Analyze This! Examining Mobile Augmented Reality Gameplay Through Analysis of End User Data

Judy Perry, Massachusetts Institute of Technology
Fidel Sosa, Massachusetts Institute of Technology
Lisa Stump, Massachusetts Institute of Technology

Background

Mobile, location-based augmented realty (AR) games have become viable tools for engaging audiences at informal learning venues (Yoon, Elinich, Wang, Steinmeier, & Tucker, 2012; Lo, Delen, Kuhn, McGee, Duck, & Quintana, 2013; Dunleavy & Dede, 2014). These AR games allow players to participate in active, situated learning (Brown, Collins, & Duguid, 1989) through their interactions with virtual characters, objects and information integrated within a real-world location (Klopfer, 2008). However, as casual visitors play mobile games in a free-choice environment, numerous questions arise: *How many visitors opt into such experiences? How long do typical game sessions last? Is gameplay continuous or divided into intermittent spurts of gameplay and respite? Are some games more "successful" than others in terms of their popularity and/or engagement? In games that include a definitive ending, what proportion of players reach this conclusion? And in games where players make choices, which options do they choose and how does this affect their experiences and learning outcomes?* While survey and interview data can inform many of these questions, data collection can be cumbersome and large sample sizes can be difficult to obtain. This poster describes an alternative approach, a web-based data analytics extension to an existing AR game platform, TaleBlazer, that automatically gathers anonymous end user data to provide a range of game analytics.

An Audience Shift: Moving From Field Trips to Casual Visitors

As part of an ongoing NSF funded research project (NSF# 1223407), TaleBlazer is now exploring ways in which informal learning institutions can leverage AR games to engage new audiences in free choice, on-site visits with the goal of engaging players in STEM learning experiences. Prior to this current phase of research, TaleBlazer had been primarily used as part of controlled research studies or field trips, using hardware loaned to players for the duration of the experience. These experiences were also typically facilitated by staff members and often included whole group introductions and/or concluding discussions. However with the new emphasis on *casual* visitors playing games as free-choice experiences, players now use their personal devices, pausing or stopping gameplay at their own discretion. Given these conditions, understanding players' play patterns becomes particularly relevant. In this way, the data automatically generated by an analytics platform could serve as a valuable tool, potentially used both formatively (to make improvements to games and software) and summatively (to assess the degree to which AR experiences were effective).

Design of Analytics Platform

To gather pertinent usage informational, the authors determined that an analytics component could be added to the existing TaleBalzer AR game platform. When designing the initial scope of this extension, it became clear that different types of end users would have distinct purposes in utilizing the analytics platform and thus different informational priorities. To meet these diverse needs, the design team began by developing narratives that embodied likely usage scenarios for each group. Specifically, narratives were developed for three types of potential analytics end users: host organizations designing games, researchers evaluating AR, and the TaleBlazer platform development team.

Based on these narratives, the design team generated a potential list of analytics features. These lists in turn became the basis for annotated screen mockups which were shown to existing TaleBlazer end users (grant partners as well as individuals who had worked with TaleBlazer to develop games), who reviewed designs and completed an accompanying written survey (n=5). Survey findings, which included feedback on prioritization of features as well as qualitative feedback with additional suggestions, were used to revise the initial designs.

Types of Data Collected & Visualizations

Three primary types of data are collected as part of the analytics platform: (1) generic data, (2) game-specific data, and (3) custom data. The generic data category includes metrics which are valid for any TaleBlazer game. These include basic frequencies (e.g., number of unique downloads and games initiated, type of device/OS) as well as the duration of gameplay sessions. The second category catalogues elements which are specific to a particular game (e.g., how many people played the "scientist" role vs. the "journalist" role?). The last category allows game

designers to tag particular in-game actions (e.g., did the player pick up the *microscope* or the *petri dish*?) in order to determine frequencies of very specific player choices. While generic or game-specific data are automatically captured by TaleBlazer analytics, the game designers must flag a priori the custom actions (using a specific "block" in the TaleBlazer Editor) for which analytics data is desired.

Currently, game analytics are displayed in a separate TaleBlazer Analytics gui for each game individually. The initial default view displays a "dashboard" that provides a quick snapshot of basic data (number of downloads to date, average duration, etc.). Additional screens provide tabular sub-categories of data, allowing analysis of games comparing versions, roles, dates played, etc. For example, a table might display data comparing the average duration of gameplay across two different versions of the same game, demonstrating that the more recent version's average duration "stickiness" is 120% greater than the earlier version.

Design Challenges

Several challenges arose during the design of the analytics platform. First, the analytics team struggled with determining the optimal ways in which users would want to filter analytics data. While some categories are straightforward (e.g., downloads over time), others are potentially more complex, involving multiple filters and categories (e.g., comparing completion rates among weekend game players across multiple games). The interface which allows analytics end users to filter and categorize game data require additional pilot testing to find the balance between flexibility and usability. Designs will also benefit from added graphical presentations of data, rather than the tabular data currently provided.

A second challenge deals with contextualizing the anonymous game analytics data within additional specific user data. Researchers might want to capture demographic data (e.g., were people playing individually or as a family group?) or survey questions (e.g., players might complete a Likert scale rating their attitudes about science). By linking analytics data with other self-reported data, researchers would be able to explore a much broader range of research questions. Upcoming pilots will explore linking analytics data with player-generated survey responses.

Lastly, the authors quickly realized that they would be incapable of anticipating the many ways in which analytics end users would want to approach the data. For this reason, the analytics platform allows the end user to download a raw dataset as a CSV file for further analysis, enabling the user to have flexibility to follow other avenues of inquiry.

Conclusions and Future Work

Piloting of games for the general public is planned for Summer 2014. These games will utilize the TaleBlazer analytics capabilities to collect initial datasets from real end users.

The authors hope that lessons learned from the development of this analytics platform will inform others who seek to utilize the TaleBlazer analytics platform effectively. Additionally, the authors hope that the outcomes of this pilot project can inform other projects which seek to develop analytics extensions for their own software platforms.

References

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational researcher*, 18(1), 32-42.

Dunleavy, M., & Dede, C. (2014). Augmented reality teaching and learning. In *Handbook of research on educational communications and technology* (pp. 735-745). New York: Springer.

Klopfer, E. (2008). *Augmented learning: Research and design of mobile educational games.* MIT Press.

Lo, W., Delen, I., Kuhn, A., McGee, S., Duck, J., & Quintana, C. (2013). "Zydeco: A mobile-based learning system to support science inquiry learning". Paper presented at the 2013 Annual Meeting of the American Educational Research Association.

Yoon, S. A., Elinich, K., Wang, J., Steinmeier, C., & Tucker, S. (2012). Using augmented reality and knowledge-building scaffolds to improve learning in a science museum. *International Journal of Computer-Supported Collaborative Learning*, 7(4), 519-541.