optimizations is interpolation search in which the value of the data item is used to predict its location in the list. However, the performance of these algorithms depends heavily on the distribution of the data. In this study, we compare the performance of binary search and interpolation search on data which fits several different discrete random probability distributions.

Education

THE DEVELOPMENTOF AN INSTRUMENT TO MEASURE STUDENTS' ATTITUDES TOWARD SCIENCE FAIRS. Kurt Y. Michael & Claudia A. Huddleston, School of Education, Liberty University, Lynchburg VA. 24515. Every year, thousands of students participate in science fairs, however, little is known about their attitudes toward science fairs. The purpose of this study was to develop an instrument that measured students' attitudes toward science fairs and determined the instrument's validity and reliability. The instrument was field-tested using 110 students in southwest Virginia. The instrument originally consisted of 45 questions. After applying a principal component factor analysis, the instrument loaded on two domains, enjoyment and value. Each domain consisted of five questions. The internal consistency for the overall instrument was calculated using Cronbach's alpha and showed good internal consistency of 0.94. Correspondingly, the sub-scale enjoyment yielded a value 0.89 and the sub-scale value yielded a value 0.90, indicating good internal consistency. Further analysis was conducted using demographic information and the results revealed a significant difference on attitudes toward science fairs based on gender. A significant difference between males ($M = 23.0$, $S.D. = 7.06$) and females ($M = 26.2$, $S.D. = 7.38$) was found, $t(98) = 2.04$, $p = 0.04$, whereas eta squared equaled 0.12 demonstrating a large effect size. Overall, females had a more positive attitude toward science fairs than males.

APPLICATION OF SIMULATION – BASED APPROACH IN PHYSICAL CHEMISTRY INSTRUCTION. Edmund M. N. Ndip, Department of Chemistry & Biochemistry, Hampton University, Hampton, VA 23668. The majority of professionals in the STEM disciplines are well versed in the content of their respective disciplines. There is general consensus that learning is best achieved by doing. Each scientific discipline and sub-discipline poses problems for the learner. Physical chemistry – the sub-discipline of chemistry that deals with the mathematical and theoretical foundations of all the chemical sciences is no different. A fundamental difficulty is the abstract nature of its concepts. Simulation based approach is a technique used to replace real experiences with guided ones often requiring active participation by the learner. Simulation based activities have been implemented to facilitate instruction in areas requiring higher mathematical skills through a combination of object oriented programming using VenSim PLE, numerical simulations using Excel, quantum mechanical modeling/calculations and visualization

techniques. The combination of simulations and wet experiments provides students avenues for developing higher order skills. Students completed term projects using this approach to more complex problems in kinetics, thermodynamics and quantum mechanics and spectroscopy. Additionally, students used simulations to interpret and explain results obtained in physical chemistry laboratory activities such as infrared spectra of organic compounds, and absorption spectroscopy of dyes.

COUPLING EXPERIMENT WITH DFT CALCULATIONS: ON THE ROAD TO DISCOVERY. Thomas C. DeVore, Department of Chemistry & Biochemistry, James Madison University, Harrisonburg VA 22807. The rapid advances in the computational capabilities of personal computers now makes it easy and relatively inexpensive to include theoretical calculations into the chemistry curriculum. These calculations can be added to the curriculum by tacking them onto an existing laboratory exercise, integrating them into the exercise, or by using them as the exercise. The well-known rotational analysis of HCl-DCl is used to illustrate how calculations can be added to an exercise. Two NMR experiments based on measurements for methanol [MeOH] are presented to illustrate integration of calculations into the exercise. Measured chemical shifts for MeOH liquid and vapor are compared to shifts calculated for MeOH, MeOH dimer, and MeOH ringed trimer to offer insight intothe changing chemical shift for the OH proton. The example for the stand alone exercise presented is an investigation of the low and high spin electron configurations for several atoms. These calculations allow the student to "discover" the Aufbau Principle and Hund's Rule. All calculations presented were done using the DFT-B_3LYP method with a 6-311G^{++} (3df, 3pd) basis set.

SCIENCE ON A SPHERE: AN ETHICS LEARNING TOOL. J. S. Boles, University of Wisconsin-Madison & E. G. Maurakis, Science Museum of Virginia & Biology Dept., University of Richmond. Finding effective ways to educate the general public about environmental ethics and the decision making process used by scientists and ethicists has been an important goal for informal science education institutions. The goal of our pilot presentation was to use NOAA Science on a Sphere (SOS®) technology to teach the general public about environmental ethics decision making processes. Using SOS® data visualizations such as global shipping routes, global air traffic patterns, and woody biomass, the presentation conveyed the interconnectedness of the global biosphere. These examples were coupled with a discussion of the individual's role in these issues to demonstrate that each audience member has an impact and can use the same ethical decision making process in their own environmental decisions. Delivered to 19 staff members and museum guests, the presentation was followed by a seven question survey that asked if the presentation changed what they learned and how they think about decision making. Preliminary results show that while 89% of audience members previously considered other people and the environment in their decision making, 76% learned something new. Additionally, nine audience members said the presentation changed the way they will

think about decision making and ethics in the future. Results also indicated the SOS® technology was successful teaching new concepts to the audience, some of whom had prior knowledge of the concepts of environmental ethics in decisions making. Based on pilot study results, SOS® can be used as an informal ethics learning tool for the general public. Travel funds provided by University of Wisconsin Genetics Department.

CREATING ENGAGING STEM OPPORTUNITIES FOR YOUTH OUTSIDE OF SCHOOL. Charles L. English, Dir. Playful Learning & Inquiry, Science Museum of Virginia, Richmond VA. 23220. The Science Museum of Virginia has developed and implemented a program designed to inspire youth towards learning more about STEM and how their academic work ties to relevant aspects of their lives. STEM, far too often, means little more than science or math classes for many youth without tangible connections to projects, activities or even career options. Educators at the Science Museum of Virginia have created a project-based program aimed at engaging youth in a variety of settings from Boys & Girls Clubs to schools, YMCAs and libraries. The program helps youth build and create solutions to open-ended problems, engaging them in a way that is unique to their school setting. It also helps participants to bridge their knowledge and skills from different disciplines into a STEM themed project so STEM seems more tied to other aspects of their educational experiences. STEM careers are also related to the hands-on projects in order to broaden youths' perspectives on STEM opportunities they may wish to investigate further. Use of undergraduate facilitators also supports a near-peer mentor piece that which helps create a dialogue with the middle school aged participants. (Supported by Altria Group, The Custis Westham Fund of the Community Foundation, the Institute of Museum and Library Services, Pauley Family Foundation, The Cameron Foundation, John Randolph Foundation, The Cognizant Technology Solutions Charitable Fund, Wells Fargo Foundation and Moses D. Nunnally, Jr. Charitable Lead Unitrust.)

THE MIX: EXPLORING PROJECT BASED AND INFORMAL LEARNING WITHING A TEEN-CENTRIC LEARNING LAB ENVIRONMENT. Matthew L.M. Baker, Outreach Education, The Science Museum of Virginia, Richmond, VA 23220. The MiX, a tech-based, maker space at The Science Museum of Virginia, was formed in 2014 to offer teens a safe and open learning environment to promote creativity, exploration, and iteration. In October 2013, a Teen Advisory Council of ten students was formed in order to involve teens in the creation of the space. Teens helped determine the type of programming they wanted to participate in, designed The MiX membership card, and created promotional videos and materials for the space. Today, The MiX consists of eighty-eight members, with more teens joining weekly. Teens now participate in monthly workshops, video filming and broadcasts, and show off their work during a monthly open house on the last Saturday of every month. The MiX has become a successful hub for project based and informal learning as evidenced through the growing number of members, workshop participation increase, and burgeoning

partnerships within the Richmond community and beyond. Additionally, The MiX is a member of the YOUmedia Learning Labs community, which consists of twenty-nine similar sites across the United States. This community helps determine best practices, shares resources and ideas, and helps like-minded practitioners create similar spaces. The MiX was made possible by generous grant support from The Institute for Museum and Library Services and The MacArthur foundation.

LEARNING WHAT THEY LEARN – ASSESSING OUT OF SCHOOL TIME PROGRAMMING. Erika R. Carson, The Science Museum of Virginia, Richmond VA 23220 & Northcentral University, AZ 86314. Children can learn so much from informal and non-formal STEM learning experiences. However, measuring what students have learned from these experiences continues to be a challenge for so many afterschool, out-of-school, museum, etc. program providers. Non-formal STEM programs and Informal Science Institutions (ISI) struggle between keeping kids excited about science, and teaching them science content without mimicking what children experience in the classroom, for better or for worse. These program providers tend to want to steer clear of tests and surveys that feel like tests for fear of losing participants. There are strategies however, for learning what these kids learn - assessments can be simple, fun, and/or innovative. Through the use observations, name tag information, participant interviews of each other, "game show" competitions, etc. we have been able to collect information about our participants understandings before, during, and after participating in our programs. Non-traditional approaches to assessment can help us learn what they learn.

Posters

ASSESSMENT OF A SECONDARY SCIENCE STEM FIELDTRIP THAT PAIRS A TREATMENT PLANT TOUR WITH A HANDS-ON NATURAL WETLAND TOUR IN EASTERN VIRGINIA. K. N. Morris, D. F. Timmer, & R. B. Atkinson, Organismal & Environmental Biology Dept, Christopher Newport University. This project evaluated changes in confidence and content retention in middle school students before and after participation in a tour of a wastewater treatment plant and a natural tidal wetland. Learning styles vary between students and traditional classroom-based approaches to teaching may not optimally support learning. During the wetland tour students rotated through three stations that focused on flora, fauna, and water quality ecosystem services in contrast with waste water treatment plant processes. Student confidence improved by 3.8 points based on attitude questions and average correctness on content questions also improved by 0.46 points. Sex and science career interest were also assessed and students interested in a career in science performed higher in both attitude and content scores than any other group; however no trends were detected based on sex of the participant. Results of this and ongoing formative assessment will be used to enhance student experiences.