

**ALIGNMENT OF  
VIRGINIA SOL TESTS  
WITH  
SOL REQUIREMENTS**

**VIRGINIA MATHEMATICS AND SCIENCE COALITION**

**WHITE PAPER**

**APRIL 1999**

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*A Virginia Mathematics and Science Coalition White Paper*

The Virginia Mathematics and Science Coalition has been very supportive of the Virginia Standards of Learning in the areas of mathematics and science. Members of the Coalition participated in the development of the mathematics and science SOL; Coalition representatives testified in favor of the Standards at public hearings; and the Coalition formally endorsed the Standards.

While the Coalition continues to support and endorse the Standards, we believe that refinements need to be made in the *testing program for the SOL*. We should note that we are particularly pleased that the Board of Education and the staff of the Department of Education have been responsive to many of the suggestions made by the Coalition and others. In particular, we are pleased that the use of the graphing calculator is an expected tool for students taking the Algebra I and Algebra II SOL tests. The use of graphing calculators prepares students to make appropriate use of technology in real applications of mathematical and scientific problems. We also appreciate the steps that have been taken to allow the 1999 tests to be administered later in the school year.

As is true of any new program, refinements need to be made. As a math and science organization, our suggestions primarily concern mathematics, science, and technology. Therefore, we are not addressing issues raised by others, although many members of the Coalition believe that refinements are also needed in such areas as: social science Standards of Learning, adequate support for teachers, appropriate summer programs, transfers from out of state and private schools, etc.

Following are the recommendations that were formally approved by the Coalition at its March meeting and that we were directed to forward to the Virginia Board of Education.

**RECOMMENDATIONS**

The Virginia Mathematics and Science Coalition recommends that the Virginia Board of Education and the Department of Education:

1. Assure the inclusion of testing on the overall statements and goals of the SOL for each grade level and subject.
2. Refine the tests to more effectively assess the areas of critical thinking, applications, and competence with hands-on approaches in science that appear in the SOL.
3. Include non-multiple choice items on the tests.
4. Test the technology SOL in situations where students use computers, rather than just paper

and pencil.

5. Develop a program to provide greater assistance to teachers and students in preparing for the tests. Such a program should be designed to solve the problem of large numbers of low-scoring students (such as in Algebra I).
6. Continue to encourage school systems to align existing courses in their curricula to match the SOL goals.
7. Revisit selected SOL so that the Standards apply to all students expected to take the courses, and not just college-intending students. This is especially critical in geometry.
8. Develop an SOL test for Physics.

### **RATIONALE FOR RECOMMENDATIONS**

The previous recommendations were initially developed by the Coalition Standing Committee on Standards, Assessment, and Accreditation and then approved by the full Coalition Board after considerable deliberation. The following rationale represents the judgment of the Coalition in formulating these recommendations:

#### ***Nature of Tests (Recommendations # 1, 2, 3)***

We are concerned that the tests do not assess as fully as possible key items that are included in the SOL, including critical thinking by students, applications of mathematics and science, and student competence with hands-on approaches to science. If the tests do not emphasize these critical components of science and mathematics, these topics will be de-emphasized in the curriculum in many classrooms.

We know that the development of the tests has been conducted in a way that assures that each item in the test is indeed contained in the Standards of Learning. The concern is centered on what is left out. For example, the fifth grade SOL states that students will “*investigate* (italics added) and understand how sound is transmitted..., *investigate* (italics added) and understand characteristics of light..., *investigate* (italics added) and understand characteristics of the ocean environment. From the point of view of science (and the Standards) the emphasis needs to be on the investigation. Indeed, the first science SOL at each grade level begins: “The student will investigate...” This key component of the Standards is not reflected on the tests.

If the testing program were to result in a curriculum that was focused on having the students learn the present conclusions of science (which, of course, change with time) and not the process of investigation, the unintended impact of the testing program would be to diminish rather than increase student learning. Recommendations #1, 2, and 3 address this concern.

#### ***Technology (Recommendation #4)***

We recommend that students be required to use a computer to take the SOL test on Technology. The Grade 8 SOL is very clear on the expectations for students. They state “the student will communicate through application software; the student will communicate through networks and telecommunication; the student will process, store, retrieve, and transmit electronic information.”

To test students’ ability to use technology via current paper and pencil tests is totally inadequate. The result of current testing can only validate knowledge of technological vocabulary and theoretical processes and applications rather than the ability to effectively use the technology in an integrated and constructive manner.

While we agree that we could certify with a pencil and paper test a brick mason’s knowledge of the necessary requirement for mortar mixture and appropriate identification of the basic tools of the trade, it is also necessary to test his/her application skills in a physical setting. Similarly, Virginia does not certify its new automobile drivers solely on the basis of the multiple choice knowledge test administered by the DMV.

In making these recommendations, the Coalition recognizes the impact of such testing in terms of computer access and standardization.

Many members of the Coalition are also concerned that technology is not a part of the testing requirement after Grade 8. One possibility would be the development of a technology SOL to be *one of the options* available to students as they fulfill their secondary school SOL requirements.

### ***Support for all systems and all schools (Recommendations # 5 & 6)***

The Coalition is well aware of the major structural changes that will be required in order for all students to become more successful. The Coalition is also aware that different systems are in need of different types of support and assistance. The effort of the Department of Education to develop and staff regional centers appears to have great promise. State support for continued efforts needs to be sustained.

Many systems have made effective use of the Lead Teacher concept to provide in-school ongoing support for classroom teachers who are expected to have strong content and pedagogical knowledge in all disciplines.

The new Teacher Licensure requirements approved by the Board of Education now require that all elementary school teachers have a substantial background in mathematics and science and that middle school teachers must have completed the equivalent of a minor in those areas that they teach. Previous licensure requirements did not include this requirement, and there are large numbers of individuals teaching mathematics and/or science in Virginia elementary and middle schools who do not have anywhere near the background that the new licensure requires. Appropriate programs need to be developed and sustained to provide adequate support for these teachers. With more and more students expected to master Algebra I, for example, it is imperative that middle school teachers have the background knowledge to lay the groundwork so that all students can be successful.

### ***Revisit SOL requirements to assure that the content is appropriate for all students (Recommendation # 7)***

We recommend that the SOL be revisited to ensure congruency with, possibly updated, student learning objectives. For example, the Geometry SOL needs to be revisited so that it reflects geometry needed by all students, not just those intending to enroll in colleges. In the view of the Coalition, the SOL and accompanying test are appropriately written for a traditional geometry course for college bound students. With its emphasis on “statement, reason, proof” the course does not address the applied geometry skills that are needed by all students. It is important to prepare all students for their next step, not just those intending to attend college. It is our belief that an applied geometry course in which students discover formulas and concepts which can be readily used in their daily life and work would be far more beneficial as an expectation for all students. The Coalition has developed and offered an in-service course for teachers focusing on the real world use of geometry; this course has proven to be an effective way to master geometric concepts and interrelationships without loss of rigor.

***SOL Test in Physics (recommendation # 8)***

With participation of school and university based physics faculty, Physics Standards have been developed. However, to this date a physics SOL test has not yet been offered. In the view of the Coalition, the study of Physics has been neglected by many schools in Virginia and the fact that an SOL test is not offered in this area makes an inappropriate statement to Virginia schools and students. The Coalition joins the Virginia Association of Science Teachers and the Virginia Instructors of Physics in urging that such a test be developed.

We are confident that these issues will be addressed by the Board and the Department of Education. The Coalition and its members remain committed to participating in any way possible in this process. The Coalition will continue to review the entire Standards program for possible long-term adjustments, including the possibility of a separate SOL option in technology. We would be happy to provide, on a timely basis, more detailed information on any topics at the request of the Board of Education.

Many more Virginia students can indeed be successful in their study of mathematics and science.