

MEMORANDUM

TO: Arlington School Board
FROM: Science Advisory Committee
DATE: November 20, 2017
SUBJECT: Recommending Year Report

In 2017, the Science Advisory Committee (SAC) has focused on (i) science education for the whole child, including outdoor learning; (ii) ways to reduce identified achievement gaps in science education; and (iii) inclusion of sustainability in science education. These themes continue discussions reported in prior years and are addressed in the four SAC recommendations for 2017, listed below. This memorandum describes the recommendations, expected benefits of the recommended actions, and likely budget impacts considered by the SAC.

Recommendation 1:

Provide additional funding for staffing and transportation needs at the Outdoor Lab to afford middle and high school students the opportunity to visit the Outdoor Lab.

Recommendation 2:

Beginning in the 2018-19 school year, provide funding and support for one full-time Outdoor Learning Coordinator to ensure that learners across all schools have grade-level appropriate outdoor learning opportunities and access to Arlington County parks and nature centers.

Recommendation 3:

Conduct an assessment of the consistency across APS middle schools of (i) science instruction differentiation and (ii) approaches to, and support for, independent science projects.

Recommendation 4:

Provide funding and support for one full-time Sustainability Coordinator starting with the 2018-2019 school year. *NOTE: This is a joint recommendation with the Superintendent's Advisory Committee on Sustainability.*

1. Provide additional funding for staffing and transportation needs at the Outdoor Lab to afford middle and high school students the opportunity to visit the Outdoor Lab.

Proposal and Benefits

Due to growing enrollment, the Outdoor Lab can no longer accommodate students across all grade levels, and the program is now available only to 3rd, 5th and 7th graders. Slots have been allocated away from middle and high school students, although older students also benefit from outdoor learning opportunities. Due to increases in demand for the facility, missed visits (for example, due to inclement weather) cannot be rescheduled because the facility is in use every available day (including mid-winter).

The learning environment at the Outdoor Lab is qualitatively different from the classroom. Exposure to nature benefits learners at all levels¹ and affords opportunities for observation, inspiration and experience that cannot be replicated in a classroom setting. Science instruction at the Outdoor Lab is aligned with the science SOLs and includes surveys of threatened species, archaeological studies, and watershed restoration. Additional staff at the Outdoor Lab would restore this outdoor learning environment to classes that have been cut as the APS population has grown.

The SAC believes that outdoor learning should not be viewed solely as an enrichment activity, but rather as a core educational focus that builds learners' understanding of the natural world and helps develop a sense of connection to the earth and wildlife. APS strategic planning has recognized the importance of science in challenging and engaging students and the need for students to be active participants in their own learning. The Outdoor Lab program provides a learning environment that supports these goals, and expansion of the program would provide various benefits:

- Older learners would have increased opportunity to connect classroom curriculum with outdoor observations and experience.
- Access to the Outdoor Lab may be a valuable component of science education for learners who have few other opportunities for guided educational time in outdoor settings.
- Access to the Outdoor Lab may benefit students with special needs, as studies have shown the benefit of a natural environment in addressing certain developmental challenges.
- Given the increasingly urban environment in Arlington County, many APS students have minimal opportunity to experience diverse aspects of nature in an educational and inspirational way.

¹A growing body of research supports the importance of experience in natural environments. See, for example, *The Nature Fix: Why Nature Makes Us Happier, Healthier, and More Creative*, Florence Williams (2017); *Last Child in the Woods*, Richard Louv (2005).

Budget Considerations

The additional funding below will fully reinstate the high school Outdoor Lab program with 30 additional days; increase 10 additional days to the Middle School program; and 10 additional Outdoor Lab overnights for the 5th grade program.

- One additional T-Scale Staff (Salary and benefits: \$92,894)
- One additional A-Scale Staff (Salary and benefits: \$48,200)
- Additional transportation expenses (Additional 45 days @ \$420: \$18,900)

Because of the partnership between APS and the Arlington Outdoor Education Association, inclusion of these additional resources in the APS budget is cost effective. The AOEA owns the property and raises its own funds to maintain the facility. The AOEA is willing and able to make improvements to the property, to purchase additional acreage if suitable adjacent property becomes available, and to support additional and simultaneous class visits.

Staff Response:

Staff supports this recommendation. Over the past three years, the Outdoor Lab has reached its maximum capacity. With record student enrollment in APS, all dates for the Outdoor Lab are filled and there are no available make-up dates. To accommodate all of the 3rd and 5th grade programs, most of the high school slots had to be reallocated to the elementary schools. Given the budget constraints and many competing priorities, the Science Office is identifying alternative options to provide students with outdoor learning opportunities and meaningful watershed educational experiences. Currently, the Science Office is collaborating with Arlington County nature centers for classroom visits as an alternative to Outdoor Lab field trips during the 2018-19 school year.

- 2. Beginning in the 2018-19 school year, provide funding and support for one full-time Outdoor Learning Coordinator to ensure that learners across all schools have grade-level appropriate outdoor learning opportunities and access to Arlington County parks and nature centers.**

Proposal and Benefits

While the Outdoor Lab provides a valuable learning experience once per year, more regular exposure to natural settings and outdoor learning would provide students with complementary educational benefits. An Outdoor Learning Coordinator would have the responsibility to ensure that learners at all schools have grade-level appropriate outdoor learning opportunities and access to available facilities, and that underperforming students are fully included in these opportunities. This position would also facilitate and broaden use of Arlington community resources.

Similar to the Planetarium Director, the Outdoor Learning Coordinator would be responsible for direct student instruction on a daily basis. Buses would transport

students from APS schools to nearby parks and nature centers. In addition to direct teaching responsibilities, the Outdoor Learning Coordinator would work with APS and County staff to leverage County resources to enhance science education. The Outdoor Learning Coordinator would be responsible for collaborating with APS and County staff (e.g., science instructional staff, the Minority Achievement office, the County Forester) to create and develop learning opportunities to complement and support in-class curriculum and to expand APS use of County facilities for science education.

Budget Considerations

- One additional T-Scale Staff (Salary and benefits: \$92,894)
- Additional transportation expenses (Additional 150 days @ \$180: \$27,000)
- Outdoor Learning Equipment (\$12,000)

Staff Response:

Staff supports this recommendation. The proposed Outdoor Learning Coordinator can alleviate the capacity issue at the Outdoor Lab through the utilization of the local nature centers. The Science Office recognizes that budget constraints and many competing priorities makes funding for the Outdoor Learning Coordinator unfeasible. Even without this funding, APS can foster partnerships with local nature centers to increase park utilization by APS schools. This can be achieved by redirecting staff members from the Outdoor Lab on days when smaller school groups are attending and instead have them lead activities at a local nature center (e.g., Gulf Branch and Long Branch). Students would conduct water quality testing, species identification and many similar activities that are provided at the Outdoor Lab. There would be no additional staffing costs and the transportation expenses would be nominal to pilot this partnership (approximately \$4,000).

- 3. Conduct an assessment of the consistency across APS middle schools of (i) science instruction differentiation and (ii) approaches to, and support for, independent science projects.**

Proposal and Benefits

With more schools, students and teachers, there may be increased likelihood of variation in practices across or within schools that impact individual students' opportunity to be challenged and engaged. While variation may occur at any level, the SAC focused on middle school, as that is generally where independent science projects are introduced and where students acquire basic scientific knowledge that will be required for high school science curriculum.

Recent APS data indicates there are achievement gaps in science for several groups of students:

- Of total APS enrollment in 2015, 34% were economically disadvantaged students. Achievement in science data for 2016-17 show that the passing rate for economically disadvantaged students was 69%, compared to 90% for non-economically disadvantaged students (a gap of 21 percentage points).
- Of total APS enrollment in 2015, 27% were English Learners (who speak another language at home). Achievement in science data for 2015-16 show that the passing rate for English Learners was 57%, compared to 85% for non-English Learners (a gap of 28 percentage points).
- Of total APS enrollment in 2015, 14% were students with disabilities (SWD). Achievement in science data for 2016-17 show that the passing rate for students with disabilities was 52%, compared to 86% for non-SWD (a gap of 34 percentage points).

An assessment should be designed to identify whether there is consistency across schools on lesson differentiation in science to support learners across the content mastery continuum. The assessment would identify procedures and resources that support differentiation, enrichment and intervention for students who experience difficulty with the science curriculum. The assessment would need to have a cross-disciplinary focus, as science challenges may be associated with other disciplines. Learners may have difficulty understanding science concepts, or they may lack math skills needed to support science curriculum. Alternatively, students' difficulty in oral or written communication may impede their ability to succeed in science. The assessment could identify whether intervention at the middle school level for math and language arts addresses learners' related needs in science, and it may help identify training needs or staff development opportunities.

The assessment would also review the availability and consistency of support for middle school learners to engage in independent science projects. At the middle school level, "independent" work requires some measure of adult support for planning and execution. Science teachers spend a significant amount of time teaching the requisite mathematics skills for data analysis and language arts to support research, writing and presentation of final reports. Some learners may be motivated to do independent projects but need more individualized support to succeed.

The assessment would identify practices for requiring or recommending independent projects as part of (or in addition to) science curriculum and identify whether there are variances across or within middle schools that result in uneven learning opportunities. The assessment would identify resources provided by schools and whether external support is needed for students to succeed in independent projects.

The assessment should determine whether there are any significant variations in practices and resources and assist in identifying best practices and optimal resource levels. Subsequent work could determine whether it would be beneficial to address any

inconsistencies by standardizing procedures or practices, or by providing additional teaching support.

Budget Considerations

- Budget impact would be limited; no additional positions are recommended.

Staff supports this recommendation. Currently, schools determine whether independent research projects are required for students in the seventh and eighth grades. By better understanding the levels and types of differentiated support, this data can be used to make recommendations for independent research projects as part of the science curriculum. This work will continue to be strengthened through our curriculum review and writing process in which enduring understandings, essential questions, assessments, and resources are built into all science units.

- 4. Provide funding and support for one full-time Sustainability Coordinator starting with the 2018-2019 school year. *NOTE: This is a joint recommendation with the Superintendent's Advisory Committee on Sustainability.***

Proposal and Benefits

The SAC and members of the Superintendent's Advisory Committee on Sustainability believe that the addition of an APS staff member dedicated to coordinating and managing sustainability programs across the school division would increase and improve educational efforts in various areas, including resource management and conservation. The Sustainability Coordinator would assist in designing, developing, implementing, budgeting, and evaluating APS sustainability programs. The Sustainability Coordinator would enhance volunteering and partnerships for sustainability projects. In addition, the Sustainability Coordinator would coordinate and oversee the work of site-based Sustainability Liaisons, including managing the application and selection process, facilitating liaison meetings, collecting data on school sustainability initiatives, identifying and implementing strategic sustainability initiatives through the sustainability liaisons, and sharing best practices among schools.

The Sustainability Coordinator would also assist in identifying and following up on opportunities for APS to obtain grant funding for facilities and programs that enhance outdoor learning. This effort would be coordinated with individual schools on specific sustainability projects, such as obtaining funding for installation and maintenance of school gardens and green spaces. The Sustainability Coordinator would have the responsibility to gather and share information and to advise on funding, maintaining and utilizing school gardens. To the extent that outdoor green space is unevenly supported at different sites, the Sustainability Coordinator could work to address gaps and particular needs.

The Sustainability Coordinator would collaborate with the Department of Teaching and Learning to develop opportunities for sustainability education to meet the needs of the whole child and to implement APS strategies on multimodal transportation, waste and recycling, and sustainability in the curriculum. The Sustainability Coordinator would provide communication and outreach across APS and the County to support sustainability, energy, stormwater, procurement and outdoor programs. Adding a Sustainability Coordinator position would reflect the importance APS places on sustainability. The Sustainability Coordinator's work would provide students with experiential learning and community involvement opportunities, and would enable consistency and coordination across all schools on sustainability issues. This position would ensure that sustainability is recognized as essential to science, outdoor education, and other subject areas.

Budget Considerations

- One additional T-Scale Staff (Salary and benefits: \$92,894)

Staff supports this recommendation. Sustainability continues to be a priority for Arlington Public Schools, both for facilities and operations, as well as teaching and learning. The Sustainability Coordinator would support multiple departments across APS in designing, developing, implementing, budgeting, and evaluating sustainability programs and practices. However, given the budget constraints, the Science Office recognizes the need to prioritize the many funding requests.

Acknowledgement

The SAC thanks Dat Le, APS Science Liaison, for all of his work in facilitating our efforts, providing data and advice, and coordinating meetings and preparation of this report.

Committee members

Judy Collins, Ann Marie Douglass, Louisa Marinaccio, Monica Mitchell, Melody Mobley, Nina Nichols (Chair)

APS Staff

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