

# SENATE STAFF ANALYSIS AND ECONOMIC IMPACT STATEMENT

(This document is based on the provisions contained in the legislation as of the latest date listed below.)

BILL: CS/SB 746

SPONSOR: Appropriations Subcommittee on Education and Senator Sullivan

SUBJECT: Math & Science Teacher Education

DATE: March 21, 2001      REVISED: \_\_\_\_\_

	ANALYST	STAFF DIRECTOR	REFERENCE	ACTION
1.	White	O'Farrell	ED	Fav/1 amendment
2.	McKee	Hickam	AED	Favorable/CS
3.			AP	Withdrawn: Fav/CS
4.				
5.				
6.				

## I. Summary:

This legislation creates a program to improve the teaching of mathematics and science in Florida, especially in kindergarten through grade 8. The Alliance for Improving Mathematics and Science (AIMS) is created to design the selection process for teachers who will participate, to provide for the selection and preparation of staff to implement the program's workshops, and to design the follow-up support for each teacher for at least a year in the classroom.

The bill creates sections 231.6015 and 240.149 and amends sections 229.592, 231.600, and 236.685 of the Florida Statutes.

## II. Present Situation:

### Background

Florida has long acknowledged the need to improve student achievement in mathematics and science, which are areas of critical teacher shortage. In 1989, the Florida Department of Education published *A Comprehensive Plan: Improving Mathematics, Science, and Computer Education in Florida*. That report recommended five actions:

1. Strengthen curriculum
2. Adjust the statewide testing program
3. Revitalize learning
4. Prepare more qualified teachers
5. Reach out to students with special needs

In the 12 years since that report was published, Florida has achieved substantial results in three of the five recommended actions. The state received nationwide recognition for its efforts to revitalize learning through technology and to strengthen curriculum through the recently adopted

Sunshine State Standards and the Subject/Content Standards for Teachers. A statewide testing program, the Florida Comprehensive Assessment Test or FCAT, has been implemented statewide. The testing program includes math and will include science beginning in 2003.

The other two recommendations have not met with the same level of success, according to research reports. The shortage of mathematics and science teachers is still critical, and teachers in elementary and middle schools frequently believe that they lack content knowledge in those areas. Unfortunately, evidence is abundant that students with special needs or educational disadvantages are not catching up in math and science.

**Disparity of Student Achievement**

When the results of the National Assessment of Educational Progress (NAEP) were linked with those of the Third International Mathematics and Science Study (TIMSS), Florida’s children measured lower than those in the United States average for all grades, and the gap widened in the upper grade levels. In mathematics, 45 percent of Florida’s 4th grade students are below basic (lowest) achievement levels, compared to 39 percent nationwide. On international comparisons, achievement of students in the United States was high in grade 4, below average in grade 8, and almost last by grade 12. The results are more alarming when broken down by race (see Table 1). Although a total of 21 percent of Florida’s eighth graders scored **Proficient** in science, only 4 percent of African American students and 9 percent of Hispanic students did that well. Other research points to the relationship between these low scores and teacher preparation: In schools with the highest minority enrollments, students have less than a 50 percent chance of getting a science or mathematics teacher who is certified to teach science or math.<sup>1</sup>

<b>1996 NAEP* Test in Science: Grade 8 Students who Scored <b>Proficient</b> or Better</b>				
	All	White	Black	Hispanic
United States	29 percent	37 percent	5 percent	11 percent
Florida	21 percent	32 percent	4 percent	9 percent

\*NAEP is a national program that has tested a sample of students periodically since 1969. Its purpose is not to assess every student but to provide a national report card.

**Florida’s Teacher Preparation Programs (and the Loophole)**

Research on student learning gains shows that the effectiveness of the teacher is the most important variable, and that the most important attribute of an effective teacher is the teacher’s pursuit of knowledge of the subject matter.<sup>2</sup>

Florida’s requirements for teacher preparation programs in approved colleges of education focus on content knowledge, and in 2000, the requirements for certification were significantly

<sup>1</sup>J. Oakes, *Multiplying Inequalities: The Effects of Race, Social Class, and Tracking on Opportunities to Learn Mathematics and Science*, RAND Corporation, 1990.

<sup>2</sup> Karen L. Bemby and others, Dallas Public Schools, *Policy Implications of Long-term Teacher Effect on Student Achievement*, paper presented at the 1998 Annual Meeting of the American Education Research Association.

strengthened. National report cards have upgraded Florida's certification process from very low compared to other states to equal to most other states. However, many of Florida's teachers were not prepared in state-approved teacher education programs. The loophole is that Florida allows over 14,000 teachers to work with temporary certificates, and many if not most of Florida's teachers were educated in other states.

### **Sources of Professional Development Programs**

#### **(a) Legislative Appropriations**

The 2000 Legislature appropriated \$36 million for the professional development of teachers (Specific Appropriation 83 of the General Appropriations Act). The federal government provides additional funds as grants to school districts (Eisenhower Title II).

In addition, the 2000 Legislature earmarked an additional \$3 million for improvements in mathematics and science instruction (Specific Appropriation 107). In January, \$2.5 million of that appropriation was awarded to a program designed by the University of Central Florida's Academy for Teaching, Learning and Leadership.<sup>3</sup> Plans are to provide professional development to teachers of grades K-8. The resources of the six Area Centers for Educational Enhancement are supposed to assure statewide access, with plans this summer to provide 500 teachers with 30 hours of training in each of the six regions (for a total of 3000 teachers).

Members of a steering committee include representatives of the area centers, school district representatives, resource teachers with classroom experience and knowledge of math and science, university math and science educators, and Department of Education math and science coordinators. The steering committee for this project is similar in its operations to the AIMS board created in SB 746.

#### **(b) Department and District Initiatives:**

According to staff of the Department of Education, a number of other initiatives to improve the teaching of mathematics and science are available. They include:

- **FANS Parent Workshop.** *Families Achieving the New Standards* is a 90-minute parent workshop focusing on mathematics and science standards. Parents view a video and participate in three hands-on activities. FANS in Florida is sponsored by the Department of Education and administered by the Area Center for Educational Enhancement at the University of West Florida. Training workshops were held in the summer of 2000 and several districts have implemented the workshops.
- **Best Practices CD ROMs.** The Science CD was distributed in 2000 in conjunction with on-going professional development workshops for K-5 teachers. The Math CD was distributed in 1997.
- **Curriculum Planning Tool.** This tool, available on the DOE website, provides a format for lesson plans and many mathematics and science activities linked to the Standards and Benchmarks.
- **Science Laboratory Safety Workshops.** Work papers on science laboratory safety serve to interpret the regulations of the State Board of Education for safe science instruction.

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<sup>3</sup> Of the \$3 million, \$500,000 is to be used for a professional development conference sponsored by the Florida League of Teachers in April.

- **Building a Presence for Science.** The Department of Education is receiving a three-year grant from Exxon through the National Science Teachers Association. The purpose is to link leaders in science through out the state of Florida. A group of 150 K-12 Florida “Key Leaders” will be identified through a process of recommendations and special invitations. To be eligible, an educator must have recognition through awards or election to office for dedication to science education. These leaders will take part in the responsibilities and rewards of key leader roles in Florida. The “Key Leaders” will be provided with the necessary professional development, materials, and expenses to share their expertise in standards-led science teaching and learning with their points of contact.
- **Opening the Gate.** This program began as part of the *Algebra for Everyone* efforts of the early 1990s. The original professional development workshops addressed appropriate curriculum and teaching strategies for “opening the gate” to wider student participation in algebra and resulted in many activities for Pre-Algebra and Algebra classes. The next phase broadened the workshops to grades K-12 and to a broader understanding of algebraic thinking. An updated version in 1998 kept the K-12 problem-solving focus and addressed links to the Standards and FCAT. This program has influenced the College Placement Test and extended versions of some of the activities make up the PASS document, *Introduction to Algebra: Teacher’s Guide*.
- **PASS (Parallel Alternative Strategies for Students) Products.** These are supplementary materials for teachers working with learning-disabled or at-risk students. They include materials for science and mathematics instruction. A current project is devoted to middle school mathematics, and the DOE math program specialist is providing technical assistance. The teacher manuals for this series are an excellent source of professional development for teachers.
- **Curriculum Frameworks for Mathematics and Science.** The *Florida Curriculum Frameworks* are technical assistance documents for local educators to use in implementing the Sunshine State Standards. Grounded in national and state reform initiatives, the frameworks do not prescribe the specifics of classroom instruction. They present broad, overarching concepts and ideas for the development of curriculum and instruction. Curriculum support specialists conduct ongoing professional development emphasizing that standards-based instruction is the goal for Florida students as well as the best preparation for FCAT.

### **Evaluation of Professional Development Programs**

Despite this long list of professional development resources, there is little evidence of statewide improvement, either in the number of teachers who avail themselves of the resources or in student learning gains.

Several legislative initiatives require measurement of effective teaching by student gains in achievement. For instance, Specific Appropriations 83 and 107 both require student achievement to be a measure of the success of professional development programs. However, measurement of student learning gains will not be statistically reliable until the Department of Education completes its research and selects a valid methodology. The earliest possible date for statewide availability of the required data is 2003, because standardized tests in each of the four subjects will not be given to every student every year until 2002.

Until that time, measurement of student learning will be subjective, and evaluation must look to the process rather than the product. A review of the process demonstrates that participation rates in professional development in mathematics and science are low. The following chart shows that fewer than 6 percent of teachers received any professional development in mathematics and science in 1999-2000:

Content Area	Participants (Number)	Participants (Percent)*	Hours (Number)	Hours (Percent)§	Average hours per participant
Science	8,588	1.5	83,047	1.2	10 hours
Math	22,760	4.0	245,946	4.0	11 hours
Language Arts	58,805	10.0	696,447	10.0	12 hours
Social Studies	5,538	0.9	54,145	0.8	10 hours
Instructional Strategies	76,624	13.5	788,513	11.6	10 hours
School Improvement	46,631	8.0	665,400	10.0	14 hours
Classroom Management	22,550	4.0	235,719	3.0	10 hours
Technology	64,413	11.0	558,127	8.0	9 hours

\*Percent of total number of inservice *participants* in all subject areas

§Percent of total number of inservice *hours* in all subject areas

**National Alliance of State Science and Mathematics Coalitions**

In summer of 1998, the National Alliance of State Science and Mathematics Coalitions convened a national group to discuss the need for improvements and to recommend action for states to take. The Florida contingent of that group is named ACoalition for Improving Mathematics and Science in Florida.@ Their major recommendations were to:

- C Focus professional development through a statewide assessment;
- C Coordinate the state=s efforts through a nongovernmental organization with considerable autonomy to define, implement, and evaluate a statewide plan;
- C Use improvement in student performance to evaluate the program=s success.

**Excellent Teaching Program**

The 1998 Legislature created the “Excellent Teaching Program” to motivate teachers to seek national certification (s. 236.08106, F. S.) The program assists teachers with the fees required to apply to the National Board for Professional Teaching Standards (NBPTS) and provides an annual salary bonus to those who earn the credential. The bonus is 10 percent of the statewide average teacher salary. In FY 2000-2001, the dollar amount is \$3,603.60.

The program is phenomenally successful. In the year before its creation, Florida had only 22 national board-certified teachers. The next year, we had 546. This year, 2000-2001, we have 1,268 teachers receiving the bonus.

**III. Effect of Proposed Changes:**

The legislation under consideration will place into law the findings and recommendations of the Coalition for Improving Mathematics and Science in Florida. The requirements of the bill resemble the activities funded by Specific Appropriation 107 of the 2000 General Appropriations Act and planned by the University of Central Florida’s Academy for Teaching, Learning, and Leadership. The following section by section analysis is a summary of those initiatives:

**Section 1.** (Creates s. 231.6015, F.S.)

Creates a grant program to fund in-service professional development activities to improve mathematics and science teaching, with an initial emphasis on kindergarten through grade 8. A school district may not divert funds provided for this program to supplant current activities.

The program has a specific description to require a focus on content sequences aligned with the state-adopted Sunshine State Standards and the content standards developed for teachers by the Education Standards Commission. The bill specifies that the program is supposed to be intensive enough to improve a teacher's command of content knowledge and teaching skills.

If the program funds are insufficient to reach all teachers, it must allocate resources to produce a measurable change in the ones it does reach. This provision appears to counter a familiar criticism that professional development is spread too thin -- ~~AA~~ a mile wide and an inch deep.@

The program's evaluation must include a component that measures student achievement. The evaluation will be designed by the Alliance to Improve Mathematics and Science, which is created in section 2 of the bill.

The bill states that teachers may be compensated for their participation and may use successful participation to extend their certificates or add a new certification area.

Delivery sites for the program are defined as joint-use facilities and may be on property belonging to a school district, a public or independent university, college, or community college.

The bill requires the program to involve the expertise of contemporary research and higher education institutions. However, a community college or university whose professors provide instruction for the program may report full-time-equivalent students for state funding only if the institution provides the instruction ~~Ain-load@~~ by its own staff paid by its own resources. The term ~~Ain-load@~~ means that the professor performs the instruction as part of his or her regular teaching duties (or teaching ~~Aload@~~) as assigned by the institution.

The Legislature will determine in an appropriations act the extent of the program and the number of delivery sites.

**Section 2.** (Creates s. 240.149, F.S.)

This section creates a quasi-autonomous nongovernmental organization called the Alliance for Improving Mathematics and Science (AIMS). The organization will be operated by a board of directors and must be registered and incorporated as a not-for-profit organization under chapter 617, F.S., and section 501(c)(3) of the Internal Revenue Code.

Although independent of state government, the organization is subject to the state's sunshine laws and is assigned to the Office of the Commissioner of Education for administrative purposes. Such an assignment is to provide a fiscal agent for a nongovernmental group to receive state funds. The arrangement gives the department no authority over the decisions of the alliance, nor any credit or blame for its accomplishments or failures.

The board of directors is appointed by the Commissioner of Education from recommendations requested from any public or private organizations with expertise in education or technology. Three of those organizations are mentioned in the bill: The Postsecondary Education Planning Commission, the Education Standards Commission, and Workforce Florida, Inc.

The board must include:

- C Four employees of postsecondary education institutions who have expertise in science and science education, mathematics or mathematics education, or a related technical field.
- C Four members who are employees of school boards. Two of these members must be teachers.
- C Four members from the private sector.
- C One member to represent the Department of Education. This member does not have a vote, although he or she may participate in the alliance's deliberations.

The board will have a chief executive officer who may employ staff.

An advisory council is created to assist the organization and to apprise decision makers of its activities. The council has six members:

- C One member of the Florida Senate,
- C One member of the Florida House of Representatives,
- C A representative of the Executive Office of the Governor,
- C A representative of the Department of Education,
- C A representative of the community college system, and
- C A representative of the state university system.

The bill does not specify responsibilities of the council; presumably it will act as an oversight group to gather and disseminate information about the alliance's accomplishments, to give it visibility, and to penetrate governmental barriers when advisable.

The bill specifies guidelines about the program to be delivered. The guidelines again emphasize focus, concentration on content, and specific sequences designed around the Florida Comprehensive Assessment Test, the Sunshine State Standards, and the content standards for teachers.

The guidelines require the alliance to design the selection process for teachers who will participate, to provide for the selection and preparation of staff to implement the program's workshops, and to design the follow-up support for each teacher for at least a year in the classroom. The alliance either could conduct a centralized operation or could contract with personnel in each district. But the bill gives the responsibility to the alliance and does not authorize it to operate as a "funding stream" by delegating authority to each district.

By December 1, 2001, the board submits a budget proposal for 2002-2005. The proposal is to go to the Legislature through the Commissioner of Education and must include alternatives for providing the program to all, half, or a quarter of the state's elementary and middle school teachers. The implication of this funding procedure is that the program should be implemented fully to the number of teachers involved, not that it should be spread out among so many teachers as to reduce its ability to effect a change.

**Section 3.** (Amends s. 229.592, F.S.)

This section requires the State Board of Education to require each school to report the number and percentage of teachers who have successfully completed the program to improve mathematics and science teaching.

**Section 4.** (Amends s. 231.600, F.S.)

This section assigns to the teacher education centers the responsibility to assure that teacher education programs will be fully aligned with the content of science tasks included in the FCAT beginning in 2003. This provision requires each teacher at least to know the skills that will be included in the FCAT, whether or not the program designed by the Alliance to Improve Science and Mathematics reaches every teacher in a district.

**Section 5.** (Amends s. 236.685, F.S.)

This section requires the annual report for education funding accountability to include the number and percentage of teachers who have completed the program to improve mathematics and science.

**IV. Constitutional Issues:****A. Municipality/County Mandates Restrictions:**

None.

**B. Public Records/Open Meetings Issues:**

None.

**C. Trust Funds Restrictions:**

None.

**V. Economic Impact and Fiscal Note:****A. Tax/Fee Issues:**

None.

**B. Private Sector Impact:**

Teachers who successfully complete the program could be eligible for compensation from the school district for their participation. The incentive plan must provide participating teachers access to any merit-pay plans developed by school districts and may provide for a stipend and a salary bonus.



**C. Government Sector Impact:**

The Department of Education has estimated the start up costs for the Alliance, Chief Executive Officer, staff and council at \$35,000, and the operating costs at \$138,000. Operating costs are recurring and include salaries, office expenses, and travel for board members.

The cost of the professional development program may vary by district, depending on how the program is implemented.

This bill specifies that the program is to be established and maintained as provided in the General Appropriations Act. The proposed Senate Appropriations Bill provides \$3,000,000 for the program for FY 2001-2002.

**VI. Technical Deficiencies:**

None.

**VII. Related Issues:**

None.

**VIII. Amendments:**

None.