

## **VSA 2018 Poster Submission**

### **1. Contact information**

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### **2. Title of no more than 10 words**

Using Narrative to Engage Girls in Museum Engineering Design Tasks

### **3. Short description of no more than 50 words for the conference program**

The New York Hall of Science, in collaboration with the Amazeum in Arkansas, the Tech Museum in California, and the Creativity Labs at Indiana University, will share findings from their design-based research study investigating whether and how narrative elements in engineering activities can influence girls' engagement in the design process.

### **4. An abstract of no more than 300 words that explains and promotes the project**

Women remain drastically underrepresented in engineering, in part because of an early-developing perception that engineering is not relevant to problems and issues that they care about. In formal education settings, engineering problems are often presented using decontextualized and competitive challenges, even though girls are more intrigued when solving problems that arise from personal or real-world circumstances. Contextualizing engineering problems with strategies such as narratives, therefore, may be a practical approach to engage girls in engineering. However, little research has been conducted to investigate how engineering activities can effectively incorporate narratives in both formal and informal education.

In this design-based research study, the New York Hall of Science, in collaboration with the Amazeum (Bentonville, AR), the Tech Museum (San Jose, CA), and the Creativity Labs (Indiana University), are examining how narratives can shape girls' engagement in museum-based engineering activities. The project involves developing and testing six engineering activities that incorporate elements of narrative. Through iterative activity development, the project team is exploring how design prompts and materials can suggest narratives via characters, settings, or scenarios in a way that invites visitors' perspective-taking and empathy. In addition, by comparing narrative and non-narrative versions of each activity, the team is gathering evidence about whether and how narratives support girls' participation in engineering activities, as well as their persistence in creating and iterating solutions. Currently, the project is in the midst of activity development and formative testing. This poster will share a theoretical framework for defining narrative and empathy in museum-based engineering activities, as well as the results from three activities developed and tested by summer 2018. Ultimately, the lessons learned from this project will provide practical guidance about how exhibit and program developers can integrate narrative elements into engineering activities to create equitable design experiences for all visitors.

### **5. One-page visual mock-up of the display**

[Attached]

## Using Narrative to Engage Girls in Museum Engineering Design Tasks

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### About the Project

The New York Hall of Science, in collaboration with the Amazeum (Bentonville, AR), the Tech Museum (San Jose, CA), and the Creativity Labs (Indiana University), are conducting a design-based research study to investigate whether and how narrative elements in engineering activities can influence girls' engagement in the engineering design process. The goal is to build evidence-based guidance about how narrative elements might be integrated into exhibit and program development, as well as the facilitation of engineering activities. In doing so, museums can provide equitable and effective engineering experiences for girls, who are often weakly engaged by abstract and challenge-based design activities.

### Theoretical framework

- Empathy is a malleable skill that is critical to design thinking, and is increasingly the focus on engineering education.
- Engineers use empathy by taking users' perspectives to understand their needs and the solutions that would be helpful to them.
- Narratives can evoke empathy and perspective-taking by calling to mind a persona, situation, or setting.

### Research questions

- How can engineering activities incorporate narrative elements?
- How can narratives evoke empathy via perspective-taking and emotion-sharing?
- Do narratives impact girls' willingness to engage in engineering, and persistence in ideation and iteration?

Through iterative activity development, we examine how narrative elements can evoke empathy in various engineering tasks. By comparing narrative and non-narrative versions of each activity, we test whether and how narratives affect girls' engagement.

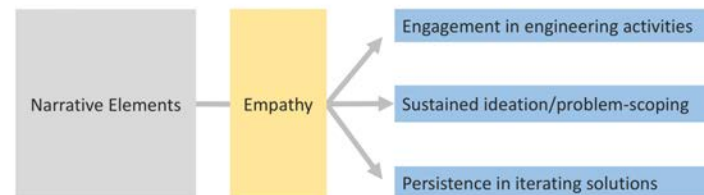
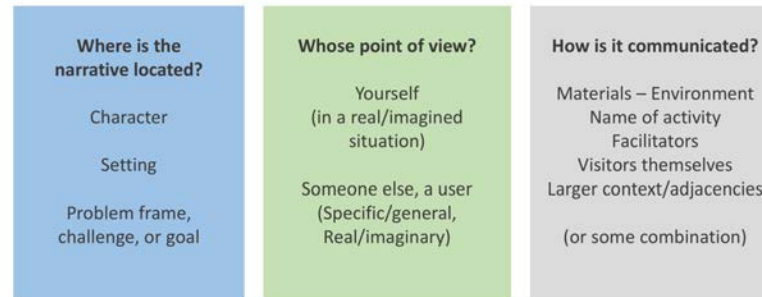


A narrative version of chain reaction invited visitors to design a contraption to take care of a pet. Children created designs that would feed, pet, or play with the animals. Researchers observed how children generated ideas, tested and iterated their designs, and then interviewed children about the activity.



In the narrative version of a dowel structures activity, facilitators challenged visitors to create a structure that could survive an earthquake or hurricane. The non-narrative version involved creating a structure that you can fit inside.

Driving Theory: What is narrative and how can it impact girls' engagement in engineering?



### Study Design

- *Activity Development*: Iteratively develop 6 matched pairs of engineering activities (narrative vs. non-narrative versions)
- *Formative Research*: Compare narrative and non-narrative versions (girls' participation, ideation and iteration, empathy & perspective-taking, persistence)
- *Impact Study*: Testing activities at 3 sites (NYSCI, Amazeum, & Tech Museum)

### Engagement in Engineering

- Who participates in each activity? How long do they stay?
- How do participants conceptualize the challenges and frame the problems? Are children able to come up with one or multiple ideas to build? Do we see divergent solutions?
- Do they test and iterate to improve their designs?
- How persistent are they in responding to failure and continuing to work on their designs?

### Empathy & Perspective-taking

- Do participants talk about the person, situation, or setting they are designing for while building or describing their work?
- Do they imagine themselves in another place or situation?
- Are participants motivated to help someone or something, or concerned with others' well-being? Do they express emotion or affect?

### Emerging Findings

Materials and facilitation are both critical factors for communicating narratives with visitors in engineering activities.

Narratives can motivate visitors, but can also constrain the goals of an activity or distract from relevant engineering concepts and learning outcomes.

Narrative frames can be strategically chosen to align with and support engineering content.

### Acknowledgements

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