Improvisational Infrastructuring by Facilitators in Public Computing

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Abstract: In this paper, we investigate the ways in which infrastructuring is emergent and enacted by facilitators of a public computing exhibit in a museum setting. We collected data in the form of video-recorded interactions of facilitators and visitors at the exhibit, interviews with facilitators, and field notes. Drawing from the experience of one facilitator in particular, we showcase that the "when"s of infrastructuring are strongly related to their figured worlds of computing and museums, and also to institutional regulations and norms. We argue that infrastructuring emerges through improvisational actions and patterns of behavior conducted by facilitators, which are bounded simultaneously by their figured worlds and institutional requirements. This study has implications for future work in informal education, bringing to light the complexity of facilitators' practices in such spaces that will impact both design and learning opportunities in museums and other educational environments.

Introduction and purpose

Located in public walkways or museums, *public computing* environments (Sengupta & Shanahan, 2017) typically consist of visually appealing simulations of complex systems alongside various interfaces that allow visitors to interact directly with the simulations and with the open-source code behind them. In museums spaces, facilitators or explainers often take part in interactions with visitors, helping them understand not only how to use the exhibits, but acting to scaffold visitors' learning and engagement in new ways of being in science. Facilitating new forms of museum experiences, such as public computing exhibits, in ways that align both with facilitators' expertise as well as their institutional roles and responsibilities within the museum can be challenging. The potential support systems that develop over time can be understood as infrastructures that are essential to the long-term sustainability of these innovations (Star & Ruhleder, 1996). In this poster, we explore the ways in which this infrastructuring intersects with facilitator roles, responsibilities, and identities, as well as the realities of these new types of learning environments and exhibits.

Background

Similar to science teaching in schools, museum educators' practices are embedded not only in professional knowledge but in their own personal and professional identities (Tran & King, 2007) as well as their understanding of what it means for visitors to learn and interact in museum settings (Ash, Lombana, & Alcala, 2012). We use the concept of figured worlds to guide our understanding of the intersecting communities, identities and values that guide facilitators' work at the exhibit. Figured worlds are cultural realms in which "particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (Holland, et al., 1998, p. 53). At any moment in time, museum facilitators may be negotiating their actions and thoughts within multiple figured worlds, which can cause tensions, especially when actions allowed and valued within one of the figured worlds are not allowed or unvalued in another. In such moments of conflict, individuals may improvise, stepping outside of a 'normal' way of doing things in order to meet goals while still aligning with the acts and outcomes of their figured world(s) (Ash et al., 2012; Holland et al., 1998). Creating new practices or new environments with any professional community where multiple figured worlds intersect—such as the public computing exhibit examined here—involves not only constant tension between local and systematic needs and practices but differing values, barriers and commitments. Star and Ruhleder (1996) use the concept of *infrastructuring* to examine those moments when local practices and solutions intertwine with larger-scale technologies and structures, creating stable systems that support new activities but often in unexpected ways. Star and Ruhleder (1996) argue that infrastructure is a "when" and not a "what". It is relational, tied to people, things and practices, and *seeing* infrastructure means paying attention to hidden work and how seemingly small gaps or barriers become magnified into experiences that are frustrating and off putting in ways that illustrate how genuinely complex the work is (Star, 1999).

Methods

The setting of our study is Hack the Flock, a public computing environment at Telus SPARK Science Centre in Calgary, Canada. At Hack the Flock, Boids (bird-droids) continuously shift and flock around the screen, and

visitors have direct access to the open-source code, and are therefore able to change values and parameters to influence the way Boids move and look in the simulation. We conducted semi-structured interviews with facilitators who had been scheduled to work at Hack the Flock which focused on their academic and professional background, their previous experience with and perceptions of computer coding, their experiences facilitating at Hack the Flock, how they felt about the exhibit, and how they thought it could be improved. Additional data collection took the form of video recordings of facilitators and visitors interacting at the exhibit and researcher field notes, which captured informal conversation between facilitators and researchers, as well as researcher perceptions of the interactions at the exhibit.

Analysis and findings

For the purposes of this paper, we focused specifically on one facilitator, Janelle, because she had the most extended experience at Hack the Flock. Drawing from Star and Ruhleder (1996), we looked for "when"s of infrastructuring that emerged from her interviews. This meant identifying moments where infrastructuring was made visible by its breakdown or when Janelle described potentially hidden work she or other facilitators did to try to support the exhibit and visitors' experiences. We found that these moments were often articulated by Janelle as a problem, or something not working properly, either with the exhibit itself or in facilitation of the exhibit. Sometimes, she discussed how she was fixing those issues, which we view as times where she was conducting emergent infrastructuring in the moment. At other times, she simply discussed an issue and may have provided a possible solution. In our analysis, we found that Janelle's "when"s of infrastructuring occurred as in-the-moment, emergent, improvisations. However, these improvisations took place within the bounds of multiple figured worlds (that of computing, museums, and museum facilitation) as well as the institutional regulations and norms at Telus SPARK.
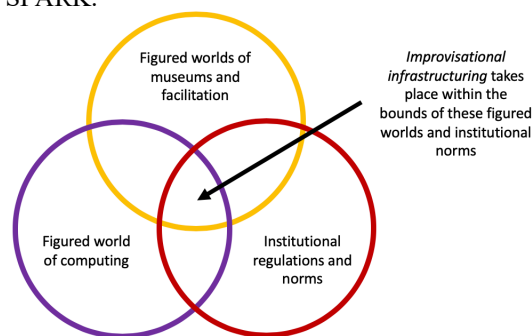

Figure 1. Improvisational infrastructuring occurs within the bounds of figured worlds and institutional norms.

This analysis brings to light the often unnoticed or unvoiced experiences of museum facilitators, who must deal with (sometimes contradictory) figured worlds of museums, scientific disciplines, and institutional regulations. Educational designers should attend to the hidden work that facilitators do to contribute to exhibits' success.

References

Ash, D. B., Lombana, J., & Alcala, L. (2012). Changing practices, changing identities as museum educators: From didactic telling to scaffolding in the zpd. In E. Davidsson & A. Jakobsson (Eds.), *Understanding interactions at science centers and museums: Approaching sociocultural perspectives* (pp. 23–44). Rotterdam: SensePublishers.

Holland, D., Lachicotte Jr., W. S., Skinner, D., & Cain, C. (1998). *Identity and Agency in Cultural Worlds*. Harvard University Press.

Sengupta, P. & Shanahan, M.-C. (2017). Boundary play and pivots in public computation: New directions in STEM education. *International Journal of Engineering Education*, *33*(3), 1124–1134.

Star, S. L. (1999). The ethnography of infrastructure. *American Behavioral Scientist, 43*, 377-391.

Star, S. L., & Ruhleder, K. (1996). Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research*, *7*(1), 111–134.

Tran, L. U., & King, H. (2007). The professionalization of museum educators: The case in science museums. *Museum Management and Curatorship*, *22*(2), 131–149. https://doi.org/10.1080/09647770701470328

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