How I Learned to Stop Worrying and Love Youth AR Game Creation

Judy Perry, MIT Scheller Teacher Education Program
Bob Coulter, Missouri Botanical Garden
Juan Rubio, Seattle Public Library
Chris Holden, University of New Mexico

Abstract: In the constructionist tradition, the creation of augmented reality (AR) games can be an effective method of engaging youth in informal learning around both domain-specific content as well as general design thinking. However, given the complex, interdisciplinary nature of AR games, the facilitation of programming in which youth create these games can be challenging. How do students from different age groups and backgrounds best learn this novel genre and the related design process? What are the most challenging issues? How can facilitators attempt to empower youth agency and youth voice in the context of a larger organization's educational goals and the desire for a "product" within a given timeframe? In this highly interactive session, panelists from diverse settings – including a botanical garden, an urban after-school program, and a university – shared insights from their efforts to empower youth via the creation of AR games.

Augmented Reality Games and Youth Design

Digital game design can be a catalyst for engaging youth with technology (Wang & Chen, 2010), creativity (Kafai, 2009), and design thinking (Kafai, 1996; Salen, 2007). A growing body of game creation toolkits enables non- or novice programmers to craft their own games, albeit frequently the tools themselves emphasize game mechanics rather than game design (Hayes, 2008). However, especially with appropriate facilitation, students tasked with constructing games can thoughtfully marry subject matter and game mechanics, and in doing so learn powerful habits of mind (Coulter, 2012; Coulter, Klopfer, et al., 2012; Matthews, 2010; Salen, 2007), including iterative design through prototyping, user-testing, and revision.

Among the many genres of games, mobile augmented reality (AR) games, which use location-aware mobile devices to anchor gameplay within real-world locations, provide additional opportunities to engage young game designers in deep thinking about the affordances of a particular locale, including its landscape and topography, physical structures, and cultural and historical context (Klopfer & Sheldon, 2010; Holden, Gagnon, Litts & Smith, 2013). Since AR games combine a digital layer on top of a real-world environment, the game designer can add creative elements such as fictionalized narratives, player roles, and other data or game mechanics. In this way, the game design experience fuses fact and fiction, the real and the imagined.

Game designers need not be experienced software programmers. Using one of several freely available toolkits, such as ARIS and TaleBlazer, participants with minimal programming skills can author and implement their own mobile AR games.

Pedagogical Considerations of AR Game Creation

While game design can be integrated into formal and informal learning settings, this panel will focus on groups taking a more *informal* approach to learning (e.g., after-school programs, workshops, and summer enrichment camps), venues which are often a good fit for the multidisciplinary, complex nature of the game design process.

In the constructionist tradition (Papert, 1980), facilitators emphasize learning that emerges from the thoughtful creation of artifacts. This creative process can vary widely from group to group given the many tasks that go into making a location-based AR game, leaving facilitators with many choices in terms of their pedagogical emphasis. Within each group, for example, efforts can vary widely and include such tasks as researching and organizing domain-specific content knowledge, articulating connections between the game and real-world locations and artifacts, designing game mechanics, engaging in prototyping and iterative design, gaining sophistication in programming, writing, and creating visual and multimedia game assets.

Diverse Audiences, Diverse Challenges and Opportunities?

Given the complexity of AR game creation, it is not surprising that facilitating youth creation of AR games comes with many inherent tensions and challenges: What happens when youth from diverse backgrounds and environments are tasked with designing AR games, a genre which is almost certainly new to them? How are youth able

to leverage the affordances of the AR tool, while working within its limits? How can organizations promote youth ownership and youth voice within a game whose topic was selected by the facilitators to align with the host organization's mission? What are the advantages and challenges of different age groups (ranging from nine-year-olds to secondary and postsecondary) making AR games? How can creation of AR games change youth perception of place and their sense agency within their community?

Three panelists, working with distinctly different populations and physical environments, shared their experiences facilitating groups of students creating AR games. Bob Coulter (Missouri Botanical Garden) described experiences facilitating summer and weekend workshops in which elementary and middle school students created their own STEM-themed AR games situated in a botanical garden setting. Juan Rubio (Seattle Public Library) has facilitated multiple groups of middle and high school-aged urban youth in after school and summer programs, in which AR games served as a design focus for youth voice and youth investigation of local neighborhood settings. Chris Holden (Assistant Professor at the Honors College of the University of New Mexico) has worked with post-secondary students to create interactive AR games as a means to explore diverse areas ranging from language learning to community action, from classrooms to museums and community centers. The panel was moderated by Judy Perry (MIT Scheller Teacher Education Program), a project manager and researcher for the TaleBlazer AR game platform.

Session Format

The goal of this 60-minute session was to give the audience a feel for some of the opportunities and challenges faced when facilitating youth creation of AR games. Following brief snapshots of AR youth workshop implementations from each panelist, participants played a short, simplified AR experience. Participants downloaded the TaleBlazer app to their Android or iOS smartphones or tablets and then loaded the game. The game required participants to walk around the room to locate virtual characters who embodied issues typical of those encountered by youth creating games and the facilitators of such groups. Examples of characters encountered included:

- **Artsy Art**: *"I've never done any coding before, and I'm not sure I'd be any good at it. But I'm a pretty good artist. Maybe I can just stick with art and leave the programming to someone else?"*
- **Abyss Abby**: "*Hi, my name is Abby. I'm an instructor here and I am feeling frustrated. No one ever seems to actually play these games. I don't even have time to walk around outside to play them when I grade them."*
- **Ambitious Alice**: *"I wanted to make a choose your own adventure, but I can't get it to work. I've been trying for hours and we're running out of time. What should I do?"*
- **Madison Backstory**: *"What if the game takes place in Hollywood which has just been invaded by aliens! But there are these bad guys with lasers. Yes, the game is about invasive species here in Madison - we just have to figure out how to work that in!"*

Discussion

After the game, the moderator facilitated discussion among panelists based on generalized challenges embodied in specific characters' narratives as well as questions from the audience.

Artsy Art: Student Comfort Zones

Given its interdisciplinary nature, AR game creation utilizes a wide range of skills, including brainstorming game concepts, integrating specific locations or objects, researching content, developing characters, writing narrative and dialogue, constructing game mechanics, creating art assets, programming and debugging the software, and play-testing and revising the game. Many students naturally gravitate toward (or away from) aspects of the AR game design. For example, Artsy Art was reluctant to program as coding intimidated him, and he would rather create visual assets. However, facilitators often view these "low stakes" opportunities as ideal for novices to try on new identities and develop new skills. In this way, facilitators are faced with the challenge: *Students are usually interested in one aspect of the program: coding, art, storytelling. Do you let them focus on one aspect of game design or rotate so they are exposed to more disciplines?*

Based on his experiences, Rubio, whose students have largely collaborated in large groups to make a single game, argued for having students specialize, yielding outcomes that are more productive and offer opportunities for students to iterate, fixing problems they have identified. Moving them around, he explains, removes the continuity. Coulter's model of youth game creation favors students working in pairs. Even when one student is stronger

than another in one aspect of game design, the pair model allows for legitimate peripheral participation in which students see that it can be done. Holden finds that students do find ways for legitimate peripheral participation, and that the process can allow student leaders to emerge, who are comfortable for example with the tool usage, and give other teammates ways to learn in non-traditional ways.

Abby Abyss: Purpose, Process, Product and Performance

Augmented reality games are an emerging genre. This can be problematic for game makers of all ages who, desiring a more public showcase for their games, do not readily have opportunities to share the product of their efforts with a larger audience. *How important is this for audiences and facilitators? Is there a larger goal for the creation of AR games, and if so, is it linked to the public consumption of these games?*

Panelists offered their thoughts on ways and reasons to give games an audience, as well as the relative importance of that as an end goal. Rubio described using games made by earlier student groups as exemplars, arguing that it makes a difference to students to see something that their peers did, providing the projection of possibility. He also felt that sharing the game could be a very empowering experience, citing the example of former students at Global Kids, Inc. who invited First Lady Michelle Obama to share their game during a visit. Coulter maintained that games did not need to have a long shelf life to be meaningful, but rather that offering an opportunity for parents and others to see a showcase of student work (e.g., as the culmination of a week long summer camp) provided a workable and specific goal and gave it meaningful purpose. Holden proposed that AR game creation provides a vibrant learning opportunity, fundamentally different from traditional assignments (e.g., writing a term paper), which is simply done because it is assigned. Holden voiced concerns that AR games might be relegated as a new form of term paper, missing a valuable opportunity to use AR as an engaging tool to think with. He emphasized that AR game creation is only not about the product (in the way that students typically view term papers as merely a product), but about the design process as well

Ambitious Alice: The Fine Line Between Focus and Flailing

Students making AR games hit brick walls. They struggle to turn a vague concept into a playable game or wrestle with scripting code to implement a particular game mechanic. Students flail and facilitators watch. Sometimes, the struggle compels students to creatively solve problems, take a step back, and redesign their work. Other times, these struggles become a wasteful and frustrating time sink. The challenge is deciding when to let students flail and when to provide guidance. *How do facilitators decide when and how to intervene?*

Coulter has seen students dive too quickly into game implementation, missing critical early design steps. The software, he notes, is not necessarily well suited for the initial brainstorming and envisioning game flow. He recommends instead utilizing a storyboarding technique to work out the flow of the game prior to jumping into the AR software implementation, helping students clarify and hone their ideas before worrying about the particularities of the software. Also, by having game creators work in pairs, Coulter's students naturally draw out tacit design attributes by explaining and clarifying their ideas to one another. Rubio commonly sees students generate overly complex game ideas and finds it appropriate to step in at this key moment to attempt to help students simplify their ideas. It is important, he notes, to make this process transparent to students so that they note the need to step back and focus on the core aspects of their game design. By giving students a designated opportunity to provide feedback, so that ultimately the simplified game is still their creation. Holden, who typically works with older college-age students, utilizes enforced playtests as deadlines to compel students to "go into panic mode and get something done." Traditional educational settings, he argues, do not prepare students well in terms of time and resource management. Creating AR games on a deadline compels students to practice these critical skills and find a way through these roadblocks.

Madison Backstory: Games Beyond Narrative

The narrative of AR games is often one of its most compelling aspects. While the genre of location-based AR games may be new to students, they are familiar with genres and narratives tropes. Students often channel their enthusiasm for a project into generating a rich backstory. However, teams often have a hard time moving forward from their first good idea into a more playable game design. *How can facilitators help them proceed? When do facilitators intervene with criticism? And how strongly should they push it?*

Holden sees his role as facilitator and helping students move from narrative to mechanics. The AR genre is still, he argues, an avant-garde genre. Using the narrative as a staring point gives the students a place to start and build from. Rubio recalls many times when students pitched complicated narratives. He relies on questioning students' rationales and prompting them to justify their choices. Also, by introducing basic story arcs (e.g., the hero's journey or hook-hold-payoff), students can begin to tune their narratives into games. Peer feedback also plays a key role.

Students are developing their identity as a game designer and the facilitator explains that designers need to revise iteratively based on feedback. In this way, the feedback and revision process is a way for students to move toward a more cohesive, playable game design.

Conclusions

Panelists shared a range of models in which youth successfully created location-based AR games. They all maintained that a rich learning opportunity emerges when youth are given the tools to creatively explore this new genre. However, panelists also noted that because the genre is still new and because generally students are not well versed in the design process, the role of the facilitator is critically important in helping students move through the challenges of creating a viable game.

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