Serious Games in Free-Choice Setting: Cooperating With Teen Leaders to Blend Learning and Fun

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Abstract

The overarching goal of our research is to leverage the popularity of virtual games to engage kids ages 12-14 in scientific exploration and learning in the informal settings of the afterschool. Following the design-based-research directive, we designed the CyberScouts model to engage kids in playing a serious educational game at leisure time.

The educational MUVE game of choice, Quest Atlantis, has been used in the enactment with no modification. We found that by thoughtful design of the social infrastructure to fit the free-choice settings and norms the enactment attracted players with varying gaming profiles. The players exhibited high degree of motivation to stay with the enactment and engage in on-task learning activities. Moreover, prolonged engagement of the players after the completion of the short intervention indicates that the model was effective in motivating the players to continue play and learn in the virtual environment.

Adopting the successful methods of the Scouts, we invited teens to lead the CyberScouts enactment. We conclude that the leaders significantly contributed to the design thoughtful refinements to the enactments, and suggest that stakeholders and educators can benefit from cooperation with teen leaders in various free-choice educational projects.

Keywords: Serious games, Free-choice learning, Afterschool, Informal learning of science

Introduction

In the quest to increase youth engagement in science, our research suggests a model that combines what kids like to do (play computer games) with game-based socio-scientific inquiry. Within the realm of educational computer games, "serious" educational games are designed to offer a complex, motivating and engaging learning environments (Aldrich, 2009; Kirkley, Kirkley, & Heneghan, 2007; Ulicsak & Wright, 2010). Taking such successful serious game, used primarily in classrooms (Barab et al., 2005), to the free-choice afterschool is not straightforward.

Since no similar enactment model that we could build on was previously developed, we opted to design one using the Design Based Research approach (Barab & Squire, 2004; Collins, Joseph, & Bielaczyc, 2004; Kali, 2008; The Design-Based Research Collective, 2002), and refine it based on multiple iterations in real-world settings.

This CyberScouts model is inspired by the successful modus-operandi of the Israeli Scouts to engage teen in mentoring younger kids. We postulated that by cooperating with the teen-leaders (only a few years older than the players) we could transition the teacher-led serious game to a fun and engaging free-choice enactment.

Theoretical foundation

The CyberScouts model bridges two existing, well-established educational foundations. The first is the Quest Atlantis game, which combines relevant scientific curriculum with a state-of-the-art technology (Barab & Dede, 2007; Barab & Squire, 2004; Barab et al., 2005). The second is the youth movements' pedagogical methods to build and mentor groups of youngsters in the free-choice setting of the afterschool.

Serious educational games

Within the realm of educational computer games, "serious" educational games are designed to offer a complex, motivating and engaging learning environments (Aldrich, 2009; Ulicsak & Wright, 2010). The rapid pace of advancement in virtual worlds technology made it easier for educators to use multi-user virtual environments (MUVEs) to design of immersive, highly graphical, multiplayer educational games. The highly motivating aspects of the multi-player virtual world are suitable for the design of serious online inquiry-based collaborative learning environment that is appealing to kids (Barab et al., 2005; Dieterle & Clarke, 2007; Ketelhut, Nelson, Clarke, & Dede, 2010). The "quest" is a common element in the adventure narrative of MUVE games. Players often have a role (either pre-constructed or self-designated) and are required to overcome difficulties or perform given tasks along the way. The role-playing and the fantasy narrative scenarios help players to practice skills, which may be applied to real world scenarios (Dickey, 2006). The serious game used for this research – the Quest Atlantis MUVE game – is aligned to standards-based curriculum and used in classrooms worldwide. The game engages the players in a socio-scientific inquiry while playing a quest in the fantasy world of Quest Atlantis.

Youth movements and their pedagogical methods

Data available on youth movements in Israel proves their effectiveness in development of value commitment, socialization, and development from childhood to adulthood (Kahane, 1975). Core to any informal youth organization is 'free-choice' and the fact that youth can choose to leave the activity at any point, and select any other leisure or recreational activity (Kahane, 1975). Israeli youth movements, such as the Israeli Scouts, successfully constructed a method of teen leaders guiding younger kids without direct adult intervention ("Council of Youth Movements in Israel", 2013; "Israeli Scouts Web Site", 2013). This teen-leadership practice is very different from most international scouts organizations. Kahane (1975) argues that the degree of 'adults intervention' is one of the characteristics of youth organizations, and ranks Israel's youth movements as very close to an "ideal youth organization". This method of teen-leaders served to transform a serious game, namely Quest Atlantis, which was originally designed for formal settings, to be used in the free-choice afterschool settings.

Designing for free-choice learning

The enactment model in this research looks beyond the technology and learning materials and includes the setting and the social infrastructure associated with it. Bielaczyc (2006) describes the importance of the social infrastructure in integrating technology-based tools into classroom practice, and suggests a framework for design and analysis.

While this framework is rooted in the context of classrooms, we found it applicable for informal setting when expanded by the principles of the model defined by Kahane (1975). Table 1 demonstrates this dimensional expansion of the framework to the informal domain:

Table 1. Designing social infrastructure in informal settings

		The social infrastructure framework (Bielaczyc, 2006)			
		Cultural beliefs	Practices	Socio-techno-spatial relations	Interaction with the 'outside world'
The youth informal organizations model (Kahane, 1975)	Active expressiveness and attractiveness				
	Symmetric relationship				
	Multi-dimensional activity				
	Structural duality, moratorium, and the transition of youth			Example 2	
	Institutional autonomy and adult intervention				Example 1

Specific combinations of the dimensions from both the social-infrastructure framework and the youth organizations model are expressed in the design considerations in the following examples:

- **Example 1:** The 'interaction with the 'outside world' dimension in Bielaczyc's framework refers to the ways in which students interact with people outside of their immediate classroom context. Kahane's principle of 'institutional autonomy and adult intervention' refers to the desire of kids to have autonomy to express themselves, free from supervision. The combination of this dimension with the principle of 'Institutional autonomy and adult intervention' in this research implied that the kids could potentially perceive presence of the leaders in their virtual word as an act of supervision. Hence, this is expressed in the teen leaders' decision to refrain any presence in the virtual world. This decision referred not only refrain from login to the game at the same time as the players (therefore eliminating any presence of 'teacher' avatars in the virtual world). It also referred to their decision to avoid other virtual connections through social networks sites such as Facebook.
- **Example 2:** The 'socio-techno-spatial' dimension in Bielaczyc's framework focuses on the organization and configuration of the physical and virtual spaces and the interaction of the participants with these spaces. One component of the concept 'structural duality, moratorium, and the transition of youth' in Kahane's model has a great impact on designing in this dimension. Kahane argues that the principle of moratorium, which grants kids in informal setting the freedom to temporarily break rules or bend formal boundaries, allows kids to experience in different types of norms among peers. While such behavior in a formal classroom is not considered normative, it is normative in informal youth organizations and of great importance in the gradual transition between childhood and adulthood. A prime example in this research is expressed in the design consideration to allow certain behaviors of the players when appropriate, even if this conflicts with formal norms of the physical setting. For instance: the decision to relax restrictions on food, music, or smartphone use,

although the meetings took place in a computer classroom with different norms during formal use. A typical scene illustrated in Figure 1.

Figure 1. The leaders (seated, left) and players in the midst of heated discussion

The CyberScouts model

The CyberScouts model in this research adopts youth-movement operational methods and pedagogies to contextualize existing serious games within the norms and preferences of youth in the afterschool. The study focuses on the impact of implementing the CyberScouts model on players' voluntary participation, engagement, and learning of science and the consequences of refinements in the design on: (a) the engagement patterns and learning profiles of the participants, and (b) on the effectiveness of the learning environment.

Following the design-based-research methodological approach, four iterations were conducted, in which the model was enacted, data was collected and analyzed, and refinements were made for the next iteration. Altogether 26 players (grades 7 and 8) participated in 3 consecutive weekly meetings facilitated by teen-leaders. Two 6-year high schools at the northern Hasharon area hosted the enactments on their facilities, outside of school hours. The six 10-grade leaders who volunteered (three in each site) had prior youth-movement experience. The players could voluntarily play the Quest Atlantis game at their leisure time, during and after the enactment.
The data sources included observations, semi-structured interviews, game data, and field-notes. We used the mixed-methods approach to analyze our data. Specifically, quantitative analysis was used to interpret engagement and participation from usage statistics, coded data, and scores in the virtual domain, and qualitative analysis was used for interpreting learning, norms and attitudes from interviews, field notes and observations.

Findings

The changes to the degree of formality of design parameters made each enactment unique, and impacted the enrollment, participation, engagement, and learning outcomes of the players. This paper reports the findings of the study related to the engagement patterns of the players, and the impact of the design changes. The schematic representation in the following Figure 2 offers

visual cues to the degree of formality/informality and the nature of each enactment. The location of the arrows on each of the meters qualitatively indicates three parameters:
Setting: how "informal" was the setting of the enactment (social and physical) as a result of design refinements and external events.
Instruction: how serious (or formal) was the instruction of the leaders in the enactment.
Participation: indicative view of the degree of participation and engagement, based on game data and observations.
Therefore Figure 2 illustrates the varying atmospheres of the enactments:

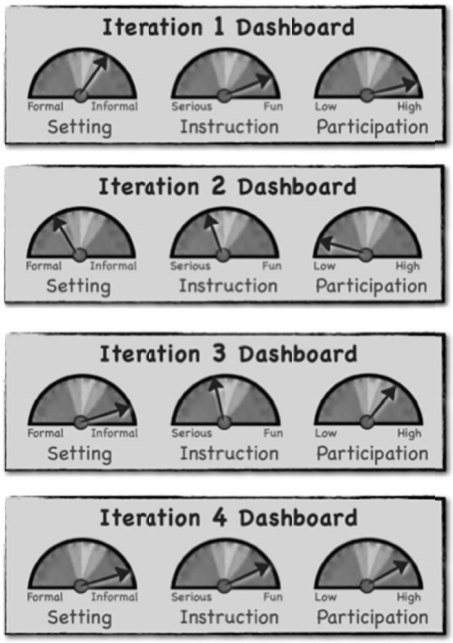

Figure 2. Schematic representation of the CyberScouts enactments

The recruitment process of players to the enactment and the instruction method demonstrated high sensitivity to the degree of informality. This led to differences between the groups in gender mix and gaming habits. The research found two distinct groups of players with different playing patterns and engagement profiles, attributed to gender and gaming preferences. We chose to name the groups in names that fit their gaming profile and observed behavior: the ***Racers*** and the ***Questers***. Table 2 presents the quantitative indicators for participation and engagement of the two groups:

Table 2. Participation and engagement by group

Engagement type		Racers	Questers
Playing the game	Login to the game, average	24.80	26.75
On-task engagement	Game award points, average	10.60	3.67
	% players still in early stage	10%	33%
	% players in advanced game stage	60%	42%
	Attention to the game narrative	0	50%
Prolonged interest	% players who played optional play-spaces of Quest Atlantis	40%	0%
	Game award points gained after last meeting, average	3.10	0.83
	Days played after last meeting	22.50	28.25

The **Racers** (players of the 1st iteration, n=10) were all gamers, mostly (70%) boys. They race through the game, find shortcuts and share their tricks with friends. They are less interested in the fantasy storyline and are quick to explore optional virtual play-spaces. They are eager to win as many game points as possible, even after the enactment is over.
The **Questers** (players of the 3rd&4th iterations, n=12) are mostly (83%) girls, the majority (63%) hardly ever played computer games, and they enrolled because it sounded interesting and fun. They stroll in the virtual world, patiently follow the fantasy and the quest, ignoring missions from optional play-spaces that can reward them with more points but derail them from the path they go.

The research found that the CyberScouts model not only attracted kids with varied gender and gaming habits to enroll, it also succeeded to attract them to login (average >24 of both groups) and to spend considerable time "on-task" in the educational world (Table 2). Some available research data on the use of Quest Atlantis in schools and community clubs (Barab, Dodge, Tuzun, et al., 2007), indicates that in such context a lower average of about 21 logins for 12-14 lessons is typical. Although the enactment mentioned in their study occurred in totally different settings, it can serve as a general reference, and suggest that the number of logins can be interpreted as a high level of engagement in this study.
Moreover, the short (three meetings, two calendar weeks) enactment resulted in engagement long after the conclusion of the intervention. This voluntary prolonged engagement in the virtual educational world by itself can indicate learning in informal learning environment (National Research Council, 2009).

Conclusion

The enactment of the CyberScouts model is contextualized in the informal, free-choice leisure-time domain. The theoretical expansion of Bielaczyc's design in social infrastructure (2006) to the informal domains defined by Kahane's general model (1975), was practically implemented in this research. The players are free to enroll, or leave if they feel uncomfortable. The physical environment is modified as well to be as informal as possible. There are no adult supervisors – just teen leaders who are free to design the settings and social activities to maximize engagement and satisfaction of the players.

We found the even perceived minor changed towards formality can result in very powerful negative effects on certain aspects of the enactment. For example, assigning the leaders to invite kids to participate proved to attract boys and girls alike, with different gaming habits or attitude to science. Increase in the formality of this process or linkage to school had a negative impact on the willingness to participate and increased dropout. We believe that researchers and educators can benefit from this theoretical expansion and design insights when designing novel free-choice learning environments that use technological educational tools.

We also would like to suggest that the method of appointing teen leaders is undervalued and underused. Their cooperation and active participation made the enactments possible. While accepting teens as leaders of younger kids is a norm in most Israeli youth movements, this is hardly the case in other formal or informal educational establishments. We conclude that the leaders significantly contributed to the design of the model and thoughtful refinements of the enactments. This suggests that stakeholders and educators can leverage this cooperation with teen leaders to successfully implement various educational projects.

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