Qualitative methods for studying learning through gameplay at museums and science centers

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Abstract: Due to the lack of research on games and learning in museums, there exists few established methods and strategies to best capture learning through gameplay in public informal learning environments. This makes research of this kind doubly complex given numerous other variables already to consider, particularly in acknowledging that learners at museums range broadly in age, gender, race and ethnicity, ability, and socio-economic status, along with their motivations for visiting in the first place. For our study at the Saint Louis Science Center, we observed player interaction with three games for learning science. In preparing for and conducting this study, we encountered several challenges unique to doing research in a public setting. We will draw from our experience running this study to highlight effective research methods for studying how people learn through gameplay in public informal learning environments.

Learning in Museums

Learning in museums can be measured in multiple ways, including capturing visitors' time on task, knowledge gain, thinking and problem solving, and motivation (Donald, 1991). Museum evaluators and researchers have taken up constructivist and sociocultural views of learning to understand visitors' meaning-making and knowledge development (Falk & Dierking, 2000). These views posit that learning is a cumulative and dynamic process influenced by visitors' prior knowledge, and that learning in museums in turn influences later developments in meaning-making. This, together with the fact that museums are free-choice institutions in which visitors may roam freely, makes conducting research on learning in museums complex (Falk, 2004). According to Falk (2004), research on learning in museums must consider numerous variables, particularly in acknowledging that the learners themselves range broadly in age, gender, race and ethnicity, ability, and socio-economic status, along with their motivations for visiting in the first place.

While there are few games in museums and fewer that exist permanently on exhibition floors, a handful of game-like interactives do currently exist in museums (Schaller, 2011). Good games can promote situated learning by providing opportunities for players to develop and practice skills in context (Gee, 2003; Shaffer, Squire, Halverson, & Gee, 2005). Similarly, science centers and museums embrace informal situated and experiential learning through play. As a result, we have begun to see more games installed at museums, including the Science Museum in London where an entire multi-floor wing is dedicated to digital interactive exhibits and games (Heath, vom Lehn, & Osborne, 2005). However, as the number of games in museums begins to grow, there remains a lack of scholarly research on them. Apostolellis (2010) echoes this sentiment, stating that there is still little understanding of how people play with games in museums and what learning outcomes such games produce. Due to the dearth of research on games and learning in museums, there also exists few established methods and strategies to best capture learning through gameplay in public informal learning environments, making research of this kind doubly complex given the previously mentioned variables.

Studying Games at the Saint Louis Science Center

For our study at the Saint Louis Science Center, we installed three games for learning science in the Cyberville gallery to observe the effectiveness and relevance of the games in a museum context. Over three peak days of one week, we documented visitor interaction (N=32) with the games through field observation notes, video recordings, and photographs. Additionally, we conducted a brief pre-game interview with visitors to determine both the experience they have had with games and museums, as well as their attitudes about games as tools for learning about science. Post-game interviews assessed how players have made sense of the science concepts presented in the games, including the depth and clarity of their understanding, as well as how they relate the games to other exhibits at the science center. These interviews also provided feedback about the games in regards to players' overall interest and appeal. As part of the study, we also ran a game design jam session at the St. Louis Public Library, where 14 children, teens, and adults spent two hours designing prototypes for the next big ideas on games in museums. Data from this session is used to triangulate our findings from the science center.

Our methods focused on 1) museum testing and evaluation; and 2) cooperative inquiry methods of design (Druin, 2002) using an intergenerational design group of children, parents, and researchers (Xie et al., 2012). While we based our methods of study on those typical of most qualitative user-centered research, we also encountered challenges unique to doing research in a public setting. From the IRB approval process, to recruiting visitors in the public space to participate in the study, to observing and interviewing the participants amidst the busyness of the museum, we overcame a handful of obstacles that would have barred the success of our data collection efforts. For instance, we noted that interviewing participants in a more secluded and quieter area of the museum, while still remaining on the exhibition floor (to be immersed in the context of study), would produce higher quality audio recordings of the interviews for later transcription and analysis. Discourse on methods for doing research in public settings is pertinent to all researchers who currently, or have intentions to, investigate how people learn in informal learning environments.

For our study in this public setting, one of our three games was installed on an iPad. In the post-game interviews, participants noted that displaying the game on a larger screen instead would have produced a greater invitation to other museum visitors both to watch and play. Participant interviews, along with our observations, suggest that mobile devices such as tablets and smart phones create a more intimate interaction that tends to hinder shared and collaborative experiences with others. In terms to data collection, the small screen size of the iPad caused difficulty for the researchers in observing and recording participants' gameplay. Future studies should consider videotaping play sessions using overhead cameras or, if the researchers have a hand in the game's development, incorporate data collection tools in the backend that log finger taps and swipes so researchers can better focus on in-museum observations.

This paper presents only a few of the preliminary findings from our study. Further analyses are planned in order to examine more deeply how people learn through gameplay in museums and science centers.

References

Apostolellis, P., & Daradoumis, T. (2010). Exploring the value of audience collaboration and game design in immersive virtual learning environments. *Proceedings of the 9th International Conference on Interaction Design and Children*, 326–330.

Donald, J. G. (1991). The measurement of learning in the museum. *Canadian Journal of Education*, *16*(3), 371-382.

Druin, A. (2002). The role of children in the design of new technology. *Behaviour & Information Technology*, *21*(1), 1-25.

Falk, J. H. (2004). The director's cut: Toward an improved understanding of learning from museums. *Science Education*, *88*(S1), S83-S96.

Falk, J. H., & Dierking, L. D. (2000). *Learning from Museums: Visitors Experiences and the Making of Meaning*. Walnut Creek: AltaMira Press.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York, NY: Palgrave Macmillan.

Heath, C., vom Lehn, D., & Osborne, J. (2005). Interaction and interactives: Collaboration and participation with computer-based exhibits. *Public Understanding of Science*, *14*, 91-101.

Schaller, D. (2011). The meaning makes it fun: Game-based learning for museums. *Journal of Museum Education*, *36*(3), 261-268.

Shaffer, D. W., Squire, K. D., Halverson, R., & Gee, J. P. (2005). Video games and the future of learning. *Phi Delta Kappan*, *87*(2), 105-111.

Xie, B., Druin, A., Fails, J., Massey, S., Golub, E., Franckel, S., & Schneider, K. (2012). Connecting Generations: Developing Co-Design Methods for Older Adults and Children. *Behaviour & Information Technology*, *31*(4), 413-423.

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