Taking Educational Games to the Afterschool: Teens and Researchers on a Quest in Collaborative Design-Based Research

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Abstract: In our ever-ending quest to promote science education, can we take educational games to the afterschool? Following the modus-operandi of the Israeli Scouts, two motivated teens (whom we call Cyberscouts) volunteered to join a collaborative design-based research (which we entitle as 'co-DBR'). Our shared objective is to design an effective model to bring educational games to the afterschool. This article reports the findings of the first iteration of the Cyberscouts model, in which the Cyberscout leaders designed and implemented the process of bringing the Quest Atlantis educational game to an afterschool setting. We find that the teens' ability to view the process "like a 10 year old" had a strong impact on the refinement of the model. We conclude that the novel co-DBR approach has the potential to serve as both a productive pedagogical approach, and as an added value to DBR methodology.

Introduction

It is not surprising for parents to find their kids playing video and computer games at their leisure time. With the flock of personal computers, netbooks, smartphones, iPads and game consoles, kids spend more and more time in front of the various media screens. The Pew Research Center (2008) reports that American teenagers (9- 17 year old) spend 9 hours a week, in average, on the Internet. Almost all teens (97%) play video and computer games, about 21% play massively multiplayer online games (Boor & Halpern, 2007; Lenhart, et al., 2008). Yet, many of these games can hardly be considered as educational. (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Lenhart, et al., 2008).

But educational games *do* exist, and few of them use the latest state-of-the-art technologies in order to keep par with commercial games, and create an environment that is both engaging and can enhance in-depth learning in general (Ketelhut, Dede, Clarke, & Nelson, 2006), and science learning in particular (Dickey, 2005; Kafai, 2006). Furthermore, the widespread of broadband internet and computational power have driven the evolution of educational Multi-User Virtual Environments (MUVE) and massively-multiplayer online games. Key benefits of MUVE games are that they can leverage aspects of authentic learning conditions, and they enable design of situations that are not possible or practical in real world (Barab & Dede, 2007; Hoadley & Lee, 2007; Ketelhut, et al., 2006). Rather than embedding "lessons", the educational MUVE games employ constructivist pedagogy and enable students to engage in science-based activities while promoting socially responsive behavior (Barab & Dede, 2007; Kafai, 2006).

The motivation for this research is driven by a strong personal experience. For the past eight years the first author of this paper has served voluntarily as a Scoutmaster in the Israel Scouts (The Zofim), and have studied (with great admiration) the unique educational enterprise based on youth counselors guiding younger children. The Scouts, as other youth movements, employ a common structure of social activity for children in the afterschool. The Scouts youth movement uses troop meetings, campouts, trips, and community service projects for educational agenda in a fun, playful and socially engaging afterschool setting (Dubas & Snider, 1993; Israeli Scouts Web Site," 2009; Kleinfeld & Shinkwin, 1983). The Zofim pedagogical way of operation is unique, and differs greatly from the US or European Scouts, due to the fact that the guides and mentors of the young scouts are all teenagers (ages 16-18), who carry all the duty for planning, executing and refining their educational work with the younger scouts. We are inspired by the possibility of using a similar model to attract teens to divert "afterschool" time to play virtual educational games.

The Current Research

Our overreaching goal in this research is to promote science learning in informal settings. To do this we decided to develop a model that brings educational MUVE games to afterschool game communities. This model, which we call the Cyberscouts model, suggests engaging teens in mentoring younger kids in playing virtual educational games, with the supporting procedures, tools and structures to ensure the sustainability and the effectiveness of the model. The teens, which we call Cyberscout leaders, receive guidance from a more experienced mentor, which in our study was the first author of this paper.

Since no similar model that we could build on was previously developed, we decided to design the Cyberscouts model using a Design Based Research (DBR) approach (Collins, Joseph, & Bielaczyc, 2004; Kali, 2008), which would enable us to refine our model based on multiple iterations in real-world settings. To build a model that would attract kids so much that they would want to participate in the designed activities in their afterschool time, we knew that we need not just an attractive educational MUVE game, but also activities

designed and led by those who know best what these kids like. We decided to design the process of creating a group of players, training and mentoring them for the duration of the game in a collaborative design process with two teens that we recruited for this Cyberscout leader role.

This approach, in which researchers collaborate with practitioners who have much experience in the field, but less experience in designing technology-enhanced innovation is similar to what Penuel, Roschelle, and Shechtman (2007) defined as 'co-design'. In our study, the cooperation between the researcher as a mentor and the Cyberscout leaders as co-designers potentially goes beyond what Penuel et al. (2007) define as co-design. We decided to expand the collaboration to include not only the design process, but also to involve the Cyberscout leaders (we will refer to them as simply 'leaders') in the iterative design process of DBR. We assumed that both the leaders and us, the researchers, would benefit from making design decisions together based on iterative enactments of the collaboratively designed artifacts and procedures. We entitle this approach as 'co-DBR'.

Our research objectives were three-fold: (a) To design an effective model for afterschool MUVE-game based learning and to explore its effectiveness, (b) To explore the learning processes of the leaders from being involved in such a process, and (c) To examine the potential of the co-DBR approach as both a pedagogical approach, and as an added value to DBR methodology.

This article reports the findings of the first phase of the co-design, in which the first Cyberscout leaders implemented the model with a group of ten kids, and on the conclusions regarding refinements required for the next implementation of the project. Specifically, the research questions we sought to answer were:

- What elements are required in a model that seeks to bring educational contents into afterschool play?
- What are the benefits and challenges for the Cyberscout leaders?

Methods

Context and Design Process

This research is built on top of two existing, well-established educational models. The first is the Quest Atlantis game, with its comprehensive Teacher Toolkit, teacher training material, instructions, game introductory unit, and variety of educational quests and units. This MUVE game, developed at the University of Indiana was chosen because it encompasses social agenda and pluralist values, and combines effective game-based learning with entertainment and fun (Barab & Dede, 2007; Barab, et al., 2005). The second model is the Zofim's operational and pedagogical methods to build and mentor groups of youngsters ("Israeli Scouts Web Site," 2009). While Quest Atlantis is primarily used to run in classrooms or computer-clubs (Barab, et al., 2005), the Zofim methods are focused solely on informal afterschool settings, at the physical, real world, with no cyberspace activity. It is the motivation and experience of the researchers that connects the two worlds together. One researcher with a breadth of experience in mentoring non-cyber Scout Leaders, and the other researcher who is experts in educational technologies and DBR methods.

Consequently, we invited experienced scout leaders to volunteer for this research not only as experienced practitioners, but also as collaborators in design and research of the Cyberscouts model. This is consistent with the Zofim paradigm, in which Scout Leaders assume leadership roles and design their course of action. This positions the leaders that volunteered for this research as experts and equal members of the co-design team.

For the duration of the project (Nov 2009 till April 2010) the leaders and the researcher met for eight co-design meetings, 60-90 minutes each. During this time, the leaders also met three times with the game players, and followed them for a 4-week period. It was the leaders who actually enacted, while being guided by the researcher-mentor. In these meetings they designed the entire process of creating game groups and guiding them through the game process. The leaders designed the approach to take, conveyed key messages for their players, which artifacts to produce, and defined the division of labor in order to get things done on time. They also decided on the initial settings and ground rules. The researcher, as part of the 'co-DBR team' assumed the role of an expert to bring a systematic approach and reflective methods to enrich the decision-making process.

Participants

As mentioned above, the research involved two types of participants: Cyberscout leaders and game players.

1. **Cyberscout leaders.** The leaders were two high-school male students, 17 year old, 11th graders from one high-school, who volunteered to be the leaders and become part of the co-DBR team. The students, Dave and Jack (pseudonyms) have prior experience in guiding younger kids (Jack with the Zofim, and Dave with another youth club). They can be characterized as highly motivated, high-achieving and very occupied students. In addition to studying in demanding school programs, i.e. majoring in chemistry, biology, computer science and ICT, they volunteer to community work, have hobbies, including the Zofim, and like many of their friends, devote much time for computing and gaming.

2. **Game players.** The players were ten younger students, grades 5th to 7th (three girls and seven boys) from a school in a high socio-economic demographic area. The specific school was selected primarily due to the active support of the principal in novel educational projects in general, and in this research in particular. The school opened its door to the leaders, and allowed them to invite kids to join the game. It was up to the kids to decide to sign up to this afterschool activity. They signed up with their parent's consent, and no screening was done.

Data Sources

Our raw data includes transcripts of meetings and interviews with the leaders. This covers about 70% of the eight design meetings (60-90 minute each), two semi-structured interviews (mid-term and end-term), and two reflective meetings at the completion of the project, after which the team generated a Final Recommendations document, which also served as data. More qualitative data was collected from observation notes and a researcher journal. In addition, all artifacts created during the process were collected. This includes electronic data of a Facebook page, website (Google Sites), presentations, invitation cards, YouTube movie, and on-line docs (Google Docs). Finally, the Quest Atlantis log data served as a tool to follow the work of the players.

Findings and Discussion

The co-DBR team, namely the researcher-mentor and the two leaders, made several decisions about the initial conditions and ground rules for this iteration of the design. Some of these decisions (1-3) were made in advance, with full awareness, and some (4-5) were realized as decisions only during the enactment. According to the transcripts of the first two meetings, and the end-term reflective document, this includes:

1. To use Quest Atlantis "as is", with no modifications to its game units, introductory unit, and norms.
2. To use the game in its native language, English, with no localization or translation.
3. To cooperate with the school and build the game group only from its members.
4. To accept all players that want to sign up, without any screening.
5. To use mainly virtual social networking tools, alongside the Quest Atlantis virtual community, as means of communication and bonding.

Design-Related Outcomes

This iteration of the design focused primarily on the model itself and the Cyberscout leaders, therefore data analysis encompassed the leaders only. Following Ronen-Fuhrmann and Kali's (2008) DBR analysis approach, our findings were interpreted as "challenging design outcomes" which needed to be explained and resolved for the next iteration as follows:

1. **Cumbersome sign-up process.** The formal sign-up process required that players would ask their parents to sign multi-page paper consent forms. Out of 23 potential players that expressed an interest to sign up for the game, ten players completed the sign-up process. Additionally, user names were generated only by the administrator. Prior to the enactment, the leaders identified this process as an obstacle: "It's very different from other games, where you just create a user name and password and you are immediately in the game" says Jack (End-term interview). In order to reduce this barrier, the design team made a design decision, which was applied already in the first enactment, to frame this activity in a kind of sign-up ceremony at the end of a group meeting with the leaders. However, evidence shows that this workaround was insufficient, and nearly 60% of the players gave up and didn't complete the signup process.
2. **Inadequate introductory unit.** The original introductory unit was designed for classroom use, and requires over 60 minutes to complete. The co-DBR team accepted this as a given, although both Dave & Jack expressed concerns about the length of this unit (Transcripts of meetings 1 and 2). Out of the ten players, only four players passed this stage and continued to play the game. "Kids are the most impatient human beings" says Jack, "an intro unit that takes lots of time to complete, with long reading parts, it is daunting" (end-term interview). Dave and Jack shared the same feeling that the introduction unit is the number one obstacle of the game (end-term interview, final recommendation document).
3. **Communication difficulties.** The artifacts and electronic data show that the leaders used all popular means of communication. A website for announcements, a Facebook group, IM and Skype, emails, and sms's. However, the leaders reported about difficulties in communicating with the players. Most players ignored emails and messages and log in when they chose to, and not when leaders were available for online support purpose. Being in a free-choice, informal settings, the players ignored requests to sign in at specific times.

Cyberscout Leaders' Related Outcomes

We find that the two leaders assumed a double role, as educational leaders as well as design "researchers", and intentionally navigated between these roles to rationalize their decisions in the following manners:

1. **Identifying educational potential.** As educational leaders, they made critical remarks about the game and how it can be most effective in afterschool settings. For instance, in the final reflective meeting, Dave and

Jack highlight that most units in Quest Atlantis deal with real-world dilemmas. "I like the method of open debates" says Jack, "… we need to do it at physical meetings… you achieve a lot in these debates, it opens up the opportunity to meaningful learning and kids learn a lot". Jack suggests doing it at the same way it is done at the Zofim. "There are moral dilemmas and social conflicts [in the Plague unit] … and in an open debate you can reach deep level of discussions and kids learn from it. They don't need to change their minds, but they learn to listen to other views and this is equally important", says Jack.

2. **Assuming a researcher's role.** One of the initial constraints was the decision to stick to the English language of the game, with no localization or translation. The leaders brought up this issue several times to the discussion, but refrained from taking a stand about this topic until they studied it carefully and collected "empirical evidence".
3. **Assuming a designer's role.** Dave and Jack reflect on the relationship between the school and the afterschool, and the linkage to the Zofim in the Cyberscouts model. "The school is just a convenient way of communication [with the players]" says Dave, "it is just a resource". "We don't want to be perceived as school-related afterschool activity" agrees Jack, during the final reflective session. They both reiterate this several times, and explain that linkage to school will deter kids from joining. Similarly, they suggest to refrain from linkage to the Zofim youth movement. "I'm sorry", says Dave, in a polite attempt not to hurt the researcher feelings, "it will have negative connotation for kids [who are not enrolled to the Zofim]".

Co-DBR Related Findings

The two leaders formed, together with the researcher, a design-based research team. Our findings show that although the researcher served as a "grown-up supervisor", the leaders saw themselves as equal partners in the co-DBR team. This was evident in the transcript of the final team meetings and the content of the final recommendation document, in instances in which the leaders did not hesitate to challenge the researcher or the Quest Atlantis design team. For instance, Jack said "we have an advantage. We have a closer point of view (to the kids). This is not like a 30-year old teacher trying to think like a 10-year old kid. We think closer to his age, so I can tell what is more fun, what is less fun, a closer point of view". Consequently, both Dave and Jack vote against the researcher suggestion to link the afterschool game activity to the school, even indirectly. They voice their opinion with confidence, and are not derailed by the researcher's (potential) authority.

Lessons Learned about the Model and about co-DBR

We find ourselves, at the end of the first iteration with conclusions in two arenas: (a) a local arena related to improving the Cyberscouts model so that it will better serve the goal of bringing science into the afterschool, (b) a more general arena summarizing the lessons learned regarding the co-DBR approach.

How to Improve the Cyberscouts Model

In addition to conclusions regarding the obvious need to remove obstacles, such as the sing-up process and the introductory unit, which were addressed by the Quest Atlantis design team, independently from the current research, the following conclusions were made regarding the Cyberscouts model:

1. **Social proximity.** To increase communication, it is important to maintain a certain social proximity between the Cyberscout leaders and the group of players. Players and leaders should either live in the same neighborhood, or study in the same school. We found out that even when we bring skilled leaders, it is difficult to overcome communication barriers and the lack of some sort of acquaintance. By electing to cooperate with a school in different township, our communication was not effective, and our leaders lost the ability to communicate with the kids during school breaks or immediately after school hours.
2. **F2f vs. virtual social networking.** The virtual social networking tools were not sufficient to create the social capital needed for the game players. In the informal setting of the afterschool, the virtual tools were not enough to grab the players' attention and call them for action. F2f social networking is required not only for practical reasons, such as training sessions, but also for improving communication by speaking at school breaks. We conclude that the f2f social networking is also required to create a team of players, with the benefits of playing together in the game rather than playing as a set of individual players.
3. **Reflective player group meetings.** As one of the Cyberscout leaders suggested, periodic face-to-face meetings of the whole player group have the potential to enhance the learning experience. The meetings can enhance the social bonding of the group, and improve the cooperation between the players while questing on Quest Atlantis.
4. **School - afterschool relationship.** Following the strong evidence reflected in our findings, we will modify the model to use the school as a resource only, and remove the linkage to school as a part of the model.

Benefits of the co-DBR approach

This study defines a novel extension to the already mature DBR methodological approach, by integrating it with the relatively new co-design approach. Co-DBR takes advantage of both DBR and co-design. It maintains the

systematic and iterative manner in which DBR investigates learning in the context of design. But it also enables to incorporate into the design a fresh perspective brought by a practitioner (who is a teacher in Penuel et al (2007) but a teenager in the current study). Our findings show that co-DBR is a win-win situation with clear benefits for both the practitioner and the researcher. The leaders' benefit in the current research was evident from their great satisfaction of the collaboration. They felt that they learned a lot, and maintained their enthusiasm even though the implementation did not work as expected. The benefit for us, the researchers was invaluable – we are now equipped not only with innovative ideas for how to refine the Cyberscouts model, but also with a viewpoint of "insiders", who know best how to attract kids to participate in this model.

We view co-DBR as both a pedagogical and a methodological approach. It is pedagogical, because it can be used to help practitioners learn important things about the learning/teaching environment they are part of. It is methodological in a similar way that DBR is methodological, but extends the viewpoint of the researcher with the perspective provided by the partnership. Finally, co-DBR seems to have a great potential, especially for exploring design for informal learning contexts, in which our perspective of learning, as researchers, is still limited. More research is required to get a better understanding of how the collaboration in co-DBR can work best, and to define guidelines for pursuing this promising direction in a productive manner by other researchers.

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