</i>	\$42.99	\$515.88	\$0.00
<i>EDU2011 Cost (73%)</i>	\$31.38	\$376.59	\$0.00
<i>District Cost (27%)</i>	\$11.61	\$139.29	\$0.00
<i>3000 Student Devices</i>	\$128,970.00	\$1,547,640.00	
<i>EDU2011 Cost (73%)</i>	\$94,148.10	\$1,129,777.20	
<i>District Cost (27%)</i>	\$34,821.90	\$417,862.80	

**Cost breakdown for EDU2011 data connection**

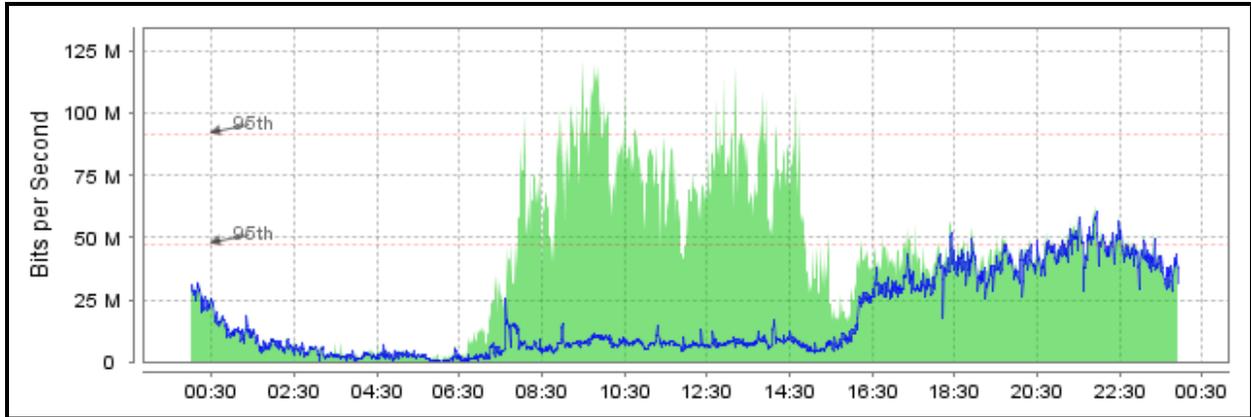
## Student Data Use on Verizon "3G" Connections



### Student use of EDU2011 data connection

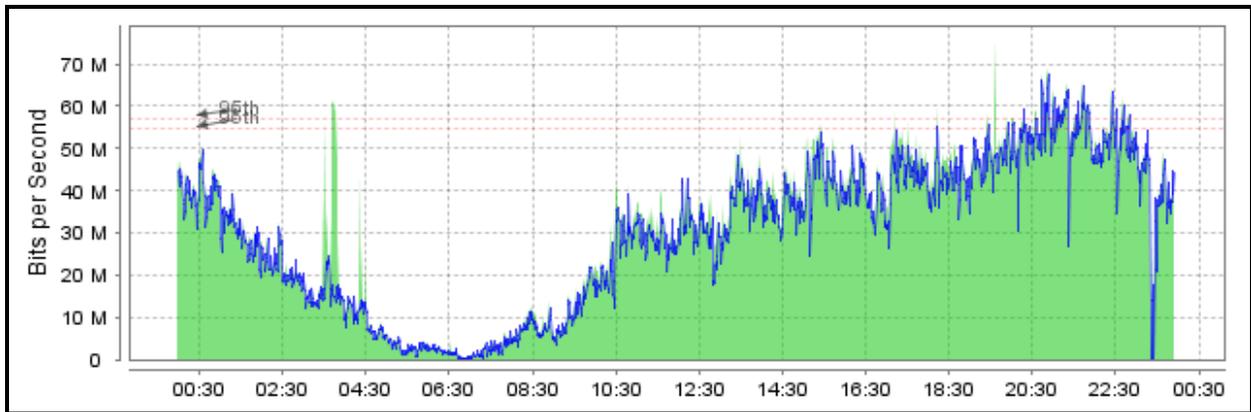
The chart above highlights the off campus use of EDU2011 provided wireless connectivity. (April data was not available due to an issue with Verizon Wireless's reporting system and loss of data for that month). The blue line (top) represents total monthly data consumed through EDU2011 connectivity. The orange line (bottom) shows average data consumed per student. Not included in these numbers are data that is used on premise or through WiFi networks. June reflects the end of school, early senior graduation, and other events that had students leave early.

While students are not required to use the EDU2011 provided "3G" wireless connectivity on the device while off premise (if for example they have a home WiFi network), 99.2 percent of devices were used to connect to the EDU2011 funded connectivity at some point throughout the school year. Students used the off premise connectivity many times even when they may have other options available. Through a recent survey we know that nearly 25 percent of households do not have consistent access to high speed internet at home. This number is as high as 60 percent in some subgroups. The overall number of households without high speed internet has declined from 45 percent in the spring of 2010.



**Typical SCHOOL DAY traffic pattern**

The chart above shows a typical school day during this year with the EDU2011 devices included. Since all traffic offsite on EDU2011 devices is routed through the district network, nearly all traffic after school hours is from EDU2011 devices. Student data usage typically peaks in the evenings around 10-1030PM but remains high until after midnight.



**Typical WEEKEND network traffic pattern**

The chart above shows a typical weekend day with the EDU2011 devices included. Nearly all traffic shown here is from EDU2011 devices. Similar to weekdays, usage climbs throughout the day and peaks typically between 8-10 PM with the low point usually around 7 AM.

\*The typical “3G” speed offered by Verizon in this region averages approximately 1 Mbps.

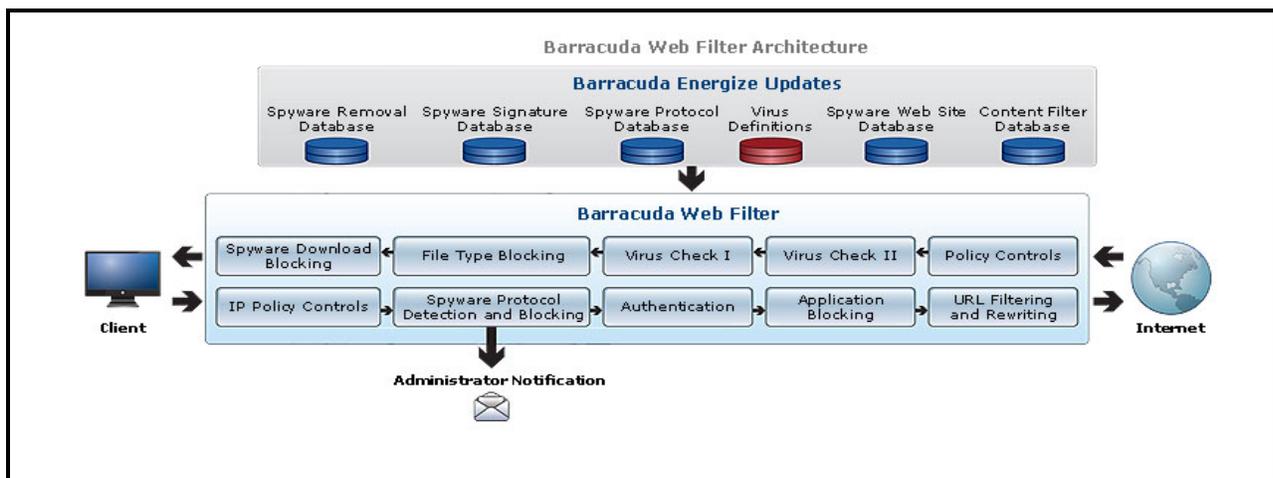
### 3. Effectiveness of Protective Measures

- a. SCCSD undertook a multi layered strategy to ensure CIPA compliance, security and protection of the wireless devices provided to students.

**Network Traffic Filtering Overview:** The district uses a twofold strategy for filtering. The primary filtering mechanism is provided through a Barracuda Networks product called Barracuda Web Filter. The Barracuda Web Filter is an integrated content filtering, application blocking and malware protection solution. It enforces Internet usage policies by blocking access to Web sites and Internet applications that are not related to business, and it easily and completely eliminates spyware and other forms of malware from your organization. Some key features of the tool include:

- Blocks access to Web sites based on domain, URL pattern, or content category
- Blocks downloads based on file type
- Blocks applications that access the Internet, including IM, music services, and software update utilities
- Integrates with "safe search" filters built into popular images search engines
- Provides integrated gateway and desktop spyware protection
- **Uses Barracuda Web Security Agents compatible with Windows PC's and Macs to enforce Internet policies on off-network computers**

As highlighted above, all wireless devices were filtered through an agent installed on the device that directed traffic through the filter regardless of the network the device was on. This means that the wireless device could be connected through Verizon's network or any WiFi network such as a home network and still be fully filtered the same as if they were on campus. All traffic was routed back through the district's network. This allowed for bandwidth tracking.



Architecture of Barracuda Web Filter

The district also employed a hosted filtering solution from OpenDNS that provided a fallback in the event our Primary Barracuda filter failed. The OpenDNS solutions blocks sites based on DNS resolution and provides fully CIPA compliant filtering as well.

**Network Traffic Filtering Efficacy:**

During a typical day the filter will process 25,000,000 network requests and block approximately 7 percent of requests based on categories and policies established. User testing and feedback indicates that the filter structure is highly successful ensuring inappropriate content is not accessed.

**Antivirus:** The school district employs Microsoft's Forefront Endpoint Protection to help guard against security threats such as malware, viruses, and other issues. Forefront also helps prevent waste, fraud, and abuse by providing the capability to block execution of programs that are not acceptable or violate the district's acceptable use policy.

**Group Policies:** The school district extensively uses Microsoft Windows 2008 R2 group policies to prevent waste, fraud, and abuse. Group policies ensure all devices are prevented from accessing functions, programs, and capabilities on the device that may lead to unacceptable use or non-educational purposes.

**Microsoft Systems Center Configuration Manager:** This tool provides several capabilities. It allows the district to push security and configuration patches to all machines remotely. Additionally it provides enhanced capability beyond group policies to control machines and report on those that for some reason may be out of compliance with the district's standard software load. SCCM provides very detailed and granular reporting on all facets of machine operation allowing district administrators to quickly identify any abuse.

**SmartSync Classroom management:** This tool gives teachers full control of network devices when in their classrooms. They are able to see what every device is doing and can control applications, what websites are used, and even completely prevent access for a period of time. This allows teachers the ability to ensure students are on task with their devices if they are being used that day in class.

- b. Several issues arose in ensuring all the tools above worked properly to ensure educational use of the above devices.

**Network Traffic Filtering:** Initially the solution provided by the vendor, in this case Barracuda Networks, was not able to handle the traffic volume from the devices off site. During the initial weeks of the implementation the service would go down. Because it was designed to "fail closed" all devices would be unable to use the internet in any capacity. This effort was resolved after the company sent an engineer on site and provided another server to help distribute the filtering load. The company also made several software updates that improved performance, reporting, and load handling over the course of the year. This issue should serve as a caution for any district looking to

scale a 1:1 effort with off-site filtering. Many solutions can handle smaller loads but when dealing with thousands of users they may falter.

**Proxy Websites and Tools:** A small minority of students will actively seek to defeat any filtering. The district is able to prevent device based proxies using the tools mentioned above. A particular challenge early on was the large amount of web based proxies that do not require an agent to redirect web traffic and by pass the filter. Through close work with several students the district was able to identify the main proxy web site mailing lists. By subscribing to their notification lists the district is able to immediately block any new proxies that come available. Districts should be aware that this is an issue to consider when providing devices both with or without off premise connectivity.

## 4. Lessons Learned

Throughout the year some issues were consistently present that merit discussion as lessons learned.

a) Summary of Technical, Operational, and administrative problems/issues.

**3G connectivity speeds:** The off-site connectivity provided by 3G connections were often viewed as good by those that had no other options. However, there were quite a few comments in our survey regarding the speed of 3G, which at an average of 1Mbps or slower, was often seen as not quite adequate enough to leverage all instructional content. This concern is almost eliminated in this area with Verizon's 4G network which offers 10x or greater bandwidth but users would need 4G compatible devices and service. 3G as a sole option for connectivity will likely not be adequate as the sole option to fully meet educational connectivity needs for students in the future. The 3G networks can fill an important role for students when mobile and traveling, but as more streaming content is used, video collaboration is incorporated, and other novel uses are undertaken with devices it will become harder to get the value out of JUST a 3G connection.

**On Premise Wireless Capacity:** Even with devices that have off premise access capabilities the organization will need robust on site capabilities of their own. The aggregation of so many devices in smaller spaces will cause issues with a cellular provider's network. Additionally the bandwidth demands on site are very high in many classes and when scaling a site over 1,000 devices a robust 802.11 network is essential. While the district underwent extensive upgrades and testing of its WiFi network, there were numerous changes that were required when all student devices were used on site. Districts should prepare to modify support server architecture (active directory, DNS, etc.), access point density, handle radio inference, and tune channels appropriately. One other lesson learned is that lower cost access devices like netbooks often do not include or even offer 802.11 a/b/g/n radios which limit the frequencies and channels available in a building causing unique wireless network engineering challenges. Districts should strive to field device with 5Ghz and 2.4Ghz radio capabilities. This may be easier said than done because many stock devices do not allow for configuration of the wireless cards.

**Staff Professional Development:** There is no such thing as enough professional development for staff. The district had a comprehensive program to scale small pilot efforts to all teachers in every building. This has proved to be quite challenging. One year of training is simply not enough. The district will be further enhancing and expanding professional development in the coming year with a comprehensive overhaul of how professional development is designed and delivered. The district is also adding 1:1 integration support specialists by subject and building to provide even more easily accessible peer based support. Another lesson learned is that it is hard to fully prepare staff without actually living and working in a device rich environment. Many teachers who thought they were well prepared realized they still had a long way to go once fully "in the game".

**Student Training:** There seems to be a conventional wisdom position that kids are digital natives and therefore are gurus with any sort of technology including mobile internet access devices. This is simply not the case. The single biggest request from teachers this year was for more instruction for students on basic operations not only of the device itself but key “work related” components of digital technology. Things like adding an attachment to an email may seem intuitive and general knowledge but for many students this is not innate knowledge. The district has implemented a comprehensive training program in middle school but those students are not through the pipeline yet into high school. There was also a day of introductory training for students at the start of the year but this proved to not be enough.

**Results will take time and consistent / persistent effort:** It is impossible to fully gauge extent and effect of changes in months. The SCCSD effort will more than likely take three years of continuous focus with staff members to see wide adoption of value added practices using mobile learning devices. The district is budgeting for expanded training and support in coming years to ensure successful outcomes are realized related to student achievement and learning even without learning to go funding.

**Student Help Desk:** Students are very capable of supporting each other and teachers when necessary. The district employed a concept where students operated a help desk in each high school media center. This has been viewed as very beneficial by both staff and students. This concept may serve other districts that have larger implementations and are not given extra manpower to fully support.

**Demonstrated Value of Internet:** It appears that exposure to internet through the learning to go program demonstrated value to families that did not previously have internet access. After the learning to program 20 percent of district families decided to obtain home internet connectivity. While not asked formally in the survey, anecdotal feedback from various families indicated that it wasn’t until their student had internet and they saw it every day that they realized the full benefit and decided the benefit justified the costs.

b) Narrative of overall lessons learned

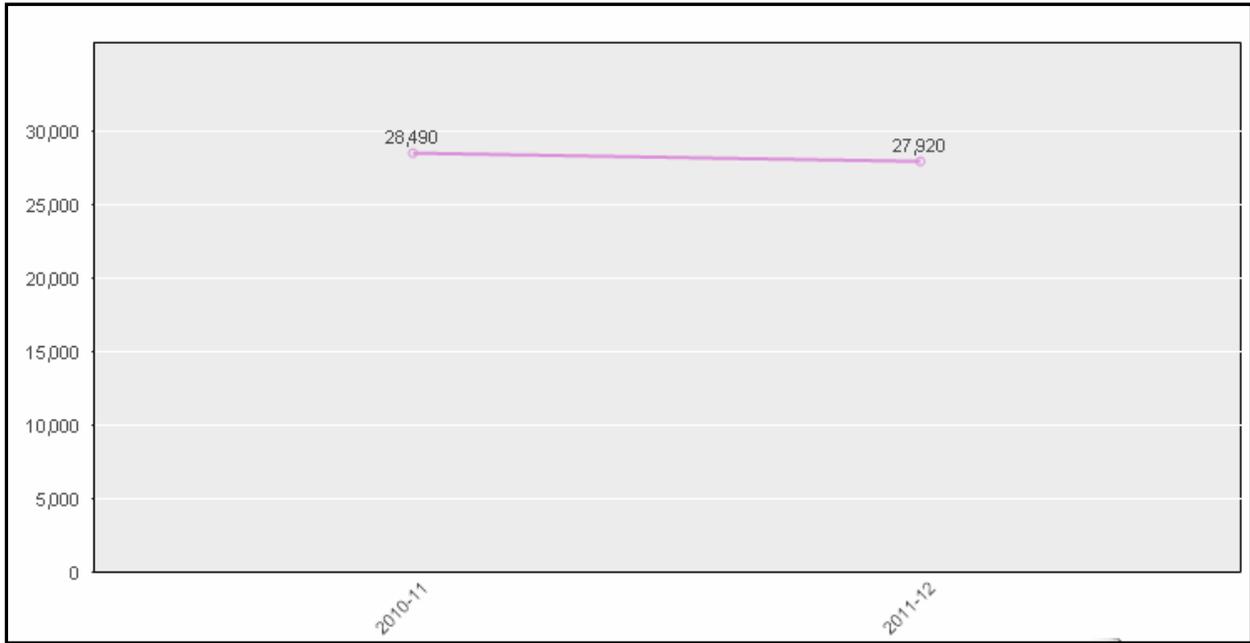
The EDU2011 funded project has been very successful to date but its full impacts and implementation will take time to completely realize. A majority of the implementation and use processes to date have worked well. Like any large scale technology rollout there have been some definite bumps as highlighted in the previous sections but they have all been manageable. The single biggest thing that the district would have changed at this point is completely redesigning our teacher professional development model rather than try to work within existing constraints.

Another important lesson is that providing internet connectivity does far more for many families that help their student in school. As mentioned in this report a fair percentage of households do not have high speed internet access in their households for a variety of reasons ranging from cost to simple availability. For these families a device with internet connectivity can have an outsized impact on all members. A couple quick anecdotes highlight this fact. The district had a mother

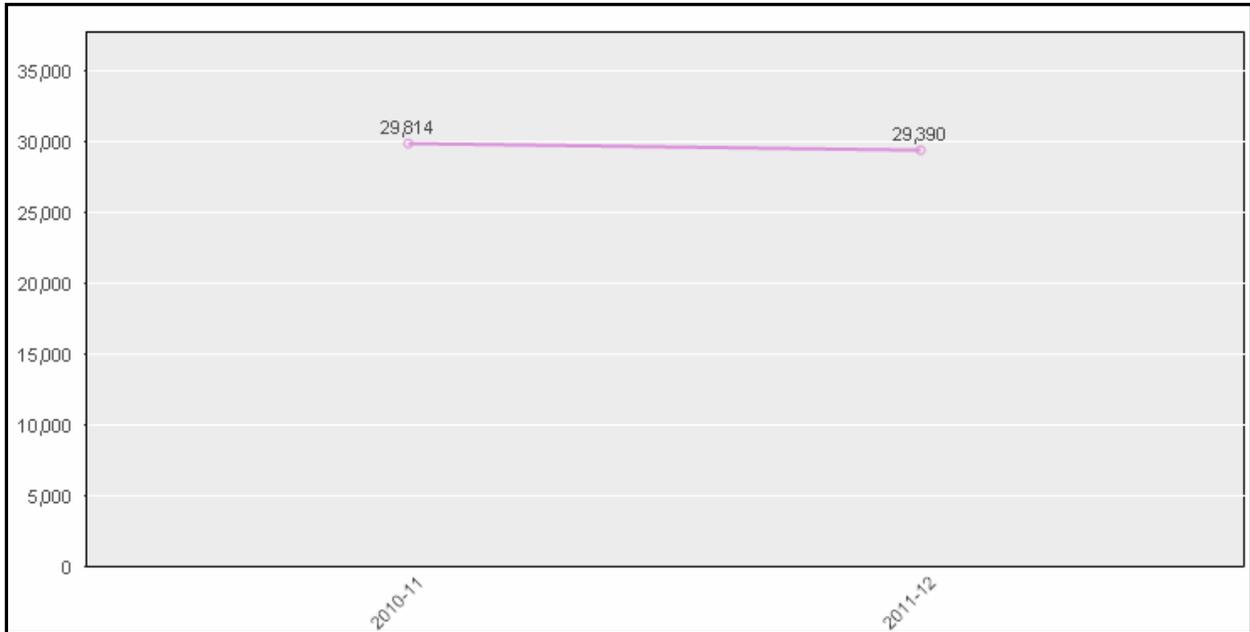
come to the hand out day with her son who translated for her. She said that she wanted to personally thank whoever was responsible. She stated, “You are not simply changing education, you are changing lives.” In another school a student was moved to tears in disbelief. He stated that no one in his family ever had a computer or internet before and this would change things for his entire family.

## Appendix A – Supporting Data

### ATTENDANCE

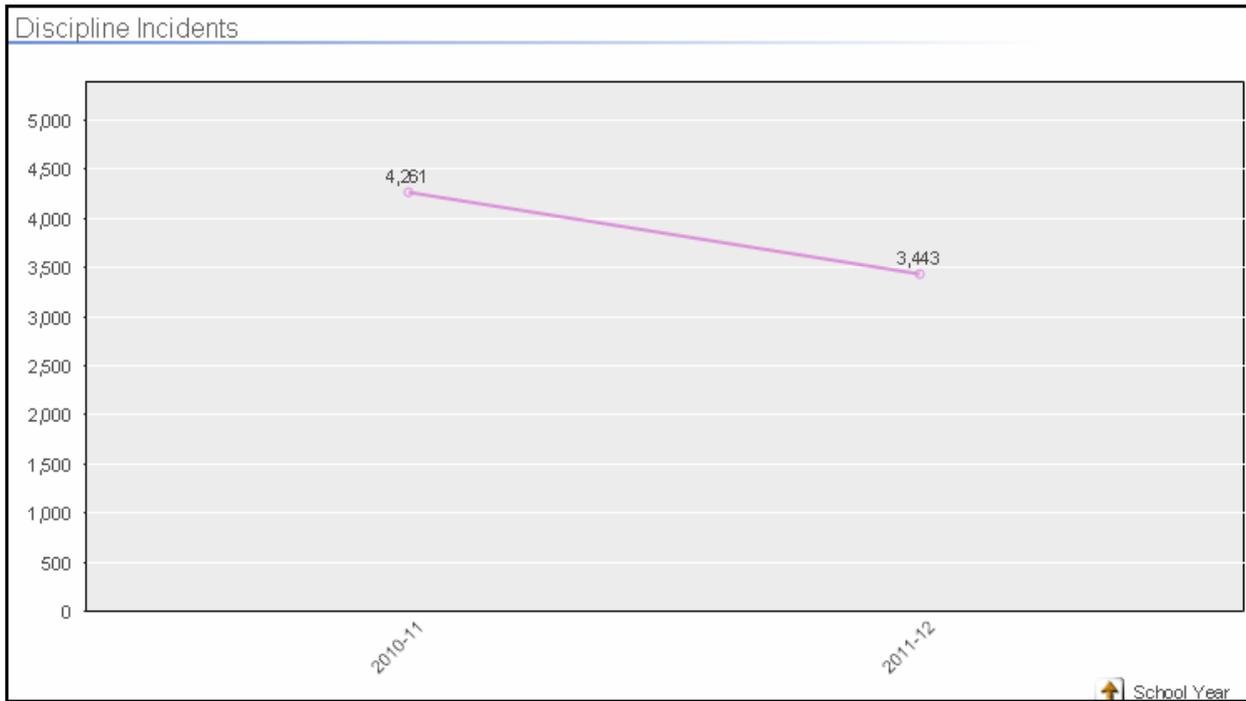


### Total tardies for students participating in EDU2011 program



### Total non-tardy absences for students participating in EDU2011 program

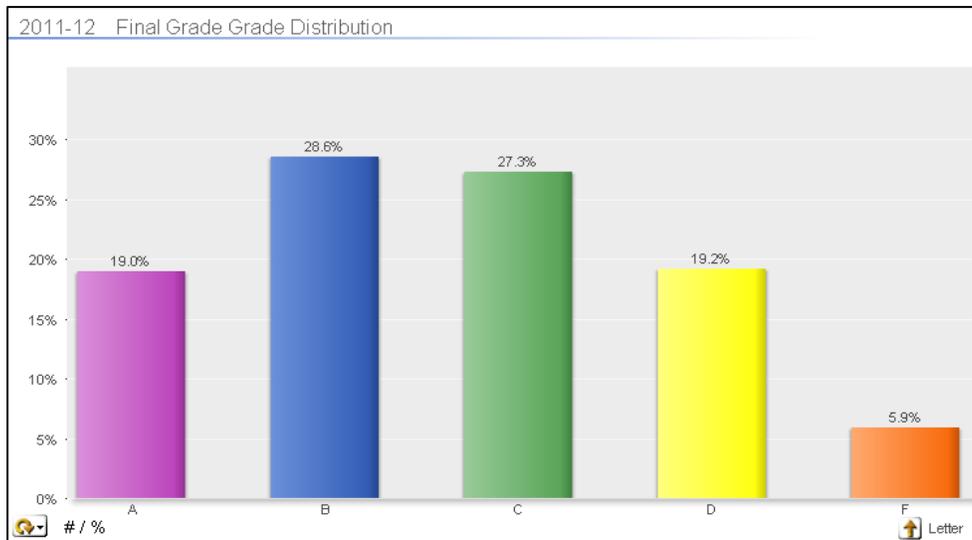
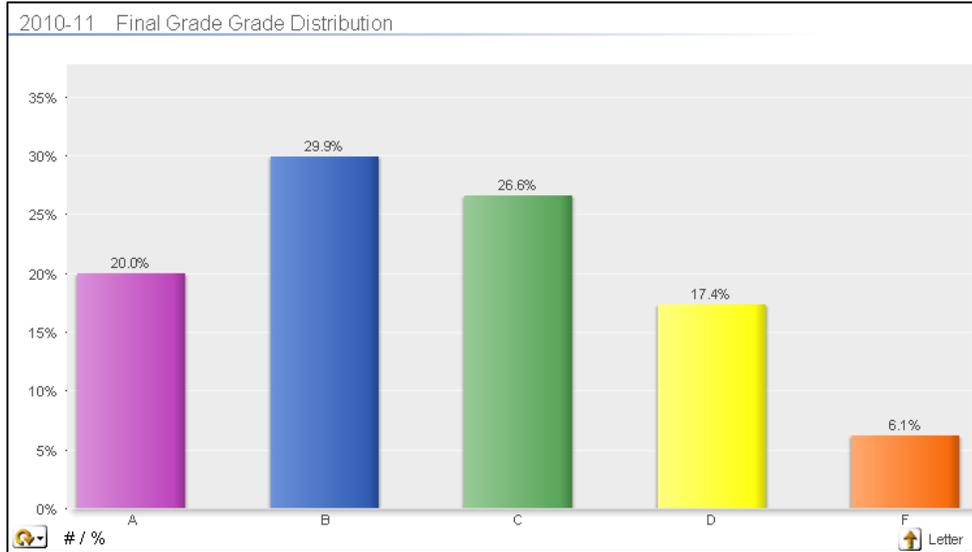
## DISCIPLINE



**Total discipline incidents for students participating in EDU2011 program**

## GRADE DISTIRBUTION

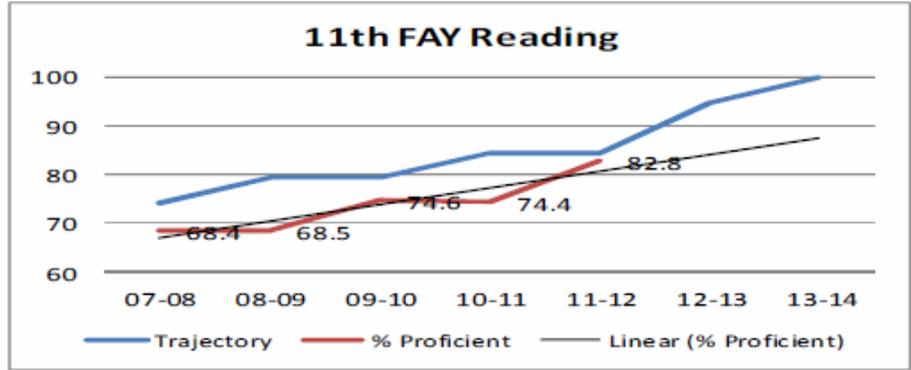
Tables below show total grade distribution for all core subjects for 10-12 grade students participating in learning to go program (math, language arts, science, social studies)



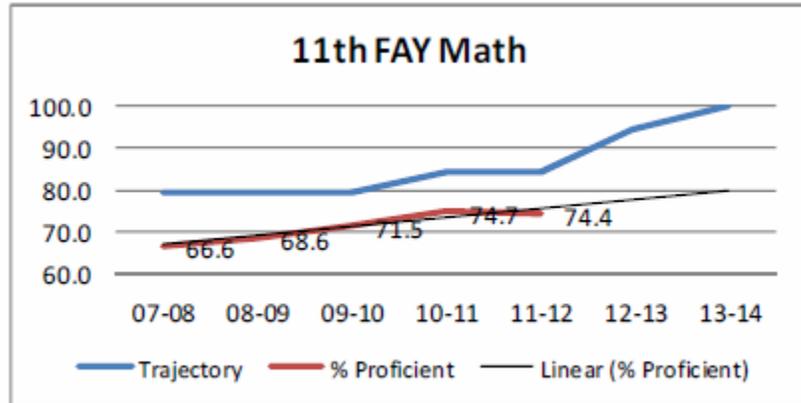
## STANDARDIZED TESTING RESULTS

State reporting for standardized test scores is only for 11<sup>th</sup> grade students. Results below cover all 11<sup>th</sup> grade students involved in the EDU2011 program.

READING % PROFICIENT FAY Grade 11			
	2009-10	2010-11	2011-2012
All	74.6	74.4	82.8
Males	71.7	69.2	78.6
Females	77.5	79.7	87.4
Low SES	66.4	60.1	75.8
Non Low SES	79.8	84.1	87.6
IEP	51	47.3	54.1
Non IEP	77.8	77.5	86.3
ELL	42.9	28	49.3
Non ELL	77.1	80.3	86.1



MATH % PROFICIENT FAY Grade 11			
	2009-2010	2010-2011	2011-2012
All	71.5	74.7	74.4
Males	71	78.9	73.2
Females	71.9	71.3	75.8
Low SES	61.9	63	65.1
Non Low SES	77.6	82.7	80.9
IEP	43.1	55.6	44.7
Non IEP	75.3	76.9	78.1
ELL	44.4	40.2	46.5
Non ELL	73.6	79.2	77.2



SCIENCE % PROFICIENT FAY Grade 11			
	2009-2010	2010-2011	2011-2012
All	77.8	83.6	83.8
Males	75.9	82.7	83.3
Females	79.6	83.8	84.4
Low SES	67.9	75.5	78.3
Non Low SES	84	89.2	87.6
IEP	52.9	71.6	58.8
Non IEP	81.1	85	86.9
ELL	50.8	59.8	53.5
Non ELL	79.9	86.7	86.8

