

MEMORANDUM

TO: Arlington School Board
FROM: Science Advisory Committee (SAC)
DATE: November 21, 2015
SUBJECT: Recommending Year Report

Current Year Activities:

Since our last report to the School Board for the school year 2014-2015 (Non-recommending Report), the Science Advisory Committee (SAC) has discussed ways to close the minority achievement gap, integrate the “whole child” approach within science instruction, and more effectively differentiate instruction. As a result of these discussions, SAC has four major recommendations:

1. More actively implement integrative learning;
2. Implement a policy to support independent science research projects in 7th and 8th grades;
3. Add a staff position focused on sustainability; and
4. Provide support for expanding outdoor learning classrooms.

1. Provide teachers, students, and schools with the necessary administrative support, resources, training, and planning opportunities needed to efficiently and effectively practice integrative learning to enhance and deepen learning in both science and other subjects.

SAC strongly believes that integrative learning between science and other subject areas will provide students with a greater opportunity for exploring and deepening their interests in science as well as other subjects such as math and English, while accomplishing the required goals of each individual field of study.

“Integrative learning” in this context is referred to as the integration of lessons, which helps students make connections across curricula. Integrative learning occurs in many forms: connecting skills and knowledge from multiple sources and experiences; applying skills and

practices in various settings; expressing diverse and even contradictory points of view; and understanding issues and positions contextually.

With proper training and coordination, integrative learning provides teachers an opportunity to utilize their time and resources more efficiently. Integrative learning supports the whole child by engaging students more fully engage in areas of interest across curricula and has the potential for strengthening learning skills, pinpointing achievement gap related issues, and helping students to develop skills and apply information learned across curricula (including science, our area of focus).

Rationale:

Select APS schools including Thomas Jefferson Middle School, Kenmore Middle School, and Yorktown High School currently practice some form of integrative learning. Based on feedback from these schools, SAC recommends APS further explore best practices in the area of integrative learning and provide faculty and students with the necessary tools, training, and time needed to most effectively practice integrative learning so that all subjects, including science, may be more fully understood and enjoyed by all students.

Budget Impact:

No budget impact.

Committee Vote:

7 yes, 0 no, 0 abstain

2. Implement APS policy requiring all 7th and 8th grade students to conduct an independent science research project. In order to overcome perceived obstacles related to this policy, increase support for integrating Science, English Language Arts, and Math curricula.

Currently, there is no district-wide policy requiring students to participate in school-based science fairs or science projects. SAC believes that whether or not to hold a science fair should

continue to be a school-based decision. However, in order to better prepare students for higher level learning in science and technical writing, SAC recommends there be a district-wide policy requiring all students in Grades 7 and 8 to undertake independent scientific research projects. This requirement would be added to the Program of Studies to ensure that all students receive the same learning opportunities related to science while in middle school. SAC also recommends greater integration among Science, English Language Arts, and Math in middle schools, which would provide students with additional writing and graphing expertise, resulting in higher quality research science project experiences.

SAC asks for all 7th and 8th grade APS science and English teachers to receive two in-service days of training on how to effectively practice integrated learning relative to the design and completion of a science research project.

Rationale:

Science research projects usually involve students researching a scientific question that they are interested in and have chosen for themselves. A science research project is one of few activities that afford a student the opportunity to integrate numerous skills including reading, logical thinking, writing, grammar and spelling, math, statistics and data analysis, computer science, and graphic arts, as well as scientific methodology. To successfully complete a science project, students must research their question, learn and apply appropriate scientific methods and interpret their results. Moreover, students who excel at their science research project may be candidates for a school science fair, or other competitions.

Currently, there is no district wide policy ensuring that all students will be provided an opportunity to conduct an individualized science research project. Therefore, this recommendation is targeted towards ensuring that all students are afforded consistent scientific research opportunities that enhance learning – not only science, but also many other competencies.

SAC recognizes the concerns of teachers and parents regarding the amount of time and diverse areas of curriculum needed to properly complete a science research project. In addition to

instructing students in experimental design, science teachers spend a significant amount of time teaching mathematics for data analysis and language arts for teaching students how to properly reference materials and present technical information. Therefore, SAC believes coordinated collaboration between teachers from different curricula to support science research projects will enhance the learning experience, provide all participating teachers with curricula material that is more applicable to student's actual work and provide science teachers with more time to assist students with completing their research project. Members of SAC have met with the Math, Social Studies and Language Arts Committees, as well as some teachers from various schools to brainstorm on ways to further integrate all curricula to better provide students with a more robust and enriched learning experience. While integrative learning practices used in some of the APS schools have experienced mixed results, the overall belief of SAC is that an integrated curriculum approach has sufficient validity to warrant additional emphasis and training, with a particular focus on scientific research projects.

Budget Impact:

\$15,000 - Training would include two days of training for 70 science and English 7th and 8th grade teachers at \$107 per day to pay the cost of substitute teachers.

Committee Vote:

6 yes, 0 no, 1 abstain

3. Provide funding and support for one full-time Sustainability and Outdoor Learning Coordinator (SOLC), starting with the 2016-2017 school year. *NOTE: This is a joint recommendation with the Superintendent's Advisory Committee on Sustainability.*

School gardens and other "outdoor classroom" spaces provide a setting for multi-disciplinary programs for pre-K through grade 12, with applicability to learning objectives in science, art, social studies, math, and PE/Health. These outdoor areas require additional staff time to create and maintain. Sustainability and outdoor learning requires support in terms of policies, funding for curriculum, collaboration, coordination, integration, training, and materials. Therefore, SAC

recommends that the School Board fund a new position for a Sustainability and Outdoor Training Coordinator (SOLC).

Sustainability and Outdoor Learning Coordinator (SOLC) description:

- Staff member within Department of Instruction with direct links to Department of Facilities and Operations
- Full-time position
- T-scale

Primary responsibilities of the SOLC:

1. Design, develop, implement, budget and evaluate the APS sustainability and outdoor interdisciplinary programs across science and all other curricular areas;
2. Enhance volunteering and partnerships for sustainability and outdoor learning projects taking advantage of the wealth of community and national organizations offering support in our area, including Master Gardeners, Arlington Regional Master Naturalists, Tree Stewards, 4-H, AES (Arlington based global energy company partnering with various schools), Arlingtonians for a Clean Environment (ACE), and Earth Force, The Nature Conservancy, the US Fish and Wildlife Service, and the National Park Service;
3. Develop additional external partnerships to benefit APS school communities; identify and write grants in the area of sustainability, environmental and outdoor education;
4. Coordinate the work of school-based sustainability coordinator liaisons;
5. Collaborate with offices within the Department of Instruction and Student Services to develop opportunities for sustainability education to meet the needs of “the whole child;”
6. Provide professional development for APS staff in the area of sustainability and outdoor learning;
7. Provide communication and outreach across the APS and the greater Arlington community to support sustainability and outdoor science program;
8. Serve as liaison with Department Facilities and Operations for sustainability, energy and outdoor classrooms; and

9. Provide the current APS Energy Manager with support for energy and stormwater initiatives, most especially mandated stormwater activities for the APS stormwater permit.

Because the position is proposed to be T-scale, the incumbent is required to have a valid Virginia teacher license with endorsement in a relevant content area, such as science or environmental education. Like other teacher positions in APS, the salary range for the position is \$48,228 - \$111,260 depending on education and years of experience. The average APS teacher salary is \$76,892 (Source: FY15 WABE). Including taxes and benefits, the estimated cost for this position would be approximately \$100,000.

Rationale:

As a result of our joint meetings with a member of the Superintendent’s Advisory Committee on Sustainability, SAC believes that the addition of an APS staff member dedicated to coordinating and managing the Sustainability and Outdoor Learning Program will significantly increase and improve efforts in sustainability and outdoor learning across the school division.

SAC envisions that this new staff member will create and share sustainability and outdoor learning curricula, provide teacher training and program management to increase student participation in sustainability and outdoor learning experiences at their schools, and collaborate with the Superintendent’s Advisory Committee on Sustainability to coordinate program ideas and initiatives.

In support of this request to fund the SOLC position, we draw on the considerable body of research evidence and documentation in favor of the benefits of connecting children and nature. We note the landmark study (Lieberman and Hoody, 1998) and subsequent body of research that promotes “closing the achievement gap” by using the environment as an integrating context for learning. We consider that funding of the SOLC will also enable APS to respond to the Governor’s Challenge of April 22 2015 inviting school districts and others to focus on environmental education and will enable APS staff and community to significantly address student well-being goals related to the APS Strategic Plan Goal 5: Meet the Needs of the Whole

Child.

Supporting Documents:

- APS Strategic Plan Goals: <http://www.apsva.us/domain/15>
- Research documenting the health benefits of connecting children and nature is at: <http://www.childrenandnature.org/learn/research-resources/>
- Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning by Lieberman and Hoody, 1998, <http://www.seer.org/pages/GAP.html>
- The Governor's Environmental Literacy Challenge, Executive Order, Number Forty Two, Establishing the Environmental Literacy Challenge <https://governor.virginia.gov/media/3797/eo-42-establishing-the-virginia-environmental-literacy-challengeada.pdf>

Budget Impact: Approximately \$100,000 for FY2016-2017.

Committee Vote:

7 yes, 0 no, 0 abstain

4. Fund School Garden/Outdoor Classroom infrastructure through mini-grants. NOTE:

This is a joint recommendation with the Superintendent's Advisory Committee on Sustainability.

APS Science Staff provided SAC with documentation that describes the outdoor learning spaces at all 23 elementary schools. Additionally, a representative of the Superintendent's Advisory Committee on Sustainability shared a list of equipment, tools, and other resources teachers have requested in order for them to provide a more enriching outdoor learning experience for their students. As a result of this information and subsequent discussions with the Superintendent's Advisory Committee on Sustainability, SAC recommends annual funding of \$20,000 to be placed in a reserve fund for enhancing outdoor learning that would be made available to elementary schools in the form of mini-grants.

Rationale:

Several schools are lacking basic supplies, equipment, and resources such as shovels, rain barrels, seeds, and proper seating, all of which are needed to create and maintain outdoor learning spaces. Therefore, SAC recommends establishing a fund of \$20,000 annually for mini-grants of up to \$1000 per school to address their needs related to enhancing the ability of schools to use their outdoor classrooms to help teachers teach science outdoors. Grants would be available for tools and equipment such as bat boxes, rain barrels, raised garden beds, soil amendments, garden tools, seating, and other outdoor science equipment, as well as guest speakers and other resources.

Budget Impact: \$20,000 for FY2016-2017. Grant program to be designed and administered by the Science Office.

Committee Vote:

7 yes, 0 no, 0 abstain

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 during the 2014-2015 school 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. Preliminary data indicate that the majority of these schools showed a significant increase in SOL pass rates. SAC will continue to monitor and track the actual use of IA in the classroom.

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 through development of instructional pacing guides, linked to the new science text books purchased in 2013 for all elementary schools and professional development activities as needed.

Status: Curriculum and pacing guides were developed. The Science Office 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 was also revised and updated with the input of Elementary Science Lead Teachers in the spring of 2015.

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. The SAC also met with the Social Studies Advisory Committee and others both this current year and last year. More integration is planned for math and social studies.

Past Recommendation #4:

Re-establish a Science Computer Fund (as a 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: Following our Non-Recommendation Year Report to the School Board in April 2015, this was addressed. Because of the personalized device initiative, students at certain grade levels began to receive tablets and computers. For grade levels that did not receive personalized devices, APS was able to secure devices ensuring that all middle and high school science classrooms had a ratio of six students to one dedicated computer for labs and scientific research. These dedicated computers will serve as a transition until the personalized devices reach students at the remaining grade levels.

Acknowledgements

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 this report possible.

Committee members

Robert Coyne, Alison Cuellar, Tina Kuklenski-Miller (Chair), Louisa Marinaccio (ACI Liaison), Kristen P. Patterson, Alan Tessier, Karolina Walkin (ACI Liaison), and Mary Van Dyke.

APS Staff

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