THE SCHOOL BOARD OF BROWARD COUNTY, FLORIDA
OFFICE OF THE SUPERINTENDENT

DR. FRANK TILL
SUPERINTENDENT OF SCHOOLS

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Approved memorandum with signatures is on file.

January 20, 2006

TO: School Board Members

FROM: Katherine Blasik, Ph.D., Associate Superintendent
Research, Evaluation, Assessment & Boundaries

VIA: Frank Till
Superintendent of Schools

SUBJECT: **DIGITAL LEARNING ENVIRONMENT STUDY (DLES) AND CURRICULUM DEVELOPMENT/INSTRUCTIONAL MANAGEMENT (CD/IM) EVALUATION REPORT**

The Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM) are components of the Instructional Technology Plan of Broward County Public Schools (BCPS). The DLES piloted a wireless campus where all students received laptop computers for school work, while CD/IM implemented a single sign-on web-based technology portal for teachers. Both projects were piloted in the same four schools during the 2004-05 school year. The attached evaluation report highlights patterns of implementation of both projects at the four pilot schools; examines the impact of technology reform on teacher behavior and instruction, student motivation and attendance, and parent involvement; and determines the extent to which students and teachers have attained requisite technology skills.

Overall, findings revealed positive effects for both projects and highlighted areas needing improvement. Extensive teacher preparation and project engagement by school staffs were the most notable facilitating factors for positively impacting teacher classroom behavior and improving the technology skills of teachers and students. Students self-reported being more motivated and interested in learning. Project barriers included issues pertaining to the length of repair time for laptop computers, computer theft, and technology support.

Recommendations are made to pursue strategies to reduce computer theft and lower computer repair time. Additional recommendations are made to continue implementing the staff development model that requires participation in the Digital Education Teacher Academy (DETA) prior to project implementation, improve the technology support provided by vendors, and examine the project impact on student achievement following the first full year of implementation in 2005-06. If you have any questions or comments regarding this report, **please contact me at 754-321-2470 or Dr. Cary Sutton, Director, Research Services at 754-321-2500**. This report may also be accessed via the Research Services website at http://www.broward.k12.fl.us/research_evaluation /newmain.htm.

FT/KAB/COS:dwv
Attachment

cc: Senior Management
Area Directors
Principals

THE SCHOOL BOARD OF BROWARD COUNTY, FLORIDA
OFFICE OF THE DEPUTY SUPERINTENDENT
CURRICULUM & INSTRUCTION/STUDENT SUPPORT

SIGNATURES ON FILE

November 18, 2005

TO: Frank Till
Superintendent of Schools

FROM: Earlean C. Smiley, Ed.D., Deputy Superintendent
Curriculum and Instruction/Student Support

Vijay Sonty, Chief Information Officer

SUBJECT: **DIGITAL LEARNING ENVIRONMENT STUDY REPORT**
CURRICULUM DEVELOPMENT/INSTRUCTIONAL MANAGEMENT PROJECT REPORT

The two projects included in the evaluation report, The Digital Learning Environment Study and the Curriculum Development/Instructional Management Project, were approved by the School Board in the April to June 2004 timeframe and are an integral part of the district's Instructional Technology plan and vision. The attached report examines factors related to project implementation and the impact of the projects to date. The recommendations and staff responses are included below.

RECOMMENDATION: The continued implementation of both projects in 2005-06 should include planning components for expansion of the DLES and CDIM BEEP teacher portal, as anticipated in the district's Instructional Technology Plan. Efforts should be made to continue emphasizing staff development, reduce computer theft, improve technology support, and examine students' FCAT performance over time. Specifically, in 2005-06, the Director of Instructional Technology and the Director of Network Integration shall: Continue implementing the staff development model, which requires teacher participation in DETA as a precursor to project implementation, and provide onsite staff development in modeling and coaching throughout the year.

RESPONSE: Both the DLES and the CD/IM projects are on-going projects that are being implemented in a continuous improvement cycle. The skills of the teachers in the DLES schools are continually being improved by providing DETA One sessions for new teachers and DETA Two sessions for advanced teachers. In addition, on-site assistance from district Instructional Technology Specialists are being continued. To build capacity in these schools to support the integration process, a peer-coaching program has been initiated in each school that is training advanced teachers to mentor and coach peers.

The funding of staff to support both of these initiatives partially comes from Title IID: Enhancing Education Through Technology funds. For the 2006-2007 school year, these funds are slated to be cut by up to 55%. If this occurs, support for both of these projects may be significantly reduced.

RECOMMENDATION: Continue to work with law enforcement, community groups, computer security experts, and computer manufacturers to reduce the threat of theft attempts against students and schools. Solutions may include (a) training students in computer security measures, (b) purchasing easily identifiable school laptops (e.g., distinctive, colorful cases), or (c) using locking devices, embedded tracking chips, remote disabling devices, or firmware location reporting solutions (e.g., Absolute software, Stealth, Wi-Fi Tracker), whereby the computer reports its location every time it is connected to the Internet.

RESPONSE: The staff at both the district and the schools has continued to work with local law enforcement and community groups to reduce the attempts of theft against students at the schools. Since Miramar High School was most affected by theft, the Miramar police department has worked with Crime Watch and the School District to make the community aware of the issue and assist with the protection of the students. This includes student and parent training on student safety while in possession of the laptop. In addition, both classroom teachers and district Instructional Technology Specialists trained students in safety and security. The district is currently producing videos to address safety issues for students. All laptops were etched with a stop tag that has been effective in recovering a small amount of stolen laptops back to the schools. The district is working with the vendors to create a solution to enable reporting through the firmware. Additionally, the district has procured a central software management system that will allow schools to track assets on a daily basis and to manage the equipment more efficiently.

RECOMMENDATION: Include in assessments of computer vendors, the issues of price, battery life, physical reliability, vendor responsiveness to warranty and other repairs, availability of computer protection solutions, and compatibility with typical home and business applications.

RESPONSE: After the assessment was completed regarding warranty and maintenance, changes were made to improve the overall support plan by the vendor. Apple has instituted the AppleCare program, which will help address these issues.

Battery Life: Batteries by nature are a consumable product. Consumable parts are those that are not expected to perform as new for the entire period of the warranty. A properly maintained portable battery is designed to retain up to 80% of its original capacity after 300 full charge and discharge cycles. Guidelines on proper battery care and maintenance was created and a Multi-Pack Program that allows for the purchase of additional batteries at discounted rates is available.

Physical Reliability: To protect from breakage, the laptop's case resists impact and a magnesium frame provides strength, while reducing the weight of the laptop. The laptop is rubber mounted

and equipped with Sudden Motion Sensor technology that helps protect data in the event of a drop or fall. In addition, there are no doors or protruding elements and no optical drive tray that could break or snap off when tucked into a backpack.

Students and parents received training on care and use of the laptop at each of the schools in order to eliminate accidental abuse or damage. However schools will play the final role in recognizing behavior or trends that can lead to accidental damage and are taking the appropriate steps to mitigate or eliminate that behavior.

Warranty and Repair: Recognizing that return to service is key for the success of the DLES project, a comprehensive service and support solution was developed. The focus is on maximum uptime and rapid return to service. The data on the laptops are backed up and the laptops are running in the shortest time possible with a one-day return to service goal for dispatch requests received by the vendor.

RECOMMENDATION: Consider establishing a pool of available laptops to be utilized as loaner units when laptops are returned for repair.

RESPONSE: Loaner units are now available for student use. AppleCare provides spares or temporary loaners for the laptops at the DLES sites to meet the one-day return to service goal.

RECOMMENDATION: Additionally, after the first full year of implementation in 2005-06, student performance on the FCAT should be examined and compared with an appropriate sample of students from non-participating schools. Future evaluations may also compare the long-term performance of participating students with students (e.g., sixth and ninth grade) progressing into non-project schools.

RESPONSE: After the end of the second year of the DLES project, another evaluative study will be conducted which will examine student achievement data from both FCAT standardized tests and student portfolios and alternative assessment projects. The recommendations will be incorporated into the next evaluation and results will also be shared with district and school stakeholders.

ECS/VS/JMG/AC

The School Board of Broward County, Florida

Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM) Evaluation Report

Bill Younkin, Ph.D., Evaluator

January 2006

Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM) Evaluation Report

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The School Board of Broward County, Florida

Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM) Evaluation Report

Executive Summary

Broward County Public Schools (BCPS) has initiated two technology related projects currently being piloted in four schools: Broward Estates Elementary, Attucks Middle, Miramar High, and Monarch High. These projects are the Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM); both projects are components of the Instructional Technology Plan of BCPS. The DLES is piloting the implementation of the district's Instructional Technology Plan by creating a wireless campus where all students receive laptops for school work and to access web-based resources at home. The CD/IM is a single sign-on web-based technology portal for teachers. The portal is part of the Broward Education Enterprise Portal (BEEP) and is being piloted in the aforementioned four schools before being rolled out to the district as a whole.

Purpose of the Evaluation

The evaluation study described herein examined the implementation and impact of the DLES and the results and teacher reactions to the first year of development of the CD/IM (i.e., BEEP Teacher Portal). The following research questions were addressed in this evaluation report:

1. What are the demographic characteristics of the schools participating in these projects?
2. What was the process of developing and implementing the DLES in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them?
3. What has been the impact of the DLES project on teacher classroom behavior?
4. What has been the impact of the DLES project on student motivation?
5. What has been the impact of the DLES project on student attendance?
6. To what extent have students and teachers attained National Education Technology Standards (NETS) skills?
7. To what extent have parents and the community been involved in the DLES project?
8. What was the process of developing and implementing, through Year 1, the CD/IM in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them? What is the current degree of implementation relative to the timeline contained in the plan?
9. What are the teachers' perceptions of the system's relevance to their curriculum needs?

Results

One of the most notable factors evident in the DLES schools was that they exhibited a rate of change that is rarely found in school reform efforts. A previous evaluation of whole school reform in Broward County (Younkin, 2000) found that, after two years of implementation, only half of the schools in the study were at the stage of everyone being aware and beginning to implement the project; only one school was at the mature stage, the next and final stage. Within the DLES project schools, after less than a full year of implementation, virtually all of the stakeholders in the schools indicated that they were aware of the project; and the school staff was fully engaged in the process of changing their approach to education to capitalize on the positive aspects of the digital learning environment. This rapidity of change, however, is not merely due to the provision of hardware and software, but is in large part attributable to the extensive amount of staff development, planning, and cooperative effort that went into the implementation.

The experience of the implementation of the DLES in BCPS reflects the findings in the literature that the most important element of success was the training and preparation of the staff. The fact that schools were selected based on teacher involvement in the Digital Education Teacher Academy (DETA) and principal leadership insured that the project would be met with confidence. The issue of repair time quickly surfaced as a major problem at all of the schools. The one major factor encountered not reflected in the literature was the issue of students targeted for laptop theft.

The project appears to have had a positive impact on teacher classroom behavior. Teachers self-reported improving their experience levels with the National Education Technology Standards (NETS) skills, increasing the use of group and project-based learning, promoting a climate where students learn from each other, and increasing their tolerance for diverse student activities. Creative lesson planning utilizing technology as a vehicle for learning was also evident.

Both teachers and students reported that students' motivation to learn increased significantly. Students self-reported that class assignments were more interesting and enjoyable, they could do a good job easier, information resources were more readily available and easier to use, and that their use of time became more efficient. They also mentioned that they enjoyed learning by accident (finding interesting information while looking for something else). High school teachers did express that problems developed with the students' inappropriate use of the technology (listening to music, sending notes in class, accessing inappropriate websites, etc.).

The students, according to the evaluator's and teachers' observations, appear to have acquired the skills specified by NETS. This appears to be true whether or not students have computers available to them at home, indicating that the project has assisted in overcoming the digital divide.

The teacher portion of the Broward Enterprise Education Portal appears to be on schedule and has been perceived by the teachers in the pilot schools as being relevant to their curricular needs, a valuable resource in curriculum planning and professional development, and a tool that they will utilize regularly.

Recommendation

The continued implementation of both projects in 2005-06 should include planning components for expansion of the DLES and CDIM BEEP teacher portal, as anticipated in the district's Instructional Technology Plan. Efforts should be made to continue emphasizing staff development, reduce computer theft, improve technology support, and examine students' FCAT performance over time. Specifically, in 2005-06, the Director of Instructional Technology and the Director of Network Integration shall:

- Continue implementing the staff development model, which requires teacher participation in DETA as a precursor to project implementation, and provide onsite staff development in modeling and coaching throughout the year.
- Continue to work with law enforcement, community groups, computer security experts, and computer manufacturers to reduce the threat of theft attempts against students and schools. Solutions may include (a) training students in computer security measures, (b) purchasing easily identifiable school laptops (e.g., distinctive, colorful cases), or (c) using locking devices, embedded tracking chips, remote disabling devices, or firmware location reporting solutions (e.g., Absolute software, Stealth, Wi-Fi Tracker), whereby the computer reports its location every time it is connected to the Internet.
- Include in assessments of computer vendors, the issues of price, battery life, physical reliability, vendor responsiveness to warranty and other repairs, availability of computer protection solutions, and compatibility with typical home and business applications.
- Consider establishing a pool of available laptops to be utilized as loaner units when laptops are returned for repair.

Additionally, after the first full year of implementation in 2005-06, student performance on the FCAT should be examined and compared with an appropriate sample of students from non-participating schools. Future evaluations may also compare the long-term performance of participating students with students (e.g., sixth and ninth grade) progressing into non-project schools.

The School Board of Broward County, Florida

Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM) Evaluation Report

Introduction

Broward County Public Schools (BCPS) has initiated two instructional technology related projects currently being piloted in four schools: Broward Estates Elementary, Attucks Middle, Miramar High, and Monarch High. These projects are the Digital Learning Environment Study (DLES) and Curriculum Development/Instructional Management (CD/IM). The DLES is piloting the implementation of the district's Instructional Technology Plan by creating a wireless campus where all students receive laptops for school work and to access web-based resources at home. The CD/IM is a single sign-on web-based technology portal for teachers. The portal is part of the Broward Education Enterprise Portal (BEEP) and is being piloted in the aforementioned four schools before being rolled out to the district as a whole.

Literature Review

The successful implementation of one-to-one computing (one computer issued to every student) is controlled by many factors and is not a matter of merely providing the hardware alone. A program consisting of training and integration that relies on the hardware and software is needed for the successful execution of a one-to-one program. One-to-one computing has the power to transform the learning process and fully integrate technology into the very fabric of the school (Greaves, 2000). Success is found through software availability, training, technical proficiency, and inquiry. Although equipment plays a role, it is not as significant as proper training and implementation (Bonifaz, 2004).

One of the most notable achievements of one-to-one computing is its function as a bridge of the digital divide. The digital divide is the inequity associated with the availability of computing and technological resources to lower income students. In 2002, the Corporation for Public Broadcasting stated that 83 percent of American households owned at least one computer (Westhaver, 2005). The passage of the federal No Child Left Behind (NCLB) Act of 2001 reinforced the public policy philosophy that any child can learn by providing more flexibility to schools while requiring greater accountability. Educators need to challenge their students to reach high academic standards and provide students with their own laptops and access to an Internet connection thereby creating equality among students (Digital, 2004; Bonifaz, 2004; Barrios, 2004).

Another aspect of one-to-one computing and the NCLB is to teach 21st century skills and reform teaching methods. Today's world requires active learners where students draw their own conclusion from understanding information and not merely from being given the answer. The "sage on a stage" method is no longer thought to be the most effective way of teaching students (Barrios, 2004). In one-to-one computing the computer serves as a productivity tool for learning how to research, network, collaborate, and problem solve. Using the computer to merely serve

as another medium for using the drill and practice method is neither meaningful nor an engaging method of incorporating technology. One-to-one computing allows for the melding of real-world news and events with standards-based lessons (Murray, 2004). This allows for the most up-to-date information in an ever-changing world to be utilized. Developing 21st century skills are paramount to educating the future workforce of this country. Developing the ability to learn independently, collaborating with peers, and communicating the conclusions of ones findings are the foundation of those skills (Barrios, 2004; Murray, 2004).

Cost. One of the first concerns that come up with any program is cost. The cost of a one-to-one program is broken down into many different areas. The first area is the hardware itself, which includes both the laptop and the infrastructure (Barrios, 2004). The decision to lease or buy is affected by many different things. Generally, computer purchases are based on a five-year useful life. At the end of the five years, the computers would need to be surplused which would result in uninstalling software, removing documents, transporting, warehousing, and eventual disposal which increases the total cost of ownership. Leasing computers lowers the total cost of ownership by eliminating the many costs associated with storing the surplus of outdated hardware. It is also a method that addresses the elimination of obsolete resources and having up-to-date devices (Digital, 2004).

In most instances schools have the underlying infrastructure to provide a wireless network throughout their respective schools. Wireless access then becomes a matter of installing access points in strategic areas to provide full coverage across the campus. This may add accessibility but bandwidth becomes an issue when there are many computers that need to access a single network. Even a network that has enough bandwidth can be slowed down with too many users. Using project-based learning as opposed to using an integrated learning system can reduce network access. An integrated learning system is instructor-based and would necessitate the need for many students to look at a single site. This would create bandwidth issues as many terminals are trying to access the same item. Project-based learning is student centered and utilizes the students to share project information with each other which reduces network time and utilization (Barrios, 2004). The network should provide a level of protection to its users in order to prevent the corruption of programs and files by viruses; but it should not be the mindset of the network administrator to develop a siege mentality, which would reduce the usefulness of the laptops. "The experience in Indiana showed that infrastructure needs to be 'well supported by onsite technical support personnel' in order to keep the network capabilities in good condition and up-to-date" (Lemke, 2004 as cited in Bonifaz, 2004).

Internet Access. Internet access is critical in a one-to-one program where students are allowed to take their laptop home with them. In order to access course materials and assignments the student needs to be able to access the Internet. Many methods can be deployed to rectify access issues. One way to extend access is by expanding the availability of the wireless network to surrounding areas of the school. Another method would be to construct towers to serve as wireless repeaters that would extend access to outlying areas. This method would also prove to be an income source for the school because tower use can be sold to various wireless providers, as it is much easier for a school to construct a tower than it would be for a wireless provider. Another method is to provide dial up access through the school or by contracting a local Internet service provider to get service at a reduced rate (Bonifaz, 2004).

With increased accessibility to the Internet, many laws apply to how schools provide Internet access to their students. In October 1998, the Child Online Protection Act (COPA) was established to study methods of controlling a minor's access to harmful material on the Internet. COPA focuses on the widespread availability of the Internet and the opportunities that are available for minors to access materials that can elude parental supervision. COPA addresses the issues associated with the "protection of the physical and psychological well being of minors by shielding them from materials that are harmful to them" (Child, 1998). The Commission studied many technologies and methods, including filtering and blocking services; labeling and rating systems; age verification efforts; the possibility of a new top-level domain for harmful to minors material; "greenspaces" containing only child-appropriate materials; the positive and negative attributes of each of the technologies and methods. The COPA commission concluded that the most effective current means of protecting children from content on the Internet include: public education, consumer empowerment, increased resources for enforcement of existing laws, and greater use of existing technologies (Telage, 2000).

The Children's Internet Protection Act (CIPA) and the Neighborhood Children's Internet Protection Act (NCIPA) were signed into law on December 21, 2000. Under CIPA and NCIPA, no school may receive e-rate discounts unless it certifies that it is enforcing a policy of Internet safety that includes the use of filtering or blocking technology. The Internet Safety Policy must protect against access to visual depictions that are obscene or harmful to minors. The school must also certify that it is enforcing the operation of such filtering or blocking technology during any use of such computers by minors. For schools, the policy must also include monitoring the online activities of minors (Children's, 2000).

Resources. Along with new network considerations, one-to-one computing puts demands on the physical classroom environment (Digital, 2004). The location and availability of a power source needs to be considered, as laptops will need to be recharged throughout the day. In addition, various types of audio/visual equipment will need to be available for presentation purposes for both the student and the teacher (Bonifaz, 2004).

Another associated cost of a one-to-one program is the availability of digital resources. Technology can transform teaching and learning by incorporating methods that would not be possible if not for one-to-one computing. Communication between teacher and student is no longer the same and will be forever changed. The simple act of explaining a problem has evolved from pencil on paper to transferring a solution written on a Tablet PC with a stylus that is e-mailed to the teacher to be displayed on a digital projector (Rother, 2004). Also the barrier created by a distance between the question and the source of the answer has been altered dramatically. No longer does one have to go to the library to access information; technology allows users to search databases anytime, anywhere (Vail, 2003).

Over time, the reliance on textbooks would be shifted to online resources, which would make funds available. Empire High School, located outside Tucson, Arizona, will change the ideas of one-to-one computing when it opens its doors for the first time in 2005-06 by not providing a single textbook for its students. Empire High School has decided to rely on the educational value of the Internet to educate its students. Textbooks for each student can cost several hundred

dollars per student and keeping them up-to-date is very expensive. To meet the demands of the technological world, monies for textbooks have been reallocated toward the purchase of laptops for each student (Murray, 2004).

To offset the cost of a one-to-one program, savings would be incurred over time through the lower cost of printing, as many documents would be transmitted electronically to the teacher and the student. Savings are estimated at $15.00 per student per year. Additionally, there would be a reduction in the purchase of materials, such as maps and charts, as there are numerous online resources that are just as good, if not better, at providing the information. One of the largest savings would come from the repurposing of computer labs into classrooms, which would provide significant savings in construction costs (Digital, 2004; Barrios, 2004).

Curriculum Development and Instructional Management. A major hurdle for a one-to-one program is having teachers that are confident in using the computer. Curriculum development and instructional management will not develop simply by supplying the computer and the software. In order for teachers to effectively integrate technology into their curriculum, it is essential to train teachers to become familiar with the technology they have before them. Although application training is necessary to understand a program, not enough time is spent on how to integrate the application for uses in the classroom curriculum. A single access point for curriculum and instructional resources for students, parents, teachers, and administrators would allow for better collaboration amongst each group. Everyone learns together and a dynamic model of lifelong learning is created (Vail, 2003). Technology planning, staff development, and training must be considered from the onset. (Bonifaz, 2004; Barrios, 2004; Greaves, 2000).

Technical Support. Technical support plays a critical role when there is such reliance on a machine as a tool for learning. Down time of equipment creates hardships for both the teacher and students, which could lead to less usage of the applications and tools available on the computer. A plan to implement a chain of command for repairs is necessary (Bonifaz, 2004). Training the end-user to conduct routine maintenance can reduce the bottleneck effect that can occur when there is a backlog of repairs that needs to be handled by a single technician. When the end-user is capable of diagnosing and repairing a problem, approximately 90% of the problems can be quickly resolved. This leaves a technician free to handle technical issues and major repairs that may be too complicated for the end-user (Barrios, 2004). Another method to expand the availability of technical support is to have a student run help desk (Studies, 2004). This not only provides much needed technical support, but also provides valuable experience for the student.

Accountability. Another concern of the one-to-one programs is accountability. Accountability of the teachers is essential to promote the active integration of technology and not merely to use it as a method for drill and practice (Barrios, 2004). Students have accountability for the computer. Many programs, such as the Jefferson County School District in Kentucky and the Green County School District in North Carolina, require that insurance be purchased if the laptop is going to go home with a student, while another method is having the family pay for a portion of the laptop (Bonifaz, 2004). This instills pride in ownership and tends to lead to better care. A school must also be accountable to the public and show that a one-to-one program is

necessary and is enhancing the learning environment. Without the support of the public, a one-to-one program cannot be successful (Barrios, 2004).

Schools measure their own success by a standard set of criteria that includes both standardized test scores and attendance. Schools with one-to-one programs show changes in the academic performance, attitudes, and work habits of their teachers and students. These changes have included transformations in classroom activities away from whole-class lecturing to group and project-based learning activities. Students have been found to embrace the technology with a sense of pride and renewed interest in learning activities (Barrios, 2004; Farag, 2003; Greaves, 2000).

Students' increased enthusiasm for school has reduced absenteeism by as much as fifty percent, and initial results have indicated increased performance on standardized tests (Studies, 2004). The experiments are currently not mature enough to support firm conclusions regarding impacts on standardized tests, but the behavioral changes reported are consistent enough to suggest a universal impact. One-to-one schools also show more parental involvement with higher PTA attendance, increased communication, and more parental participation and volunteering (Barrios, 2004; Greaves, 2000).

One-to-one computing is not a novelty or a gimmick, but an approach to teaching and learning that is necessary for the future (Murray, 2004). Initial programs and studies have shown that the digital students of today are more engaged and motivated to learn in a technological environment. One-to-one computing is a solution for instilling students with 21st century skills and preparing them for the digital age.

Program Description

The Digital Learning Environment Study (DLES) is part of the Instructional Technology Plan of BCPS as presented in the report produced by the Digital Natives Committee entitled, *Changing the learning environment for our students: Vision into Action* (Digital, 2004). The defining vision of the DLES was to provide a laptop computer to each student in the project schools for use in the classroom and at home to further their educational activities. The other major component of the DLES was the establishment of a campus-wide wireless network that could be accessed by any laptop (or other wireless device), thus providing connectivity with the resources of the network (including the Internet) anywhere on the campus. These resources would be supplemented with classroom-based projectors, interactive white boards and teacher stations, including a sound amplification system and multiple media options. These latter resources were not deployed into every classroom, and thus, were not examined in this study.

The CD/IM is the teacher component of the Broward Education Enterprise Portal (BEEP), which represents a comprehensive strategy for delivering high-quality digital resources; management tools; services; and professional development that is personalized to teachers, students, parents, and administrators. CD/IM is designed to utilize the power of technology to provide teachers with easy access to rich curriculum and instructional content. The idea of the teacher portal is to create an online curriculum map that organizes all educational and instructional resources in the district, that links directly to the district's online professional development opportunities, data

warehouse, and other strategic applications, and that effectively links student curriculum content and performance to teachers curriculum and classroom management. The framework of BEEP, together with important links for administrators, students and parents, in addition to teachers, has been completed. The CD/IM is frequently referred to as the Teacher Portal of BEEP.

Cost Impact

DLES and CD/IM expenditures for 2004-05 totaled $8,457,482 and were funded through Title IID and existing technology capital budgets. DLES expenditures ($6,876,843) for 2004-05 included expenses related to the purchase and maintenance of 5,361 laptops for project students (DLES project capital budget accounts), and other costs, which included spare parts, video projectors, servers, security tags, and management software (end-user equipment capital budget account). CD/IM ($1,580,639) expenditures were within budget and included contracted services to Riverdeep, Inc. for three years for vendor project management, technical support and co-development services of the Learning Village portal, and content development costs for the BEEP teacher portal, which includes the development of elementary and secondary unit and lesson plans (*n*=3,887) by district staff.

There were other costs associated with the DLES and CD/IM projects. For example, existing district staff funded through the Department of Instructional Technology and Educational Technology Services (ETS) was assigned to provide support to the four project schools. One Instructional Technology Specialist was assigned to each of the four project schools to integrate technology into classrooms, provide curriculum support, procure digital curriculum resources, and monitor training. Similarly, one ETS staff member was assigned to each of the project schools to provide guidance in the installation of hardware and software in addition to providing ongoing technical support. Additionally, networking costs were incurred to upgrade the existing wireless infrastructure.

Table 1
2004-05 DLES and CD/IM Expenditures

Item	DLES ($)	CD/IM ($)	Total ($)
Laptops (*n*=5,361)	6,427,139	--	6,427,139
Contracted services (Riverdeep, Inc.)	--	1,400,000	1,400,000
Other	449,704	--	449,704
Content development	--	180,639	180,639
Total	6,876,843	1,580,639	8,457,482

The unit cost of laptop computers totaled approximately $1,199 each with 5,361 laptops distributed at the four project schools: Broward Estates Elementary (*n*=221), Attucks Middle (*n*=828), Miramar High (*n*=2,890), and Monarch High (*n*=1,422). DLES expenditures for laptops were higher than originally anticipated due to increased student enrollment once the DLES project began; an underestimation of spare parts needed and equipment attrition during the year created an on-going budgetary impact. Equipment needs were covered using existing project funds.

Purpose of the Evaluation

The evaluation study described herein examined the implementation and impact of the DLES and the results and teacher reactions to the first year of development of the CD/IM (i.e., BEEP Teacher Portal). The following research questions were addressed in this evaluation report:

1. What are the demographic characteristics of the schools participating in these projects?
2. What was the process of developing and implementing the DLES in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them?
3. What has been the impact of the DLES project on teacher classroom behavior?
4. What has been the impact of the DLES project on student motivation?
5. What has been the impact of the DLES project on student attendance?
6. To what extent have students and teachers attained National Education Technology Standards (NETS) skills?
7. To what extent have parents and the community been involved in the DLES project?
8. What was the process of developing and implementing, through Year 1, the CD/IM in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them? What is the current degree of implementation relative to the timeline contained in the plan?
9. What are the teachers' perceptions of the system's relevance to their curriculum needs?

Methods

The design for this evaluation study is a combination of a control group design and a case study. The non-equivalent control group design was used to examine the impact of the Digital Learning Environment on student attendance. The case study approach was used to examine the development of both projects, the experiences of the participants, and the perceived impact on teachers and students.

A combination of approaches was used to collect data to answer the questions posed in this report. The evaluator attended a project principals' meeting where he interviewed district and school-based staff. The evaluator visited each of the project schools. During these visits, interviews were conducted with school-based staff to obtain background information and implementation experiences. These interviews were followed up with questions via e-mail and telephone where needed. The evaluator visited classes, observed activities, and talked with the classroom teachers. Focus groups were conducted with students at the middle and high school levels; however, caution should be used when interpreting this data, as participants were selected by school staff to be representative of the student body. The curriculum specialists filled out some classroom observation sheets in November 2004 (right after the laptops were distributed), but have not completed follow-up observations to determine the status of the classroom activities at the end of the year. Since the observations that were completed did not reflect the impact of the DLES, they were not utilized in this report.

Surveys were developed and administered electronically to all teachers in the project schools (*n*=292). A total of 168 teachers completed surveys electronically resulting in a 57.5% response rate. Data was obtained from the Department of Instructional Technology including the results of a Teacher Competency Survey, a list of training sessions conducted, equipment lists, and other relevant documents. Data was also obtained on equipment and network expenditures from the ETS department. A data set was developed and analyzed that included demographic and attendance data for students enrolled in BCPS for the 2004-05 school year.

Results

1. *What are the demographic characteristics of the schools participating in these projects?*

The demographic characteristics of the students in the schools that participated in the DLES are examined and compared with BCPS student populations by level. Demographics examined included gender, race/ethnicity, Free and/or Reduced-Price Lunch (FRL) status, Limited English Proficiency (LEP) status, and Exceptional Student Education (ESE) status.

Table 2 shows the distribution of students by gender in each of the four project schools compared to all district students. The gender distribution was identical between Broward Estates Elementary and district elementary schools. There were no significant differences between the gender distribution of district middle schools and Attucks Middle ($\chi^2(1)=1.9$, *ns*). Both Miramar High (52.5%, *n*=1,538) and Monarch High (53.5%, *n*= 936) had a higher proportion of males than district high schools (50.1%, *n*=37,253), $\chi^2(1)=6.5$, $p<.05$.

Table 2
Gender of DLES Students by School and all District Students

	School		District	
School/gender	*n*	*%*	*N*	*%*
Broward Estates Elementary				
Female	328	48.0	59,045	48.0
Male	355	52.0	63,978	52.0
Attucks Middle				
Female	464	50.6	30,594	48.3
Male	453	49.4	32,711	51.7
Miramar High				
Female	1,394	47.5	37,168	49.9
Male	1,538	52.5	37,253	50.1
Monarch High				
Female	815	46.5	37,168	49.9
Male	936	53.5	37,253	50.1

As shown in Table 3, the ethnic distributions of participating schools differed from district distributions at each level. The proportion of Black students was higher than the district at Broward Estates Elementary (97.8% vs. 35.2%), Attucks Middle (48.0% vs. 36.2%), and Miramar High (67.0% vs. 35.9%), $\chi s^2>50.0$, $p<.001$. Monarch High School had a lower proportion of Black students (16.0% vs. 35.9%, $\chi^2(2)=333.4$, $p<.001$). The chi-squared tests of significance were performed on the ethnic categories of Black, Hispanic and White only, due to the low numbers of students in the other categories.

Table 3
Race/Ethnicity of DLES Students by School and all District Students

	School		District	
School/ethnicity	*n*	*%*	*N*	*%*
Broward Estates Elementary				
Asian	2	0.3	3,911	3.2
Black	668	97.8	43,346	35.2
Hispanic	4	0.6	30,970	25.2
Multi	6	0.9	3,585	2.9
Native American	1	0.1	277	0.2
White	2	0.3	40,934	33.3
Attucks Middle				
Asian	9	1.0	1,913	3.0
Black	440	48.0	22,898	36.2
Hispanic	197	21.5	15,443	24.4
Multi	23	2.5	1,418	2.2
Native American	2	0.2	128	0.2
White	246	26.8	21,505	34.0
Miramar High				
Asian	112	3.8	2,556	3.4
Black	1,963	67.0	26,702	35.9
Hispanic	617	21.0	17,408	23.4
Multi	38	1.3	891	1.2
Native American	16	0.5	154	0.2
White	186	6.3	26,710	35.9
Monarch High School				
Asian	52	3.0	2,556	3.4
Black	280	16.0	26,702	35.9
Hispanic	462	26.4	17,408	23.4
Multi	31	1.8	891	1.2
Native American	0	0.0	154	0.2
White	926	52.9	26,710	35.9

Table 4 shows the distribution of students in each of the four project schools by FRL, LEP, and ESE status. The proportion of FRL students was higher than district proportions for Broward Estates Elementary (83.2% vs. 46.1%), Attucks Middle (66.6% vs. 44.0%), and Miramar High (38.6% vs. 28.8%), $\chi s^2<375.5$, $ps<.001$. Monarch High had a lower proportion of FRL students (23.6% vs. 28.8%), $\chi^2(2)=22.5$, $p<.001$.

All of the schools had a different proportion of LEP students than the district at each level. The proportion of LEP students was lower than the district at Broward Estates Elementary (2.0% vs. 12.8%), Attucks Middle (6.8% vs. 8.6%), and Miramar High (6.3% vs. 8.7%), $\chi s^2<70.5$, $ps<.05$. Monarch High School had a higher proportion of LEP students (13.8% vs. 8.7%), $\chi^2(2)=56.2$, $p<.001$.

District proportions of ESE students were similar to ESE students at Broward Estates Elementary (13.0% vs. 14.6%), and Monarch High (9.7% vs. 10.0%), $\chi s^2<1.3$, *ns*. Attucks Middle (19.5% vs. 13.8%), and Miramar High (11.5% vs. 10.0%) had a larger proportion of ESE students than the district at each level, $\chi s^2<25.1$, $ps<.01$.

Table 4
Student Status of DLES Students by School

	School		District	
School/student status	*n*	*%*	*N*	*%*
Broward Estates Elementary				
FRL	568	83.2	56,703	46.1
LEP	14	2.0	15,724	12.8
ESE	89	13.0	17,914	14.6
Attucks Middle				
FRL	611	66.6	27,825	44.0
LEP	62	6.8	5,466	8.6
ESE	179	19.5	8,717	13.8
Miramar High				
FRL	1,131	38.6	21,415	28.8
LEP	185	6.3	6,464	8.7
ESE	336	11.5	7,441	10.0
Monarch High				
FRL	413	23.6	21,415	28.8
LEP	242	13.8	6,464	8.7
ESE	169	9.7	7,441	10.0

Teachers

The demographic characteristics of teachers in schools implementing the DLES and CD/IM projects and teachers districtwide were compared by school level. Demographics examined included teaching experience, gender, and race/ethnicity. All elementary, middle, and high school instructional staff were included. Table 5 summarizes the teaching experience of participating teachers and teachers districtwide by school level.

The distribution of DLES and CD/IM teacher experience was similar to the district values at the same level for Broward Estates Elementary, Attucks Middle and Monarch High Schools, $\chi s^2<4.0$, *ns*. Miramar High School had a smaller proportion of teachers with 5 years or less experience than district high schools overall (37.3*% vs. 51.5%, $\chi^2(2)=11.0, p<.01$).*

Table 5
Teaching Experience of DLES and District Teachers

	School		District	
School/teaching experience	*n*	*%*	*N*	*%*
Broward Estates Elementary				
5 years or less	14	31.8	3,054	41.9
6-10 years	24	54.5	2,901	39.8
More than 10 years	6	13.6	1,339	18.4
Attucks Middle				
5 years or less	11	25.0	1,170	37.5
6-10 years	24	54.5	1,420	45.5
More than 10 years	9	20.5	528	16.9
Miramar High				
5 years or less	50	37.3	1,915	51.5
6-10 years	59	44.0	1,200	32.2
More than 10 years	25	18.7	606	16.3
Monarch High				
5 years or less	42	51.2	1,915	51.5
6-10 years	26	31.7	1,200	32.2
More than 10 years	14	17.1	606	16.3

Note: Teaching experience included all teaching and was not restricted to Florida or Broward County.

Table 6 compares the gender distributions of DLES and CD/IM and district teachers. Broward Estates Elementary, Miramar High and Monarch High had proportions of male and female teachers similar to that of all schools in the district at their same level (χs^2<0.4, *ns*). Attucks Middle had a higher proportion of male teachers than that of all middle schools in the district (43.2% vs. 26.8%), $\chi^2(1)=5.9$, $p<.05$.

Table 6
Gender of DLES and District Teachers

	School		District	
School/gender	*n*	*%*	*N*	*%*
Broward Estates Elementary				
Female	40	90.9	6,643	91.1
Male	4	9.1	651	8.9
Attucks Middle				
Female	25	56.8	2,283	73.2
Male	19	43.2	835	26.8

(*table continues*)

Table 6 (*continued*).

School/gender	School *n*	School %	District *N*	District %
Miramar High				
Female	83	61.9	2,298	61.8
Male	51	38.1	1,423	38.2
Monarch High				
Female	48	58.5	2,298	61.8
Male	34	41.5	1,423	38.2

Table 7 summarizes the race/ethnicity of DLES and CD/IM teachers and teachers districtwide by school level. Monarch High School had a racial distribution among its teachers that was similar to that of all district high school teachers ($\chi^2(2)=.4$, *ns).* Broward Estates Elementary, Attucks Middle, and Miramar High Schools had a greater proportion of Black teachers, $\chi s^2<49.9$, *p*s< .001. The chi-squared tests of significance were performed on the ethnic categories of Black, Hispanic, and White only, due to the low numbers of teachers in the other categories.

Table 7
Race/Ethnicity of DLES and CD/IM and District Teachers

School/teacher experience	School *n*	School %	District *N*	District %
Broward Estates Elementary				
Asian	0	0.0	80	1.1
Black	28	63.6	1,468	20.1
Hispanic	3	6.8	828	11.4
Native American	0	0.0	32	0.4
White	13	29.5	4,886	67.0
Attucks Middle				
Asian	1	2.3	43	1.4
Black	23	52.3	903	29.0
Hispanic	1	2.3	280	9.0
Native American	1	2.3	17	0.5
White	18	40.9	1,875	60.1
Miramar High				
Asian	2	1.5	41	1.1
Black	58	43.3	871	23.4
Hispanic	18	13.4	369	9.9
Native American	0	0.0	16	0.4
White	56	41.8	2,424	65.1
Monarch High				
Asian	2	2.4	41	1.1
Black	17	20.7	871	23.4
Hispanic	7	8.5	369	9.9
Native American	1	1.2	16	0.4
White	55	67.1	2,424	65.1

2. *What was the process of developing and implementing the DLES in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them?*

The DLES project began with a presentation at a School Board Retreat on November 25, 2003 given by curriculum and technology staff (i.e., Digital Natives Committee). A follow-up of the Instructional Technology Plan was presented on April 13, 2004. The School Board approved the DLES and budget on June 14, 2004. The schools to be involved in the study were selected based on teacher involvement in the Digital Education Teacher Academy (DETA), principal leadership, and school infrastructure. These schools were Broward Estates Elementary, Attucks Middle, Miramar High and Monarch High Schools.

Following budget approval, a needs assessment was completed at each site to determine deficiencies in equipment, software, and infrastructure. The decision to use Apple laptop computers was based on the individual school's choice of platform. Currently the district allows site-based technology management; therefore the schools choose the laptop vendor of choice for their site. In addition, the vendor must be selected from the current district awarded Request-for-Proposal for computers. This left only two choices, Apple Computer or Dell Computer. The principals and school staff selected Apple Computer as the vendor of choice.

The campuses had to be upgraded to include a wireless infrastructure, which incorporated the portable classrooms as well as the permanent buildings. The technical staff was trained to support the infrastructure, servers, and repair problems that would arise. Equipment was procured and installed by mid-October. The networks at each of the schools functioned well, with only a few problems reported involving rooms with intermittent dead spots, particularly those rooms designed for special activities, such as dance, or weight lifting, or located on the periphery of the school. The network staff has been making progress in identifying solutions for each of these problems. Vendors met at each site to identify locations for repair pick-ups and the creation of student help desk technical support areas.

ETS personnel, in addition to coordinating the purchase and installation of the wireless networks and software installation, provided ongoing support for network maintenance and problem solving. A district Instructional Technology Specialist was assigned to each school. The role of the specialist was to provide on-site professional development, assist the school with creating a training plan, mentoring and coaching DLES teachers, and providing problem solving assistance.

Policy issues were addressed regarding student use of technology at home, insurance, lost and stolen equipment. A Technology Use Agreement addition to the Student Code of Conduct and a Parent/Student Agreement for Off-Campus Use of Laptop Computers were developed. The use agreement was translated into Spanish, Creole, and Portuguese. Due to the complexity of the issues raised by the laws governing Internet access by children and a school's provision of same and the technical issues involved, it was decided not to address the provision of Internet access to families that did not have it during this initial period.

One issue encountered was that the original network design could not handle the wireless traffic generated by all of the laptops. The network was re-designed to accommodate the demand. Another issue encountered was setting up the wireless network security and password encryption. This problem was solved by re-configuring the laptops. The servers were originally configured according to the county standard, but this proved to be unable to meet the needs of the project (e.g., saving students' work). A third party software solution was used to solve the problem.

Originally, it was determined that it would be optimal to configure all of the laptops with the same image (same software and settings). However, since some schools had different software licenses and needs, it proved necessary to configure each school uniquely. Additionally, it was necessary to add software later for increased security and other reasons. This proved to be a problem due to the limitations of Apple Remote Desktop and other technical issues. A third party software solution was identified and utilized.

Repair issues surfaced quickly as a difficulty with problems in determining qualification for warranty repair and turn-around time. The principals reported that some students were without laptops for six to eight weeks. This created difficulties for the students and their teachers in instructional use of the laptops in class and in completing laptop-based assignments. A new repair vendor was identified for major repairs, and the schools developed and improved their infrastructure for minor repairs. While problems associated with students whose laptops are non-functional is still a problem, the time for repair has decreased significantly to less than two weeks.

Three schools began the distribution of laptops in mid-October, following the completion of the preparations, wireless network installations, and equipment purchase. One school, Broward Estates Elementary, was scheduled to distribute later, but opted not to do so after learning of the problems with laptop theft at Miramar High. Each school followed a slightly different distribution pattern. Attucks Middle elected to distribute approximately 200 laptops at each Saturday training session. Monarch High distributed approximately 150 laptops daily. Miramar High distributed approximately 150 laptops at each training session held on Tuesday nights and two sessions on week-ends. The high schools started distributing laptops to Seniors, then Juniors, Sophomores, and Freshmen. All of the schools required that at least one parent attend the distribution and orientation session. The students and parents were introduced to their responsibilities in regards to the laptops and received basic training on their operation. The parents and students reviewed and signed the Parent/Student Agreement.

All of the schools developed an intense training program for teachers, parents, and students. The number of unique training sessions and the total number of training sessions are presented in Table 8. At participating schools, 106 unique training classes were held with teachers, students and parents. Additionally, Attucks Middle held one meeting for community members and Miramar held one meeting for department heads. These trainings were viewed by administrators and teachers at each of the schools to be a key facilitating factor in the successful implementation of the project.

The majority of the formal parent and student training sessions were given during the period of October through November, coinciding with the laptop distribution. The teacher trainings began in August and were presented regularly throughout the year. Parents and students received training relating to general information regarding the laptops and their use, Internet skills, and laptop safety and responsibility. The teacher training was part of the ongoing professional development including topics, such as computer and software skills, electronic communication, curriculum integration and electronic content, concept mapping skills, modeling and coaching, presentation skills, student reading skills, and technology integration.

Table 8
Summary of Technology Training Sessions by School

School	Number of unique training classes				Total number of trainings
	Teachers	Students	Parents	Total	
Attucks Middle	20	2	2	24	86
Broward Estates Elementary	12	4	3	19	43
Miramar High	34	5	2	41	79
Monarch High	17	4	1	22	68
Total	83	15	8	106	276

Note: Total Attendance represents the total attendance at all trainings, not unique headcount.

At Miramar High School, like all of the schools, the reception and usage of the laptops was enthusiastic and positive with teachers, parents, and the community excited by the new dimension added to the education of the students and their ability to access information. The students tended to treat the laptops as status symbols. Unfortunately, some predators in the neighboring communities learned that students received laptop computers. Students were targeted as they traveled to and from school and in their regular gathering places. While the police and community responded well in an effort to stop the theft, nine incidents involving 14 students occurred until the decision was made in December 2004 to retrieve the laptops. At first students were instructed to leave them at home, then the school organized collection days for the students to return the laptops. The laptops were placed on carts and every class had a cart, so students would pick up their laptop as they entered class.

This same approach was utilized by Broward Estates Elementary, where the laptops were never distributed for students to take home. The school was funded for 20 laptops per class (two carts) for grades four and five. The school chose to stretch this allocation to provide ten laptops per classroom (one cart) in grades three through five.

Of 5,361 computers purchased, a total of 50 laptops were not returned or remaining at the end of the year for an overall loss rate of just under 1.0%. The largest proportionate loss was at Broward Estates with a loss rate of 3.2% (7 lost/stolen), followed by Miramar High School with a loss rate of 1.3% (39 not returned). Both Attucks Middle and Monarch High School had a loss rate of .2% and .1%, respectively, for two laptops not returned at each school.

At Attucks Middle School, battery life evolved as a major issue. Since the laptops had only 2.5 hours of battery capacity, the teachers had to work together to determine who would get to use the laptops each day. The homeroom teachers would give “battery quizzes” where the grade was the percentage of battery life available at the beginning of the day. The battery issue was not a

problem at Monarch, where students were better attuned to power management, there was a better availability of outlets, and differences existed in the pattern of laptop usage. Of course, in the schools where the laptops were distributed from charging carts at the beginning of each class, this problem did not exist.

In each of the schools, the administrators identified training, staff participation, staff willingness to change, student and parent enthusiasm, and district support as the major facilitating factors. The Teacher Survey included open-ended items where teachers were asked to identify the major facilitating and blocking factors that affected the implementation of the DLES. The major facilitating factors identified by the teachers are presented in Table 9. Reflective of administrator comments (and the findings in the literature), training was the most frequently mentioned facilitating factor, followed closely by access to technology (laptops, the network and classroom equipment). These issues were followed by students' response (eagerness, etc.), administrative support and lesson plan support (having technology-based lesson plans readily available).

The factors of staff preparation (participation in DETA), school infrastructure, and administrative leadership were the major factors utilized in choosing the schools to participate in this study. These same factors were identified by both the administrators in the interviews and by the faculty in the survey as facilitating the implementation of the DLES.

Through interviews with school administrators and classroom teachers as well as observations of the classroom teachers, it became clear that a critical factor in the successful implementation of the DLES, especially given the late notification received by the schools, was administrative leadership. In each of the schools, the school leadership had set the tone that technology was the wave of the future for their students, and that it should be infused into every educational activity. When the announcement was made that the laptops were coming, the principals made it clear that the faculty's job was to optimize their use to improve the education of their students. Moreover, the teachers in all of the schools appeared to be ready and eager to adapt their curricular approaches and to use a variety of strategies to integrate technology into their classroom approach. This topic is covered in greater detail in research question three.

Table 9
Teacher Responses Regarding Facilitating Factors in the Implementation of the DLES by Level

	Elementary		Middle		High		Total	
Factor	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Training	7	26.9	7	33.3	19	25.7	33	27.3
Access to Technology	8	30.8	3	14.3	21	28.4	32	26.4
Student Response	3	11.5	5	23.8	15	20.3	23	19.0
Administrative Support	4	15.4	3	14.3	11	14.9	18	14.9
Lesson Plan Support	3	11.5	2	9.5	7	9.5	12	9.9
Accessibility of Data	1	3.8	1	4.8	1	1.4	3	2.5
Total	26	100.0	21	100.0	74	100.0	121	100.0

Blocking factors identified by the teachers are presented in Table 10. Overall, one-forth (25.4%) of responding teachers identified student response (use for games, messaging, music,

downloading inappropriate material, etc.), as a blocking factor, although this appeared to be primarily a high school problem. Smaller proportions (15% or less) of respondents identified other blocking factors, including repair needs, computer problems (other than repair problems), time (for teacher learning, planning, etc.), and lack of laptops for everyone (limitations on the number of carts in the elementary school and as a result of repair problems elsewhere).

Table 10
Teacher Responses Regarding Blocking Factors in the Implementation of the DLES by Level

	Elementary		Middle		High		Total	
Factor	*n*	%	*n*	%	*n*	%	*n*	%
Student response	0	0.0	3	17.6	27	34.6	30	25.4
Repair needs	5	21.7	2	11.8	11	14.1	18	15.3
Computer problems	2	8.7	3	17.6	12	15.4	17	14.4
Time	6	26.1	4	23.5	7	9.0	17	14.4
Lack of laptops for everyone	7	30.4	2	11.8	6	7.7	15	12.7
Administrative problems	0	0.0	1	5.9	5	6.4	6	5.1
Community issues	0	0.0	0	0.0	6	7.7	6	5.1
Equipment needs	1	4.3	0	0.0	1	1.3	2	1.7
Printing problems	0	0.0	2	11.8	0	0.0	2	1.7
Lack of accessible training	1	4.3	0	0.0	1	1.3	2	1.7
Computer choice	0	0.0	0	0.0	1	1.3	1	0.8
Curricular issues	0	0.0	0	0.0	1	1.3	1	0.8
Not the expert anymore	1	4.3	0	0.0	0	0.0	1	0.8
Grand total	23	100.0	17	100.0	78	100.0	118	100.0

3. *What has been the impact of the DLES project on teacher classroom behavior?*

The administrators all reported that their faculties (with very few exceptions) embraced the use of the laptops and were well into the process of revising their approach to teaching and learning. Administrators expressed that they had observed the following changes in teacher classroom behavior:

- More group activities-cooperative learning with students actively learning with and from each other rather than passively receiving information;
- More instances of students teaching students (and even the teacher);
- More group projects assigned as homework and less dependence on the questions at the end of chapters in textbooks;
- More use of external resources such as University and research websites;
- Increased tolerance of diverse activities where student workgroups divide the assigned tasks among themselves and each student worked on a different part of the project;
- Creative lesson planning (e.g., teaching Spanish by having students write and record songs in Spanish);
- More cross-discipline activities (e.g., track and graph personal fitness measures in Physical Education class);
- Fewer disciplinary referrals; and
- More use of productivity tools such as online gradebooks, presentation software, and electronic communication.

DLES teachers (*n*=168) also responded to survey items relating to the degree to which they have been able to utilize the National Education Technology Standards (NETS) skills in their classroom teaching. The results of this section of the survey are presented in Table 11. For all of the skills listed, 6.5% (*n*=11) or less of the teachers reported that they had not begun to use the skill in their classroom. Eighty percent (*n*=135) or more of teachers indicated that they were at the Basic Level or above in usage of all of the skills listed. These findings suggested that DLES teachers were well on their way to achieving and utilizing all of the NETS skills.

Table 11

Teacher Responses Regarding the Degree to Which They Have Utilized NETS Skills

Please indicate the degree to which the Digital Learning Environment (campus wireless network/student laptops) have enabled you to:	*n*	Percentage responding				
		NOT	BEGIN	BASIC	INTER	MAST
Facilitate technology-enhanced experiences that address content and student technology standards.	168	1.8	7.1	25.0	46.4	19.6
Use technology to support learner-centered strategies that address the diverse needs of students.	168	5.4	4.8	22.6	47.0	20.2
Use technology to develop students' higher order skills.	168	3.6	8.3	19.0	47.6	21.4
Manage student learning activities in a technology-enhanced environment.	168	4.2	7.8	21.6	38.9	27.5
Use technology to assess student learning of subject matter using a variety of assessment techniques.	168	5.4	10.2	20.4	41.3	22.8
Use technology resources to collect and analyze data to improve instructional practice and maximize student learning.	168	3.0	8.3	24.4	39.9	24.4
Determine students' appropriate use of technology resources for learning, communication, and productivity.	168	6.0	7.7	26.8	36.3	23.2
Expose students to the legal and ethical issues related to technology use.	168	6.5	13.1	22.6	34.5	23.2
Apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.	168	3.6	10.1	24.4	35.7	26.2
Facilitate equitable access to technology resources for all students.	168	3.0	6.6	23.4	37.7	29.3

Note. The response scale is: NOT=Not at All, BEGIN=At a Beginning Level, BASIC=At a Basic Level, INTER=At an Intermediate Level, and MAST=At a Mastery Level.

4. *What has been the impact of the DLES project on student motivation?*

The administrators interviewed at each school indicated that they observed that students had become more engaged in the learning process, were excited about their class projects, and were reading more. There were more opportunities for success for each individual student as they inputted their own unique talents into completing class projects and had more resources available for help with learning the material.

All of the students participating in focus groups at the middle and high school level expressed great enthusiasm regarding the DLES and their access and use of laptop computers in class. Focus group participants indicated that they used the laptops for the following major applications:

- Class projects (both group and individual);
- Research both for class and personal interest;
- Homework assignments – writing and editing;
- Computer Aided Instruction such as FCAT Explorer, Atomic Learning and other online learning opportunities;
- Accessing textbooks both online and through CD's;
- Taking supplemental courses (e.g., Broward Virtual Education);
- Utilizing supplemental and review material (e.g., "I found a great site at a University that really helped with Algebra II."); and
- Taking notes in class and organizing study materials (one group of high school students, while being polite, could not understand why the evaluator was not taking notes electronically in their focus group session).

When specifically asked about the impact of having laptop computers on their motivation to do class assignments and projects, all of the groups gave the following responses:

- Laptops make it fun – assignments are more interesting and involving.
- Doing a good job is easier – more resources are immediately available, there are more opportunities for creativity, additions and revisions are easier, making it look good is easier.
- They enjoy "learning by accident" – finding interesting information, while searching for something else.
- Online textbooks (including CD-based) are easier to use and are available when they have spare time to study, both in and out of class.
- Use of time becomes more efficient and "boring" down time is eliminated (even if it is just to "do their own thing" when they are not involved in class activities).

The students did mention that, to do well in their classes, they had to resist the temptation to use the computers as a distraction rather than a learning tool. Moreover, students expressed that some of these distractions could be positive rewards for students finishing class assignments early as compared to sitting around bored as other students completed their tasks.

Teachers (n=168) also responded to items on the Teacher Survey relating to the degree of motivation by their students. The results of this section of the survey are presented in Table 12. On all but one of the motivation questions, more than 90.0% (n=152) of the teachers indicated

that their students demonstrated an increased motivation at a level greater than a Beginning Level. The exception was increased interest in a subject area, which was rated at a level greater than a Beginning Level by 88.1% (*n*=148) of the teachers. Overall, these findings suggest that the DLES resulted in increased student motivation and interest in class projects and other learning opportunities.

Table 12

Teacher Responses Regarding the Degree to Which the DLES has Motivated Their Students

Please indicate the degree to which the Digital learning Environment (wireless network /student laptops) have enabled your students to:	*n*	Percentage responding				
		NOT	BEGIN	BASIC	INTER	MAST
Demonstrate an increased interest in your subject area.	168	5.4	6.5	13.1	50.6	24.4
Demonstrate an increased motivation to complete technology-based class assignments.	168	4.2	5.4	14.3	48.2	28.0
Become more successful at completing technology-based class assignments.	168	4.2	5.4	17.9	45.8	26.8
Demonstrate an increased interest in technology-based class projects.	168	3.6	5.4	19.6	42.3	29.2

Note. The response scale is: NOT=Not at All, BEGIN=At a Beginning Level, BASIC=At a Basic Level, INTER=At an Intermediate Level, and MAST=At a Mastery Level.

5. *What has been the impact of the DLES project on student attendance?*

To determine whether participating in DLES had an impact on student attendance, attendance rates were examined for DLES and other district students for 2003-04 and 2004-05. Students who attended DLES schools in 2004-05 were compared to other district students at the same level (elementary, middle, and high). Students were selected who had 175 days in membership for both 2003-04 and 2004-05. This value was selected because it included those students who entered only a few days late and included approximately 90% of district students in each year. To control for student specific factors that affect attendance, weighted comparison groups of non-DLES students were created for each level. These comparison groups were weighted on the demographic variables of gender, race, FRL status, LEP status, and ESE status. Using these weighted comparison groups ensured that the DLES and non-DLES groups were of similar demographic composition.

The attendance rate was computed by dividing the number of days present by the number of days in membership, thus standardizing the measure for those students who entered school a few days late. Table 13 compares the attendance rates of DLES and other district students at the same level for the 2003-04 and 2004-05 school years. Inspection of this table shows that DLES students had similar or lower attendance rates than did the comparison group at all levels and for all years and that attendance rates tended to drop from 2003-04 to 2004-05. This drop in attendance level from year to year is a common trend as students get older. However, the question of interest was: Did the DLES students drop more or less than the other students? To test this question, the attendance rates were entered into a two-factor Analysis of Variance (ANOVA) with DLES participation serving as a between groups factor and school year as a repeated factor. The presence of a significant interaction term would indicate that there was a

difference in the change in attendance of DLES students compared to that of non-participating students.

Table 13
Attendance Rates of DLES and Comparison Group Students in 2003-04 and 2004-05

		2003-04		2004-05	
Level	*n*	Mean	Std. Dev.	Mean	Std. Dev.
Elementary					
DLES students	552	.960	.038	.959	.042
Comparison group students	552	.960	.042	.960	.042
Middle School					
DLES students	681	.941	.056	.925	.070
Comparison group students	681	.947	.055	.939	.066
High School					
DLES students	3,237	.940	.059	.918	.082
Comparison group students	3,237	.940	.060	.922	.080

At the elementary level, there was no difference in the change in attendance over time between DLES and comparison students from 2003-04 to 2004-05. In other words, there was no significant interaction between DLES participation and time, $F(1, 1{,}102)=0.08$, $p=.777$.

At the middle school level, there was an interaction between DLES participation and time in terms of attendance rates, $F(1, 1{,}360)=9.11$, $p<.01$). DLES students, at the middle school level, experienced a greater drop in attendance than did students at other middle schools. This trend is pictured in Figure 1. The amount of this difference (0.008) and the effect size ($\eta^2=.007$) was small, which suggests **no practical difference between groups**.

Similarly at the high school level, there was an interaction between DLES participation and time in terms of attendance rates, $F(1, 6{,}472)=9.03$, $p<.01$. DLES students at the high school level experienced a greater drop in attendance than did students at other high schools. This trend is shown in Figure 2. Again, the amount of this difference (.004) and the effect size ($\eta^2=.001$) were small, which indicates **no practical difference between groups**.

6. *To what extent have students and teachers attained National Education Technology Standards (NETS) skills?*

Focus group interviews with students in the project schools revealed that students had adapted well to using technology as an integral part of their life and education. Students were comfortable with using technology and considered it a vital tool rather than an object of study. As reported in research question four, students were enthusiastic about the contributions of technology to improve their ability to obtain, process, and communicate information. Students were regular users of telecommunications to communicate and collaborate with each other, their teachers, and others. The student interviews demonstrated by their responses that they had acquired the NETS skills for students.

Teachers (*n*=168) responded to survey items relating to the degree of mastery of the NETS skills by their students (see Table 14). For all of the skills in the standards, less than 8.9% (*n*=15) of the teachers reported that their students had not achieved at least a Beginning Level of mastery. Fifty-five percent (54.8%, *n*=92) or more of the teachers indicated that their students were at the Intermediate or Mastery Levels for all of the skills listed.

Table 14

Teacher Responses Regarding the Degree to Which the DLES Enabled Students to Master NETS Skills

Please indicate the degree to which the Digital learning Environment (wireless network/student laptops) have enabled your students to:	*n*	Percentage responding				
		NOT	BEGIN	BASIC	INTER	MAST
Become proficient in the use of technology.	168	1.8	7.9	21.8	45.5	23.0
Understand social issues related to technology.	168	5.4	11.3	28.6	35.1	19.6
Practice responsible use of technology systems, information, and software.	168	5.4	8.9	23.8	37.5	24.4
Develop positive attitudes toward technology uses that support lifelong learning.	168	4.2	6.0	16.1	42.9	31.0
Use technology tools to enhance learning.	168	1.8	9.5	16.7	44.6	27.4
Use technology-based tools to produce creative work.	168	3.0	8.4	17.4	46.1	25.1
Use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.	168	8.9	11.9	20.2	34.5	24.4
Use a variety of media and formats to communicate information and ideas effectively.	168	3.0	13.2	19.8	42.5	21.6
Use technology to locate, evaluate, and collect information from a variety of sources.	168	1.8	9.5	23.8	38.1	26.8
Use technology tools to process data and report results.	168	7.7	11.3	20.2	38.1	22.6
Evaluate and select new technology-based tools based on the needs of a particular task.	168	6.0	11.9	26.8	35.7	19.6
Use technology resources for solving problems and making informed decisions.	168	5.4	12.6	24.6	36.5	21.0

Note. The response scale is: NOT=Not at All, BEGIN=At a Beginning Level, BASIC=At a Basic Level, INTER=At an Intermediate Level, and MAST=At a Mastery Level.

A Teacher Competency Survey keyed to the NETS skills for teachers was administered by the Department of Instructional Technology to teachers at the project schools from 2003 through 2005. Only three survey responses were received from Broward Estates teachers, and therefore were not reported. The Miramar High School survey was administered in February 2003, prior to most teachers' participation in the Digital Education Learning Academy (DETA). The Attucks Middle School survey was administered part in June 2004 and part in December 2004. The Monarch High School survey was administered during March 2005, and thus, is the only survey that can be treated as an outcome measure for DLES in 2004-05.

The survey contained a total of 74 questions that were divided into the following NETS skills categories:

- Technology Operations and Concepts (40 questions);

- Planning/Designing Learning Environments and Experiences (9 questions);
- Teaching, Learning and the Curriculum (5 questions);
- Assessment and Evaluation (4 questions);
- Productivity and Professional Practice (10 questions);
- Social, Ethical, and Legal Issues (4 questions); and
- Social, Ethical, and Legal Issues (Broward Policies) (2 questions).

A total of nine questions were excluded from the calculation of the overall rating in the following sections: Technology Operations and Concepts (*n*=5), Planning/Designing Learning Environments and Experiences (*n*=2), and Productivity and Professional Practice (*n*=2). Excluded questions reflect NETS skills that had not yet been implemented in DLES schools. The rating scale for each survey question was:

- Unaware—I have not heard of this technology concept.
- Aware—I am familiar with the concept or skill but have little or no experience using it and need additional assistance or support.
- Early User—I have some experience using the concept or skills but still need some support.
- Routine User—I have experience using the concept or skill and need tips and pointers.
- Expert User—I have extensive experience using the concept or skill and could teach it to others.

Summary ratings were determined by assigning these responses the values of 0 to 5 (e.g., Unaware=0 to Expert User=5), summing the values in each category, and dividing by the number of responses. The result was assigned the rank representing the closest category value (e.g., an average of 2.6 were given a category value of Routine User=3).

As shown in Table 15, prior to taking the DETA course in February 2003, 39.6% (*n*=19) of teachers at Miramar High School rated themselves as Routine or Expert overall. Over 75% (77.1%, *n*=37) rated themselves Routine or Expert on Social, Ethical, and Legal Issues, and approximately one-fifth (22.9%, *n*=11) rated themselves as Routine of Expert in Productivity and Professional Practice.

Table 15
Teacher Competency Ratings by Standard – Miramar High School

Competency standard	*n*	Percentage scoring			
		Aware	Early	Routine	Expert
Technology Operations and Concepts	48	22.9	27.1	35.4	14.6
Planning/Designing Learning Environments and Experiences	48	47.9	16.7	31.3	4.2
Teaching, Learning and the Curriculum	48	45.8	27.1	12.5	14.6
Assessment and Evaluation	48	54.2	20.8	12.5	12.5
Productivity and Professional Practice	48	33.3	43.8	18.8	4.2
Social, Ethical, and Legal Issues	48	10.4	12.5	10.4	66.7
Social, Ethical, and Legal Issues (BCPS Policies)	48	45.8	25.0	18.8	10.4
Overall ranking	48	22.9	37.5	33.3	6.3

Note. The response scale is: NOT=Not at All, BEGIN=At a Beginning Level, BASIC=At a Basic Level, INTER=At an Intermediate Level, and MAST=At a Mastery Level.

Table 16 shows, that prior to students receiving their laptops June 2004 and in December 2004, 50.0% (*n*=25) of teachers at Attucks Middle School rated themselves as Routine of Expert overall. Eighty-four percent (*n*=42) rated themselves Routine or Expert on Social, Ethical, and 40.0% (*n*=20) or more of the teachers rated themselves as Routine or Expert in each of the categories.

Table 16
Teacher Competency Ratings by Standard – Attucks Middle School

Competency standard	*n*	Percentage scoring			
		Aware	Early	Routine	Expert
Technology Operations and Concepts	50	22.0	24.0	42.0	12.0
Planning/Designing Learning Environments and Experiences	50	28.0	24.0	36.0	12.0
Teaching, Learning and the Curriculum	50	44.0	14.0	30.0	12.0
Assessment and Evaluation	50	46.0	14.0	28.0	12.0
Productivity and Professional Practice	50	24.0	28.0	40.0	8.0
Social, Ethical, and Legal Issues	50	6.0	10.0	8.0	76.0
Social, Ethical, and Legal Issues (Broward Policies)	50	34.0	22.0	30.0	14.0
Overall ranking	50	16.0	34.0	38.0	12.0

As the 2004-05 school year was approximately three-fourths complete, 76.9% (*n*=40) of teachers at Monarch High School rated themselves as Routine or Expert overall (see Table 17). The only category where more that 10% of the teachers rated themselves as merely Aware was Assessment and Evaluation.

A comparison of different DLES schools at different times does not produce a statistically sound conclusion. However, it appears that, as the DLES progressed, the teachers involved steadily increased in their level of experience with the NETS skills for teachers. The reader is directed to the discussion in research question three regarding the degree of usage of the NETS in teachers' classroom activities.

Table 17
Teacher Competency Ratings by Standard – Monarch High School

		Percentage scoring			
Competency standard	*n*	Aware	Early	Routine	Expert
Technology Operations and Concepts	52	1.9	23.1	38.5	36.5
Planning/Designing Learning Environments and Experiences	52	5.8	21.2	42.3	30.8
Teaching, Learning and the Curriculum	52	7.7	25.0	40.4	26.9
Assessment and Evaluation	52	15.4	23.1	42.3	19.2
Productivity and Professional Practice	52	5.8	19.2	40.4	34.6
Social, Ethical, and Legal Issues	52	9.6	1.9	3.8	84.6
Social, Ethical, and Legal Issues (Broward Policies)	52	1.9	13.5	42.3	42.3
Overall ranking	52	1.9	21.2	48.1	28.8

7. *To what extent have parents and the community been involved in the DLES project?*

The principals reported that, in all of the schools, the parents were excited and very receptive to students receiving laptop computers. At Monarch High, Miramar High, and Attucks Middle, as parents were required to attend an orientation and sign the Parent/Student Agreement for Off-Campus Use of Laptop Computers, 100% of the parents were involved in the implementation. All of the principals reflected that this was the first time that their schools had 100% parent involvement in any activity, and that it was probably the first time that many of the parents were involved in anything at the school.

At Monarch, the parents had a positive response to students receiving laptops and considered it the fulfillment of the school's vision. At Attucks Middle, the principal reported that the community was grateful and spread the word to "protect" the kids and the laptops. At Miramar, parents have been very involved in the security issues and have shown great interest in working on the task forces formed to determine a solution of the security problem for 2005-06. The parents at Broward Estates supported the new technology by attending formal training sessions as well as an evening Cyber Café, organized by the school to assist in online activities.

As presented in Table 7, above, there were 2,777 instances of attendance in formal training sessions by parents across the four schools. These enrollments did not include the brief introduction provided during the laptop distribution process, which resulted in every parent signing an agreement at all of the schools except for Broward Estates (where the laptops were never distributed). There were no attendance logs available for the more informal Cyber Café or parent telephone support activities.

The community became involved in the DLES, both formally and informally. At Miramar High School, the community leadership rallied around the school and worked to provide solutions to the security issues. They are continuing to work with the school leadership to develop solutions for the 2005-06 school year. At Attucks Middle, the principal reported that the community spread the word to "protect" the students. At all of the schools, the principals reported that the community has expressed pride in the school and what is being done with technology to train their students for the future.

8. *What was the process of developing and implementing, through Year I, the CD/IM in the four schools? What changes were made to the implementation strategy contained in the plan? What were the major blocking and facilitating factors encountered during implementation and what steps were taken to overcome or capitalize on them? What is the current degree of implementation relative to the timeline contained in the plan?*

The concept of developing a Curriculum Development/Instructional Management (CD/IM) system was presented at a School Board Retreat on November 25, 2003, by curriculum and technology staff (i.e., Digital Natives Committee). The vision of the CD/IM was to create a single source for instructional resources, curriculum, staff development, and management tools for teachers. The CD/IM was part of a larger vision that led to creating digital learning environments in all BCPS. The Instructional Technology plan, which included the CD/IM as a project, was presented to the School Board on April 13, 2004. Subsequently, the School Board approved the development contract with Riverdeep, Inc., on April 25, 2004, which enabled staff to begin the project and provided both a system and a vendor partner to co-develop the system.

The schools selected as the pilot schools for the DLES were also selected to pilot the CD/IM teacher portal. The project was planned to be implemented over a three-year period. Milestones for each year are presented in Table 18.

Table 18
Annual Milestones for CD/IM in BCPS

Year One Milestones
• Develop a teacher portal with single sign-on access to five curriculum applications by May 2005.
• Develop curriculum content to include four core curriculum areas of science, social studies, language arts, and mathematics to include 180 days of instructional content per area by September 2005. Initially focus on content aligned to standard curriculum resources available in every school.
• Pilot initial teacher portal in May 2005 with four DLES schools and incorporate feedback into continuous improvement phase.
• Conduct initial evaluation of progress to date by July 2005.

(*table continues*)

Table 18 (*continued*).

Year Two Milestones
• Continue to develop curriculum content in core areas and refine content developed in year one. Begin to add project-based learning plans and interdisciplinary lessons. By June 2006, curriculum content will be fully developed and continuous improvement cycle will be generated. • By August 2005, open access to all teachers to use the system to create their own individual work space of units, lessons, activities, and resources. • Develop a roll-out strategy which includes professional development, marketing, and technical support. • By June 2006, incorporate new applications to the single sign-on. • By June 2006, staff development will have been provided to core groups of teachers at all schools.
Year Three Milestones
• Continuous improvement cycle will be implemented. Content will continue to be added as needed. • Begin to incorporate teacher portal into larger NEXUS project. • Continue to provide staff development to new teachers and inservice teachers as needed.

To reach the year one milestones, both a technical and a curriculum team worked on various tasks simultaneously to ensure goals were met. Year one implementation was divided into five phases. Phase One began on April 30, 2004, and Phase Five was completed by July 31, 2005. A website was developed by Riverdeep (http://cdim .riverdeep.net/) to present the project and report on its progress through each phase to BCPS stakeholders. The timeline and major accomplishments of each of the five phases are presented in Table 19.

Table 19
CD/IM Timeline and Major Accomplishments

Phase/dates	Accomplishments
Phase One May-August 2004	• Installed Learning Village on Broward Server. • Imported Sunshine State Standards to Learning Village. • Developed lesson/unit plan templates for use in curriculum development efforts. • Riverdeep assigned a project manager to work with BCPS. • BCPS identified an initial county-wide project team.
Phase Two August-October 2004	• Testing completed on pilot server. • Project moved to BCPS servers ready for installation of curriculum content. • 270 curriculum maps configured as unit plans within Learning Village. • Imported 260 BEACON elementary lesson plans. • Public website posted at http://cdim.riverdeep.net/ • Weekly team conference calls between Riverdeep and BCPS established.

(*table continues*)

Table 19 (*continued*).

Phase/dates	Accomplishments
Phase Two August-October 2004	• Development of lesson/unit plans initiated. • Two Millennium Group consultants hired to support curriculum content development and training. • Process for reporting and resolving issues established.
Phase Three October-December 2004	• 300+ unit plans completed in mathematics, reading, language arts, science, social studies, art, music, and physical education. • Virtual Technology Recognition Project and BEACON lessons made available within Learning Village. • Development teams began populating Learning Village with 150+ lessons, resources, and activities specific to Broward's instructional program. • Customized Learning Village portal homepage, corresponding teacher portal page, and single sign-on page completed for testing. • Tested video capabilities on Learning Village.
Phase Four January-April 2005	Learning Village Content Update: • 500+ unit plans completed in mathematics, reading, language arts, science, social studies, art, music, physical education and career technical. • Established single sign on to Atomic Learning, Virtual Counselor, Riverdeep Learning Management System, Blackboard, and Learning Village. • Supplemental and Enrichment Lessons o 170 Virtual Technology Recognition Project lessons and project-based plans o 2,500 BEACON lesson plans imported to portal o 100 plans in review and editing process • Staff Development (teachers trained) o 125 District Core Curriculum and Technology Integration Specialists o 135 teachers writing lesson/unit plans o 300 teachers from DLES schools
Phase Five May-July 2005	• Portal Design- Complete and Operational o Roll out to faculty in pilot schools in May 2005 • Summer Training for BEEP Rollout o New Teacher Academy o Digital Education Teacher Academy o Critical Content • ETS Help Desk Support Initiated.

Overall, the development progress of the CD/IM for year one was on track with the schedule anticipated in the initial design. During the first year of implementation, the goal was to create a teacher portal with single sign-on access to five curriculum applications and to pilot the system

in the four schools that were part of the DLES. The five applications made available through the teacher portal included:

- *Riverdeep Learning Village*. This application enables the district to create a bank of quality unit plans, lesson plans, activities and resources aligned with the Sunshine State Standards, NETS, ESOL Strategies and ESE standards. A major task of the first year was to get the Learning Village installed and create and import curriculum content.
- *Atomic Learning Video Tutorials.* BCPS had previously purchased a district license to use this staff development resource.
- *Virtual Counselor.* BCPS has developed a web-based resource that provides access to student achievement data for teachers.
- *Broward Virtual University/Blackboard.* BCPS uses the online course development system called *Blackboard* to deliver online staff development.
- *Riverdeep Destination Mathematics/Reading.* As part of the Riverdeep contract, a license to access the learning systems, Destination Mathematics and Reading was procured.

The portal was rolled out to the teachers in the pilot schools in May 2005 as planned. Teachers' reactions to the portal are reported in question 9.

The major challenges encountered during the first year of implementation involved content development and management of the co-development process. The initial plans called for importing lesson plans from a previous Florida Department of Education initiative in which BCPS played an integral part. It was anticipated that the importation of this data would cut down on the development time needed to create new content. However, when this strategy was implemented, it was discovered that the time needed to import the data correctly, correct errors, add content to blank fields, and match the content to Broward's curriculum needs was more time consuming and tedious than creating original content that exactly matched the district's curriculum needs. Therefore, the strategy was changed and a new model adopted. The new model called for each curriculum area to be responsible for selecting and aligning corresponding units and lessons and entering the content into the Learning Village system. This model worked well and provided an opportunity for curriculum specialists and staff to take ownership and responsibility for the quality of the system.

Table 20 summarizes the number and percentage of lesson plans developed by subject and level as of August 3, 2005. As shown, most lesson plans (31.6%, *n*=2,220) have been developed for elementary school with mathematics (37.7%, *n*=1,465) having the most lesson plans developed across levels, followed by language arts (23.0%, *n*=893) and reading (20.3%, *n*=791).

Table 20
Lesson Plans Developed by School Level and Subject

	Elementary		Secondary		Total	
Subject	*n*	*%*	*n*	*%*	*n*	*%*
Reading	702	31.6	89	5.3	791	20.3
Language arts	610	27.5	283	17.0	893	23.0
Mathematics	644	29.0	821	49.3	1,465	37.7
Social Studies	264	11.9	474	28.4	738	19.0
Total	2,220	100.0	1,667	100.0	3,887	100.0

The contract with Riverdeep was set up as a co-development initiative. This strategy enabled Broward to customize the system to meet its specific needs. Because of the requests for changes and updates as the portal was developed, technical challenges developed. A schedule of weekly conference calls between the project staff and the Riverdeep developers led to consistent communication and status reports that enabled the co-development process to proceed in a consistent manner. In addition, Riverdeep provided a full-time, on-site project manager for the term of the contract. This project manager was the liaison between the district and the vendor, which has been important in solving issues as they arise.

9. *What are the teachers' perceptions of the system's relevance to their curriculum needs?*

Teachers (*n*=168) responded to items on the Teacher Survey relating to the BEEP Teacher Portal. Teacher responses are presented in Table 21. Eighty percent (80.4%, *n*=135) or more of the teachers surveyed agreed that the BEEP teacher portal was relevant to their curriculum needs, provided a valuable resource for both curriculum planning and professional development, simplified access to curriculum software and planning resources, and is anticipated to be used regularly. These responses suggest that the teacher portal will become a valuable asset in improving teachers' abilities to deliver high quality instruction in project schools.

Table 21
Teacher Responses Regarding the BEEP Teacher Portal

		Percentage responding				
The BEEP Teacher Portal:	*n*	SD	D	A	SA	DK
Is relevant to my curriculum needs.	168	6.5	3.6	50.0	32.1	7.7
Will provide a valuable resource in my curriculum planning.	168	4.8	4.2	47.6	34.5	8.9
Will provide a valuable resource in my continuing professional development.	168	5.4	4.2	46.4	34.5	9.5
Will simplify my access to curriculum software and planning resources by providing a point of entry.	168	4.8	4.2	48.8	35.7	6.5
Is a resource that I anticipate using regularly.	168	6.0	4.8	45.8	34.5	8.9

Note. Response scale is: SA=Strongly Agree, A=Agree, D=Disagree, SD=Strongly Disagree, and DK=Don't Know.

Summary and Conclusions

One of the most notable factors evident in the DLES schools was that they exhibited a rate of change that is rarely found in school reform efforts. A previous evaluation of whole school reform in Broward County (Younkin, 2000) found that, after two years of implementation, only half of the schools in the study were at the stage of everyone being aware and beginning to implement the project; only one school was at the mature stage, the next and final stage. Within the DLES project schools, after less than a full year of implementation, virtually all of the stakeholders in the schools indicated that they were aware of the project; and the school staff was fully engaged in the process of changing their approach to education to capitalize on the positive

aspects of the digital learning environment. This rapidity of change, however, is not merely due to the provision of hardware and software, but is in large part attributable to the extensive amount of staff development, planning, and cooperative effort that went into the implementation.

The experience of the implementation of the DLES in BCPS reflects the findings in the literature that the most important element of success was the training and preparation of the staff. The fact that schools were selected based on teacher involvement in the Digital Education Teacher Academy (DETA) and principal leadership insured that the project would be met with confidence. The issue of repair time quickly surfaced as a major problem at all of the schools. The one major factor encountered not reflected in the literature was the issue of students targeted for laptop theft.

The project appears to have had a positive impact on teacher classroom behavior. Teachers self-reported improving their experience levels with the National Education Technology Standards (NETS) skills, increasing the use of group and project-based learning, promoting a climate where students learn from each other, and increasing their tolerance for diverse student activities. Creative lesson planning utilizing technology as a vehicle for learning was also evident.

Both teachers and students reported that students' motivation to learn increased significantly. Students self-reported that class assignments were more interesting and enjoyable, they could do a good job easier, information resources were more readily available and easier to use, and that their use of time became more efficient. They also mentioned that they enjoyed learning by accident (finding interesting information while looking for something else). High school teachers did express that problems developed with the students' inappropriate use of the technology (listening to music, sending notes in class, accessing inappropriate websites, etc.).

The students, according to the evaluator's and teachers' observations, appear to have acquired the skills specified by NETS. This appears to be true whether or not students have computers available to them at home, indicating that the project has assisted in overcoming the digital divide.

The teacher portion of the Broward Enterprise Education Portal appears to be on schedule and has been perceived by the teachers in the pilot schools as being relevant to their curricular needs, a valuable resource in curriculum planning and professional development, and a tool that they will utilize regularly.

Recommendation

The continued implementation of both projects in 2005-06 should include planning components for expansion of the DLES and CDIM BEEP teacher portal, as anticipated in the district's Instructional Technology Plan. Efforts should be made to continue emphasizing staff development, reduce computer theft, improve technology support, and examine students' FCAT performance over time. Specifically, in 2005-06, the Director of Instructional Technology and the Director of Network Integration shall:

- Continue implementing the staff development model, which requires teacher participation in DETA as a precursor to project implementation, and provide onsite staff development in modeling and coaching throughout the year.
- Continue to work with law enforcement, community groups, computer security experts, and computer manufacturers to reduce the threat of theft attempts against students and schools. Solutions may include (a) training students in computer security measures, (b) purchasing easily identifiable school laptops (e.g., distinctive, colorful cases), or (c) using locking devices, embedded tracking chips, remote disabling devices, or firmware location reporting solutions (e.g., Absolute software, Stealth, Wi-Fi Tracker), whereby the computer reports its location every time it is connected to the Internet.
- Include in assessments of computer vendors, the issues of price, battery life, physical reliability, vendor responsiveness to warranty and other repairs, availability of computer protection solutions, and compatibility with typical home and business applications.
- Consider establishing a pool of available laptops to be utilized as loaner units when laptops are returned for repair.

Additionally, after the first full year of implementation in 2005-06, student performance on the FCAT should be examined and compared with an appropriate sample of students from non-participating schools. Future evaluations may also compare the long-term performance of participating students with students (e.g., sixth and ninth grade) progressing into non-project schools.

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