MEMORANDUM

TO: Arlington School Board

FROM: Science Advisory Committee

DATE: March 3, 2015

SUBJECT: Non-recommending Year Report

Current Year Activities:

Since our last report to the School Board for the school year 2013-2014 (Recommending Report), the Science Advisory Committee (SAC) has spent the majority of its time reviewing the status of recommendations presented to the School Board in the Recommending Year report and discussing issues and data related to science instruction and student test results.

Our activities and findings for 2014-2015 are organized in the following eight topics, several of which we expect to formalize in our recommending report next year:

1. Inconsistent amount of instructional time and content amongst APS elementary schools.

    SAC continues to review the amount of instructional time and content dedicated to science instruction in elementary schools. As previously reported, science instructional time and content are inconsistent amongst APS elementary schools.

    We are particularly concerned that, as teachers focus more of their time and resources on subjects that are tested during the 4th grade academic year, there will be a further decline in time devoted to science instruction which has previously resulted in a significant gap between student achievement on the 3rd grade and 5th grade science SOL test".

    Data shows that many APS elementary schools suffer a drop in SOL science pass rates between 3rd and 5th grade while math and reading increase or remain largely unchanged respectively. This pattern has remain consistent and grown more evident in recent years (Figure 1).

    Not all schools show large drops in science SOL pass rates between 3rd and 5th grades. We remain concerned that the large drops in science SOL pass rates are particularly concentrated in APS's Title I schools.
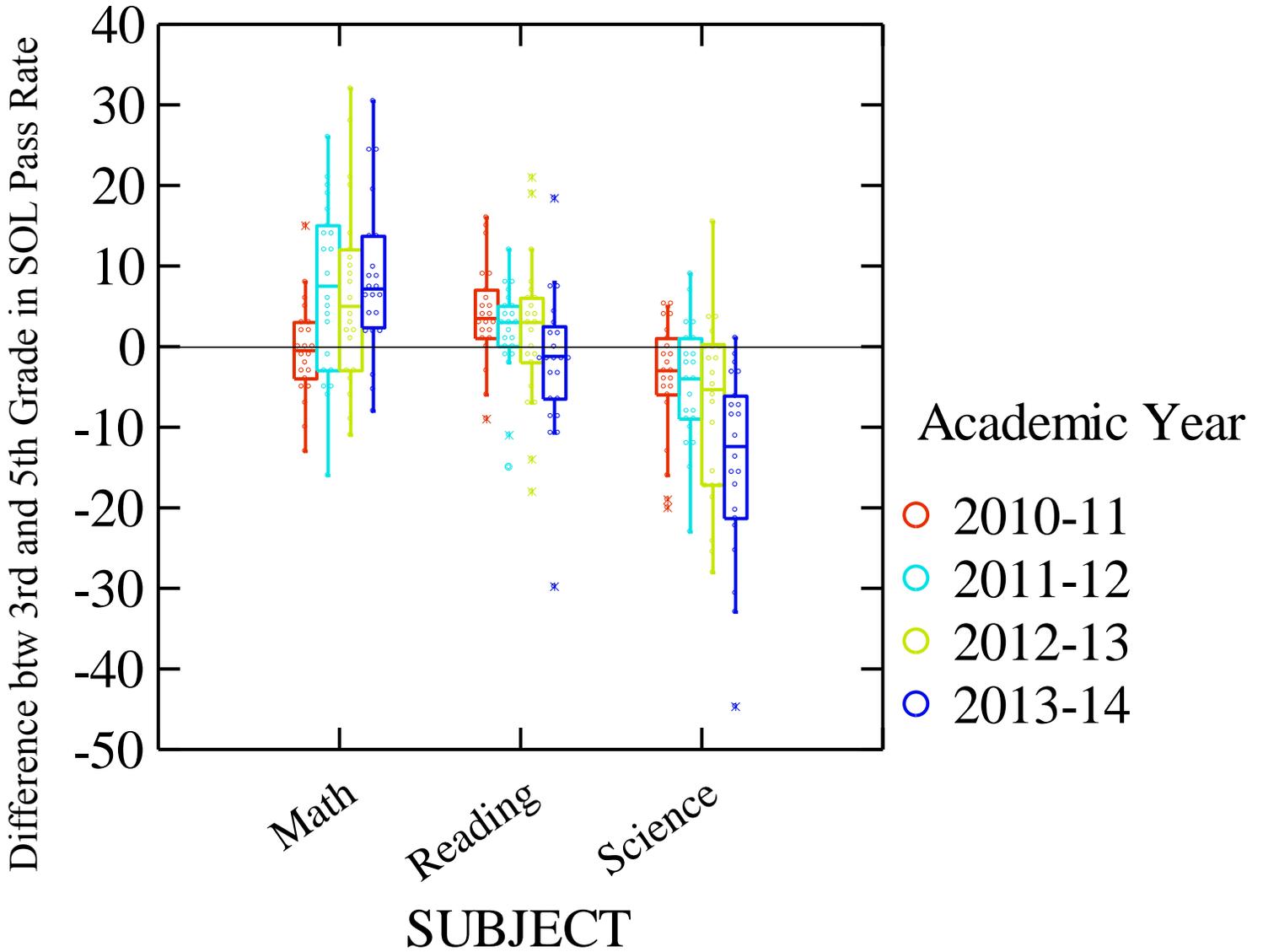
Figure 1a. Differences in SOL pass rates between 3rd and 5th grade (positive values reflect higher pass rates in 5th grade) for 22 APS elementary schools, by subject and for each of the past three years

2. Adoption of Interactive Achievement (IA)

SAC continues to monitor the elementary school use of the Interactive Achievement software as a means of formative assessment for science in grades 3-5. We are particularly interested in its use by those elementary schools with science SOL pass

rates at or below 70%. We expect to report on this and recommend formal adoption again next year.

Last year, Hoffman-Boston Elementary was the only Arlington elementary school to pilot Interactive Achievement (IA) for science. Hoffman-Boston was the only elementary school to show an increase in SOL pass rates for science; their pass rate for Grade 5 Science increased by 21%. Hoffman Boston was also the only school to show an increase in pass rates for science between grades 3 and 5, and also showed a nearly 20 percentage point increase in pass rates for math between grades 3 and 5 (see Figure 1b below).

Notably, there was an overall drop in pass rate in the Grade 5 Science for both Arlington and the State of Virginia for the spring 2014 test. Hoffman-Boston's results strongly suggest that our recommendation from last year - to require use of IA for science in elementary schools with low science pass rates - should have been implemented by APS.

Following the very poor pass rates in spring, 2014 and the success shown at Hoffman-Boston, a number of schools have voluntarily implemented IA. The SAC plans to the monitor the pass rate for spring 2015 for schools that are using IA.

Figure 1b - Figure 1a but indicating Hoffman Boston scores for math and science in past
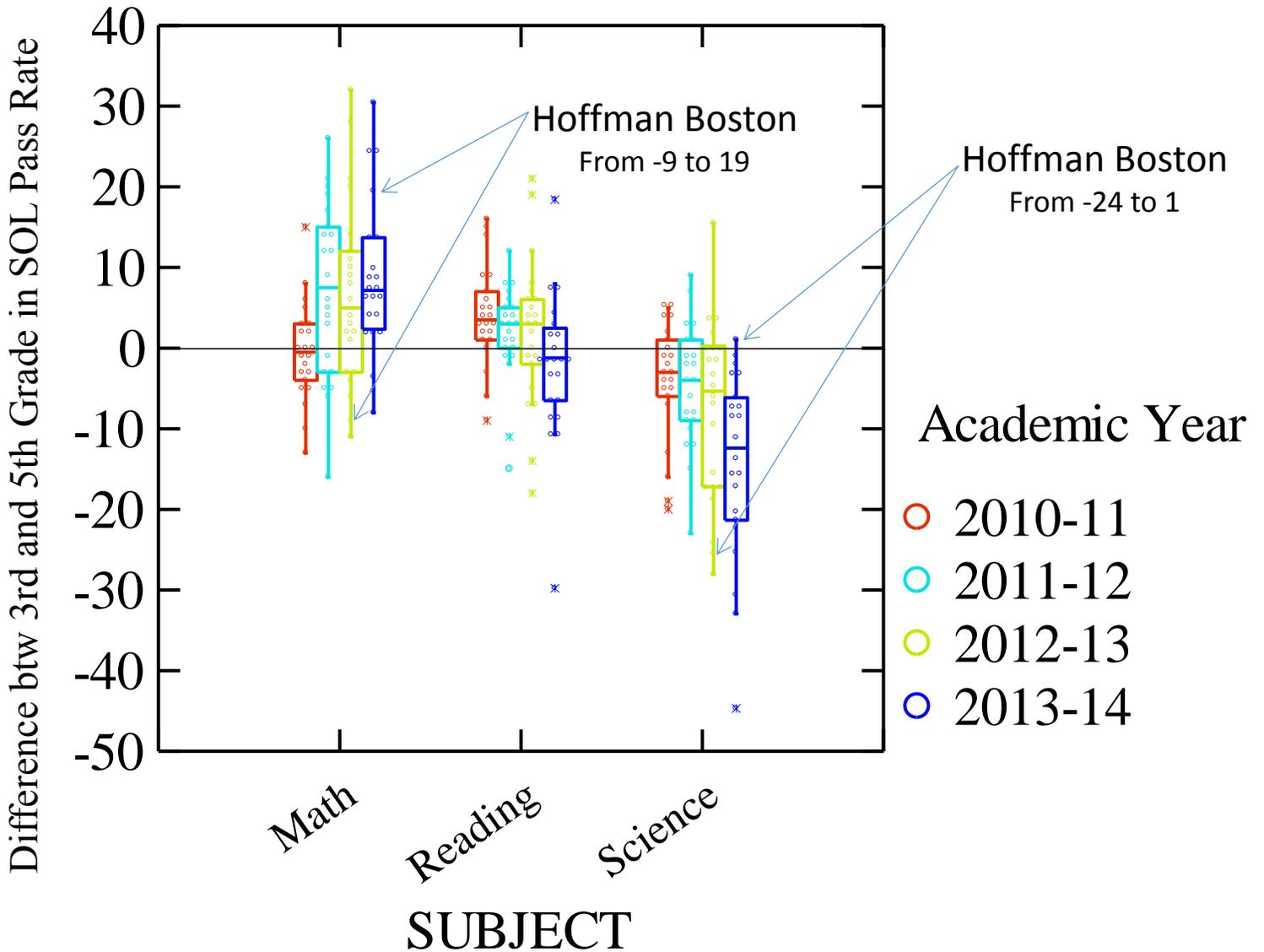
two years

3. Integration of science curriculum with other subject matters

The SAC is actively engaged in finding a solution for the inconsistency in time devoted to science instruction. We believe that further integration of science with other subjects such as reading or social studies would be of benefit. A pilot project, which linked a set of non-fiction science texts to grade level and SOL reading standards, was completed by APS teachers and staff and is available online at http://www.apsva.us/Page/19272. Integrating nonfiction

science materials from the Science Fusion program during reading times is another way teachers could boost science exposure. SAC continues to encourage the integration of science with all core subject areas. Last year, the SAC began this work by meeting with the Social Studies Advisory Committee to brainstorm ways of integrating the two subject areas. The two committees found unlimited possibilities on potential topics and a common belief that by integrating the two subject areas students are more likely to gain an understanding of how science works in the real world as well as the role that science has played throughout history.

4. Elimination of the 3rd Grade Science SOL

Previously, the SAC expressed concern about the elimination of the science SOL test in 3rd grade, which will occur for the first time during the current 2014-2015 school year.   Our concerns were lessened with the development of the third grade alternative assessments. These alternatives require schools to implement a minimum of 8 performance-based science tasks to ensure consistency, dedicated science instruction time, and the use of the Science Fusion program. We will continue to monitor the implementation of the alternative assessments and the amount of science instruction taking place in the 3rd and 4th grades.

5. Mandatory science fair participation

For the past 7 years, SAC has been recommending mandatory middle-school participation in a science fair and a requirement for an inquiry-based science project. Data from Jefferson Middle School, which requires all students in grades 6-8 to undertake a science project and participate in a science fair each year demonstrates increased student pass rates in the 8th Grade Science SOL from 2013 to 2014, whereas there was a slight decline in pass rates for APS as a whole. These results build on the more extensive analysis SAC provided in last year's report and demonstrate the value of science fair projects to overall science instruction at the middle school level.

Figure 2. Grade 8 Science SOL Pass Rates for 2013-2014

Grade 8 Science SOL Pass Rates (2013-2014)
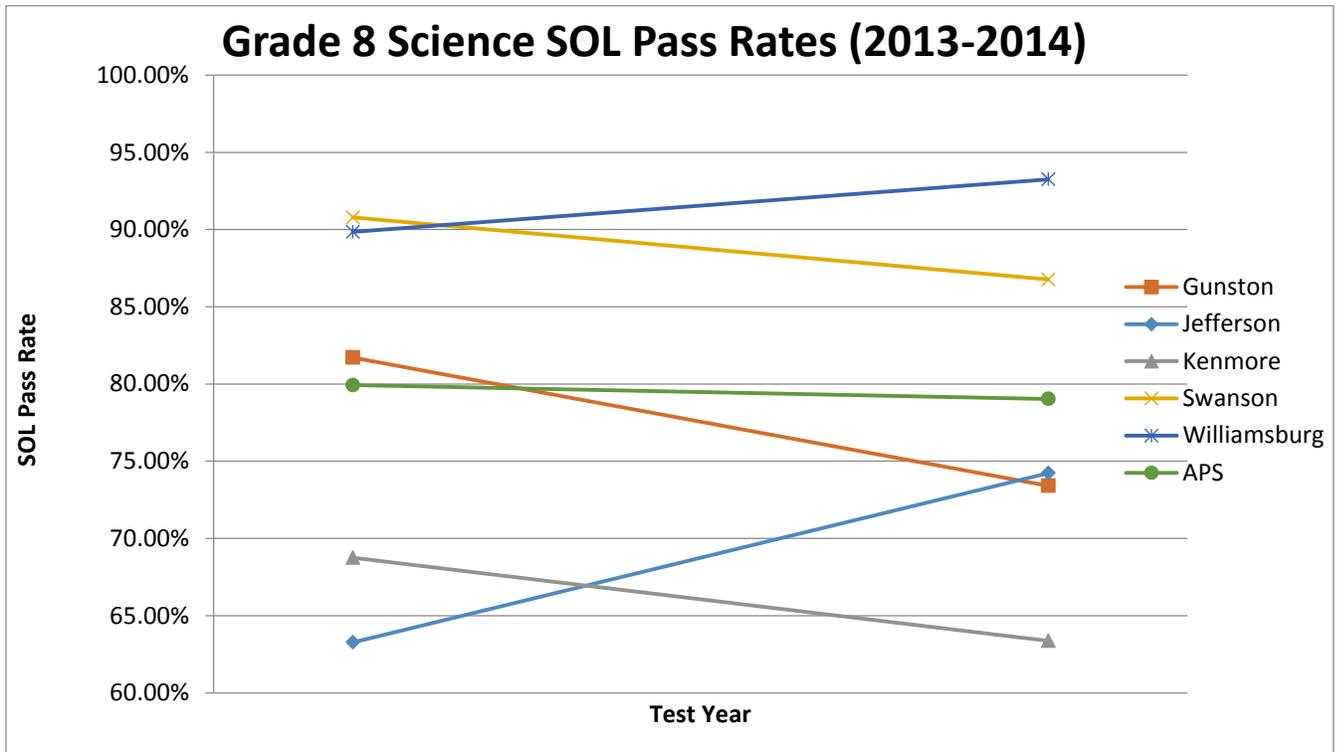
6   Impact of personalized devices versus dedicated lab computers

SAC remains concerned about the lack of dedicated science computers in middle and high school science classrooms to enable students to fully participate in and analyze the results of lab activities. Although the new personalized devices may be a suitable alternative for the dedicated science computers at the high school level, the roll out over a span of several years may limit the use of data collection tools and the ability to accomplish independent scientific research. The SAC is also concerned about whether the personalized devices will be suitable for the Vernier probeware equipment used in science instruction at the middle school level. Currently, iPads are not fully compatible with the Vernier equipment. As a result of the lack of funding for replacements, as recommended by SAC the past several years, and the inadequacies of the personalized devices, SAC is consulting with the secondary school lead science teachers to determine the impact on science instruction and help facilitate the reallocation of older computers, if needed.

7. Reevesland Learning Center

The SAC has been actively brainstorming on ways to alleviate overcapacity at the Outdoor Lab as student enrollment continues to increase in Arlington Public Schools. The SAC discussed outdoor learning opportunities at the Reevesland Learning Center. Through its "Lawn to Lettuce" program, the Reevesland Learning Center's focus is to provide students with gardening experience while integrating science, math, social studies, language arts and

nutrition. Currently, the program is free and is available to all APS schools. The SAC recommends transportation funding to allow schools that are not in walking distance to participate.

8. Scientist in the Classroom

For the past three years, APS has been partnering with American Association for the Advancement of Science (AAAS) with the Scientist in the Classroom Program. Currently there are 26 scientists volunteering in 20 APS elementary schools to support STEM education. These scientists are committed to volunteering at their assigned school on a weekly basis for the entire year to help with lab experiments, career explorations, classroom discourse and supporting overall science instruction. The SAC is enthusiastic about this partnership and would like to help identify additional scientist volunteers and promote its value to the broader community.

Updates on Previous Recommendations

Past Recommendation #1:

APS should implement the Science portion of the Interactive Achievement (IA) - Formative Assessment software for grades 2 through 5 to monitor the progress of students in science in those elementary schools whose science SOL pass rates are at or below 70%.

Status:

Although the School Board did not mandate use of IA for science, 14 elementary schools have participated this year to varying degrees (e.g., implementation for grades 3-5 versus only grade 5). The schools are: Abingdon; Arlington Science Focus; Arlington Traditional School; Barcroft; Barrett; Carlin Springs; Claremont; Patrick Henry; Hoffman-Boston; Jamestown; Key; Long Branch; Oakridge and Taylor. It would also be interesting to know how these schools are using Interactive Achievement to inform and modify classroom instruction (e.g., re-teaching of difficult concepts).

Past Recommendation #2:

APS should help schools and teachers implement and interpret the results of the science assessments and react to classroom and individual student scores though development of instructional pacing guides, linked to the new science text books recently purchased for all elementary schools and professional development activities as needed.

Status:

Curriculum and pacing guides were developed. Provided Lead Teachers with professional development on 1) 3rd grade science alternative assessments 2) Interactive Achievement 3) Science Fusion Materials 4) Using data in Professional Learning Communities (PLC). The pacing guide will be revised and updated with the input of Elementary Science Lead Teachers in the spring.

Past Recommendation #3:

APS should foster greater integration among instructional disciplines through an expanded effort to link science instruction and pacing guides with language arts instruction at all elementary schools.

Status:

Work completed so far on integration among instructional disciplines include: 1) The use of materials and resources from the Infusion of Science into Language Arts and 2) Encouraging teachers to use reading time to implement the Science Fusion Leveled Readers. More integration is planned for math and social studies.

Past Recommendation #4:

Re-establish a Science Computer Fund (separate line in the APS science budget) dedicated to providing middle and high school science classrooms with modern laptop computers and replacing them on a 3 year cycle.

Status:

This was not funded. While the implementation of personalized devices has helped to relieve some of the stress of not having the recommended computers, there may still be some voids in the grades that do not have devices. For instance, as of this report, grades 7, 8, 10, 11, and 12 do not have new devices therefore students in those grades may not have enough laptops to accommodate the increase in enrollment, as well as to replace the 6+ year old laptops that are no longer functional for the purpose of using the Vernier equipment in science labs.

Acknowledgement

The Science Advisory Committee wishes to thank Dat Le and Matt Hubbard (APS Science Staff) for their hard work in facilitating our efforts. They responded to all our questions and provided the data, advice and encouragement that made possible this report.

Committee members:

Robert Coyne, Herb Fontecilla, Tina Kuklenski-Miller (Co-Chair), and Louisa Marinaccio (Co-Chair), Kristen Patterson, Alan Tessier, Karolina Walkin (ACI Liason), Nathan Zee

APS Staff:

Dat Le (Staff Liaison) and Matt Hubbard (Science Specialist)