The Canary's Not Dead, It's Just Resting: The Productive Failure of a Science-Based Augmented-Reality Game

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Abstract: A prototype alternate-reality game called *Canaries in a Coalmine* presented players with an ominous message from the future, a modern-day battle with overly sensationalized media, and a challenge to both solve the game's mystery and take environmental action in the present. Designed to engage a broad public in citizen science using high quality scientific digital resources to build knowledge about complex scientific issues facing our society, *Canaries* failed...or did it? Fewer than expected players interacted with the game, prompting the designers to close the game without it being played through to completion. The designers and researchers share lessons from this experience that can inform the education and gaming communities.

Introduction

The Educational Gaming Environments group (EdGE) at TERC designs free-choice games that engage the public in scientific inquiry. The participatory framework that we use builds upon the growing understanding that the Internet and social gaming are revolutionizing the way educators think about learning (Collins & Halverson, 2009; Falk & Dierking, 2010). To investigate how digital scientific resources can be infused into social games, we created and studied a prototype Web and Flash-based alternate-reality game (ARG) called *Canaries in a Coalmine*. In this paper, we present the lessons learned in the less than successful implementation of the game. Some of the difficulties may stem from the challenge of embedding citizen science into any form of game and others may come from the designers' assumption that a social community could form more easily than it did.

The Vision for *Canaries in a Coalmine*

The goal of *Canaries* was to introduce and engage the public in citizen science, using high-quality scientific digital resources to support players in understanding complex scientific issues facing our society. This work builds on literature that shows that 1) games can be richly complex and engaging learning environments (Gee, 2003; Barab et al., 2007) and 2) successful game play can foster collaborative problem-solving (Steinkuehler & Chmiel, 2006), systemic thinking (Squire, 2003), and can increase players' collaboration and civic activity in real life (Barab et al., 2005; Ito et al., 2008; Lenhart et al., 2008).

We chose an alternate reality format for the game in the spirit of games like *World Without Oil.* We felt that an alternate reality approach would engage players' imaginations and interest by allowing for a storyline driven by the players' actions. This also provided the designers with great flexibility for crafting the story around science content that could be woven into challenges. *World Without Oil* engaged over 1800 people to live out a fictional oil crisis online for a month (McGonigal, 2011). We were attracted to the game's method of combining an online fictional narrative with real-world activity and documentation. While we were designing *Canaries*, McGonigal's team released another game, *Evoke*, which reinforced some of our design considerations. *Evoke* was more "text-heavy" in nature and it was felt that *Canaries* should strive for a more graphic and activity-based style of delivery and narrative.

As conceived, *Canaries* was to engage players in real-world activities in their own neighborhoods. These activities would include observing birds in their habitats, considering threats to birds in the context of local and global ecosystems, and taking environmental actions when warranted. The activities would be driven by an unfolding storyline about a mysterious message from the future that birds are key environmental indicators that had been ignored in the past and a journalist's vicious battle with a tabloid newspaper that ensued over the validity of the message:

Jade Moneitree, a former journalist and recent recipient of a large cash settlement from a legal dispute with the Daily Rap tabloid, has created a foundation to re-instate evidence-based reasoning in a population gone wild with sensationalized media and has invited volunteers to join her. Their first task: to work together to solve the mystery of an ominous video message and clear the reputation of Frank Martine, a scientist and friend of Jade's who is being besmirched by the tabloid. Within the message is the idea that "birds are the key," which is meant to justify the challenges presented in the game to learn about birds and their role in Earth's future survival.

Presented with the beginning elements of the story and invited to "heed the call," players would join the foundation and be given an office with tools and resources related to birds. The office (Figure 1) included communication tools and a series of challenges that ask the community to unpack a bunch of tabloid stories, provide evidence for what is science versus pseudo-science, and otherwise tackle the mystery and the science of what was happening. To do this, they are encouraged to become involved in associated real-world activities and return to the game to document their activities and findings.

Figure 1: **The office in the first launch version of *Canaries***

The Design

When designing *Canaries in a Coalmine*, our team had to find a balance between a storyline nimble enough to be adjusted based on community input, and real-world science resources and activities well-integrated enough to support deep understanding of stewardship of the natural environment. Since this research project was funded to target how to distribute digital scientific resources through games, the designers focused on creating challenges that would encourage players to share resources such as bird-call libraries, citizen science resources, and activist sites. A rating system allowed players to acknowledge the value of resources other players posted and resources were listed in order of highest rating. These features were put in place with the intent to create a community of scientific inquiry among the players, incorporating their real-world activity and fictional online narrative.

A set of casual mini-games (Figure 2) introduced methods to identify birds through images, silhouettes, and calls. To encourage players to return, new mini-games were revealed daily. Although players could guess in the mini-games, the point structure rewarded getting it right on the first try and therefore, finding and using Web-based resources. Players were also given a life list tool for documenting personal bird observations, which overlaid their sightings onto a Google map.

Figure 2: Two sample mini-games

Players were awarded badges for completing challenges (Figure 3) and other activities in each of three categories: *awareness*, *knowledge*, and *stewardship*. Players were expected to post information and data from their responses to the challenges and their contributions would be rated by other players voting with a "thumbs-up" or "thumbs-down"—earning them more points for higher ratings. In addition to being a form of peer-reviewed resources, the voting structure allowed players to become recognized as leaders in the community.

Figure 3: Two sample challenges

Launch
Canaries in a Coalmine was first available to the general public (ages 15+) for eight weeks starting in August 2011. Then it was taken down, redesigned, and re-launched.

Initial Launch
For the initial launch, at least one team member monitored the game most hours from 8 am to 8 pm EST. During these hours, about 10 people arrived each hour. We used a commercial monitoring tool to help us track visitors, which enabled us to identify when players entered the site and whether they registered. Once players registered, our game-tracking software identified when they played mini-games, did challenges, and posted to forums. In addition, an embedded chat feature let team members who were playing roles within the game talk with players.

Canaries failed at gaining an initial audience. The home page had 2,000–3,000 visits, which translated into about 75 new registrants. Fewer people participated than we had hoped, and of those who came, few went beyond the registration page. Approximately 20 people posted game activities and only 10 players engaged in chat sessions.

Second Launch
Towards the end of the first month, fewer new players started the game and players that had been engaged began to drift away. We decided that the game needed to be revised to have any chance of garnering a community. We suspended the game while the designers regrouped to identify changes that might increase registration and engagement. Operating under tight time and financial constraints, we knew our options were limited and changes had to be tactical. The primary focus of the revisions was to create a more engaging introduction and facilitate more interactions among the players.

New Introduction: The designers saw that too little information was provided at each step about why a player might want to continue. We created a more in-depth, dynamic introduction to explain the story

(Figure 4) and moved the registration page to the first point at which a player tried to enter data. We also implemented an entry point to let potential players try the mini-games and poke around the site before being asked to commit to registration.

Figure 4: Expanded introduction

Office Reorganization: The designers reorganized the "office" dashboard to highlight communication and collaboration (Figure 5). We made chat and activity log windows open upon entering the game, allowing players to immediately see one another. When players closed the chat window, an icon showed when others entered the chat. Players could now be in any part of the game without missing an opportunity to connect with others. Player profiles were enhanced so that players could learn more about the current activities of others in the game. Finally, to provide a clearer path for players toward the activities that would increase community, we reorganized the challenges into themes and created mouse-over tool tips that showed players what each office element did.

Figure 5: Revised office with news window open

Recruitment approach and issues

Canaries' primary barrier to success was in being unable to recruit and establish a community. The reliance on that community so early in the gameplay meant that nothing meaningful could happen without a critical mass.

Our recruitment was substantial, given our budget, but still insufficient. About $10,000 (about 10% of the overall development budget for the game) was allotted for advertising and recruitment. In the end, only about half was spent because much of the paid advertising was not generating sufficient traffic.

Our efforts included advertisements, press releases, and secret game clues that were distributed in a variety of ways to gaming enthusiasts, informal science centers, citizen science groups, naturalists, educators, and others. For both game releases, we advertised. For the first release, we advertised on Mochimedia and Facebook, and posted a press release on gamedev.net that was forwarded to game development blogs and email lists.

Our outreach team searched for blogs and email lists of potential players, and posted to many of them, but some were private and discouraged posts. The advertising brought players, but not necessarily interested players.

We distributed fifty flash drives with the URL, a game clue embedded in a birdcall, and sound analysis software to help find the clue. The URL led to a fictitious hacker page that had information about Jade Moneitree's organization, which was intended to offer other clues to help drive the game in a more subversive manner. There was no evidence that any of the flash drives resulted in players entering the game.

For the second release, we e-mailed the 100 or so previously registered players, putting a sample mini-game on Mochimedia, posting press releases, blog posts, and on relevant web sites, and recruiting by large email lists for science educators, birders, and gamers. We did not re-instate paid advertising.

Even with the enhanced second release, a sustainable community did not form. Players came and individually interacted, but players were rarely there simultaneously. In addition, there was still not enough back and forth between participants to create a community of inquiry. Although we did have a small group of interacting players who wanted *Canaries* to continue, the limited audience did not merit the time it would take for us to facilitate the game and create new materials. With regret, but knowing we were making the right decision, we closed *Canaries*.

Lessons Learned

With hindsight, we still think many of our game elements are strong (which makes the failure to catch on all the more disappointing). The scientific resources were high quality and well integrated into the game. The mini-games and challenges were fun. The storyline was engaging. Visually the game was appealing. Regardless, an ARG is not much of a game without players.

The game itself was not without problems, however. Because of budget limitations, we focused development efforts on tools for embedding and rating scientific resources in the game environment. This meant that other elements of the game were possibly insufficient to have wide, long-lasting appeal. Some tools were simplified more than ideal, such as the life list tool. Others were cost-prohibitive to build, such as an integrated discussion and activity feed where people could work cooperatively toward consensus. Instead we relied only on a third-party forum infrastructure for consensus-building. Finally, we lacked the resources to polish the design or do as much quality-assurance testing as we would like.

Sigh, have a bigger budget

One interpretation of our experience is that one needs a bigger marketing budget to get the word out. We have received additional funding for our next round of development and have a larger budget, which will allow us to do a bigger blitz the next time. In particular, we will work with members of our target audience to test and better hone components and to foment buzz in the process as well as build on the marketing outlets we identified for *Canaries*.

But we also learned another lesson that is potentially more important than increasing the budget.

Promote our work as a part of practice

Through *Canaries*, we really learned that part of the regular work process has to be promoting our work. We need to have an online presence representing our work and we need to connect with other gaming researchers, educators, designers, and players. Then when we want to get beta-testers or announce the release of the next game, we can tap into a larger, built-in audience that is familiar with our work, and we will know how to target our marketing resources more effectively.

Our efforts are multifold. We are redesigning our web site to be more appealing and easier to update. We are using social media tools that allow our outreach, design, and research teams to coordinate postings to our blog, Twitter, and Facebook. We previously read and discussed articles and played and discussed games internally, but now are beginning to post the results of these discussions publically. We also are paying more attention to what others are saying on social media. We are working with teachers to make them aware of our work. Moreover, we are going to more conferences and trying to meet more people.

Know your audience and reach out to them

We learned the value of teasers and pre-registration samples to entice players before asking them to register. This may mean that researchers lose a bit of early data, but in the end, they may keep more players. Developing an ARG like *Canaries* is a time- and cost-intensive endeavor, and sacrifices along the way due to constraints of either are magnified and hard to recover. As such, EdGE has changed tactics somewhat in reaction to *Canaries* in that we are building a set of smaller, mobile games that we can do less expensively, more nimbly, and market to a wider audience.

Emphasize social presence in the game

Our previous experience with social presence among players that occurs in a massively-multiplayer online environment (MMO) did not translate immediately to a non-avatar environment. Our previous science inquiry game in an MMO used a similar mystery narrative and facilitation style (Asbell-Clarke et al., 2011; Asbell-Clarke & Sylvan 2012). This game was an activity within an existing environment, so the community came to the game rather than the game having to recruit a community. This may have been more important to the growth of the community than we realized previously. *Canaries*, which did not have avatars, showed less interactivity among players and players did not come to synchronous events, despite posted notices.

For both the designers and the players, creating a social presence or community—even among the small number of players—was difficult. We may have assumed too much of the avatar-based social presence that occurred in our previous MMO work (Asbell-Clarke et al., 2011) would carry over to the Flash-based web game, and they are just not comparable. In *Canaries*, people completed the challenges and posted comments, but our initial design did not support players responding to one another's activities. They could enter the chat room to talk with our team members' characters, but if we were not sitting in chat at that split second, players would leave immediately. Before the revisions, members had to rely on seeing players' avatars in chat to 1) know that others were in the game at the same time and 2) provide an impetus to start a conversation. We assumed that the chat and forums would be vehicles for communication and inquiry among players, but that was not the case, even with the modifications to the game.

The narrative grows with the community

The narrative was designed to be flexible enough to grow and reflect the community's input. Some players were quite engaged, which supported the designed narrative arc. However, keeping these players engaged, pushing the narrative forward, and growing the community all at the same time was difficult.

A better strategy may have been to create short narrative elements that were less dependent on community input, allowing us to reach a critical mass that could engage in a more complex and fluid storyline. Having these simpler elements may not have led to a larger community, but perhaps the community would have grown fast enough to push the game forward and to complete the game.

Doing it differently next time

Some of the most enthusiastic players were teachers who saw the potential for *Canaries* in a more structured setting (such as a class project or in an after school program). We are currently using *Canaries* in a few small, informal settings such as local science festivals, where our designers are soliciting ideas from educators and the public about how they might engage with the *Canaries* environment. We have also attended science teacher conferences and other events and have been connecting with teachers both locally and nationally to relaunch *Canaries* as an in-class experience. Teachers as facilitators will help drive the game, especially as much of the game's elements are aligned to meet science standards, but are delivered in a format that will interest students tired of more traditional methods of learning.

We are re-thinking how to approach social interactions in games. We realize that the social element, while essential to the scientific inquiry, may not be the best place to start in a game. Perhaps it is better to start with rich activities and build social elements around them. We are doing this to establish some visibility as game designers before trying to recruit a community from scratch for an inquiry game again. The alternate reality genre is not often listed as one of the categories used on game publicity sites (e.g., Mochimedia). We are developing our new games to fit into one of the common categories such as action or puzzle, at least until we have a public following.

It could be that gamers who might be attracted to an alternate reality game format are not so interested in citizen science and birds. We will not know that until we figure out how to find the proper recruitment methods for a game like *Canaries*.

Conclusions
Canaries in a Coalmine was intended to engage public gaming audiences in an alternate reality game that enticed them to participate in citizen science in their own backyard. Because of budget constraints, we had to make difficult design choices and limit our advertising. These limitations along with inadequate social presence and narrative elements reduced the game's appeal and, thus, the player community.

We learned some important lessons along the way. Small groups like ours may benefit from building their audience throughout the design and development process, regardless of how pressing deadlines feel. The ease with which particularly gaming environments support social presence is an important consideration, particularly for alternative reality games. Growing the community takes time and effort and players need to be kept engaged while the community grows. One way to do this is to create many short and flexible narrative elements can be used flexibly.

Going forward, our next games are being designed and developed with these lessons in mind. And *Canaries*, while resting, is returning as a classroom activity supported by teachers.

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