AMERICA'S DIGITAL SCHOOLS 2008

THE SIX TRENDS TO WATCH

Conducted by

The Greaves Group ■ The Hayes Connection

Sponsored by

Pearson ■ AMD ■ Promethean ■ Qwest

AMERICA'S DIGITAL SCHOOLS 2008

The Six Trends to Watch

Thomas W. Greaves

Jeanne Hayes

THE GREAVES GROUP
Strategic Educational Consulting

THE HAYES CONNECTION
Connecting you to the education market

"As superintendents envision teaching and learning in 2011, it is most helpful to have projections from colleagues across the country regarding new technologies that they will and will not adopt. We found *America's Digital Schools 2006* to be a useful report in forecasting change, so that we can keep up with rapidly changing technologies."

James Wilson, Superintendent of Fulton County Schools, Georgia

Sponsored by Pearson Education, AMD (Advanced Micro Devices), Promethean, and Qwest Communications.

Supported by the American Association of School Administrators (AASA), the National School Boards Association (NSBA), the Consortium for School Networking (CoSN), the State Educational Technology Directors Association (SETDA), the Software & Information Industry Association (SIIA), and the International Society for Technology in Education (ISTE).

Published and distributed in partnership with MDR. www.schooldata.com.

Confidential and proprietary. Please do not copy.

Contents

Foreword vi

Acknowledgments vii

Key Findings: The Six Trends to Watch 1-7

Chapter 1: 1:1 Computing 9-30

Introduction 10-12
- The Role of Professional Development 10
- Impact on Students 11
- Lessons Learned 12
- Looking to the Future 12

Findings 13-29
- 1:1 Computing Implementation 13
- Measuring Success of 1:1—Top 5 Measures 15
- Measuring Success of 1:1—Less Important Factors 16
- Students Involved in 1:1 17
- Number of Schools Per District in 1:1 18
- Academic Improvement with 1:1 19
- Sources for Academic Improvement Results 20
- Years of Data Used for Evaluation 21
- Spending Per Student on 1:1 22
- Key Factors: Academic Performance Objectives 23
- Key Factors: Academic Performance Objectives 24
- Key Factors: Teachers and Involvement 25
- Key Factors: Use of Online Resources 26
- Key Factors: Personalized Student Instruction and Parental Access 27
- Implementing 1:1 in the Future 28
- Factors for Not Implementing 1:1 29

References 30

Chapter 2: Learning Management Systems 31-48

Introduction 32-34
- Benefits and Cautions 32
- Virtual Schools 33
- Content or Content-Free? 33
- Individualized Instruction 33
- Looking Ahead 34

Findings 35-47
- Learning Management Systems 35
- Type of LMS Desired 36
- LMS Usage: Top Five Brands 37
- Frequency of LMS Usage by Group 38
- LMS Uses by Frequency 39
- LMS Usage by Student Type 40
- Top Six Teacher-Facing Features of LMS 41
- Student-Facing Features of LMS 42
- Top Technology Features of LMS 43
- Assessment Capabilities in an LMS 44

Top Seven LMS Issues 45
Future LMS Plans 46
Why LMS Not Implemented Yet 47
References **48**

Chapter 3: Online Assessment **49-61**

Introduction **50-53**
Overall Benefits 50
Impact on Students 50
Opportunities for Special Needs Students 51
Challenges 52
Technical Tips 53

Findings **54-60**
Use of Online Assessment 54
Online Assessments Being Used 55
Top Inhibitors to Online Assessment Use 56
Top Factors in Online Assessment 57
Top Online Writing Assessment Issues 58
Plans to Implement Online Assessment in the Future 59
Top Inhibiting Factors for Online Assessment 60
References **61**

Chapter 4: Computing Devices **63-77**

Introduction **64-67**
Student Devices 64
Desktop Developments 64
Mobile Developments 65
The Role of Handhelds 65
Research Update 66

Findings **68-76**
Deployment of Student Computing Devices 68
Teachers Supplied with Computing Devices 69
Primary Brand of Mobile Computing Device 70
Computing Device Form Factors 71
Mobile Computing Device Issues 73
Ideal Battery Life for a Mobile Student Computing Device 74
Optimal Weight of a Mobile Student Computing Device 75
Mobile Computing Devices Advice 76
References **77**

Chapter 5: Interactive Whiteboards **79-101**

Introduction **80-84**
Reviewing the Novelty Factor 80
Impact on Teachers 80
The Importance of Professional Development 81
Impact on Students 82
Support for Learning Differences 83

Findings **85-100**
Interactive Whiteboard Use 85
Important Factors in Using Whiteboards 86
IWBs: Installed Base 87
IWBs: Plans to Purchase 88
Percentage of Classrooms with Interactive Whiteboards 89
Percentage of Large-Screen Whiteboards 90
Interactive Whiteboards by Grade-Level Usage 91
Interactive Whiteboards: Professional Development 92
Inhibiting Factors to Whiteboard Use 93
Measuring Impact of Whiteboards 94
Important Features in Whiteboard Brand Selection 95
Non-User Plans for Whiteboards 96
Why Not Implementing Whiteboards 97
Integration of AV Tools 98
Other Essential AV Tools 99
Interactive Classroom Improvements: Top Advice 100

References **101**

Chapter 6: Internet Bandwidth **103-116**

Introduction **104-107**
The Problem 104
The Potential 105
The Funding 106

Findings **108-115**
Internet Bandwidth Growth 108
Internet Access Provider 109
Type of Internet Connections 110
Future Funding Challenges 111
Frequency of Internet Access Interruptions 112
Leveraging Bandwidth Capacity 113
Local Hosting or ASP 114
Third-Party Software Applications Inside the District Firewall 115

References **116**

Methodology **117-120**

Appendix A: Mobile Computing Devices **121-123**

Appendix B: Internet Bandwidth **125-141**

Appendix C: Top-Line Findings **143-147**

Appendix D: Additional Resources **149-152**

Chart Display: Please note that many charts have five options ranging from such choices as "Most Important" to "Not At All Important." To improve readability, the charts in this report display only the answers for the first two or three options.

Cross Tabs: The 500+ pages of the cross tab results are available to all report purchasers and to all district respondents; please contact info@ads2008.org in order to receive a copy of the results.

Survey Instrument: For a copy of the survey instrument, please visit www.ads2008.org.

At the Consortium for School Networking (CoSN), our mission is to help technology leaders increase their knowledge and skills, advocate for their participation in their leadership teams, and accelerate the strategic and system-wide uses of technology in their districts. Our many initiatives are designed to move these goals forward.

The rapid progress we are seeing in these areas is leading to a growing sense that technology in education is truly taking off. We are delighted to note that this trend is confirmed by the newly released *ADS 2008* insights into the detailed plans of school districts. *ADS 2008* identifies the "six trends to watch" and demonstrates that they are picking up momentum, sometimes to a surprising degree, and helping fulfill the potential of technology to help all students succeed.

ADS 2008 also confirms the essential requirements for technology success—teacher buy-in, professional development, long-range planning, proactive leadership, and an understanding of Total Cost of Ownership. Technology initiatives in schools cannot succeed without careful attention to these issues.

ADS 2008 is an invaluable source of hard data for long-range planning, essential for both education and industry leaders. We at CoSN are pleased to include the *ADS 2006* groundbreaking findings on broadband connectivity in the special section of our website devoted to this important issue.

In addition, the new *ADS 2008* report goes beyond the data to provide meaningful insights into the implications of each set of findings for both education and industry leaders. It is an important resource that can help guide the rapidly evolving technology implementations in schools toward a successful outcome.

With warm regards,

Keith Krueger
Chief Executive Officer
Consortium for School Networking
Washington, D.C.

"I skate to where the puck is going to be, not to where it has been."

-Wayne Gretzky

Like Wayne Gretzky, we are also looking at where the puck will be in the future. The goal of *America's Digital Schools 2008: The Six Trends to Watch* is to isolate the most important ways in which technology is changing teaching and learning and identify the implications of those changes for the future.

This challenging undertaking would not have been possible without the help of many special people.

First, and most importantly, we express our appreciation to the over 400 thoughtful school administrators who took time out of their busy schedules to complete our very challenging educational technology survey.

Our sponsors' teams, those of Michael Golden at Pearson Education, George Warren at Advanced Micro Devices (AMD), Pat Henry at Promethean, and Sharon Montgomery at Qwest Communications, were a tremendous help. They had the faith and foresight to fund an important piece of work. Chris Brown of Pearson Education and Pat Henry of Promethean contributed materially to the quality of the final product. And Kathy Hurley of Pearson Education, in her own unique way, contributed to the success of the project.

Our supporting organizations also provided us with strong support throughout the process. In particular, Keith Krueger, Executive Director of CoSN, and Karen Billings, Education Division Head of SIIA, provided resources and thoughtful insights.

Diane Rapley, our chief editor, and Professor Dan Hamilton, our chief statistician and professor at the University of Denver, provided invaluable assistance and wisdom that went beyond their job descriptions. Richard Milewski, our chief technical officer, could always be counted on to handle all things technical, from the website to the SQL Server.

Fady Khairallah and our friends from Market Data Retrieval (MDR) exceeded our expectations at every turn. They put tremendous data resources at our disposal, and they took on the key role of publishing the final product.

And, finally, our thanks go to our spouses Vylee Greaves and Tom Olkowski, Ph.D., whose counsel and patience can only be described as exemplary.

To each of you, and to the many others who contributed to the quality of the work, we say thank you!

Thomas W. Greaves

Jeanne Hayes

Key Findings

The Six Trends to Watch

Key Findings: The Six Trends to Watch

America's Digital Schools 2008

The *ADS* team believes that the six trends analyzed in this report—1:1 computing, learning management systems, online assessment, computing devices, interactive whiteboards, and Internet bandwidth—are the major drivers of change in the use of technology in America's schools today.

In their careful answers to our questions, district-level respondents make clear that these six trends are becoming increasingly entrenched, indicating that America's digital schools are moving beyond the concept stage and becoming a reality. Understanding the trends and their implications is increasingly important for educators, policymakers, and industry alike—to help them make plans, maximize opportunities, and avoid pitfalls.

In addition to an in-depth data analysis, we have provided a commentary on each set of responses to help both groups understand what the data means for them. Each chapter opens with an overview of the current research, thinking, and in-school applications. Demographic highlights indicate important differences among regions and subgroups.

We expect that in the future educators and industry will look back on the years from 2006 to 2011 as a period of great change, during which U.S. schools transitioned to digital media across many areas, including communications, assessment, content, and data management. The six trends analyzed in this report are driving our schools along the path into this digital world.

Unique Insights

ADS 2008, the second report in our series, bears out the major findings from last year. In addition, much of the data in *ADS 2008* is new and sheds light on numerous topics not covered in other surveys, such as:

- How much do 1:1 computing programs cost per student?
- Why is online testing growing so quickly?
- Do most districts give computing devices to all teachers? Are we behind?
- Where are computers located in schools? Are computer labs obsolete?
- Where do districts get Internet service besides state networks?
- What are the key success factors and academic improvement results in 1:1 computing?
- How many districts are using learning management systems? What for?
- How many students are in 1:1 computing programs per school?
- Why are some districts using optical networks rather than T-1 lines for high-speed bandwidth?

Educators and vendors who understand the answers to these questions will be in better position to meet the needs of schools and improve student performance—the major goal of both groups.

America's Digital Schools 2008, © 2008 The Greaves Group, The Hayes Connection.

Trend 1: Large-Scale 1:1 Implementations Are Alive and Well

1:1 implementations have been around for at least 20 years, during which time we have seen some major migrations. Twenty years ago, the desktop computer was the primary student device. About ten years ago the laptop became the primary device for 1:1 computing. Then wireless LANs entered the scene nine or ten years ago via an add-on card.

Most of the early 1:1 implementations were driven by the technology rather than by the academic needs of students, leading to less than optimum results and a somewhat negative perception. Large-scale implementations like the Maine Middle School Initiative, although groundbreaking in many ways, did not include academic performance as a critical design objective. Many other implementations suffered from:

- Lack of experience in implementing highly complex wireless mobile computing environments
- Frequent catastrophic hardware and software events (affecting all student device vendors)
- Inadequate or incorrect professional development
- Insufficient software applications that exploited the ubiquitous mobile computing environment

In addition, in informal discussions with *ADS* staff, numerous educators have stressed that teacher ownership, a bottom-line requirement for 1:1 success, was often lacking. In the words of David Underhill, Principal of Bayshore High School in Manatee County, Florida:

"If teachers are presented with the new machines without any prior involvement in the decision, the program probably won't succeed. It will be seen as an idea of the IT team, not arising from classroom needs that teachers deal with every day. But if teachers have an opportunity to learn about the program early in the process and provide input, they feel bought in and the picture totally changes."

However, a new and much more positive picture has emerged over the last year, supported by *ADS 2008* findings such as:

- Academic improvement results have climbed sharply. In 2006, 30% of districts reported moderate to significant improvement. In 2007, this number climbed to 78.7%—a very large year-over-year gain.
- 1:1 implementations are now relatively widespread. With 27.1% of districts reporting their involvement in 1:1 computing, this trend has moved into the mainstream, especially since the *ADS* definition of 1:1 is fairly strict—at least a full grade and no mobile carts.
- The average district pilot program has climbed to include 1,631 students. 40% of the district pilots include over 1,000 students, and 10% include over 5,000 students.
- 30.6% of the district pilot programs involve three or more schools. These districts have moved beyond the initial stages and are on the path toward system-wide implementation.
- Only 7% of districts report that they are experiencing widespread technology problems with their 1:1 implementation. We believe that this represents a substantial decline in technology problems. The reports of catastrophic failure, which were common earlier in the process, have slowed down to a considerable degree.

These findings indicate that districts and suppliers are moving with some speed along the 1:1 experience curve. Professional development has improved, teachers are more involved, hardware failures have been reduced, and so on.

Trend 2: Learning Management Systems Go Mainstream

In 2007, the number of school districts using an LMS climbed to almost 50% of respondents, with another 19% indicating plans for the future.

In the past, districts were faced with two alternatives, neither of which met all their needs—either a highly sophisticated LMS with good educational content but no ability to add other applications or an open LMS from the university world with no K-12 content (sometimes at no charge).

Now we see the two groups merging. The proprietary systems are opening up, using standards as the vehicle, and the open standards systems are maturing, giving schools K-12 features such as the ability to search for content using state standards tags.

Learning management systems address a very wide array of services, and schools frequently take less than full advantage of the available applications, which include:

- School portals: Setting up a school portal and linking to teachers, subjects, calendars, and resources is easy with an LMS.
- Teacher authoring: An LMS offers teachers a practical approach to content authoring. Teachers used to keep a "big box of stuff," to which they added class outlines, handouts, pictures, maps, homework assignments, resource lists, etc., over time. An LMS provides an easily accessible electronic repository for all these materials.
- Electronic assessments: Teachers can select pre-made tests or assemble tests from test items that have been tagged to state standards.
- Electronic supplements: An LMS includes materials that correlate to and supplement the print-based core curriculum.
- Electronic core curriculum: Many LMS courses are comprehensive enough to be used as the core curriculum instead of a textbook.
- Content management: In an LMS, thousands of pictures, text documents, videos, test questions, and audio files can be tagged with state standards and stored where everyone can access them. As it becomes even easier for teachers and students to produce materials, these libraries will grow exponentially. The content management systems may become separate from the learning management systems, for simplified uniform controls on access, permissions, and publishing.

Trend 3: Online Assessment Is Replacing the No. 2 Pencil

In 2007 we saw widespread use of online assessment in schools for the first time, with 30.4% of districts reporting their use. The 77-year dominance of No. 2 pencils and mark sense paper tests appears to be coming to an end.

Some powerful forces are driving this growth. Schools are now more data-driven and more careful to ensure that assessment is driving instruction. With the widespread availability of high-quality online assessment software and test items, it is likely that this trend will continue to accelerate.

The major inhibitor to online assessment is the lack of suitable student devices. However, the plethora of lower-end devices now coming to market is likely to radically change this situation over the next few years (see Trend 4).

As online assessment takes hold, it will enable many powerful assessment innovations that are difficult to do manually. These include:

- Adaptive assessments: Here students are given questions where the level of difficulty depends on previously asked questions. The result is that student performance levels can be determined more quickly and with fewer questions.
- Constructed assessments: Modern algorithms, such as latent semantic analysis, can be used to grade student-written sentences and paragraphs.
- Variety: Online assessments can take a variety of forms, including teacher observations of students and student work, which often take too long to do manually.
- Physical security: Paper tests must arrive in advance of the exam time, opening up the possibility of tampering. This is eliminated with online testing.
- Special needs: Section 508 compliance is easier to provide with online tests, which can be quickly adjusted according to timing, style, delivery, and language preferences.
- Assessment results: Results can link automatically to courseware delivery and learning management systems. Considering the number of students and the number of standards taught per student, this is much faster than manual matching, saving teachers countless hours.
- Practice tests: Online testing can provide large pools of test questions randomized for each standard. This allows students to take multiple tests on the same subject without seeing the same questions.
- Easy test creation: With a few clicks of the mouse teachers can select test items that are correlated to the academic standard being taught, and with a few more clicks they can deliver the test to the students, saving huge amounts of teacher time.
- Data timeliness: Online testing provides immediate results, avoiding the unfortunate situation where test scores arrive after the next school year has started.
- Data aggregation: It is very difficult for schools to fully aggregate manual test data into their data-driven decision-making systems. Online testing solutions facilitate and streamline this process.
- Online writing assessments: These assessments when tied to the curriculum are an excellent way for students to show subject matter comprehension.

Trend 4: The Student Computing "Race to Mobility" Accelerates

ADS 2006 was the only industry report to predict that more mobile computing devices would soon be sold into schools than desktop computers.

In 2006, there were some doubts regarding the capabilities of the low-end devices. However, in 2007, we saw vendors race to ship sub-laptop devices into education. At this time, the student mobile computing market is segmented as follows:

- Traditional laptops (Windows or Mac OS)
- Student appliances (defined in Appendix A)
- Handheld devices (including a few sub-categories)

- Traditional PDAs (with rapidly declining vendor support)
- Smart phones (growing rapidly but facing the issue of monthly phone service cost)
- Wi-Fi-enabled music/video devices (such as the iPod touch)

ADS 2008 makes clear that vendors have a long way to go before the ideal student device emerges. For example, our survey respondents indicate that they require an average battery life of eight hours, but today the average is less than four hours.

As student devices begin to address these issues successfully, they will form the foundation for many other important developments in schools.

Trend 5: Interactive Whiteboards Come Into Their Own

Interactive whiteboards (IWBs) have moved well beyond the initial adoption stages and are increasingly viewed as standard equipment in schools. Teachers like them and quickly come to find them essential.

IWBs have matured substantially in the last few years, with innovations such as:

- Boards that support multiple simultaneous pens
- Improved classroom ergonomics (This can be as simple as a board that changes height for older and younger students—not available when IWBs were primarily transplants from the business market.)
- Integration with other classroom technologies, including student response units and mobile computing devices
- A trend toward very specific software (high school algebra, calculus, etc.)
- More mature purchasing processes (Districts now know what they want, and order sizes are increasing as schools move from pilot programs to full-scale rollouts.)

It is likely that IWBs will be in almost every school five years from now. Educators will be much more adept at using them to their maximum potential, and—thanks to the researchers who are busy in this area—vendors will be providing applications that might astound us today.

Trend 6: Awareness of the Internet Bandwidth Crisis Reveals New Concerns

Without adequate connectivity, all school-based Internet activities are subject to disruption. The Internet bandwidth crisis in 2007 is a good news/bad news story.

ADS 2006 reported a bandwidth crisis based on a projected future demand for bandwidth three to five times higher than anticipated in district and state budgets and anticipated a robust 45% growth rate of average bandwidth per student.

One year later, the good news is that awareness of the issue has risen substantially among educators and that average bandwidth per student climbed an astounding 123% year over year. The rapid growth of optical-based solutions has allowed districts to substantially expand data rates at a lower cost per megabit than copper solutions.

ADS 2008 reveals that the crisis is evolving and intensifying. Schools are dealing with the problem by adding bandwidth shaping and metering devices. Their level of knowledge and their awareness of potential solutions are increasing. They are more in tune with their future requirements and have increased their projected requirements in out years.

America's Digital Schools 2008, © 2008 The Greaves Group, The Hayes Connection.

However, the bad news is that the crisis is intensifying in terms of educators' views on future funding challenges. An astonishing 54.2% of districts foresee a problem obtaining sufficient funding, regardless of the source (local, state, or E-Rate). 42.9% foresee a problem with E-Rate funding levels. This number is substantially understated since it applies primarily to the less than 50% of districts that actually receive E-Rate funding today.

The prevailing opinion is that E-Rate funding will remain capped at $2.25 billion a year. As demand goes up, the percentage of reimbursement will go down. Since we are facing another funding shortfall cycle where states are projecting teacher layoffs, the possibility of increased bandwidth funds is slim.

Finally, a surprising 36.7% of districts foresee a problem obtaining sufficient bandwidth regardless of their ability to pay. According to one network director for a large rural state, a single copper pair serves a large number of schools in his state, effectively limiting them to one T-1 line. Depending on the circumstances, installing new fiber or copper may be uneconomical. Frequently this forces the districts to move to fixed wireless microwave solutions.

As Internet usage in schools is shifting into high gear, it appears that students will find the going slow, and teachers may shy away from Internet-based tools unless they are sure that capacity will be sufficient. An astonishing 67% of polled districts report that they are using an application restriction policy to conserve bandwidth, including banning streaming video. Unfortunately, students in these districts will not be able to benefit from the educational value of streaming video applications.

The *ADS* team believes that a greater understanding of these six trends will help improve student performance in our schools, make our country more competitive in the world economy, and address the problem identified by Thomas L. Friedman in *The World Is Flat: A Brief History of the Twenty-First Century:*

"When I compare our high schools to what I see when I'm traveling abroad, I am terrified for our work force of tomorrow. In math and science, our fourth graders are among the top students in the world. By eighth grade, they're in the middle of the pack. By 12th grade, U.S. students are scoring near the bottom of all industrialized nations…. The percentage of a population with a college degree is important, but so are sheer numbers. In 2001, India graduated almost a million more students from college than the United States did. China graduates twice as many students with bachelor's degrees as the U.S., and they have six times as many graduates majoring in engineering. In the international competition to have the biggest and best supply of knowledge workers, America is falling behind."

Jeanne Hayes, The Hayes Connection, and Tom Greaves, The Greaves Group

---