STATEWIDE WEB-BASED STANDARDS OF LEARNING TECHNOLOGY INITIATIVE

PRESENTED TO THE

GOVERNOR OF VIRGINIA AND THE VIRGINIA GENERAL ASSEMBLY

SEPTEMBER 2008

COMMONWEALTH of VIRGINIA

DEPARTMENT OF EDUCATION
P.O. Box 2120
Richmond, Virginia 23218-2120

BILLY K. CANNADAY, JR., Ed.D.
Superintendent of Public Instruction

August 29, 2008

Office: (804) 225-2023
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The Honorable Lacey E. Putney, Chairman
House Appropriations Committee
Post Office Box 127
Bedford, Virginia 24523

The Honorable Robert Tata, Chairman
House Education Committee
4536 Gleneagle Drive
Virginia Beach, Virginia 23462

The Honorable Charles J. Colgan, Chairman
Senate Finance Committee
10677 Aviation Lane
Manassas, Virginia 20110-2701

The Honorable R. Edward Houck, Chairman
Senate Education and Health Committee
Post Office Box 7
Spotsylvania, Virginia 22553-0007

Dear Delegates Putney and Tata and Senators Colgan and Houck:

I am pleased to transmit the status report, *Statewide Web-Based Standards of Learning Technology Initiative*, as required by Chapter 879 Item 140 C.14.h. of the 2008 Acts of Assembly.

This attached report details the progress to date of this very important initiative. The Department of Education and the Virginia Information Technologies Agency have worked together on this status report and the implementation of this exciting project.

If you have questions or require additional information, please do not hesitate to contact me or Tammy McGraw, director of educational technology, at (804) 225-4429 or tammy.mcgraw@doe.virginia.gov.

Sincerely,

Billy K. Cannaday, Jr.

BKCJr/slm

Attachment

c: The Honorable Timothy M. Kaine
       The Honorable Thomas R. Morris

CONTENTS

EXECUTIVE SUMMARY

The 2008-09 school year marks the ninth year of implementation for Virginia's Web-Based Standards of Learning (SOL) Technology Initiative. Its goal is to use Web-based systems to improve SOL instructional, remedial, and testing capabilities in high schools, middle schools, and elementary schools. The initiative has four objectives:

1. Provide at least one computer for every five students
2. Create Internet-ready local area network capabilities in every school
3. Assure adequate high-speed, high-bandwidth capabilities for instructional, remedial, and testing needs
4. Establish a statewide Web-based SOL test-delivery system

As detailed in previous annual reports, the Virginia Department of Education (VDOE), with assistance from the Virginia Information Technologies Agency (VITA), implemented a formal project management structure at the outset to ensure successful project completion. The VDOE still employs that structure while guiding school divisions toward completion of the four objectives.

The Web-Based SOL Technology Initiative continues to provide technical and financial resources to Virginia's school divisions in addition to benefits gained from administering SOL tests in an online environment. Through the implementation of the initiative, Virginia is recognized as a national leader in the area of online high-stakes test administration.

Impact of the Initiative beyond Web-Based Test Delivery

The success of the Web-Based SOL Technology Initiative has affected the overall Virginia Assessment Program beyond the delivery of online SOL tests. The VDOE has completed the transition to a new statewide assessment contract, which places a greater reliance on technology for all aspects of test administration and reporting. The school divisions view the transition as a positive improvement for the assessment program.

The changes were significant. They were designed to streamline administrative processes associated with the assessment program for school division and the VDOE staffs, improve the accuracy of data reported by divisions, improve the accessibility of assessment data and reports, and continue the growth of online test delivery options. The technology and network capacity required for these changes was made possible through the Web-Based SOL Technology Initiative.

Divisions electronically enter assessment data into a Web-based test administration system, PEMSolutions™, for all student records regardless of whether the

testing was conducted online or with paper/pencil. Student demographic information is no longer recorded manually with number-two pencils on paper documents.

Another benefit is that division staff can review their student demographic data (e.g., date of birth, race/ethnicity, transfer status, etc.) and correct any inaccurate assessment data before, during, and after testing by accessing PEMSolutions. These options were not available previously.

This additional technology use has improved divisions' accessibility to student performance data. Electronic student performance reports are made available in a reduced time frame and in more formats. The reports and data files are now downloadable through a secure transfer from PEMSolutions after completion of the tests and scoring regardless of whether the student was tested online or with paper/pencil tests. Data updates are reflected in the downloadable data file the day after the changes have been made. Previously, it took a minimum of several days to make student data files available.

Technical issues experienced during the spring 2007 test administration prompted a collaborative effort between the VDOE and Pearson, the assessment contractor. Implemented changes over the past year will significantly reduce the likelihood of future technical interruptions. These improvements are detailed in the body of the full report. Similar efforts by the VDOE and Pearson in other areas of the assessment program will mitigate risks associated with all aspects of test administration and reporting.

Financial Support for the Initiative

Funding for year eight (2007-08) was generated by proceeds from the Series VIII Technology Equipment Notes, sold by the Virginia Public School Authority (VPSA) in May 2008. As a result, divisions had access to approximately $59,170,000 to improve technology infrastructure. These funds increased the total statewide investment in technology infrastructure for the initiative to more than $465,498,000.

Table 1 shows a summary of the annual investments to date, based on an allocation of $26,000 per school and $50,000 per school division. This formula has remained constant since the start of the initiative.

Table 1. Annual Investment in the Web-Based Standards of Learning (SOL) Technology Initiative

Series #	Date of Issuance	Total Dollars Available to School Divisions	Percent Expended by School Divisions (as of July 2008)
I	May 2001	$57,248,000	100%
II	May 2002	$58,286,000	100%
III	May 2003	$58,390,000	100%
IV	May 2004	$58,728,000	100%
V	May 2005	$58,330,000	99.7%
VI	May 2006	$58,624,000	99.3%
VII	May 2007	$58,728,000	71%
VIII	May 2008	$59,170,000	33%

Achieving Readiness for the Web-Based SOL Technology Initiative

The Commonwealth launched the initiative in July 2000 and introduced preliminary architectural guidelines for high schools in January 2001, followed by permanent guidelines in July 2001. In 2004, the certification procedures were revised to include middle and elementary schools, higher minimum specifications for newly purchased technology equipment, a more manageable process for determining a division's technical capacity to administer online SOL tests, and the flexibility to certify multiple school levels simultaneously.

All 132 Virginia school divisions have achieved the first two stages of High School Readiness Certification. As of June 2008, 124 divisions (94 percent) have attained Middle School Readiness Certification; 64 of these (48 percent of all divisions) have realized Elementary School Readiness Certification. The specific divisions with Middle School and Elementary School Readiness Certification are listed in the Certification section.

School Division Participation

All 132 divisions use state funding to upgrade technical infrastructure, improve student-to-computer ratio, and achieve School Readiness Certification. While a number of school divisions still administer paper/pencil tests, all divisions participated in the 2007 SOL online testing. The number of divisions participating in End-of-Course (EOC) online SOL testing increased steadily until reaching the maximum number of 132 divisions the last three years (see Figure 1).

Figure 1. Number of School Divisions Administering Online SOL Tests
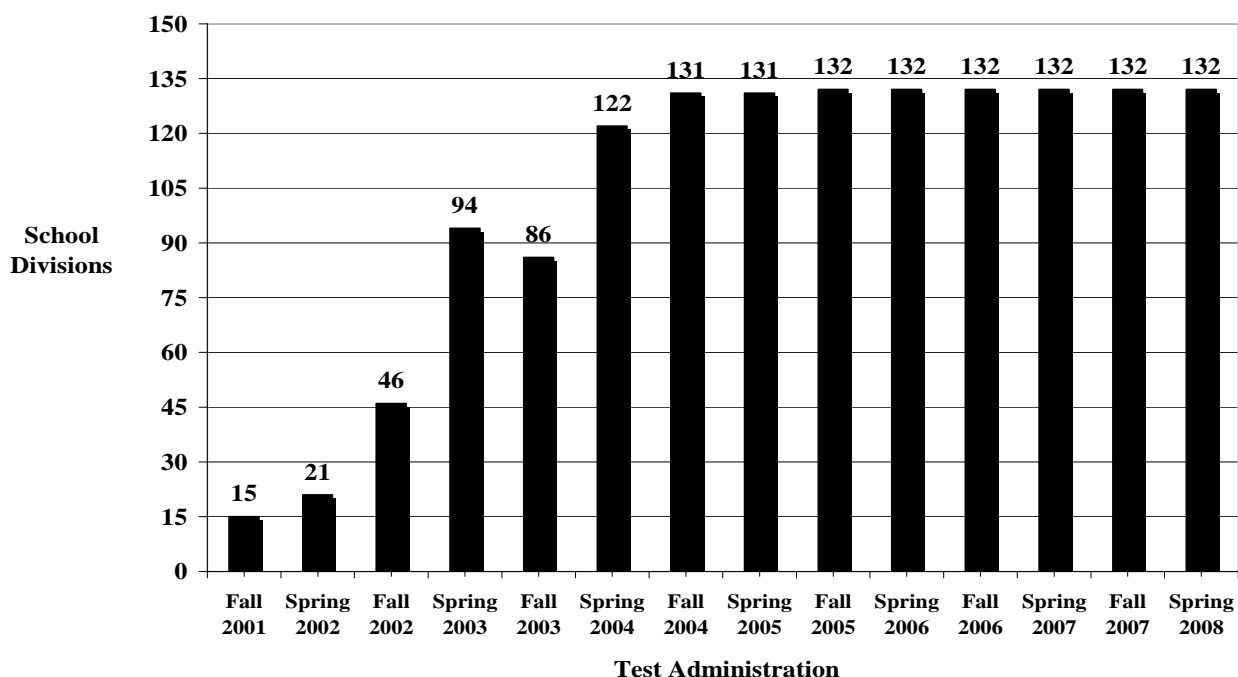
While paper/pencil tests remain an option, divisions increasingly are administering SOL tests online (see Figure 2). The spring 2008 online test administration presented the highest volume of concurrent online SOL tests administered to date. At the highest volume, the PEMSolutions System supported the online delivery of more than 125,200 SOL tests in a single day; the highest weekly number occurred in May 2008, when more than 532,000 SOL tests were completed online. More than 23,000 simultaneous SOL tests were administered online on multiple occasions during the spring 2008 online test administration.

Figure 2. Number of Online SOL Tests Administered
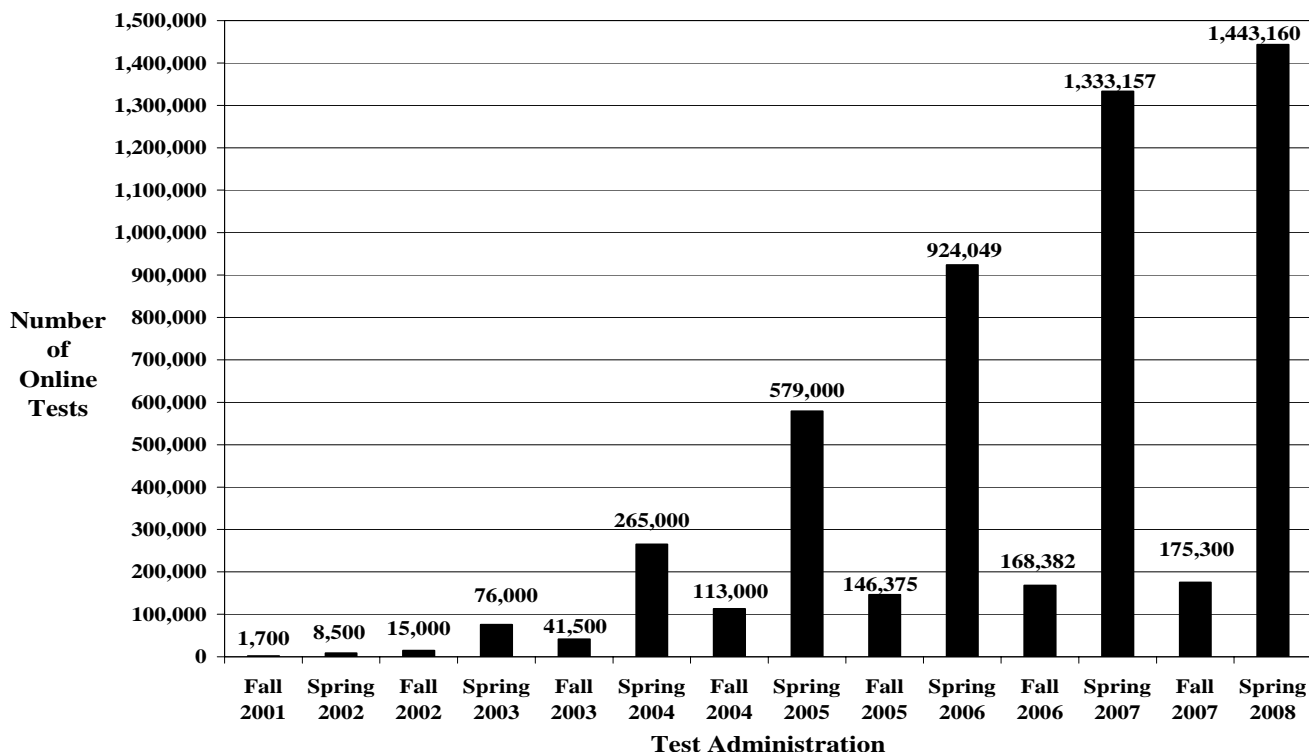
Increased Availability of Online Testing

Over the course of the initiative, the number of different SOL tests offered online increased each year through spring 2007 (see Table 2). By spring 2008, all SOL tests were available to be administered online with the exception of the Plain English Mathematics test at grades three, four, and five and the English Writing tests. The Plain English Mathematics test at the lower grades was administered in only one mode because of the small number of students taking that test. In order to meet the needs of all students, this test will continue to be administered in paper and pencil forms. The English Writing tests are administered at grade five, grade eight, and End-of-Course levels and also were administered only in paper and pencil forms. The writing test requires students to complete a multiple-choice section of the test on one day and write a short paper in response to a writing prompt on another day. Administering the English Writing test as an online test will require significant changes in how the test is developed and administered. Initial planning for this eventual transition has been started by the Division of Student Assessment and School Improvement.

Table 2. Schedule of Online Test Administration

| Standards of Learning Test	Online Implementation Date
End-of-Course SOL Tests	
Algebra I	Fall 2001
Earth Science	Fall 2001
English: Reading	Fall 2001
Algebra II	Spring 2002
Biology	Spring 2002
Virginia & U.S. History	Fall 2002
World History I	Fall 2002
World History II	Fall 2002
Chemistry	Spring 2003
World Geography	Spring 2003
Geometry	Spring 2004
Middle and Elementary School SOL Tests	
Grade 8 Science	Spring 2005
U.S. History to 1877	Spring 2005
U.S. History: 1877 to Present	Spring 2005
Civics & Economics	Spring 2005
Grade 8 Mathematics	Spring 2006
Grade 8 Reading	Spring 2006
Grade 7 Mathematics	Spring 2006
Grade 7 Reading	Spring 2006
Grade 6 Mathematics	Spring 2006
Grade 6 Reading	Spring 2006
Grade 8 Plain English Mathematics	Spring 2007
Grade 7 Reading	Spring 2007
Grade 7 Plain English Mathematics	Spring 2007
Grade 7 Mathematics	Spring 2007
Grade 6 Reading	Spring 2007
Grade 6 Plain English Mathematics	Spring 2007
Grade 6 Mathematics	Spring 2007
Grade 5 Science	Spring 2007
Grade 5 Reading	Spring 2007
Grade 5 Mathematics	Spring 2007
Grade 4 Reading	Spring 2007
Grade 4 Mathematics	Spring 2007
Grade 3 Science	Spring 2007
Grade 3 Reading	Spring 2007
Grade 3 Mathematics	Spring 2007
Grade 3 History & Social Science	Spring 2007
Virginia Studies	Spring 2007

In 2006, the VDOE developed several new SOL tests to meet the No Child Left Behind (NCLB) mandates for annual reading and mathematics assessments for all students in grades three through eight. During the first administration of these new SOL assessments in spring 2006, online versions were not administered below the sixth grade level. In spring 2007, the VDOE responded to school division requests and significantly expanded the availability of online SOL tests. For the first time, all elementary school SOL tests, with the exception of the writing assessment and Plain English Mathematics in grades three through five, were available to schools in an online format. A grade eight Direct Writing field test was conducted in both paper/pencil and online modes in spring 2007 as a first step toward administering the statewide writing tests online.

During the past year, the VDOE continued maximizing the availability of online SOL tests by further considering the necessary preparation process for administering the SOL English: Writing test online. The data from the grade eight Direct Writing field test were analyzed, and the VDOE staff discussed the results from technology and psychometric perspectives. A preliminary timeline for implementing online SOL English: Writing tests is under development.

Future Activities

Implementation of the Web-Based SOL Technology Initiative continues to progress as initially planned. Figure 3 shows a high-level timeline of the initiative as planned through spring 2009.

Figure 3. High-Level Timeline of the Web-Based SOL Technology Initiative through Spring 2009
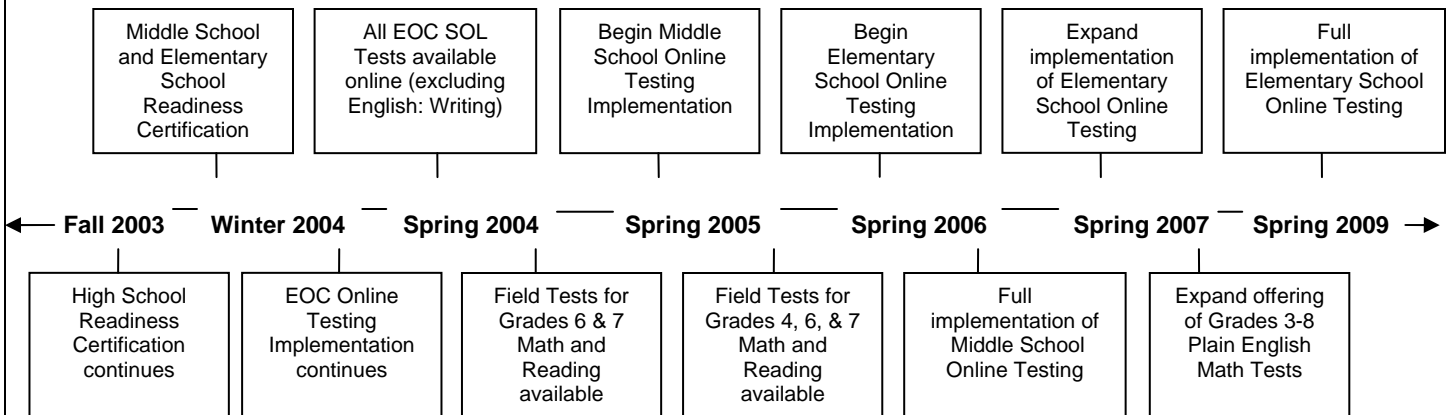
The timeline represents activities associated with making all SOL tests available online except the English Writing tests administered in fifth and eighth grades and at the End-of-Course level. While not part of the initiative's initial scope, the VDOE has begun implementing the first steps for making the English: Writing tests online.

The volume of online SOL tests administered by divisions has increased annually; this trend is expected to continue in the coming year as more middle and elementary schools transition to online SOL tests. Continued support and monitoring of the School Readiness Certification process also will occur as this trend persists.

Report Format

The remainder of this report addresses specific elements of the initiative implementation. Each section provides additional details regarding information presented in the Executive Summary.

FINANCE

Financial support for year eight of Virginia's Web-Based SOL Technology Initiative was generated by the Virginia Public School Authority's sale of Series VIII Technology Equipment Notes in May 2008. The proceeds resulted in approximately $59,170,000 for school divisions to improve technology infrastructure. The additional funds increased the total statewide investment in technology infrastructure for the initiative to more than $465,498,000.

Table 3 summarizes the annual investments to date, based on an allocation of $26,000 per school and $50,000 per school division. This formula has remained constant since the start of the initiative.

Table 3. Annual Investment in the Web-Based Standards of Learning (SOL) Technology Initiative

Series #	Date of Issuance	Total Dollars Available to School Divisions	Percent Expended by School Divisions (as of July 2008)
I	May 2001	$57,248,000	100%
II	May 2002	$58,286,000	100%
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IV	May 2004	$58,728,000	100%
V	May 2005	$58,330,000	99.7%
VI	May 2006	$58,624,000	99.3%
VII	May 2007	$58,728,000	71%
VIII	May 2008	$59,170,000	33%

All Web-Based SOL Technology Initiative funds awarded to school divisions are reimbursements for eligible technology expenditures. To be eligible, the appropriate division personnel must certify to the VDOE that all expenditures meet the criteria of one or more of the four categories detailed in Table 4. This certification of expenditures is part of the Request for Reimbursement forms completed by divisions.

Table 4. Categories for Reimbursements

Category	Definition of Category
1. Classroom Multimedia Network Computers	Requests in this category include only the cost of the new computer system itself (e.g., monitor, CPU, keyboard, mouse, operating system software).
2. Internet-Ready Local Area Network (LAN) Capability	Requests in this category include costs related to networking, retrofitting, upgrading school buildings, and operating software related to Internet-ready local area network capability (e.g., wiring, servers, power upgrades).
3. High-Speed Access to the Internet	Requests in this category include costs related to networking, retrofitting, upgrading school buildings, and operating software related to providing high-speed Internet access (e.g., wiring, servers, power upgrades).
4. Instructional Software	Requests in this category shall not exceed $1/13^{th}$ of the amount spent on hardware in categories 1 through 3. Purchased software must have a useful life of at least one year and be included in the division's approved technology plan; this does not include software such as student information systems, network operating systems, and desktop operating system upgrades.

From the time technology equipment notes are issued, school divisions have approximately 18 months to complete eligible purchases and apply for reimbursements. Within that same time period, divisions are required to appropriate and utilize local matching funds for technology that total 20 percent of the annual allocation from the General Assembly; one-quarter of the 20 percent match must be dedicated to instructional technology training for division teachers.

Each year, the VDOE provides information to divisions regarding their funding allocations and the reimbursement process for eligible expenditures. On April 11, 2008, the VDOE published a superintendent's memo with details of the Series VIII technology equipment notes:
http://www.doe.virginia.gov/info_centers/superintendents_memos/2008/04_apr/adm011.html.

CERTIFICATION

The legislation creating the initiative stated that all Virginia public schools must become technologically capable of utilizing Web-based systems for instruction, remediation, and assessment. As the state agency responsible for implementing this legislation, the VDOE developed a process enabling divisions to certify schools that meet the minimum technological requirements.

The original legislation required divisions to certify high schools first, followed by middle schools, and finally elementary schools. Because of the focus on high schools, the process initially was called High School Readiness Certification. The process eventually was expanded to account for the technical capability at all school levels (elementary, middle, and high schools) and was renamed School Readiness Certification. The current School Readiness Certification process consists of three different levels:

- **Stage 1 Certification** allows divisions to self-certify when their schools meet the required specifications in the areas of (1) awareness and planning; (2) infrastructure; (3) computers and printers; and (4) wide area networks, local area networks, and network equipment and servers.

- **Stage 2 Certification** requires divisions to estimate the maximum volume of online SOL tests to be administered concurrently throughout the division. The division then verifies the technical capability of its infrastructure to support that volume. Utilizing the available financial resources (see Finance section), the divisions must upgrade their technology to support the necessary number of concurrent online tests across their division.

- **Stage 3 Certification** consists of a checklist of technology and assessment tasks to be completed prior to all online SOL test administrations. This certification is known more commonly as the *96-Hour Checklist*. The VDOE strongly encourages divisions to reference the checklist as a final readiness check 96 hours (four days) before starting each online SOL test administration. As a result, Stage 3 is the only certification level not required to be submitted with signatures to the VDOE.

Due to the nature of technology infrastructure and bandwidth, the School Readiness Certification is a cumulative process. All Virginia school divisions have fully certified their high schools at the three stages. As a result, the focus has shifted to middle and elementary schools. As divisions extend their technical capability downward to the middle school level, the overall infrastructure throughout each division must support both high school and middle school online activities. After achieving middle school certification, the technical capability must then be expanded to support elementary schools.

Some divisions are certifying their remaining schools simultaneously, with the understanding that middle schools must be certified before elementary schools. The School Readiness Certification includes most elements of the previous High School Readiness Certification process and a few significant changes.

First, the Stage 1 Readiness Checklist denotes higher minimum specifications for newly purchased technology equipment. Examples include faster minimum processor speeds and increased workstation memory.

Second, Stage 2 Certification requires a process for divisions to verify the technical capacity of their infrastructures. Divisions previously utilized the Load Test™ software application, developed by Pearson Educational Measurement. This application simulated the typical network load produced by a high school online test administration. While this software worked effectively for a small number of schools, it was unmanageable for simulating a typical network load produced by simultaneous online testing at multiple sites. The VDOE partnered with Pearson Educational Measurement to develop the Stage 2 Bandwidth Estimator Worksheet, which compiles data such as available bandwidth, bandwidth utilization, and number of computers used simultaneously for testing. These data are combined with the requirements for TestNav™, the online test-delivery software. Data calculations based on the worksheets determine if the existing technical resources can adequately conduct the specified level of simultaneous online testing. Beyond the certification process, divisions use the Stage 2 Bandwidth Estimator Worksheet to predict how network changes may affect the performance of online SOL testing.

Third, two procedural changes were implemented in the School Readiness Certification process. Divisions now complete their Stage 1 and Stage 2 certifications within the same document, thus streamlining the process and reducing paperwork. In addition, divisions now have the flexibility to certify multiple school levels at the same time. For example, a division that has achieved High School Readiness Certification may certify middle and elementary schools simultaneously if those schools are prepared. The division also can follow the original process of certifying middle schools first, followed by elementary schools. The VDOE added this flexibility to meet the varying needs of divisions.

Regardless of certification levels, the process still requires collaboration among various division personnel. The director of testing, director of technology, and Web-Based SOL Technology Initiative project manager play important roles in providing the information needed to complete the process. The division superintendent must approve and sign the final documentation before submitting it to the VDOE.

Since publication of the new School Readiness Certification process, 124 school divisions (94 percent) have achieved Middle School Readiness Certification; 64 of these (52 percent of the 124 divisions, or 48 percent of all divisions) have achieved Elementary School Readiness Certification. The deadline for divisions to certify middle schools was spring 2006; elementary schools are to be certified by spring 2009. As of June 24, 2008, the divisions listed in Tables 5 and 6 had certified all their middle and elementary schools.

Table 5. School Divisions with Middle School Readiness Certification (124)		
Accomack	Franklin County	Page
Albemarle	Frederick	Petersburg
Alexandria	Fredericksburg	Pittsylvania
Alleghany	Galax	Poquoson
Amelia	Giles	Portsmouth
Amherst	Gloucester	Powhatan
Appomattox	Grayson	Prince Edward
Arlington	Goochland	Prince George
Augusta	Greene	Pulaski
Bedford	Greensville	Radford
Bland	Halifax	Rappahannock
Botetourt	Hampton	Richmond City
Bristol	Hanover	Richmond County
Brunswick	Harrisonburg	Roanoke County
Buchanan	Henry	Rockbridge
Buckingham	Highland	Rockingham
Buena Vista	Hopewell	Russell
Campbell	Isle of Wight	Salem
Caroline	King and Queen	Scott
Carroll	King George	Shenandoah
Charles City	King William	Smyth
Charlotte	Lancaster	Southampton
Charlottesville	Lee	Spotsylvania
Chesapeake	Lexington	Stafford
Chesterfield	Louisa	Staunton
Clarke	Lunenburg	Suffolk
Colonial Beach	Lynchburg	Surry
Colonial Heights	Madison	Sussex
Covington	Manassas	Tazewell
Craig	Manassas Park	Virginia Beach
Culpeper	Martinsville	VSDB Staunton
Cumberland	Mathews	Warren
Danville	Mecklenburg	Waynesboro
Dickenson	Middlesex	Westmoreland
Dinwiddie	Montgomery	West Point
Essex	New Kent	Williamsburg/James City
Fairfax County	Newport News	Winchester
Falls Church	Norfolk	Wise
Fauquier	Northampton	Wythe
Floyd	Northumberland	York
Fluvanna	Nottoway	
Franklin City	Orange	

Table 6. School Divisions with Elementary School Readiness Certification (64)		
Accomack	Henry	Scott
Amelia	Highland	Shenandoah
Appomattox	King and Queen	Smyth
Arlington	King George	Spotsylvania
Bland	Lancaster	Staunton
Bristol	Lee	Stafford
Brunswick	Lexington	Suffolk
Campbell	Louisa	Surry
Caroline	Madison	Sussex
Charles City	Manassas Park	Tazewell
Charlotte	Martinsville	Warren
Colonial Beach	Mathews	Waynesboro
Cumberland	Northampton	West Point
Dickenson	Northumberland	Winchester
Franklin City	Page	Wise
Franklin County	Patrick	Wythe
Frederick	Poquoson	
Fredericksburg	Portsmouth	
Giles	Prince Edward	
Goochland	Radford	
Greene	Richmond County	
Greensville	Rockbridge	
Halifax	Russell	
Harrisonburg	Salem	

TECHNOLOGY

The goal of the initiative is for divisions to use Web-based systems to improve the SOL instructional, remedial, and testing capabilities in their schools. Much of the required technology centers on infrastructure, specifically available bandwidth, consistency, and reliability of networks.

The 2007-08 academic year was the fifth full year school divisions had access to the proctor-caching software for online SOL testing. This software maximizes a school's available bandwidth to the Internet by allowing the secure download of SOL test content prior to the actual test administration. Although students must log in and authenticate with Pearson servers via the Internet, proctor-caching software reduces the demand for bandwidth by enabling students to retrieve test content from a location within the school's network. As a result, students do not need the bandwidth to download content at the time of testing.

The VDOE continued emphasizing the performance benefits of the proctor-caching software and urged all divisions to either implement the software as part of a standard online testing configuration or ensure that other caching software or caching appliances in their networks provide the same benefits when downloading secure, encrypted SOL test content. The VDOE and Pearson provide training and support documentation for divisions that may experience staff turnover or that could benefit from a review of how to configure and utilize the caching technology.

Even with full utilization of this software, unpredictable network slowdowns or complete network failures are possible when administering a statewide Web-based assessment program over the Internet. The disruptions experienced in spring 2007 were the types of problems that can occur with no advance notice. Although full protection is not possible, the VDOE and Pearson have collaborated over the last year to prevent interruptions and data loss during SOL test administrations.

The online system used to administer Virginia's SOL testing program is part of the PEMSolutions system maintained by Pearson. All online test administration activities conducted by division staff occur within PEMSolutions. Students taking online SOL tests interact with a client application called TestNav™, which communicates with PEMSolutions to receive and display SOL test content and then transfers student responses back to PEMSolutions for scoring. Communication between PEMSolutions and the TestNav™ client software installed on school computers occurs over the Internet. Successful administration of online SOL tests depends on the consistent performance of PEMSolutions, TestNav™, and each school's computers and technology infrastructure. Reliable Internet connectivity between Pearson and the individual schools is also necessary.

As part of the collaborative efforts by the VDOE and Pearson, the following changes were made during the 2007–08 school year:

- Pearson, with representatives from its various third-party technology vendors, conducted a large-scale review of system architecture. The review addressed all aspects of PEMSolutions, such as Web servers, application servers, database servers, network operating systems, and network hardware.

- The Basic Early Warning System (EWS) and Enhanced Early Warning System (EEWS) were integrated into a single improved solution called the Early Warning System (EWS). The new EWS significantly reduces the potential for students to be interrupted by on-screen messages during testing in the event of network connectivity problems.

- The appearance and text of on-screen messages have been altered to present a more subtle, less alarming message. The simplified text appears on a white screen as opposed to the previous bold, blue full-screen message.

- Pearson revised its TestNav™ software so the implementation and configuration of the EWS feature is a required installation step rather than an option. This prevents divisions from conducting online SOL testing without the EWS feature enabled.

- PEMSolutions revised the user interface to produce more efficient system transactions and reduce overall response times for users. The most significant reductions were experienced by large school divisions with high numbers of student test records.

- System monitoring tools were expanded and new monitoring components were added to provide a continuous and comprehensive view of PEMSolutions. These new and expanded tools improve Pearson's ability to recognize and respond to system issues proactively.

- Various Pearson staff responsible for system monitoring were relocated to a newly expanded and permanent operations center in the Pearson facility. This single location will improve communications, increase efficiency of response, and improve visibility across all real-time system monitoring.

For purposes of tracking student data, the VDOE utilizes a unique state testing identifier (STI) in its Educational Information Management System (EIMS). The STI is a unique 10-digit number assigned to each Virginia public school student. If a student leaves the state and then returns to re-enroll, the student's original STI is reactivated. The VDOE requires inclusion of a valid STI on any assessment record submitted for online or paper/pencil tests. To guarantee each test record's authenticity, a student's last name, first name, gender, birthday, and STI must match exactly when the record is processed. If any

of these fields differ, the record is flagged, and division staff must resolve the discrepancy before the test score will be reported. This ensures the accuracy and integrity of student data while enhancing the use of longitudinal assessment data in the instructional decision-making process. This demonstrates just one example of how the Web-Based SOL Technology Initiative can improve the technology, assessment, and instructional elements of public education in Virginia.

The spring 2008 online test administration presented the highest volume of concurrent online SOL tests administered to date. At the highest volume, the PEMSolutions System supported the online delivery of more than 125,200 SOL tests in a single day; the highest number administered during a single week occurred in May 2008, when more than 532,000 SOL tests were completed online. More than 23,000 simultaneous SOL tests were administered online successfully on multiple occasions during spring 2008.

WEB-BASED ASSESSMENTS

The VDOE gradually increased the number of End-of-Course (EOC) tests available online from fall 2001 through spring 2004. In 2005-06, the VDOE introduced online assessments in middle schools; in 2006-07, the agency expanded online testing at the middle schools and introduced the initiative in elementary schools (see Table 7).

Table 7. History of the Online SOL Test Implementation

Standards of Learning Test	Online Implementation Date
End-of-Course SOL Tests	
Algebra I	Fall 2001
Earth Science	Fall 2001
English: Reading	Fall 2001
Algebra II	Spring 2002
Biology	Spring 2002
Virginia & U.S. History	Fall 2002
World History I	Fall 2002
World History II	Fall 2002
Chemistry	Spring 2003
World Geography	Spring 2003
Geometry	Spring 2004
Middle School SOL Tests	
Grade 8 Science	Spring 2005
U.S. History to 1877	Spring 2005
U.S. History: 1877 to Present	Spring 2005
Civics & Economics	Spring 2005
Grade 8 Mathematics	Spring 2006
Grade 8 Reading	Spring 2006
Grade 7 Mathematics	Spring 2006
Grade 7 Reading	Spring 2006
Grade 6 Mathematics	Spring 2006
Grade 6 Reading	Spring 2006
Grade 8 Plain English Mathematics	Spring 2007
Grade 7 Reading	Spring 2007
Grade 7 Plain English Mathematics	Spring 2007
Grade 7 Mathematics	Spring 2007
Grade 6 Reading	Spring 2007
Grade 6 Plain English Mathematics	Spring 2007
Grade 6 Mathematics	Spring 2007
Elementary School SOL Tests	
Grade 5 Mathematics	Spring 2006
Grade 5 Reading	Spring 2006

Standards of Learning Test	Online Implementation Date
Grade 4 Mathematics	Spring 2006
Grade 4 Reading	Spring 2006
Grade 3 Mathematics	Spring 2006
Grade 3 Reading	Spring 2006
Grade 5 Science	Spring 2007
Grade 5 Reading	Spring 2007
Grade 5 Mathematics	Spring 2007
Grade 4 Reading	Spring 2007
Grade 4 Mathematics	Spring 2007
Grade 3 Science	Spring 2007
Grade 3 Reading	Spring 2007
Grade 3 Mathematics	Spring 2007
Grade 3 History & Social Science	Spring 2007
Virginia Studies	Spring 2007

Participation in Online Testing

In fall 2005, the number of divisions administering online SOL tests increased to include all 132 school divisions (see Figure 4). In addition, many divisions administered more online SOL tests (see Figure 5). Divisions still have the option of using paper/pencil tests, but the VDOE encourages them to administer tests online whenever possible. For students taking SOL tests in their senior year to earn sufficient verified credits for a diploma, online tests offer a much quicker return for results.

Individual schools that implement online SOL testing typically request permission to administer additional online tests. No divisions or schools have attempted online SOL testing and later decided to return to the traditional paper/pencil format.

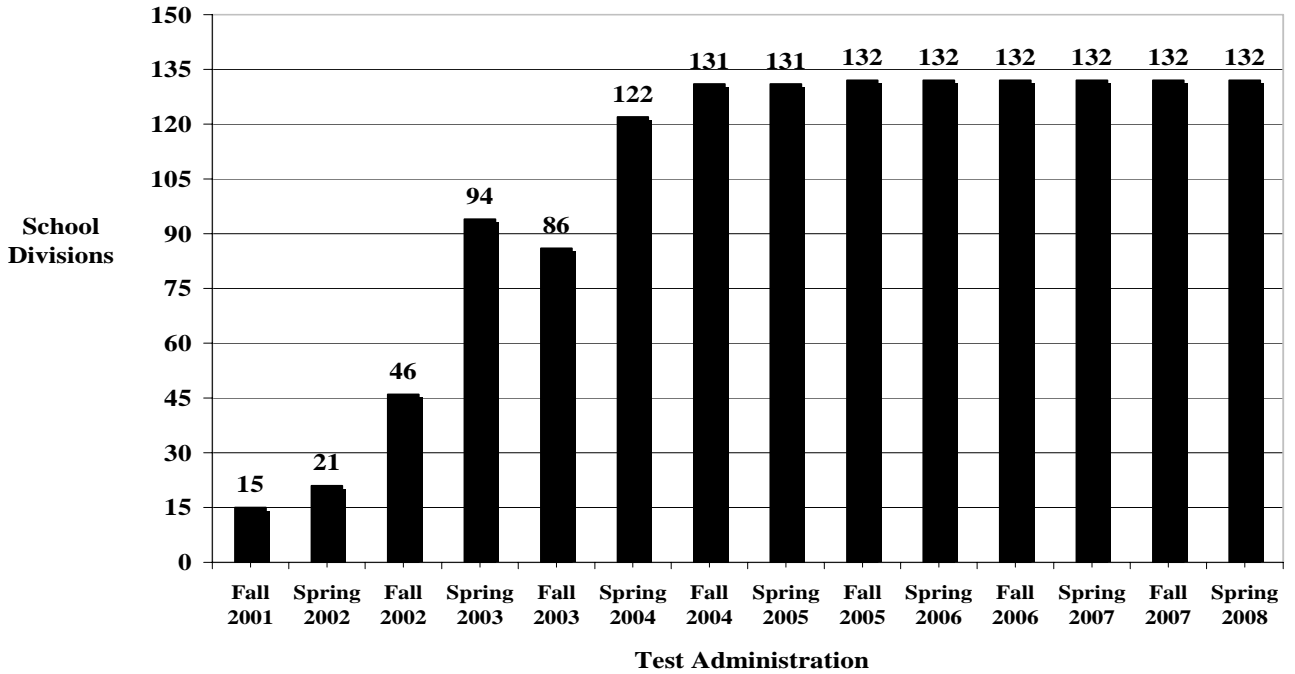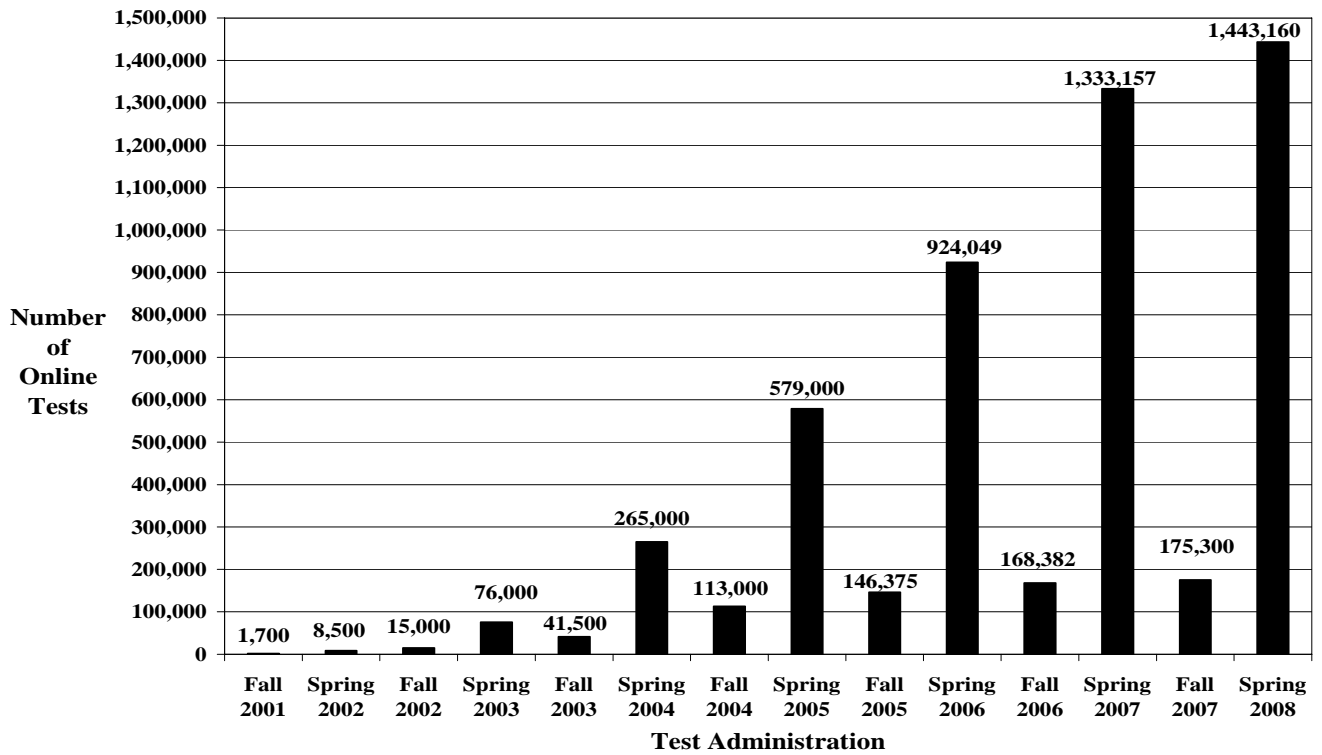**Figure 4: Number of School Divisions Administering Online SOL Tests**

School Divisions

Test Administration	Value
Fall 2001	15
Spring 2002	21
Fall 2002	46
Spring 2003	94
Fall 2003	86
Spring 2004	122
Fall 2004	131
Spring 2005	131
Fall 2005	132
Spring 2006	132
Fall 2006	132
Spring 2007	132
Fall 2007	132
Spring 2008	132

Test Administration

Figure 5: Number of Online SOL Tests Administered

Number of Online Tests

Test Administration	Value
Fall 2001	1,700
Spring 2002	8,500
Fall 2002	15,000
Spring 2003	76,000
Fall 2003	41,500
Spring 2004	265,000
Fall 2004	113,000
Spring 2005	579,000
Fall 2005	146,375
Spring 2006	924,049
Fall 2006	168,382
Spring 2007	1,333,157
Fall 2007	175,300
Spring 2008	1,443,160

Test Administration

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Supporting Online Testing Participants

Pearson and the VDOE staff collaboratively provide support and training to division staff. A shared effort is necessary as training needs span various topics, such as the PEMSolutions system, SOL testing procedures, SOL assessment data, and state and federal assessment policy. Modes of delivery include Web-based training, face-to-face training at regional meetings and conferences, and written documentation.

Customer support, or the support of division staff, is another shared effort among Pearson and the VDOE staffs, who receive questions and requests for assistance in the form of telephone calls, e-mails, and interactions during face-to-face meetings. Divisions are provided with a toll-free telephone number and e-mail address to contact Pearson. All inquiries received by Pearson are entered into the Service Center database and assigned a case number for tracking purposes. Inquiries to the Service Center may be addressed by level 1 or 2 support or through escalation to members of the Virginia program team. The VDOE staff is accessible by telephone and e-mail, and inquiries are distributed to individual staff members for resolution.

In preparation for the 2007–08 school year, a number of changes were implemented after the spring 2007 test administration:

- PEMSolutions initiated additional training regarding online-test-delivery technology. The topics targeted division technology staff and included areas such as PEMSolutions, TestNav™, proctor caching, EWS, and optimal configurations of local hardware and software to deliver online tests.

- Subsequent training addressed the processes for entering participation counts; a review of procedures; amounts and types of test materials to be shipped; tracking initial orders, additional orders, and return shipments; reporting shipment issues (such as damaged or missing materials); and steps for accessing on-screen PEMSolutions reports to view historical data about previously ordered materials.

- PEMSolutions increased the types and availability of training and resource materials. Whenever possible, content was delivered via Web-based training, written guidance documents, or face-to-face presentations at regional meetings and conferences. All Web-based training sessions were recorded, produced as stand-alone training modules, and posted for download in PEMSolutions. More than 15 different training resources currently are available to division staff.

- The Virginia Assessment System status page was redesigned to highlight more clearly revised messages. The objectives of the status page were reiterated with each Division Director of Testing (DDOT) in training and regional meetings.

- The VDOE deployed a new Web-based DDOT resource. The password-protected DDOT page represents a single online location for announcements; schedules; and archived resources, such as e-mails sent by the VDOE and Pearson and official testing memos issued by the VDOE.

- Pearson and the VDOE increased monitoring of all Service Center inquiries and responses. Pearson's and the VDOE's oversight ensures accurate and timely Service Center responses, identifies additional training needs, and recognizes potential system or policy issues.

- Pearson and the VDOE implemented a shared review of preauthored Service Center responses, called knowledge base articles. Pearson and the VDOE staff review and approve the accuracy of these articles before they are published. They also identify topics to be addressed and initiate the authoring of new knowledge base articles.

Increased Availability of Online Testing

With the planned growth of the Web-Based SOL Technology Initiative, the number of available online tests continues to increase. In 2006 and 2007, all middle school tests, except the grade eight Cumulative History and Social Science test and the English: Writing tests, were available online. The grade eight Cumulative History and Social Science test is being phased out and will no longer be administered; in its place, school divisions will administer the various content-specific history tests (online or paper/pencil).

The VDOE has started the process of transitioning the English: Writing test to an online environment. This test is administered in fifth and eighth grades and End-of-Course (EOC) levels. A passing score on the EOC English: Writing test, or an equivalent substitute test, is required for graduation. Given the high-stakes nature of this test, additional consideration must be given when planning for a significant change, such as the mode in which the test is administered.

The VDOE, Pearson, and Pearson's subcontractor, Educational Testing Service (ETS), have held meetings and conference calls regarding the English: Writing test. Topics and issues have included technology, psychometrics, the length of the testing window, the desired computer interface, and available features (e.g., cut, copy, paste). The type of technology and amount of hardware necessary must be considered since the direct writing portion of the English: Writing test currently is administered to all students in a division in a single day. Most divisions, however, do not possess enough computer workstations to test all their students in one day. As a result, divisions need options other than simply increasing the number of available workstations; possibilities include increasing the number of available writing prompts or introducing other challenges related to the scoring, equating, and scaling of student test results.

Analysis of the Grade 8 English: Writing Field Tests and the initial meetings of the VDOE staff and assessment contractors have prompted staff to begin developing a preliminary timeline and initial implementation plan for introducing online English: Writing tests. Divisions appear interested in administering the test online, and the various groups—the VDOE, Pearson, and ETS—will continue planning and moving toward a successful implementation in the near future.

INSTRUCTIONAL SOFTWARE

The goal of the initiative is to use Web-enabled systems to improve instruction, remediation, and testing capabilities in Virginia schools. One of the objectives is to make up-to-date instructional and remedial software applications available for teachers and students.

During the past year, divisions continued using the Electronic Practice Assessment Tool (ePAT), a standalone version of the TestNav™ application into which Pearson has loaded previously released SOL test items. The benefits of ePAT are twofold. First, students can study subject-area content by reviewing and answering previously released SOL test items. Second, students can become familiar with the test items in the same type of environment as the online SOL tests. ePAT incorporates the same tools, reflecting the look and feel of live SOL testing. Students can view the multiple-choice test items and click on a tool bar to select answers. A separate browser window displays all answer choices, indicates the correct answer, and explains why each is correct or incorrect. The student then proceeds to the next question.

In 2007–08, the existing ePAT content was transferred into an updated version that enabled students to see how they performed on each question after completing the ePAT practice test. In addition, a new series of ePAT, with different test subjects and levels, was introduced after the public release of the spring 2007 SOL tests in March 2008.

School divisions also use the application as a remediation tool for students who need to retake a recently failed test. The software has been used widely as one of the remediation tools in the Project Graduation program. This application is available for free download at http://www.pearsonaccess.com.

The VDOE also assists divisions with educational software procurement. In collaboration with the WHRO Ed Tech Consortium, the VDOE works with the MiCTA Service Corporation (MSC)/American TelEdCommunications Alliance (ATAlliance) to secure reduced prices on software approved by the Virginia Board of Education for remediation and instruction.

FUTURE ACTIVITIES

Implementation of the Web-Based SOL Technology Initiative continues to progress as initially planned. Figure 6 shows a timeline of activities through spring 2009.

Figure 6. High-Level Timeline of the Web-Based SOL Technology Initiative
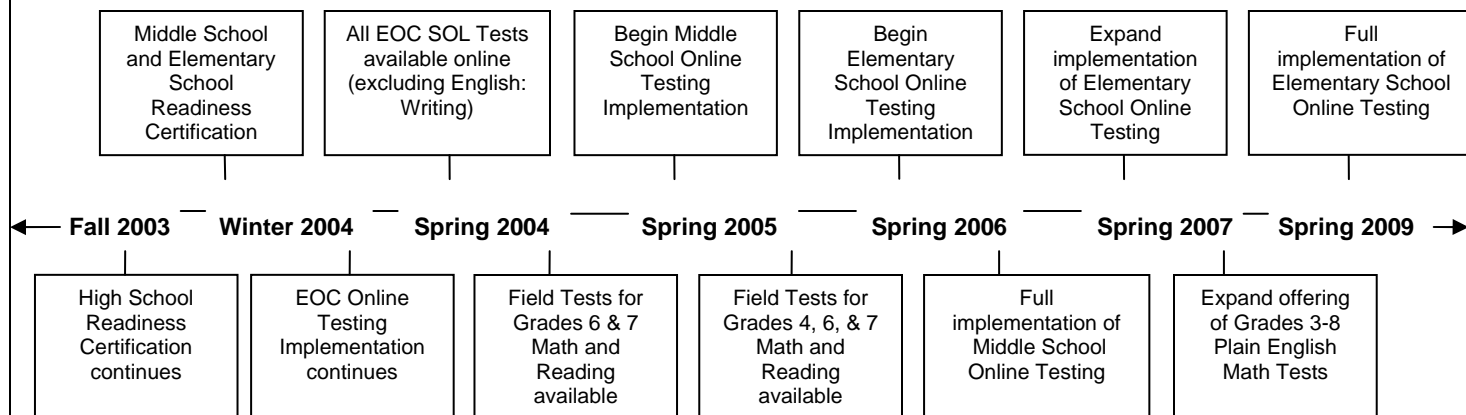
The timeline represents activities associated with making all SOL tests available online except the English: Writing tests administered in fifth and eighth grades and at the EOC level.

Feedback from school division personnel indicates the volume of online SOL tests will continue to increase in the coming year. The VDOE will support and monitor the School Readiness Certification process as divisions prepare additional middle and elementary schools for technical certification.

The Web-Based SOL Technology Initiative project team will continue to collaborate with the project team responsible for developing and implementing the Educational Information Management System (EIMS). Joint meetings have helped both project teams establish and deploy standardized data definitions for all student information. This shared awareness enables the VDOE to deliver a consistent, unified message to school divisions. By fall 2008, the VDOE and Pearson plan to deploy a single sign-on system, allowing users to visit one Web site (www.pearsonaccess.com) to access either EIMS or PEMSolutions. Existing user accounts and permissions will be updated to reflect this integration, and training events will familiarize all audiences with the newly implemented single sign-on portal.

As Virginia moves into the ninth year of the Web-Based SOL Technology Initiative, the collaborative effort among the VDOE, Pearson, and school divisions continues. Pearson and the VDOE actively work to improve the tools and resources

available to division staff and mitigate risks associated with the current processes and systems. Constructive feedback by the divisions will help both organizations improve the effectiveness and efficiencies of the systems and associated policies.