When Simple Is Not Best: Issues that Arose Using Why Reef in the Conservation Connection Digital Learning Program

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Abstract: Employing a combination of web-casting, vlogging, virtual world simulations, and social networking, The Field Museum connected American and Fijian teens interested in environmental conservation through an after-school program entitled Conservation Connection. Participating teens learned reef biology, increased their digital literacy, and produced plans for sustainable management of reefs. A key component was a 2D coral reef simulation on Whyville.net—*WhyReef*. We envisioned that *WhyReef* would serve as an interesting and age-appropriate platform through which teens would develop a common knowledge base about coral reefs. Additionally, we believed that banners, advertisements, and virtual money incentives would motivate lurkers on *WhyReef* to take interest in Conservation Connection and participate via the social network. Our observations and interviews indicated that *WhyReef* was too simplistic to engage non-Whyvillian teens. Furthermore, *WhyReef* did not succeed in incentivizing lurkers to participate. We attribute this low participation to perceived exclusivity, program timing, and access to technologies.

Introduction

Biodiversity loss and species extinction are approaching, or may have already reached, a critical moment. Many scientists agree that the Earth is experiencing its 6th mass extinction; though unlike previous extinctions, this one is caused by human activity (Human Footprint too Big for Nature, 2006; Mittermeier, 2011). Coral reefs are hotspots for biodiversity but are in imminent danger. For example, there are currently 845 known species of reef-building coral and of that number, 231 species (almost one-third) are facing extinction (Black, 2008).

Natural history museums and other informal learning institutions can use their frequent interaction with the public and their status as trusted sources to impact both science education and awareness of the biodiversity crisis (Drew, 2011). Digital learning programs for youth at The Field Museum of Natural History (FMNH) aim to introduce the tools, such as critical thinking and problem-solving, necessary to understand the consequences of biodiversity loss, and engage youth in the global connections between species survival, biodiversity, conservation, and human communities. FMNH developed Conservation Connection (ConConn) to engage youth, aged 13-18, in the stewardship of coral reefs using the cross-location, collaborative problem-solving necessary to affect change. FMNH partnered with a high school within the Chicago Public School District and a high school in Suva, Fiji to create a core team of teens, separated by geography but working together towards a common goal. Additionally, FMNH reached out to youth on Whyville.net, specifically those interested in marine conservation, to join the ConConn community and aid in reaching the program's conservation goals.

While the program had many successes, the project team also experienced a key failure. A central component of ConConn was *WhyReef*, a simulated coral reef experience accessed on Whyville.net. During the development phase of ConConn, the project team's intention was to leverage *WhyReef* in two ways. First, *WhyReef* was to serve as a platform through which core teen participants in Fiji and Chicago could develop a common knowledge and language base around the topic of coral reefs. Although *WhyReef* was successful in generating this common foundation from which both sets of teens could work, the virtual experience and accompanying graphics were too simplistic to engage core teen participants long-term. Second, *WhyReef* was intended to bring lurkers from *Whyville* to the social networking site built specifically for ConConn, where they would be asked to participate in both online and real-world activities. Despite the project team's best efforts, *WhyReef* was not successful in incentivizing a large number of lurkers to participate in ConConn activities.

Conservation Connection – Program Summary
Conservation of coral reef ecosystems is most successful when action is both local and global. Using a combination of *WhyReef*, web-casting, blogging, vlogging, and a customized social networking site (FijiReef, http://fijireef.ning.com), ConConn attempted to engage American and Fijian teens as well as youth players on Whyville in the stewardship of reefs through direct involvement in the scientific process. This after-school program launched in January 2011 and concluded in June 2011.

WhyReef (reef.whyville.net), a coral reef simulation and suite of learning-based gaming activities in the 2D virtual world of *Whyville*, was leveraged in order to ensure that core participating teens and *Whyville* youth gained equivalent knowledge in coral reef biology, ecology and conservation. They also took part in specific activities, such as Save the Reef, to gain insight into current reef conservation practices. Save the Reef recreated real-world perturbations, such as overfishing and bleaching, which caused the reef to slowly change in appearance and composition over a period of several weeks. Core teen participants and *Whyville* youth were asked to identify the cause of the catastrophe and help alter the state of the unhealthy reef. They used the Reef Simulator module available within *WhyReef*, which allows players to test their hypotheses about the reef perturbation and develop solutions that they can implement through civic action.

The FijiReef Ning was used by core teens, expert participants (e.g., marine biologists, conservationists, and underwater photographers), and *Whyville* youth to share and provide feedback on the ideas, blogs, photos, videos, and projects posted to the social networking site. Given that real-time collaboration was not possible between all participants (e.g. 17-hour time difference), the FijiReef Ning became the virtual hub where teens in both countries and *Whyville* youth created and shared blogs and videos to learn about each other and about topics in coral reef biology, ecology and conservation. These blogs and videos were then shared with peers and experts to communicate knowledge gained and to obtain valuable feedback to increase that knowledge. While core teens in different countries and *Whyville* youth did not work on identical projects, they were able to share ideas, critique each other's work, and learn from their peers and experts.

In this program, fusing virtual and real experiences was a powerful combination for learning science content and empowering youth to engage in science. By including real-world activities, core teen participants were able to connect knowledge gained in the virtual settings to the real world, gather data and information from their local communities to share with their international peers, and then use those data and experiences to inform their conservation plans. Each set of core participants went on four field trips in which they were able to engage with and learn about local aquatic environments and participate in hands-on science. Teens in Chicago, IL participated in a fish dissection, received a personalized tour of the Pacific coral reef exhibit at the Shedd Aquarium, performed DNA extractions on coral reef fish samples, and explored their local aquatic environment on a trip to the Indiana Dunes National Lake Shore. Teens in Suva, Fiji participated in a fish dissection, went on an investigative trip to a local fish market where they interviewed fishers about changes in marine resources, visited a nearby village in a locally managed marine area, and explored their local aquatic environment by taking a snorkel trip on a coral reef.

For their final projects, teens attempted to make a real-world impact on Fijian reef conservation efforts. Both groups decided that making educational/outreach pieces would be the most effective way for them to address specific threats to Fijian coral reefs and encourage locals in Fiji to take action. Teens in Fiji wrote an article, later published in the Fiji Times, to raise awareness of overfishing and outlined causes, effects and possible solutions. Teens in Chicago wrote an editorial for the Fiji Times that called attention to the problem of abandoned fishing vessels, and also produced a public service announcement on the effects of garbage on coral reefs (http://www.vimeo.com/27538531).

Through evaluation of the blog posts, videos and comments on the FijiReef Ning, post feedback surveys, and post program interviews we were able to assess the program learning, inquiry and attitudinal learning goals for the core teens. We found that through the multi-faceted digital and real-world activities of ConConn, core teen participants showed their understanding of the interconnectedness of life in a reef, how food webs are important gauges of energy flow, and the consequences of disrupting that energy flow. These teens were also able to comprehend the causes of degraded corals and the main threats to them, and showed a deep understanding of the importance of reefs not only for the health of the ocean but also for the health of all animals, including

humans. Core teens also obtained a solid grasp of the varying problems with implementing strategies to save reefs, from cultural roadblocks to economic ones. They were quite astute at seeing the problem from varying points of view and understanding who may resist such conservation plans. Final projects showed that core teen participants gained an understanding of the interactions within a reef ecosystem, how humans are impacting these interactions, and ways to solve these problems to keep the ecosystem healthy. Incorporating global perspectives on local issues allowed participating core teens to have a more holistic understanding of these issues.

Aspects of ConConn that Did Not Work

While ConConn was educational for the core teen participants and achieved the learning goals outlined by program designers, some aspects of the program design did not work out as planned. Here, we highlight two ways in which the program failed to satisfy its core teen participants and failed to reach the broader youth audience from Whyville.net.

Fail #1, The Simplicity of *WhyReef*

Core teen participants of ConConn used *WhyReef* as a primary source of information due to its content, ease of use, low barrier to participation, and ability to provide an immersive experience for youth players. Gameplay allowed teens to virtually experience the charismatic ecosystem that they were tasked to conserve. Despite *Whyville*'s median user age being around 12 years, within *WhyReef*, we had previously observed a large number of older teens participating, which surprised us initially when we launched *WhyReef* in 2009. We decided to leverage this teen interest and participation when designing the activities in ConConn. However, surveys and interviews of core ConConn participants revealed that playing in *WhyReef* had the least appeal for both Fijian and Chicago teens. From the feedback, we learned that the core teens felt that *WhyReef* was too simplistic for them. *WhyReef*'s appeal rated last out of the 10 program activities listed in the post-program survey. One Fijian teen commented, "(Honestly) I didn't really like playing on *WhyReef* because it was (no offense :) a bit childish but it was also very informative." During the first session of gameplay in *WhyReef*, both teens in Chicago and Fiji were highly engaged and excited to be using *WhyReef*. Over the next few weeks of the program, this excitement wore off as the teens determined that *WhyReef* was below their age level. While teens still gained valuable information and assets from *WhyReef* to use in program activities, as the program progressed, teens increasingly asked and turned towards more age-appropriate information sources (such as expert-created videos, museum specimens, and text books).

This attitude towards *WhyReef* was in stark contrast with another program run at FMNH, called the Kids Advisory Council (KAC). The KAC was comprised of 15 students, aged 10 to 14, and aimed to assess how youth use digital and real-world museum collections and how each of these formats may enhance the other. KAC participants used *WhyReef*, supplemented by hands-on experiences with coral reef specimens and collections, customized programs at a local aquarium, and real-world interactions with reef conservationists. Participants then demonstrated knowledge gained to an audience of experts and peers through video production. KAC participants were highly engaged with *WhyReef* and, during gameplay, simulated real-life scientific observations about coral reef ecosystems, mimicking the scientific process in order to inform solutions to real-world questions; and had real-life "scientific discovery" moments and opportunities for "higher-level" engagement (Aronowsky et al, 2011).

One key difference between ConConn and the KAC was the utilization of *WhyReef*. In the KAC, *WhyReef* was central to the program and a significant amount of time was spent playing in the virtual world. Surveys and interviews revealed that many of the KAC participants played in *Whyville* outside of program hours. In ConConn, the use of *WhyReef* was more of a springboard into the main goals for the program, and less time was spent there during the program sessions. Additionally, ConConn teens did not use *Whyville* outside of the program, as neither set of teens had sufficient Internet access outside of their schools. Thus, partly due to program design and access, ConConn teens did not become invested members of the *Whyville* community, and the games and activities were perceived as childish, stand-alone activities and not part of a vibrant virtual world. It is possible that if we had recruited core teens from *Whyville* into the ConConn program instead of partnering with specific schools, the use of *Whyville* may have been more robust and organic.

A second, and perhaps important, difference was the age of the participants in each program: 10-14 for the KAC and 13-18 for ConConn. *Whyville* is targeted towards ages 8-16, with the average player

age being 12.3 years (Kafai, 2010). Because the graphics and point-and-click mechanics of *Whyville* are geared towards an audience younger than the core ConConn participants, it may have been natural for them to feel that *Whyreef* was "beneath" them and not challenging. In the future, we plan to scale back the use of *WhyReef* in programming for teen audiences and instead use it as an introductory activity and as a source for information and digital assets.

A final difference was the length of the two programs. While each program used the same model of virtual, digital and hands-on activities, the KAC occurred over a much more condensed period of time (4 full-day and 2 half-day sessions run over the course of a month compared to the twice-a-week full-semester after-school program for ConConn). This time frame could have given the KAC program a feeling of immediacy for the KAC youth. In comparison, it is possible that ConConn, a semester-long program, lacked a sense of immediacy for teen participants. Additionally, the duration of ConConn meant that the program encountered competition with other after-school activities such as sports, drama, and social events.

Fail #2, Recruitment of Whyvillians

A goal of the ConConn program was to create a community of interest-driven youth, generating and sharing content about conservation and coral reefs on the FijiReef Ning. Our plan was to recruit *Whyville* youth to the ConConn program to participate with the core teens from Chicago and Fiji and learn about Fijian reefs and their problems. To encourage the growth of this community, we placed an animated vertical banner in rotation on the main *Whyville* home page (to advertise the ConConn program throughout *Whyville*) and on the *WhyReef* Station landing page (to advertise to youth already interested WhyReef). This vertical banner linked to a ConConn landing page in *Whyville* that highlighted program activities, advertised virtual currency rewards for participation, and provided links to the FijiReef Ning. A "Y-Blast", a message sent to all Whyvillians using *Whyville*'s internal e-mail system, was sent out near the start of the program. Finally, MarkEOL, the avatar for FMNH Curator of Fishes Dr. Mark Westneat and the acknowledged coral reef expert within *Whyville*, wrote an article for the *Whyville Times* entitled "Saving the Reefs in Whyville and Fiji." This article was a call to participate in Save the Reef and to join ConConn to learn about and conserve reefs in Fiji.

Based on data provided by the parent company of *Whyville*, we know that 426,604 Whyvillians viewed the ConConn banner. Of these, 1,796 Whyvillians clicked on the banner to reach the ConConn landing page (a 0.42% click-through rate). Only 310 Whyvillians clicked through to the FijiReef social networking site (a 0.17% click- through rate), with 22 joining the FijiReef Ning. While these click-through rates are on par with click-through rates for similar sites (see below), we were disappointed with the low number of Whyvillians who joined the program and the even lower rate of participation despite the virtual currency incentives. Only six of 22 Whyvillians who joined FijiReef participated in the program and their participation was minimal. Most participation consisted of uploading a profile picture or commenting on content contributed by others. Only one Whyvillian contributed to an event by adding a blog about a coral reef species. Participation in *WhyReef* has been extremely high with 150,000 unique users visiting in the first year (Aronowsky et al, 2011), however, we wrongly assumed that this enthusiasm for *WhyReef* within *Whyville* would translate to enthusiasm for a related off-site program.

There are many reasons why participation among Whyvillians was low. The small number of Whyvillians who joined the program may have resulted from 1) the program existing on an external site and not embedded within Whyville; 2) only being able to see the front page of FijiReef and not being able to interact without creating a login; 3) requiring a new login and the completion of a short application form to gain access to the FijiReef site; and/or 4) a combination of any of these factors. While it is standard for many sites to require a login before posting comments and COPPA compliancy requires limiting access to member data before joining a site, it is possible that we would have had a higher level of *Whyville* participation if FijiReef had fewer barriers to membership.

However, another reason for the disappointingly low participation may have to do with our own expectations, rather than program design. It is possible that we set ourselves up to fail when it came to the participation of regular Whyvillians in ConConn. The ConConn click-through rate and *Whyville* participation numbers are lower than the accepted standard for Internet culture, the "90-9-1 rule" (Hill et al, 1992; Whittaker et al, 1998), that describes the percentage of people that will lurk (90%), comment on content created by others (9%), and become creators of content (1%). However, this "rule" might not be valid as online communities expand exponentially and become more specialized.

Some Internet authors note that a new rule may be emerging for different types of online interactions and for specific web niches (Steinberg, 2011). Data from Adweek suggests that there are significant differences in click-through rates for kid sites (0.37%), gaming sites (0.21%), and social media sites (0.08%) (Chapman, 2011). Given the Adweek data, we might expect *Whyville* click-through rates to be intermediate of these three values because *Whyville* crosses all three categories. Taking these newer opinions and data into consideration, our click-through rates are consistent for youth/game/social network click-through rates. Similar rates can be found anywhere on the Internet from Amazon.com to Wikipedia (Nielsen, 2006). We now believe that our expectations were skewed by the "90-9-1 rule" and not supported by more recent data and observations. We should have recognized this during the development phase of the program and planned accordingly.

Of the Whyvillians who did join the FijiReef Ning, low level of participation may be attributed to different factors, the first being the timing of the program. ConConn took place during the school year, a time when youth are typically at their busiest. We have found from four perturbations and Save the Reef events that we have facilitated in *WhyReef* since the 2009 launch that participation is significantly higher during the summer months than during the school year (Aronowsky et al, 2011, unpublished data). This also correlates with trends in *Whyville* where utilization peaks during school holidays. In fact one 11-year-old Whyvillian who joined the FijiReef Ning noted in a comment "yea me (sic) and my family are always sooooooooo busy now in days." A second factor that may have impacted ConConn participation by Whyvillians is the fact that ConConn activities included a significant amount of video production. While many youth have access to some type of digital camera, this does not mean that they are allowed to use the camera, or have the ability to create a video about an academic topic. For example, when a facilitator asked one *Whyville* member of the FijiReef Ning to contribute a video, she replied, "I don't think my mom would let me post videos and I would need her help...so..." A third factor that may have deterred participation by Whyvillians was a perception that the program was exclusive to the core teens in Chicago and Fiji and not open enough to the needs of Whyville lurkers. As the program progressed and more content was contributed and discussed via the FijiReef Ning, the content and comments morphed into a discussion of and by the core participants. This may have made lurkers feel like outsiders instead of invited guests.

This lower than expected rate of participation from the Whyvillians had a negative effect on the program learning and attitudinal goals, as we were not able to engage a large number of youth to learn and participate in Fijian coral reef biology, ecology and conservation. Only a small number of youth outside of the core teens were exposed to Fijian reefs and the global problems that they face. We are unable to assess if this low-rate of Whyvillian participation had any effect on the core teens. As stated above, we found that the core-teen received a rich experience from participation in the program. We can only speculate that an increased participation from *Whyville*, and hence disseminating to a broader audience, could have had an additional positive effect on the core teens.

Conclusion

From ConConn, we found that involving youth in ecosystem conservation is most successful when virtual, digital and real-world activities are fused to allow youth in disparate locations to enter into active, social, and meaningful relationships with each other, science mentors, and their environment. However we must pay close attention to the types of virtual worlds and digital media used to engage those youth. We should not assume that successful implementation of a virtual world in one program is transferable to other programs with different goals and demographics. As recent data and opinions suggest, digital participation rates may be decreasing and evolving and our future program designs will consider these facts more carefully. Running a program that is both tailored for a core group of teens and lurkers is a delicate balancing act, and one that requires more thought on the part of the project team prior to re-implementing this program model.

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