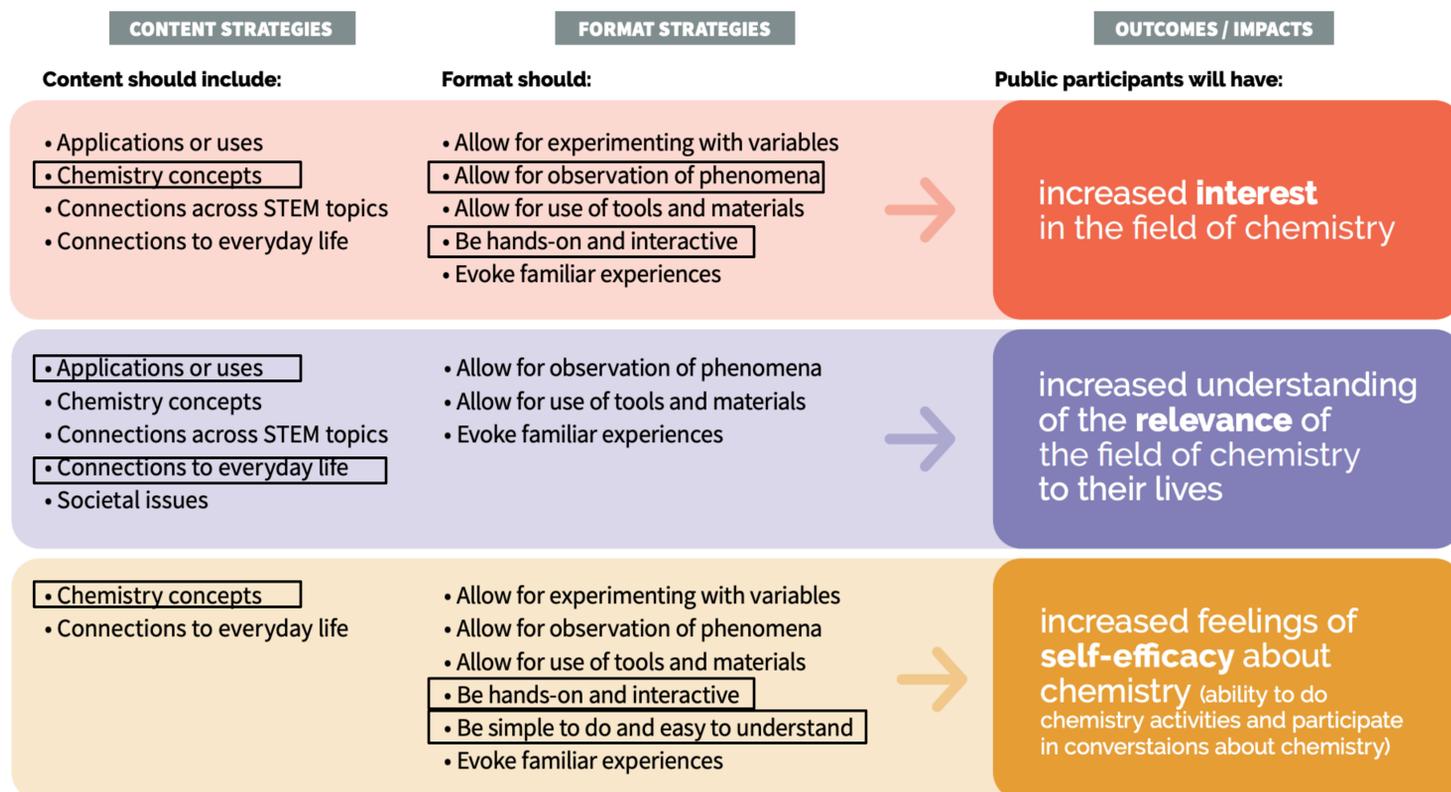


Using Design-Based Research to Develop and Disseminate Strategies and Materials to Support STEM Interest, Relevance, and Self-Efficacy

AISL 1612482

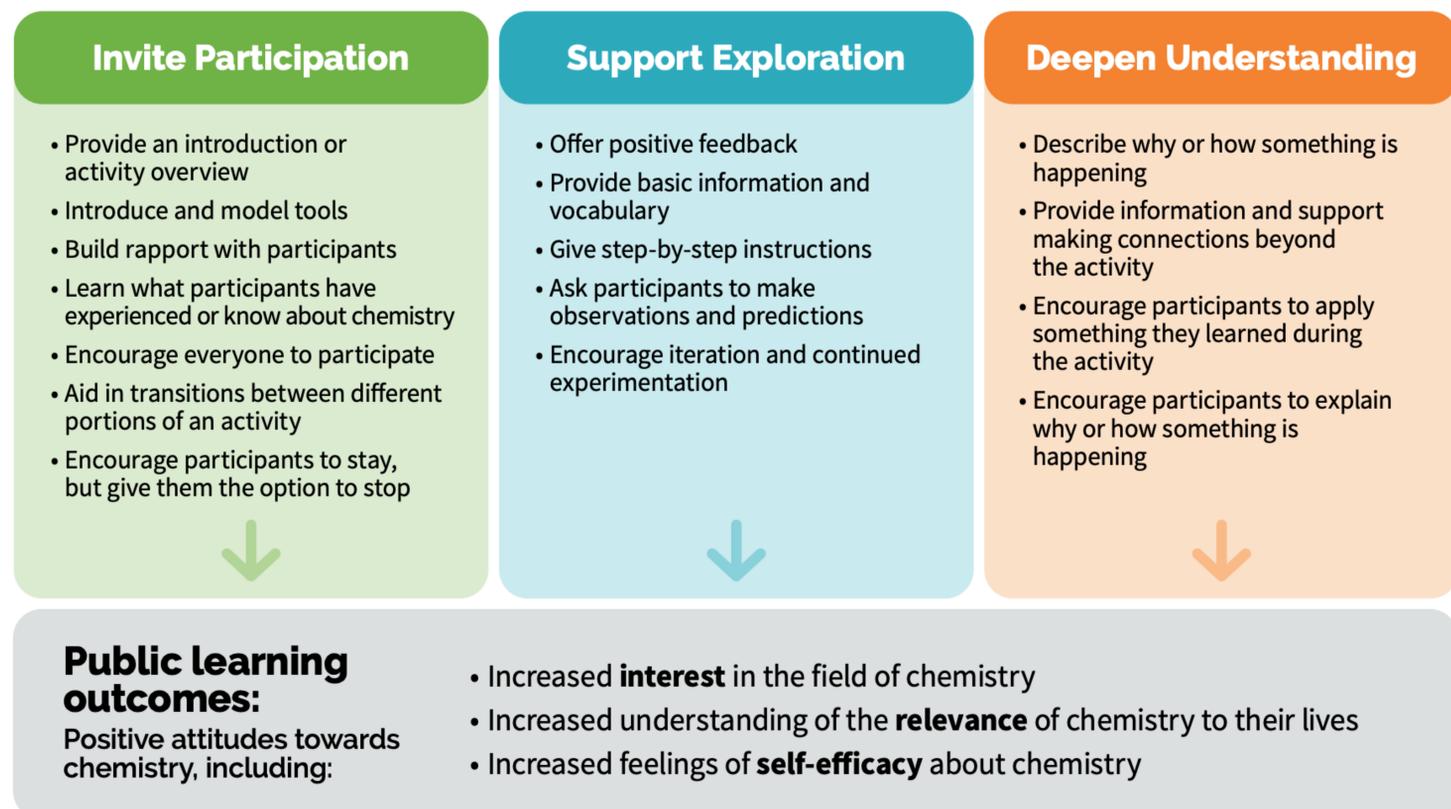
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Design strategies framework overview



Note: The strongest factors in stimulating specific outcomes are highlighted by boxes in the table above.

Facilitation framework overview



The starting Facilitation framework was adapted from work by the Exploratorium in their Tinkering Studio maker space

While this research focused on chemistry, the findings can be applied to STEM topics more broadly, including nanomanufacturing. The findings are summarized in frameworks for **designing and facilitating educational activities in informal settings with public audiences.**

Museum of Science collaborated with American Chemical Society, National Informal STEM Education Network, Science Museum of Minnesota, Sciencenter, and University of Wisconsin-Madison to conduct design-based research to develop strategies for stimulating **interest, sense of relevance, and feelings of self-efficacy.**

Research subjects were general public museum visitors in Boston and St. Paul, mostly in mixed generational groups including children eight years old or older, and adults online.

Testing found ⁽¹⁾ that:

- using hands-on and interactive methods of engaging audiences is the strongest strategy for stimulating interest and feelings of self-efficacy.**
- connections to everyday life is strongest at stimulating a sense of relevance, more so than addressing broad societal issues.** [This proved true for the UWisc-Madison online adult public audience as well as for the in-museum audience.⁽²⁾]

While the research focused on hands-on chemistry activities, the framework strategies found to be successful are broad. Learner activities encouraged may be **as important for engaging young learners in finding interest, relevance, and feelings of self-efficacy with nanomanufacturing as they are for chemistry.**

Links to training and professional development resources for informal educators and researchers doing public outreach are here: <https://www.nisenet.org/chemattitudes>

1. Anderson, A., Kollmann, E.K., Beyer, M., Weitzman, O., Bequette, M., Haupt, G., & Velázquez, H. (2021). Design strategies for hands-on activities to increase interest, relevance, and self-efficacy in chemistry. *Journal of Chemical Education*, 98(6), 1841–1851. DOI: 10.1021/acs.jchemed.1c00193

2. Howell, E., Yang, S., Holesovsky, C., & Scheufele, D. (2021). Communicating chemistry through cooking & personal health: Everyday applications increase perceived relevance, interest, & self-efficacy in chemistry. *Journal of Chemical Education*, 98(6), 1852–1862. DOI: 10.1021/acs.jchemed.1c00125



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