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The Role of Interest in STEM Learning and Science Communication

Reflections on Interviews from the Field

Background

The landmark National Research Council consensus report Learning Science in Informal Environments (2009), which was based on a review of the literature to date, posited that learners in informal environments "experience excitement, interest, and motivation to learn about phenomena in the natural and physical world" as one of six strands of informal science learning. In 2016, the American Association for the Advancement of Science (AAAS) Center for Public Engagement with Science and Technology identified "increased interest and motivation" around STEM topics as a short-term, measurable outcome of science engagement activities. For many designers, evaluators,

JANUARY 2019

and researchers, these findings and developments affirmed a long-held claim that catalyzing interest is one of the key strengths of informal STEM learning and engagement experiences.

To further explore these constructs, in 2018, the Center for Advancement of Informal Science Education (CAISE) interviewed 10 leading researchers and practitioners who are designing for and/or studying the impacts of informal STEM learning and science communication activities and settings on participants' interest in STEM. We asked these professionals how they conceptualized interest, how they measured it, and how interest intersects with other concepts, such as identity and engagement. CAISE's aim is that these resources will provide an overview of the landscape of current thought and practice around interest that will be of use to others who are already working in this area or considering it.

What is interest?

CAISE collected a range of perspectives that informal STEM education (ISE) and science communication professionals can explore and apply as they develop activities and environments to communicate science to the public, as well as further studies and proposals for funding. We learned that while professionals in these two fields view interest slightly differently, they generally agree that is it a complex concept describing a long-term pattern of choices and pursuits, and that it has a multidimensional structure that includes affective, intellectual, and social components. Interest plays a significant role in informal STEM learning and communicating science, often in concert with other constructs such as identity, motivation, and engagement.

But what do we mean by "interest"? Because the term is used in everyday language, it can be laden with personal meanings. The researchers and practitioners we interviewed have spent a lot of time considering and developing technical definitions of interest, which one science communication

Who we interviewed

Adam Maltese
Associate Professor in Science Education, Indiana University

Flávio Azevedo
Assistant Professor, Department of Curriculum and Instruction, University of Texas at Austin

Janet Yang
Associate Professor, Department of Communication, University at Buffalo

Julia Metag
Associate Professor, Communication Science, University of Fribourg

Nancy Staus
Research Associate, Oregon State University

Nichole Pinkard
Associate Professor, Learning Sciences, Northwestern University

Preeti Gupta
Director of Youth Learning and Research, American Museum Natural History

Rena Dorph
Director, Lawrence Hall of Science

Robert Tai
Associate Professor, Department of Instruction and Special Education, University of Virginia

Scott Pattison
Research Scientist, TERC

researcher called a "core variable in attitudes toward science" (Metag). Some researchers and practitioners use different terms to describe related phenomena, such as preference (Tai, Azevedo), choice (Pinkard, Maltese), or, in risk communication theory, perceived information insufficiency (Yang). Researchers studying what they call the "activation" of learners conceptualize interest as consisting of (at least) two dimensions: fascination and value (Dorph).

An Interview Series on STEM Identity, Interest, and Engagement | bit.ly/eval-measure

Explore videos, interview Q&A, and resources from our interview series sharing diverse perspectives from scholars whose work focus on different aspects of STEM identity, interest, and engagement.

How does interest develop?

A common theme that emerged from the interviews was that interest has emotional, cognitive, and social components. Several ISE researchers we spoke with use Suzanne Hidi and K. Ann Renninger's Four-Phase Model of Interest Development (2010), in which initial "triggered situational interest," with sufficient support, becomes "maintained situational interest," developing over time into "emerging individual interest" and ultimately "well-developed individual interest." Many of the science communication researchers we interviewed, on the other hand, work from Sharon Dunwoody and Robert Griffin's Risk Information Seeking and Processing model (2015), which can be used to study a person's sense of "information sufficiency" (or insufficiency) with regard to a given topic or issue. Designers of informal STEM activities noted that it is important for people to have authentic experiences with phenomena and artifacts and to be exposed to new technologies in order for the experiences to attract and retain their interest (Gupta). Others described "turning up the dial" on various aspects of designed settings and experiences, such as museum exhibits, by tailoring them to the intended audience (Maltese), taking into account historical and cultural factors that affect interest development in different populations (Azevedo), and building and supporting ecosystems with multiple, varied opportunities for exposure and engagement in order for STEM interest to take hold (Pinkard). In science or risk communication, designers may find it necessary to develop new and innovative angles to appeal to audiences' sense of information insufficiency, in order to spark their further interest in socio-scientific topics such as climate change (Yang).

How can we measure interest?

Many researchers measure interest using psychometric scales (e.g., survey instruments) that directly ask individuals to rate their interest. In order to make the measure more robust, multiple items describing the topic of interest are often used (Yang). The advantages of this approach are that it is simple, it can be used inexpensively with large numbers of participants, and it provides a range of values that can be quantitatively compared within and between individuals or groups. Many scales for interest have been refined over time to improve internal consistency (reliability) and appropriateness to the context (validity).

However, researchers continue to debate how stable these self-reports are, whether they are biased, how robust they are over time and within different contexts, and how much they can tell us about the

construct of interest. One alternative to using surveys is conducting open, semi-structured or structured clinical interviews that reveal a more nuanced picture of the role of interest in learning and communication. Some researchers approach interest by documenting learners' preferences for activities that involve collaboration, competition, or creating/making, e.g. (Tai). There are also ethnographic studies that track the development or loss of interest over time (Azevedo). Some researchers are studying "family interest pathways" by piloting strategies such as video observations, family-created journals, and artifacts (Pattison). Designers of programs may also look at outcomes such as when and how learners share their STEM experiences with others as indicators of interest (Gupta).

How is interest related to other constructs?

Overall, CAISE's interviewees collectively painted a complex, overlapping picture of the relationship between interest and other learning constructs, such as identity, motivation, and engagement. These concepts may inform, precede, and/or follow each other as learners are exposed to phenomena, activities, environments, and peers that may or may not support their interest in a topic. One ISE researcher described a "motion picture" in which these concepts are constantly ebbing and flowing over time, during the individual's lifespan (Maltese). In that view, the task of designers and researchers is to keep the door open as long as possible for interest to develop by creating STEM learning or communication settings that nudge participants toward positive attitudes about these subjects so that they will want to re-engage with them.

The professionals we interviewed agreed that while interest is a defining variable in the choices that people make with regard to how to spend their time, what to study, or what type of career to pursue, interest often varies over time and as such is a challenging but stimulating construct to design for, study, and measure. There was consensus that there is more to be done to better understand and design for this construct and CAISE's hope is that these interviews clips and transcripts will contribute to and complement the efforts of others.

Additional interest resources on InformalScience.org:

- Science Interest Development in Early Childhood
- Affective Experiences Are an Important Part of Informal Science Education

Suggested Citation

Bell, J., Besley, J., Cannady, M., Crowley, K., Grack Nelson, A., Philips, T., Riedinger, K., & Storksdieck, M.(2019). *The Role of Interest in STEM Learning and Science Communication: Reflections on Interviews from the Field*. Washington, DC: Center for Advancement of Informal Science Education.

This material is based upon work supported by the National Science Foundation (NSF) under award nos. DRL-0638981, DRL-1212803, and DRL-1612739. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NSF.