Playing in School or at Home? An Exploration of the Effects of Context on Educational Game Experience

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Abstract: The goal of this paper is to gain insight into the effects of context on the educational game experience. More particularly, it deals with the differences in the playing and learning experiences of adolescent players in a domestic (N=135) compared to a classroom (N=121) context. It is hypothesized that the playing and learning experiences will differ significantly between contexts. Results of the quasi-experimental design suggest that game and learning experiences are higher in a domestic compared to an educational context. These experiences, however, are influenced by the time spent playing and by technical performance. Moreover, the effect of experiences such as enjoyment and identification on learning experiences have a more substantial impact on perceived learning than differing contexts.

Keywords/Key Phrases: context, awareness-raising, game-based learning, situated play, game experience.

1. Introduction

The use of digital games for learning has received considerable academic attention in the past decade (Gros, 2007; Kiili, 2005; Michael & Chen, 2006; Papastergiou, 2009; Prensky, 2003, 2005; Ritterfeld, Cody, & Vorderer, 2009; Smith & Mann, 2002; K. Squire, 2005b; Squire & Jenkins, 2003). Educational games cover a broad range of topics featuring different goals eliciting different types of use. Moreover, playing games and learning are context embedded activities. Thus playing the same game in an educational context tends to be experienced in a different way than in the private sphere (K. Squire, 2005a). Whilst the use of learning games has been studied in educational settings, little is known about how such games are experienced when played in other environments and even less is known about the experiential differences between differing settings. The aim of this study is to explore whether the play and learning experiences evoked by playing an awareness-raising game differ between a domestic and an educational context. More particularly, we present a quasi-experimental design in which we compare experience and learning between players in school and at home of the social awareness raising game Poverty Is Not a Game (PING). First, we provide a brief overview of existing literature on the influence of different contexts on the game experience. Next, we discuss three experience dimensions related to playing educational games. Finally, we report on the empirical exploration of how the awareness-rising game PING is experienced in the different settings.

2. Poverty Is Not a Game

In order to understand the choice of the theoretical constructs underlying this research, the game used for testing is briefly described. Poverty Is Not a Game (PING) is an awareness-raising game of which the primary aim is to raise consciousness in adolescents concerning poverty and social exclusion in a way that relates to their everyday lives. The game takes place in a three-dimensional environment which represents an average Western European city. Players can choose between a male or female avatar. Although the decision to play with a certain avatar has an impact on the storyline, the central message the game wishes to convey is the same. It aims to raise awareness concerning the mechanisms underlying poverty and is specifically aimed at what is sometimes referred to as the fourth world. Academic insights in learning and games motivate the inclusion of enjoyment and learning effects in the research design (cf. infra). However, due to the importance of the avatar and its relation with the story,

there is also a strong interest in how players identify with their avatar and how this is related to their playing and learning experiences.

3. Theoretical framework

3.1 Play in context

While video games take place in a virtual world, they are played by individuals in a physical space defined by socio-spatial characteristics. These characteristics influence and shape the individual game experience (Mäyrä, 2007). It is therefore surprising that until now, little attention has been directed towards integrating contextual factors into conceptualizations or operationalizations of game experience or into empirically grounded game experience research (De Kort & Ijsselsteijn, 2008). According to Mäyrä (2007) immediate social and personal contexts influence the experience while, on a more abstract level, experiences are influenced by social norms and values, by the contexts of digital game production and by the contexts provided by earlier forms of gaming and play. This model remains high-level however. The idea of social norms and values for instance is a complex one. Playing a video game in a public versus a private place can be expected to result in a different game experience because the possible socio-spatial affordances are shaped by the public or private character of those places. While such consideration might fit Mäyrä's model, it does little more than that. To our knowledge no other integrated models have been proposed that approach game experience as a contextual phenomenon.

Most research taking into account the role of context does this from the immediate sphere of social context. De Kort and Ijsselsteijn (2008) give an overview of possible social roles (e.g. spectator, co-player, opponent) and discuss how these roles might evoke different experiences. Empirically, several authors have explored the importance of the social component as motivator for playing games (see e.g. Cole & Griffiths, 2007; De Vocht, Van Looy, Courtois, & De Marez; Griffiths, Davies, & Chappell, 2003; Yee, 2006a, 2006b). Others have used a comparative approach to see how different social contexts affect the game experience. Weibel and collegues (2008) explored the experiences of people when playing online against a human versus a computer controlled opponent and found higher instances of presence, flow and enjoyment for people playing against another human. Likewise, the differences in several game experience dimensions between virtual, mediated and co-located play have been studied for adolescents (B. Gajadhar, de Kort, & IJsselsteijn, 2008a, 2008b) and seniors (B. J. Gajadhar, Nap, de Kort, & IJsselsteijn, 2010).

While the aforementioned studies provide valuable insights into the effects of different social configurations on the game experience, they do not take the broader setting in which these games are played into account. Educational games, for instance, can be played in a classroom context. This imposes certain limitations regarding the possible social and spatial configurations in which such games are used. It is argued that these broader contexts instill different social roles and have different spatial and physical characteristics. Research taking the broader context into account in this manner can mainly be found in research on computer-supported collaborative learning in which the effect of group learning in a computer mediated environment is examined (Kreijns, Kirschner, & Jochems, 2003; Nastasi & Clements, 1993). These studies, however, only focus on different social configurations within the educational context. To our knowledge, no empirical research has explored how the educational game experience differs between a school and a domestic context.

3.2 Game experience and digital game-based learning

3.2.1 *Enjoyment*

While video games evoke a broad range of different experiences, most studies focus on what makes them enjoyable. Several approaches exist, however, as to the causes and conceptualizations. Vorderer et al. (2004) identify motives and user and media characteristics as determining factors leading to enjoyment. Tamborini et al. (2010) approach enjoyment from an interpersonal point of view and conceptualize it as the satisfaction of three different needs: autonomy, competence, and relatedness. On a similar plane Sweetser and Wyeth (2005) define game enjoyment in relation to intrinsic motivations and

adapt the flow theory (Csikszentmihalyi, 1990) to the specificity of video games. Notwithstanding these different approaches, they all take into account the role played by the social context. As discussed earlier, empirical studies have found a significant effect of social context on enjoyment. It is argued that this direct effect not only holds true for social context, but that enjoyment will also differ between a private and a public context.

H1: The enjoyment evoked by playing an awareness-raising game in an educational context will differ significantly from playing it in a domestic context.

3.2.2 Learning effects

Enjoyment is regularly conceptualized as the motivational basis for digital game-based learning (see e.g. Garris, Ahlers, & Driskell, 2002; Michael & Chen, 2006; K. Squire, 2005). Video games are intrinsically motivating because they are enjoyable and it is this trait that is used as a lever to facilitate learning (Chuang, 2007). Authors like Gee (2003, 2005, 2007) and Prensky (2003, 2005) argue that the motivational nature of video games combined with certain educational content will make learning more effective. Moreover, several models have conceptualized learning as an effect of enjoyment (Kiili, 2005; Vorderer, et al., 2004).

H2: Feelings of enjoyment positively influence perceived learning effects

However, previous research has shown that different social configurations lead to different learning experiences (cf. supra). Analogous with enjoyment, it is argued that the broader context affects the range of socio-spatial possibilities. This will in turn result in different learning experiences.

H3: The learning experiences evoked by playing an awareness-raising game in an educational context will differ significantly from playing it in a domestic setting.

3.2.3 Identification

Identification is a concept that has been used in traditional media research to explore the attractiveness of media such as television, film and books. Two central concepts are connected to the process of identification: perceived similarity and wishful identification. The former entails that the process of identification is possible because the observer has certain salient characteristics in common with the character (Feilitzen & Linné, 1975). Wishful identification refers to the desirability to imitate the virtual character in general or specific terms and is related to the idea of vicarious learning (Konijn, Bijvank, & Bushman, 2007). To account for the specificity of games, Van Looy and colleagues (2010) propose to introduce the concept of embodied presence (see also Ducheneaut, Wen, Yee, & Wadley, 2009). This concept combines the idea of presence (Lee, 2004; McMahan, 2003; Schubert, Friedmann, & Regenbrecht, 2001) with the fact that experiences in a virtual reality are observably mediated, hence embodied. On account of learning effects, the concept of identification is closely related to social learning theory (Konijn, et al., 2007). With an awareness-raising game that uses the character and storyline to make players experience what it means to be poor, it is expected that identification will have an effect on perceived learning effects.

H4a: Feelings of identification with the avatar will positively influence perceived learning effects.

Whereas the effect of (socio-spatial) context on enjoyment and learning experiences has previously been studied, to our knowledge no such research exists for identification. It is expected, however, that context influences the experience of identification. Based on the fact that other experience dimensions have been found to be affected, we expect that, next to the individual situation, the proximity (or absence) of important others influences the feelings of identification. If peers in a classroom make certain remarks on the protagonist in PING, these will affect the feelings of wishful identification of other students. Moreover, the concept of embodied presence entails the idea of 'being there'. As several authors have noted, social interactions can prevent deep engagement in the game (De Kort & Ijsselsteijn, 2008; Mäyrä, 2007).

H4b: The identification evoked by playing an awareness-raising game in an educational context will differ significantly from playing it in a domestic context.

4. Method

4.1 Design and procedure

PING was launched online on October 20, 2010 and its free availability was advertised on several specialized websites on educational games as well as in the national, regional and specialized press. Anyone interested in playing the game could go to the game website, play directly in the browser or download the game and play locally. For several months every visitor of the website was invited to take part in a survey for evaluating the game with the possibility of winning a smartphone as incentive. As too few respondents turned out to have played the game in a classroom setting, the game was tested additionally in five different classes. All participants were asked to fill out a questionnaire before and after playing the game.

A quasi experimental between subjects design was used with type of context as a factor with two levels: classroom and domestic. In the first analysis, dependent variables are enjoyment, identification and perceived learning. The time spent playing and technical performance are used as control variables. In the second analysis, perceived learning is the dependent variable while enjoyment, identification, the time spent playing and technical performance are the independent variables.

4.2 Subjects

In total, 787 participants filled out the questionnaire. As our interest lies with adolescents, participants born before 1990 were extracted from the dataset. After cleaning the data, 264 were retained of which 125 played the game at school and 139 played the game at home. Analysis revealed that there were no significant differences between both groups regarding male (N_{class}=90; N_{home}=88) and female (N_{class}=35; N_{home}=51) participants (chi^2=2.26; df=1; p=0.15). While the mean age in both groups was statistically different, this difference is considered negligible (M_{class}=17.3 M_{home}=17.8; t=-2.5; p<.05).

4.3 Measures

4.3.1 Enjoyment (Chronbach's α: .90)

To measure enjoyment, the scale from Trepte and Reinecke (2011) was used. Due to the fact that playing in a classroom is embedded within a certain time frame, it was decided to omit the question "I'm glad the game did not take any longer". As such, the scale consists of four items rated on a 7-point likert scale (totally disagree to totally agree). Sample items are "I enjoyed playing PING" and "I found it interesting to play PING"

4.3.2 Perceived learning (Chronbach's α: .90)

A scale to measure self-reported learning effects in PING was developed during previous research (De Grove, Van Looy, & Courtois, 2010). This scale explores cognitive as well as attitudinal learning effects. It consists of five items rated on a 7-point likert scale (totally disagree to totally agree). Sample items are "By playing PING I got a better understanding of the problems poor people face" and "If I were a politician I would now better be able to combat poverty".

4.3.3 Identification (Chronbach's α: .89)

Identification was measured using the short avatar identification scale developed by Van Looy et al. (2010). It consists of six items rated on a 7-point likert scale (totally disagree to totally agree). It

incorporates the concepts of wishful identification (two items), perceived similarity (two items) and embodied presence (two items). Sample items are "Jim as a person, resembles me" and "I would like to be more like Jim".

4.3.4 Time played

As the time that is spent playing the game can possibly influence game and learning experiences, a subjective measure was added asking for how long the participant had played the game (in minutes). A significant effect was found for this variable between both contexts (M_{class}=27min; M_{home}=37min; t=-3.99; p<.001). Play duration ranged from 10 minutes to 180 minutes.

4.3.5 Technical performance

Previous tests with the game (De Grove, Van Looy, Courtois, & De Marez, 2010) showed that technical problems occasionally occurred during game play. It was therefore decided to add a subjective measure assessing the technical performance of the game. Participants were asked to rate the technical performance of the game on a scale ranging from 1 (*bad*) to 10 (*excellent*). Technical performance differed between contexts. On average, respondents playing at school scored lower than those playing at home (M_{class}=5.9; M_{home}=7; t=-5.09; p<.001).

5. Results

5.1 Game experience in context

In this first analysis, identification, perceived learning and enjoyment are separately analyzed using ANOVA to check whether there are significant differences between contexts. Similar effects are found for all three variables. As shown in Table 1, enjoyment (M_{class}=4.03, SD=1.22; M_{home}=4.43, SD=1.32), perceived learning (M_{class}= 3.24, SD=1.31; M_{home}=4.26, SD=1.22) and identification (M_{class}=2.51, SD=1.13; M_{home}=3.03; SD=1.21) all score significantly higher in a domestic compared to a classroom setting. When the same procedure is repeated using time spent playing and technical performance as covariates, however, only perceived learning scores significantly higher in a domestic setting. There are no longer any differences between contexts for enjoyment and identification (Table 1). The effect of both time played and technological performance is significant for all experience dimensions. When the effect of these covariates is omitted, 14% of the overall variance in perceived learning is explained by differing contexts. When taking these factors into account, 5.4% of the total variance in perceived learning is explained by the difference in context.

Table 1: GLM results with and without covariates

		F	df	df error	η^2
Identification	*Without covariates*	18.01	1	262	.048***
	With covariates	1.36	1	260	.005
Perceived Learning	*Without covariates*	42.37	1	262	.140***
	With covariates	18.75	1	260	.054***
Enjoyment	*Without covariates*	6.45	1	262	.024***
	With covariates	.21	1	260	.001

5.2 Context effects of identification and enjoyment on perceived learning

The previous analysis explored the differences in game and learning experiences between contexts. These experiences, however, are not unrelated (cf. supra). Learning effects can be conceptualized as evoked by enjoyment and identification. Testing this model (ANCOVA) explained 56% of the variance in perceived learning. Results show that the score on perceived learning is different between an educational versus a domestic context ($F_{(1,258)}=20.63; p<.001; partial \eta^2=.074$) when using enjoyment ($F_{(1, 258)}=49.88; p<.001; partial \eta^2=,16$), identification ($F_{(1, 258)}=30.55, p<.001; partial \eta^2=.11$), time played ($F_{(1, 258)}=3.81; p=.052; partial \eta^2=.015$) and technical performance ($F_{(1, 258)}=4.45; p=0.05; partial \eta^2=.017$) as covariates. This tells us that, in accordance with our first analysis, (adjusted) means show that those playing in school reported lower scores on perceived learning than those playing at home ($M_{class}= 3.49$, SD=.08; $M_{home}=4.03$, SD=.08, b=-5.45; t=-4.54, p<.001). Furthermore, perceived learning is positively influenced by enjoyment (b=.40; t=7.06, p<.001) and identification (b=.32; t=5.53; p<.001) and to a lesser degree by the time played (b=.005; t=.003; p=.052) and technical performance (b=.077; t=2.11; p<0.05).

6. Conclusion / Discussion

The results of this explorative study suggest that context has an effect on game and learning experiences. Although the effect of context was small to moderate, people playing at home reported significantly higher scores on enjoyment, perceived learning and identification. It is interesting to see that the technical performance of the game and the time played account for these differences regarding enjoyment and identification. This means that if these two covariates were kept constant, there would be no difference in the feelings of enjoyment or identification evoked by playing PING. It should be noted, however, that technical performance and the time that can be spent playing a game are part of the broader context in which an educational game is played. Education in schools is typically embedded within a certain time frame and IT infrastructure which is not always up to date (K. Squire, 2005). Findings thus suggest that not only socio-spatial characteristics play a significant role in influencing the game experience. Regarding our hypotheses, our first analysis shows that context has an effect on all three experience dimensions (**H1, H3, H4b**). While it could be expected that the different social contexts evoked by playing in different settings would result in differences for enjoyment and identification, this is not confirmed by our data. Moreover, with the available data it is not possible to say what caused the feelings of enjoyment and identification. Acquiring the same score on enjoyment does not guarantee that the cause of enjoyment is the same for both groups. A part of the score on enjoyment in a classroom could stem from the social dynamics while the same score on enjoyment in a domestic setting could be caused by in-game characteristics. The same holds true for identification. While the score on identification is the same in both contexts (when controlled for time played and infrastructure), the processes leading to identification might be different.

For perceived learning, differences remain when accounting for (significant effects of) time played and technical performance. It is remarkable to see that higher learning is reported by people playing in a domestic context hence indicating that a domestic setting produces stronger learning effects than an educational one. A possible explanation might be that people playing at home have different expectations than those playing in class. Due to the class context, students may have had higher learning expectations compared to people playing the game at home. Or people playing the game voluntarily at home may have been more interested in the subject matter than those playing it compulsory in class. Such assumptions, however, cannot be confirmed by the present study.

As learning in the broadest sense of the word is seen as the main goal of playing or designing an educational game, the second part of our analysis focused on the learning experience and its relation with enjoyment and identification. A model was constructed that explained 56% of the variance in perceived learning. There is a relatively strong relation between enjoyment and learning (**H2**). This is in line with most research on the topic (cf. supra). The same goes for identification (**H4a**). A higher degree of

identification is related with higher learning effects. Even when controlling for enjoyment, identification, time played and technical performance, a significant effect of context remains (7,4% of total variance in perceived learning).

7. Limitations and future research

Exploring context effects raised several important questions. While, initially, enjoyment and identification differed between contexts, these differences disappeared when time played and technological performance were used as covariates. This points to little or no influence of e.g. social context. The question remains, however, as to the antecedents of enjoyment and identification. Future research could explore what causes these experiences and whether these causes differ between contexts. Furthermore, it should be noted that participants playing the game at school did so in a compulsory framework while those playing at home did not. It could be useful to explore how learning is experienced by students playing compulsorily at home as well (e.g. as homework).

Moreover, this study is limited by the consequences of the design. Using a quasi experimental design allows to test in a naturalistic setting but the flip side of the coin is that there is little control over such a setting or over the participants hence endangering the internal validity. This implies several problems which makes this study exploratory at best. Due to the fact that we had no control over who was allocated to what experimental condition, it is possible that both groups differed on important characteristics. Although no relevant differences were found between groups on account of gender, age and feelings of empathy, future research should at least take into account participants' interest in or relatedness with the subject matter. Another option might be to complement quantitative research with qualitative research such as observations and interviews. As such, it can be explored why little to no differences were found on account of enjoyment or identification. Furthermore, there was no control over the setting in which the game was played. Different classrooms might have had different social configurations while the same holds true for the domestic setting. Again, observations and interviews could have been valuable complementary techniques to gain better insight into these questions. While there are without doubt some issues surrounding the choice of the research design, the differences between playing at school or at home are, from a practical point of view, sufficiently large in terms of context so that it was reasonable to expect differences in game and learning experiences. Hence, these findings provide a valuable starting point for further research. What is more, as video games are played within a variety of contexts and not within one contextual layer, it is not illogical for future research to take these broader contexts into account on a theoretical as well as on an empirical level. More specifically, this is supported by the finding that other contextual aspects besides socio-spatial characteristics influence the game experience.

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