Concept Development to Expand Vacuum Technology Course Content for Secondary Education in Historically Underserved Communities

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History and Background — ~30 Years of AVS Science Educator Workshop (SEW) = ~500-1000 Kits in US High Schools

For ~30 years, the AVS has offered training to groups of high school teachers in vacuum technology through the Science Educators Workshop (SEW). The SEW also provides the teachers with a small vacuum system for demonstrations in their classrooms. The training occurs at the annual International Symposium of the AVS, with travel and lodging paid for by a combination of funds from National AVS Education Committee, and Regional AVS Chapters. It is estimated that between 500-1000 kits have been distributed to high-schools across the US in the past ~30 years.

Initial Concept – Expand SEW to “Historically Underserved Communities” (HUCs)

The AVS SEW is viewed as a valuable educational outreach activity of the AVS. Still, discussions with SEW-participating teachers over many years has suggested that the majority of teachers come from relatively well-funded schools. Additional insight from SEW committee members, and regional chapters members who have participated for many years in various "Science Fairs", has suggested that while some school districts strongly encourage continuing education such as the SEW for their teachers, others are much less able to do so. These realizations suggested that the SEW should consider attracting more teachers from these "Historically Underserved Communities" (HUCs).

The resulting AVS/AIP Venture Fund proposal had 3 goals: (1) Understand the locations and needs HUCs better; (2) Determine how the AVS SEW might be able to reach out to historically underserved communities more effectively; and (3) Understand how the SEW might modify its content and delivery to better address HUC needs. The AVS VF Team included members from the AVS Education, SEW, and DEI Committees. Within these AVS Committees was representation from institutions with strong interest in STEM Education (e.g., Academia, NSF, etc). Team Members also included the AIP/AAPT UToP Program, and the AIP Statistical Research Center.

Year 1 Focus - Understanding HUCs

Partly due to COVID limitations, Year 1 activities focused primarily on research to understand how school district funding, science education, standardized science/math test scores, and community location interact. With help from the AIP Statistical Research Center, and combining previous studies from the AAPT UToP Program, it was realized that although HUCs exist in both rural and urban communities, the project would benefit from choosing a location where HUC teachers could easily attend an SEW-like training without significant teaching disruptions or travel costs. Therefore the initial project focused on urban school districts. Also, it was determined that an urban area with co-located AVS SEW instructors would help logistics. Within these constraints, the areas of Minneapolis-St. Paul (MSP), and Denver (DEN) were chosen as likely sites. The above analysis (DEN – Left, MSP – Right) indicates that HUC areas are often a ring around the main city, and are bounded by higher-funded school districts.

Year 2 - Recent Opportunities/Possibilities

Year 1 research provided significant insight for schools in DEN and MSP metro areas where logistics of a HUC SEW seemed workable. However, initial inquiries with school-district officials suggested that participation from COVID in Fall 2022 was still impacting their districts, and so would prefer discussing additional teacher training once more "normal operations" prevailed.

On Nov. 5, 2022, the first in-person meeting for the VF project was held at the 68th AVS International Symposium in Pittsburgh, PA. Discussions with the VF Team included review of processes used to identify schools within HUCs, ideas to streamline this identification process in the future, and what modifications to SEW content and delivery might be needed before a SEW/HUC.

An unexpected opportunity: In addition to the in-person SEW/HUC kick-off meeting at the 2022 AVS Symposium, the first post-COVID Science Educators Workshop (SEW) was also offered. After learning of the AVS/AIP HUC Venture Fund Project idea, one SEW participant realized that their home school met many of the criteria envisioned for this Venture Fund Project, and likely be able to provide a location for the workshop, as well as provide regional teachers. This led to the idea for a "Test HUC/SEW". A similar opportunity has arisen with the Expanding Your Horizons (EYH) activities in California. Discussions have since been ongoing to more fully explore these possibilities.

Potential Test location for first on-site “Test SEW/HUC”

Although analysis and outreach continues with school districts in the DEN and MSP areas toward a goal of an SEW/HUC offering in Summer 2024, discussions are presently ongoing with the following two institutions with a goal of offering a “Test SEW/HUC” sometime in the Summer of 2023:

- Girls Leadership Academy of AZ (GLAZZ), Phoenix, AZ, Connie Jordan, Principal of GLAZZ
- Chicanos Por La Causa (CPLC), Tucson, AZ, Lori Najia, Tucson Superintendent of CPLC

The present concept of the “Test SEW/HUC” would be slightly different from the SEW/HUC, and combine both SEW instructors to present SEW content to high-school teachers, but also to use graduate students (from Colorado School of Mines) to interact directly with the high-school students through a series of “vacuum-science demonstrations”. It is expected that these envisioned “Test SEW/HUC” would provide considerable insight regarding how to optimize delivery and content for any future SEW/HUC offerings, and thereby assist the long-term success of the SEW/HUCs concept.

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