How to get the girls Gaming: A Literature Study on Inclusive Design

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Abstract: Gaming is a ubiquitous activity today where many children spend considerable amounts of time playing various games. Serious games have also become a mainstream educational tool in a wide variety of school subjects. Despite this, many games still have a design that mainly appeals to boys where girls are less frequent players. The aim of this study was to gather requirements for a design of serious games where girls should not feel excluded. The research question to answer was: *"Which design concepts are important if girls should be engaged in serious gaming?"*. Furthermore, the results from this study could be useful for future implementations of educational games. This study strives to address the research gap in the field of inclusive game design, and to gather important requirements for games where girls and boys want to play together. This study was carried out as a scoping literature review to map literature in the field of game design to identify key concepts that can attract the younger girl audience. Scoping literature reviews offer a method of mapping key concepts in a research field to identifying the main sources and types of evidence available. A central aim of a scoping literature review is to synthesise research results to a specific target group as a foundation for future research. For this study, the future research will consist of implementing the found design factors in an educational game on computer science. Findings indicate that there are specific game design concepts that girls find appealing. Important main themes to consider are Creativity and customisation, Character diversity, Collaborative interaction, and Exploration without violence. However, there seems to be several challenges related to the concept of designing specific girl games. The conclusion from this study is rather to choose a more inclusive game design where girls and boys would like to play together. A concept for game design that could be described as having a low threshold, wide walls and a high ceiling. The recommendation for a girl inclusive design is to carefully consider factors such as narration, backstory, social interaction, game graphics, sound design, and personalisation.

Keywords: Game design, Inclusive design, Games and girls, Game-based learning, Scoping review

1. Introduction

Games and game-based learning have been around for thousands of years, long before the appearance of digital video games (Hellerstedt & Mozelius, 2019). After the so-called casual revolution (Juul, 2010), gaming is a ubiquitous activity today in a larger target group than ever. Many children spend considerable amounts of time playing various types of games. At the same time serious games for educational purposes have become a mainstream teaching and learning activity in a wide variety of school subjects (Moreno-Ger et al., 2014), with game-based learning for students with special needs as an emerging research field (Hersh & Leporini, 2018).

However, as highlighted by Casell and Jenkins (2003), Carr (2007), and Lima and Gouveia (2020, girls and women have refused to embrace videogames with the same passion, and to the same extent as boys and men. Moreover, there are also research studies indicating that certain types of games are more appealing to a female audience than others, and that there are game design elements that better should be avoided (Subrahmanyam & Greenfield, 1998; Cunningham, 2018). Moreover, several research studies have identified that certain types of gameplay appeal more to boys than to girls (Subrahmanyam & Greenfield, 1998; Dilmaghani, 2022). However, there still seems to be a research gap to address regarding the more concrete game design. For an improved future game development, it is important to identify which game design concepts that could attract more girls to use serious games in educational contexts. Authors hope that the design factors found in this study should be useful in the implementation of games with a more inclusive design. The aim of this study was to gather requirements for a design of serious games where girls should not feel excluded. The research question to answer was: *"Which design concepts are important if girls should be engaged in serious gaming?"*.

2. Method

This study was carried out as a scoping review to provide an overview of the studied topic (Munn et al., 2018). The scoping review can be an appropriate approach to use when the studied topic is complex or heterogeneous (Pham et al., 2014; Mays, Roberts & Popay, 2001), and in studies with an aim of clarifying concepts and

identifying knowledge gaps. Moreover, his kind of literature review offers a method of finding key concepts in a specific research field, and to identify the main sources and types of evidence available (Munn et al., 2018). A central aim of this scoping review was to synthesise research results to a specific target group as a foundation for future research. The findings from this study will be used as a part of the design requirements in a future game development. Considering the aim, and the type of literature review the research question was formulated concrete and specifically to support this research design. Despite the narrow and specific research design, authors find the results from this literature review also could add a more general knowledge, useful for future implementations of educational games.

Google scholar was used as the main search engine to identify research papers of interest. With the use of Boolean operators OR and AND, keywords such as *Games*, *Inclusive*, *Design*, *Girls, Women* were combined in the search. Backward and forward searches were also used to identify additional research papers of interest. The scoping review was carried out in combination with a thematic analysis (Braun & Clarke, 2012) with an abductive process of analysis to move between deductive and inductive coding (Graneheim, Lindgren & Lundman, 2017). That is, the selection of research papers to include in the study was conducted in parallel with the analysis and no predetermined categories were used for analysis. Papers of interest were analysed immediately and identified themes were collected in a text document. The collected themes were organised, and reorganised, in categories as the analysis proceeded, with each new paper and identified theme either adding to the categories, creating new categories, or re-organising categories. Lastly, all themes and categories were revised for consistency and definitions of categories where formulated.

23 research papers, that are published between 1994 and 2021, were selected and analysed in the study (Table 1).

Table 1: Summary of included papers

Author(s)	Year	Title	Published in
Kafai, Y. B.	1994	Minds in play: computer game design as a context for children's learning	Hillsdale, N.J.: Lawrence Erlbaum Associates
Miller, L., Chaika, M., & Groppe, L.	1996	Girls' preferences in software design: Insights from a focus group	Interpersonal Computing and Technology
Kafai, Y. B.	1996	Gender differences in children's constructions of video games	P. M. Greenfield & R. R. Cocking (Eds.), Interacting with video. Norwood, NJ: Ablex Publishing Corporation
Rubin, A., Murray, M., O'Neil, K. & Ashley, J.	1997	What kinds of educational computer games would girls like?	AERA Presentation, April, 1997
Vail, K.	1997	Software companies are targeting girls, but is their marketing on the mark	Electronic School
De Castell, S., & Bryson, M.	1998	Retooling play: Dystopia, dysphoria, and difference	From Barbie to Mortal Kombat: gender and computer games
Graner Ray, S. G.	2004	Gender inclusive game design. Expanding the market	Hingham, MA: Charles River Media
Carr, D.	2005	Contexts, gaming pleasures, and gendered preferences	Simulation & gaming
Dickey, M. D.	2006	Girl gamers: The controversy of girl games and the relevance of female-oriented game design for instructional design	British journal of educational technology
Carr, D.	2007	Contexts, pleasures, and preferences: Girls playing computer games	Weber S., Dixon S. (eds) Growing Up Online. Palgrave Macmillan, New York
Dondlinger, M. J.	2007	Educational video game design: A review of the literature	Journal of applied educational technology
Fullerton, T., Fron, J., Pearce, C., & Morie, J.	2008	Getting girls into the game: Towards a 'virtuous cycle'	Beyond Barbie and Mortal Kombat: New perspectives on gender and gaming
Kinzie, M. B., & Joseph, D. R.	2008	Gender differences in game activity preferences of middle school children: implications for educational game design	Educational Technology Research and Development

Author(s)	Year	Title	Published in
Ioannidou, A., Repenning, A., & Webb, D. C.	2009	AgentCubes: Incremental 3D end-user development	Journal of Visual Languages & Computing
Vermeulen, L., Van Looy, J., Courtois, C., & De Grove, F.	2011	Girls will be girls: a study into differences in game design preferences across gender and player types	Under the mask: perspectives on the gamer conference 2011
Kafai, Y. B., & Burke, Q.	2014	Beyond game design for broadening participation: Building new clubhouses of computing for girls	GenderIT 2014
AlSulaiman, S., & Horn, M. S.	2015	Peter the Fashionista? Computer Programming Games and Gender Oriented Cultural Forms	Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play
Alserri, S. A., Zin, N. A. M., & Wook, T. S. M. T.	2017	Gender-based engagement model for designing serious games	2017 6th International Conference on Electrical Engineering and Informatics (ICEEI)
Çakır, N. A., Gass, A., Foster, A., & Lee, F. J.	2017	Development of a game-design workshop to promote young girls' interest towards computing through identity exploration	Computers & Education
Spangenberger, P., Kapp, F., Kruse, L., Hartmann, M., & Narciss, S.	2018	Can a serious game attract girls to technology professions?	International Journal of Gender, Science and Technology
Spieler, B., & Slany, W.	2018	Game development-based learning experience: Gender differences in game design	Proceedings of the 12th European Conference on Games Based Learning
Leonhardt, M., & Overå, S.	2021	Are There Differences in Video Gaming and Use of Social Media among Boys and Girls?—A Mixed Methods Approach	International Journal of Environmental Research and Public Health
Sharma, K., Torrado, J. C., Gómez, J., & Jaccheri, L.	2021	Improving girls' perception of computer science as a viable career option through game playing and design: Lessons from a systematic literature review	Entertainment Computing
Dilmaghani, M.	2022	Chess girls don't cry: Gender composition of games and effort in competitions among the super-elite.	Journal of Economic Psychology, 89, p.102482.

3. Results and discussion

The scoping review identified five main themes in the reviewed literature. Four of the themes are considered important design concepts for engaging girls in serious games, while the last theme addresses potential problems in designing games specific for girls' motivation and engagement. The identified themes are presented under separate sub-headings here below.

3.1 Category1: Creativity and customisation

Girls have expressed a greater preference and more positive preferences for games that encourage creativity, where creativity could be encouraged by features for modifying game characters and game elements, or the possibility to create artwork for use within or outside the game (Kinzie & Joseph, 2008). It was also pointed out in the study by Spieler and Slany (2018) that female players spent much more time creating artwork than gathering game points, if compared to male players. Girls prefer to create, modify and to avoid the violent feedback that appears in combat games, while boys seem to choose the opposite (Kafai, 1996; Kafai & Burke, 2014). The study by Fullerton et al. (2008) recommends the possibility to change the world in games, and that players could have a positive impact on the surrounding society as well.

Sharma et al. (2021) highlighted that gaming girls appreciated functionality that enables them to customise components in the game environment. Something that helped the girls to express themselves and to demonstrate their preferences (Çakır et al., 2017) and that it was reported that girls became fully engaged in these activities (Ioannidou, Repenning & Webb, 2009). An example of a game with more of customisation and creativity than of actual gameplay is Sims games (Fullerton et al., 2008). Most of the games in the Sims series rather lack clearly defined game goals, and have been called digital doll houses. The Sims series, are game where

virtual characters get sad, moody and even depressed if they get isolated from other sims, and that there are concrete things to learn in Sims that could be useful in a player's daily life and work as found in Mozelius (2014).

3.2 Category2: Exploration without violence

One of the most obvious differences seems to be that boys are attracted to games with combat and violence, while girls prefer indirect competition without violence (Ray, 2003; Vermeulen et al., 2011). This difference has even more clearly been identified in studies on game creation, where the study by Spieler and Slany (2018) found that boys created significantly more shooter games while girls preferred to build role playing games. It has also been identified that girls have a stronger tendency to design games with a mix of male and female characters, with more options to choose different game avatars (Kafai, 1996). In this type of game creation studies there have also been reported that there are differences in the feedback design. Several research studies have reported about girls building games with little violence or punishing feedback, compared to boys that created features with violent feedback in fantasy settings (Kafai, 1996; Dickey, 2006; Kafai & Burke, 2014). In a recent study of Dilmaghani (2022), it was claimed that female chess elite players' approach to competitive chess is shaped by the belief that they have something to prove to males. A statement that origins from the Woman Grandmaster (WGM) Jennifer Shahade (2010), and her observations of the female chess elite. However, what goes for WGM Shade and other females in the chess elite, would probably differ from the attitudes among girls that do not play chess at elite level.

Instead of violence in the gameplay, girls want exploration, collaboration and challenge in a game design with more realistic adventures and activities in game environments with sophisticated graphic and sound design (Miller, Chaika & Groppe, 1996; Dickey, 2006). Other studies have pointed out that girls want an explorative gameplay with a rich narrative, diverse activities, engaging characters, and social interaction (De Castell & Bryson, 1998; Rubin et al., 1997). It could be argued that some of studies above were conducted over two decades ago, but the high percentage of violent games still remains. The balance seems better in the realm of serious games, where the design often is closer to the vision of the Johan Amos Comenius. The father of game-based learning propagated for a peaceful utopia where enlightened citizens living in harmony. Comenius's pedagogic works on game-based learning in the 17th century were developed around the idea of *"without violence, everything would flow spontaneously "* ("Omnia Sponte Fluant: Absit Violentia Rebus"). (Hellerstedt & Mozelius, 2018, p. 7)

3.3 Category3: Collaborative interaction

The various studies on children creating games reports that boys to a higher degree preferred to build competition and combat games, compared to girls that cared more for social interaction. In Kafai's (1994) landmark study on the gender differences in game design this was identified that girls created games with richer interaction, whereas boys tended to create games around the idea of combat. Miller, Chaika and Groppe (1996) found in their focus group discussions that girls prefer games with collaboration and challenge instead of combat. Other studies have highlighted that girls in general want a gameplay with social interaction built around a rich narrative and sophisticated game characters (De Castell & Bryson, 1998; Rubin, Murray, O'Neil & Ashley, 1997). As summarised by Dickey (2006, p. 78) *"There are many commonalities between most of the studies concerning female-oriented design, but the most notable is the importance placed on collaboration and community."*

One way of classifying games is by the division between combat games, competition games and collaboration games. Findings indicate that boys prefer combat games (Kafai, 1996; Spieler & Slany 2018), whereas girls fancy a game design that involves collaboration (Miller, Chaika & Groppe, 1996; Dickey, 2006). Competition seems to be more in-between, and as claimed in the study by Taylor (2003), games with competition appeals to girls when combined with collaboration. Back in the 17th century Comenius described how he wanted to combine his peaceful and serious gaming with both collaboration and competition to stimulate learning (Hellerstedt & Mozelius, 2018). As described by Demetriadis, Tsiatsos and Karakostas (2012), a 21st century concept to stimulate collaboration in serious games is to involve scripted collaboration. Collaboration scripts could be further divided into the sub-categories of Conflict scripts and Role-playing scripts (Mozelius, Borglund & Öberg, 2021). A hypothesis to test in future research is if boys tend to prefer Conflict scrips and girls prefer Role-playing scripts.

3.4 Category4: Character diversity

As pointed in the seminal studies by Kafai (1994; 1996), girls prefer a game design with both male and female characters, and that girls often creates games design for both male and female characters. Moreover, girls also like non-gender-specific characters in realistic settings (Kafai, 1994; Dickey, 2006). In the recent study by Leonhardt and Overå (2021, p. 7) it was reported that *"Both boys and girls were critical of gender representation in video games"*, and 25 years after Kafai's studies this unbalance seems to remain. As formulated by a 9th grade girl: *"The characters in video games are mostly guys. There are lots of war games. I don't play any video games where the main character is a man."*. This is a statement from a girl that described herself as having gaming as a hobby, but at the same time being reluctant to many video games because they lack *"good female characters"*. In the same study, another girl brought up the passive and helpless princess character in the Super Mario Bros games as an example of a bad female character (Leonhardt & Overå, 2021, p. 7).

Female role models are important, and as highlighted by Spangenberger et al. (2018), in a game with a female protagonist the girls' interest in technical subjects increased after playing the game. In a study on serious games for learning computer programming, two games were intentionally designed different. The first game was designed to be gender neutral, whereas the second had a girl-oriented design. Findings from the study indicated that the two games were equally effective regarding the learning outcomes, but that players with a preference for girl-oriented games got a stronger motivation to learn computer programming when they played the girl-oriented game. (AlSulaiman & Horn, 2015) This contradicts the findings in the study by Kafai (1994), where it was reported that girls prefer non-gender-specific characters. A contradiction that leads to the next category of 'Gender specific game design', and at the same time relates to Category 1, 'Creativity and customisation'. As pointed out by Sharma et al. (2021) in a study on design of serious games for girls learning about computer science, personalisation was one of the most desired design factors in the games. Moreover, it has been claimed that personalisation could motivate girls to see themselves as role models (Alserri, Zin & Wook, 2017; Sharma et al., 2021). Might customisation and personalisation be a key concept for inclusive design, and in more aspects than the one of gender?

3.5 Category5: Gender specific game design

Previous research has noted that the challenge of getting more girls and women into games and game design could be addressed through gender specific design, a so called "virtuous cycle " (Fullerton et al., 2008). Girls and women may be more attracted to games and making games if there are more games that appeal to girls and women, resulting in more games that are created by girls and women (Fullerton et al., 2008). However, games that appeal to women and girls alone will not result in more female game designers. A game on designing dresses will probably appeal to many girls and women, but will likely not influence them in taking a career path as engineers (Dickey, 2006; Vail, 1997). Further, it may be advised to offer both girls and boys the opportunities to develop in areas that they normally would not be drawn towards. If given the opportunity to develop appropriate skills, girls and women may appreciate Strategic and Active gameplay; and boys and men may appreciate more creative gameplay (Kinzie & Joseph, 2008).

As expressed by Dondlinger (2007), the presumption that girls and women differ from boys and men in gaming habits, for example that it is not done with the same intensity and duration, has little empirical support in research. The potential problem of ascribing gaming preferences to gender is that it may hide the underlying structures that fuel these preferences:

> *"The problem with ascribing particular preferences directly or solely to player gender is that it implicitly divorces gaming tastes from the economic, social, and cultural forces that fuel and inform gaming practices."* (Carr, 2007)

Previous research has pointed out that the notion that girls and boys prefer different types of games may have more to do with exposure and marketing, rather than real preferences (Dondlinger, 2007; Carr, 2005). In a study by Carr (2005), it was observed that female players played the games that they knew about and was exposed to. A conclusion of this study was that gaming preferences have more to do with prior experiences and exposure, rather than gender specific game design (Carr, 2005). If exposed to games marketed towards boys and men, girls and women seem to enjoy them and play as aggressively (Dondlinger, 2007; Carr, 2005). An example of girls and women that appreciates both competition and combat can be found in the highly aggressive, but non-violent game of chess (Dilmaghani, 2022). At the same time, it is a well-reported fact that there are substantially fewer girls that participate in competitive chess (Chabris & Glickman, 2006; Barbier, A., 2020).

4. Conclusion

The conclusion is to choose an inclusive game design where girls and boys would appreciate to play together. This game design concept could be described as a game space with a low threshold, wide walls and a high ceiling with as few barriers as possible. A girl inclusive game design should consider factors such as narration, game characters, social interaction, game graphics, and sound design. This should also be complemented with features for customisation and personalisation of these factors. Findings that not only are important to authors' future game development, but also to the general knowledge base of inclusive game design.

5. Future Work

The findings from this study should be used as input to the requirement definition for a serious game that will be developed in the Erasmus+ Gaming4Coding project. In the future work with the game design the relationship between gender, gameplay, learning outcomes and learning theories should also be addressed. This study has the limitations of a scoping review, and for a more complete view of the state-of-the art in the field of gender aspects of game design, a systematic literature study is recommended.

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