

Make It Fun Or Real – Design Dilemmas And Their Consequences On The Learning Experience

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Abstract. In game development designers will be confronted with design dilemmas, such as choosing either 2D or 3D graphics. In this paper we focus on a typical dilemma for educational game design: to make it fun or real. To get more insight into the consequences of design choices, we investigated how students in higher education evaluated the choices of *Sharkworld*, a game about project management, and the consequences of these choices on their learning experience. While students (N=23) generally indicated that they liked the game, found it valuable, and were clearly engaged with it, they expressed their frustration with certain game elements. These elements made the game neither fun and especially not real. We further found that the design decisions regarding these game elements had an important influence on their learning experience, making us conclude that design choices—even little ones—seem to matter and that it is valuable to investigate their consequences.

1. INTRODUCTION

In the general design process of games with a serious purpose, the designers do not only have to focus on typical aspects that make up a game; they also need to deal with aspects that relate to the real world and the creation of meaning (see Harteveld, 2011). Whether it concerns a game for promoting a low fat product (“advergame”) or for losing weight (“exergame”), in both instances designers need to consider aspects related to the domain the games belong to (“health”) and the value they aim to bring forth (“attitude change”), aside from the usual game design decisions on what power-ups, scores, challenges, and storyline to include.

The problem is that one cannot simply pour everything together. While in certain situations choices come naturally or reinforce each other, such as in deciding to build a multiplayer game when social learning objectives are involved (Harteveld & Bekebrede, 2011), in others a conflict could arise, forcing designers to choose. An example of such a conflict is the choice of implementing funny yet unrealistic cancer cells—with eyes and teeth—or plain but realistic ones in a game aimed at medical adherence and self-efficacy of children with cancer (Tate, Haratatos & Cole, 2009). No recipe exists to decide on these design dilemmas. It is up to the designers what the best or most sufficient solution is.

However, it can be expected that some choices are better than others. Based on experiences in developing and evaluating games, insights can be retrieved about the consequences of design choices. With these insights, it becomes possible to provide designers support in making these choices, in a similar vein as design patterns do (see Björk & Holopainen, 2005).

To make a small step towards the investigation of design dilemmas and their consequences, we focus in this paper on a highly specific dilemma often observed in educational games: to make the game more fun or real. For exploring this matter, we looked into how *Sharkworld*, an educational game about project management, was experienced by students in higher education.¹ At the start of our research our question was: how do students in higher education evaluate the design choices and what are the consequences of these choices on their learning experience?

Before we answer this question, we will elaborate on the investigated design dilemma in the next section. In the subsequent section we will introduce the game *Sharkworld* and discuss how and why certain design decisions were made. In Sections 4 and 5 our research approach and results are discussed. In our conclusion we will reflect on what the results mean for designing educational games.

2. DEALING WITH DESIGN DILEMMAS

A dilemma is generally defined as a choice between two equally (un)desirable options. When it comes to designing games, design dilemmas refer to circumstances in which designers are forced to choose to develop their game one way or the other. Many different types of dilemmas can arise—for different reasons (see Harteveld, 2011). Sometimes

¹ See <http://www.sharkworldgame.com/>

tensions may appear between the educational purpose and the suggested gameplay challenges; on other occasions tensions may take place how things work in the real world and how this should be depicted in the gameworld. These confrontations happen quite often. In fact, designing games can actually be thought of as solving dilemmas.

As explained in the introduction, in this paper we focus on a specific dilemma and one which has been of particular relevance to *Sharkworld*. This dilemma is about making the game more fun or more real. As regards to our study we found two criteria of importance in this dilemma: *flexibility* (Section 2.1) and *fidelity* (Section 2.2). Before we proceed to elaborate on *Sharkworld* and its design, we explain these two criteria and how they could possibly lead to a dilemma.

2.1 Flexibility

The world is dynamic and diverse. The world of today may look quite different than the one of tomorrow. This means that if designers take a snapshot of the world today and process this in a game, the game may be old and useless tomorrow. In addition, the world allows for many possible outcomes, depending on many factors. This degree of freedom is difficult if not impossible to capture in algorithms. The more degrees of freedom are taken into account, the more complex the game becomes, and the more time and budget is needed to develop it.

The criterion of flexibility is on the one hand about being able to adapt the game for future developments and extra features and on the other hand about the degree of freedom in playing the game (Harteveld, 2011). Aside from time and budget constraints a good reason to limit flexibility is to create for an engaging gameplay experience with a compelling story. For example, if the audience would direct a piece by Shakespeare the eventual story and the enjoyment of it might be significantly less. However, it needs to be stressed that being in control over what happens leads to engagement as well (Malone, 1981).

Another reason to limit flexibility is to increase the usability of the game (Isbister & Schaffer, 2008). With many options and possibilities players might become lost, find the game too complicated, and/or it will take them ample time to reach the goals of the game. For this reason, designers may choose to decrease the flexibility offered in the real world in their game, to prevent players from becoming frustrated.

2.2 Fidelity

The other criterion concerns fidelity (also referred to as “realism,” see Feinstein & Cannon, 2001). This pertains to the look & feel of a game. Some games, take *Flight Simulator*, have a gameworld remarkably similar to the actual world. Not only do these games visually represent their reference system, they also include other characteristics, such as the type of information and response options (think of the cockpit), which are more or less identical to the real world situation (Hays & Singer, 1989).

In other games this is much less so. They immerse players into rather fictional worlds, with imaginable creatures and other fantasy elements. Reasons for departing the level of realism are abundant, and depend largely on the purpose and context of using the game (Harteveld, 2011). In general, a decrease in fidelity enables for greater artistic freedom, less distraction of irrelevant details, and more fun. For example, while completely non-sense, killing a cow with a flame thrower is much more fun than injecting it with a deadly medicine.²

On the other hand, exactly these types of “funny” elements could be experienced as annoying or distracting by players, especially if players take the game very serious. In addition, players may want to have the richness of the real world and not a too simplistic or too arty depiction of it.

3. DESIGNING SHARKWORLD

Sharkworld is a project management game developed by Ranj Serious Games.³ Originally, it was developed for OTIB, a Dutch institute for developing educational material for technical installation companies and vocational schools. However, after the game received much praise and won several prizes, the game found a wider interest as a teaching tool, such as at universities and even consultancy firms.

The name of the single player game refers to the first large-scale shark aquarium to be built in the city of Shanghai in China. According to the game’s story, a large multinational company called “Spector Install” has acquired this building project. At the start of the game, this company sends the players to China to replace the last project manager who suddenly disappeared. The players have to ensure that *Sharkworld* will be successfully realized. Success is measured on hard project management criteria, like planning, budget, and quality, but on softer criteria as well, as performance also depends on the satisfaction of the project team, the client, and the players’ boss.

² This gameplay option is implemented in *The McDonald’s Video Game*.

³ See <http://www.ranj.nl>

Although the game is mainly played online, it uses other ways of interacting with the player, like actual phone calls, text messages, real and virtual websites, chat, and e-mail. Information provided through these communication channels invites players to go back to the game. The online game environment consists of a point-and-click interface, with a mixture of virtual images, footage with actors, and real world pictures (see Figure 1). While the goal of the game is to finalize the Sharkworld project in time, within budget, and to the satisfaction of the stakeholders, the educational purpose of this game is to let players experience the trade-offs that project leaders of large, innovative, multi-cultural projects face.

With this general description of *Sharkworld* in mind, we can now turn to how the designers dealt with the criteria of flexibility (section 3.1) and fidelity (section 3.2).



Figure 1: Screen shot of *Sharkworld*. On the left side the different locations can be seen. At the top the tools are depicted that can be used in a certain situation

3.1 Design choice on flexibility

An important constraint regarding flexibility concerns the available budget. More flexibility implies more budget, because this requires the game to include more options, more possible storylines, and everything else. As most games work with only a limited budget, designers are forced to think of how to spend this wisely. In this regard an important design choice for *Sharkworld* concerns the usage of actual footage. The game's story unfolds largely by conversations with real life actors. While this choice was made to increase the game's fidelity (see Section 3.2), it has two disadvantages. First, after the movies are shot, few adjustments can be made. Creating new footage is in fact the only option.

Second, the way the game progresses is dependent on the available footage; this is on its turn dependent on the available budget. In the game, players do have an impact on what footage they get to see—within conversations they can choose between several response options (see Figure 1) and dependent on their choices they get to see a specific reaction from the actor. However, to prevent a “combinatorial explosion” (Harteveld & Bekebrede, 2011) of possible story developments, and stay within the budget restrictions, the conversations and their outcomes are relatively fixed: some response options result in the same footage and the footage players get to see after the conversations is in many cases independent on their performance.

3.2 Design choice on fidelity

Despite the inflexibility, the choice for actual footage creates a sense of urgency and impact: players are involved with a “real” project with “real” people. This works especially well with students, since most of them have never been involved in a building project and especially not in a foreign country such as China. For the first time in their lives they are in charge of something big. The use of actual footage may increase the feeling that what they are doing is very “real.” And while they may know it is just a game, without any doubt the game looks & feels real.

This feeling is strengthened by the use of different communication channels. A game that only unfolds on a screen gives much more the idea that it is “virtual” than when players receive actual phone calls on their mobile phones. It may be just a computer voice that they hear, but it definitely blurs the line between what is real and what is virtual. Moreover, the tasks and tools that players have to perform with resemble those of actual project managers. A good example of this is that players have to fill out a Gantt chart, which provides an overview of all (assigned) tasks, progress, time schedule etc.

Whereas many game elements increase the level of realism, the designers tried to incorporate some fun into it and make the story more compelling. For example, in the game players have to deal with a professor who is assigned as

the caretaker of the sharks. It appears that this professor wants to use the sharks for some questionable experiments. This should provide a warning to the players, especially after a shark has gone missing and another simply “explodes.” Clearly, this addition makes the game more interesting yet also somewhat unrealistic.

4. RESEARCH APPROACH

To investigate how students in higher education evaluate the design choices regarding flexibility and fidelity and to assess the consequences of these choices on their learning experience, we played and evaluated *Sharkworld* with third years bachelor students at Delft University of Technology (DUT). The bachelor students who participated in the research study were required to play *Sharkworld* as part of a course within the minor Consultancy. The educational purpose of using this game in this context was to let the students experience what project management means in practice.

The general set up consisted of four steps. First, the students had to make a preparation assignment about what types of trade-offs they would expect in the game and how they would deal with these. Next to this activity they needed to fill out the pre-questionnaire, which included variables on the background of the participants (age, gender, game experience, etc.), attitudes regarding games and the subject, and expectations of *Sharkworld*. Second, the students had to play the game at home, which took a couple of days. After playing the game the students needed to fill out the post-questionnaire, reflecting their judgments on game use and quality and on what they have learned. Third, they had to keep a logbook about their decisions and reflect on their role in the project. And fourth, a general debriefing, including a lecture on project management, was held to share experiences and relate the game to theory.

In total 23 students, consisting of 20 males and 3 females, played the game. The average age was 21.2 years ($SD=1.61$). Although the students followed the same minor, a high variety existed in their majors, like architecture, industrial design, computer science, electrical engineering, and policy analysis. For both the pre and post game questionnaires students had to respond to statements with 5 point Likert scales (from totally disagree to totally agree).

As outlined in the previous section, the game was originally developed for vocational schools and *not* for universities. As differences can be expected between these two educational levels, it would be interesting to see how the design choices were perceived by this target group.

5. RESULTS

Based on the acquired data, we will now turn to how students regard the design choices on flexibility (section 5.1) and on fidelity (section 5.2) and what effect this had on their learning experience (section 5.3).

5.1 Evaluation on flexibility

While expectations about how fun *Sharkworld* would be were relatively high ($M=3.91$; $S=.68$), the post-test results indicate a significant drop in the perceived fun ($M=3.36$, $SD=.91$); $t=2.81$, $df=21$, $p=.011$. Despite this drop, more than half of the students were so motivated that they started to play it again ($n=13$). Some even finished the game twice ($n=5$). This shows that the game sparked the interest of some of the students.

During the discussion, however, it turned out that most students played it again to see if their actions really made a difference and to get a better understanding of how their scores were calculated. They were curious to find out and, in the end, they came to the conclusion that it hardly made a difference. This conclusion was consistent with the observation that the scores between students was marginally distinct. According to one of the students this was not surprising:

“The indifference amongst students is logical. The game is very structured and the choices that the game offers are relatively easy to answer. Every student will follow more or less the same path.”

Other students agreed that the tasks and assignments were too easy ($M=3.85$, $SD=.82$). They also expressed their frustration about not having enough freedom to organize the project: for example, they could only do the planning in a certain moment in the game and not revise this in later stages. They had to rigidly stick to the game flow, but wanted to have more control.

All of this may be an important explanation for the significant drop in the perceived fun. Due to the inflexibility in the game flow and the relatively easy challenges, the game not only became less real, it also became less fun. Therefore, this design decision made the game neither fun nor real.

5.2 Evaluation on fidelity

In contrast, the students were much more positive about the look & feel of the game. They indicated that they had the strong feeling of leading a project. As another student said:

“I have never been a project manager and I really felt a big responsibility to bring this to a good end. That is why I kicked that professor out of the project. He would otherwise cause more trouble.”

The student’s comment shows that he was deeply engaged and immersed in the game. It also shows that while many of the game decisions may have been easy, some of them, such as what to do with the professor, made an impact. It forced students to reflect on diplomacy, ethics, and management styles.

Similar to the professor and his shady intentions, the other game characters and game decisions also made a long-lasting impression. To the astonishment of the teachers, the students were able to describe all the trade-offs they encountered and in much detail.

Despite this, *Sharkworld* was perceived as not sufficiently realistic ($M=2.57, SD=1.08$). An explanation of this surprising result came during the discussion. Many students expressed their frustration with some unrealistic elements. At a certain stage in the game, an event occurred in which a shark unexpectedly exploded. While it was intended to be fun, this element actually made the students feel they were not being taken serious. To them the game should have been less fun and more real.

5.3 Expected and perceived learning

Whether fun or real, in the end, an educational game is intended to achieve its learning objectives. The findings on this component are not that positive. Compared to students’ expectancies, a significant decrease was found for the variable “perceived learned knowledge” ($M_{pre}=3.31, SD_{pre}=.51; M_{post}=2.76, SD_{post}=.73; t=-3.42, df=20, p=.003$). Students perceived to not have gained more theoretical knowledge by playing the game. A similar significant decrease in perceived learning practical skills was found as well ($M_{pre}=3.44, SD_{pre}=.71; M_{post}=3.02, SD_{post}=.80; t=-3.12, df=19, p=.006$). Although it can be concluded that the expectations may have been too high, judged on their own, the post-test learning perceptions have a stronger tendency toward disagreeing than agreeing on having learned something.

To conclude that due to the decrease in learning perception this game was not successful goes too far. First of all, we never expected a high perception score on “perceived learned knowledge,” as the game is not so much focused on theoretical knowledge of project management and we also did not embed the game into a curriculum in which theories about project management were discussed. It was a practical course. And while the scores on “perceived learned practices” are not very high as well, the students firmly agreed with each other that it was a great game and that the game should be used again in this context. But as one student remarked:

“The game should be used again, but I hope they can make it more challenging and flexible. And...they should get rid of that exploding shark.”

This remark further indicates that a possible explanation for the decrease might be based on the design decisions. To investigate this, we looked at the correlations between the learning variables and the statements we associated with flexibility and fidelity (see Table 1).

Table 1: Correlations between learning objectives, flexibility, and fidelity after playing *Sharkworld*

	Perceived learned knowledge	Perceived learned practices	Flexibility (task difficulty)	Fidelity (realism)
Perceived learned knowledge	1	.75*** <.001 21	-.40 .069 22	.45* .037 22
Perceived learned practices	.75**** <.001 ^b 21 ^c	1	-.59** .004 22	.59** .004 22
Flexibility (task difficulty)	-.40 .069 22	-.59** .004 22	1	-.64** .001 23
Fidelity (realism)	.45* .037 22	.59** .004 22	-.64** .001 23	1

^a pearson correlation, ^b p value, ^c number of respondents
 *** $p < .001$; ** $.001 < p < .005$; * $.01 < p < .05$

For flexibility the statements had to do with the difficulty of the tasks in the game; for fidelity this had to do with realism. Based on this we found a strong negative relation between perceived learned practices and flexibility, $r=-.59$,

$p=.004$, and a similar strong yet positive relation between perceived learned practices and fidelity, $r=.59$, $p=.004$.⁴ Apparently, more difficult tasks and more realism leads to an increase in learning practical skills. As according to the students the game was lacking in this regard, it explains why the learning perceptions are relatively low.

Furthermore, these results indicate that design decisions may have a potentially large effect on the perceived learning experience of students. Although this was not part of this study, based on experiences at vocational schools (Martin Volkering, personal communication, n.d.; Hatte vander Woude, personal communication, n.d.), we know that vocational students expressed less frustrations with the game. This is not a complete surprise. Compared to vocational students, university students are able to deal with much more challenging tasks and demand more freedom. They, therefore, also expect a lot more from an educational game such as *Sharkworld*.

6. CONCLUSION

Make it fun or real. This is a frequently occurring dilemma in designing games with a serious purpose. To get more insight into the consequences of design choices, we investigated how students in higher education evaluated the choices of *Sharkworld*, a game about project management, and the consequences of these choices on their perceived learning experience. In our study we focused on how design choices were made on two design criteria, flexibility and fidelity, as these appeared to be particularly relevant for this game.

Based on the results we found that with regards to flexibility, the students indicated that the game was too structured. It gave them insufficient control and freedom on what to do. As control concerns also an important engagement factor (see Malone, 1981), it can be concluded that the design decisions made the game neither fun nor real. As for fidelity, the highly structured storyline did engage and immerse them into the feeling of being a real project manager. The students, however, expressed their frustration about certain unrealistic elements. They found this an unnecessary part of the game.

While the students were still very positive about the game, these decisions did seem to have a great impact on their learning perception. Overall, the perceived learning experience did not live up to their expectations. Although this result could be attributed to poor expectation management, a poor debriefing or embedding in the curriculum, from the reactions of the students it became quickly clear that content-wise they were not challenged enough. They liked it as a “game.” Yet as an educational tool it needed improvements.

What does this mean for designing educational games? No firm conclusions can be made on this small study, but this research first of all indicates that design choices—even little ones—have a great impact on the learning experience. Repurposing a game for a different target group may thus require to adapt the game in several ways: to make it more fun or real. Second, university students seem to have different demands and expectations than vocational students. Most evident from this study is that university students tend to prefer to keep it real.

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⁴ For “learned knowledge” a similar but less strong tendency can be observed.