



A Review of Game Elements in Developing Persuasive Game-Based Learning Model for Children's Safety from Sexual Abuse

Azliza Othman^(✉), Nassiriah Shaari, and Sobihatun Nur Abdul Salam

Universiti Utara Malaysia, Kedah, Malaysia
azliza@uum.edu.my

Abstract. Recently, designing games for educational purpose has attracted much interest. Game-based learning (GBL) offers an alternative approach to learning that implements game elements in the learning environment. In addition, persuasive technology has been used to persuade users to change their attitudes and behaviours. In this digital era, the learning process can be more straightforward, effortless, and effective with the support of elements provided in game-based learning and persuasive technology. Realizing the high prevalence of Child Sexual Abuse (CSA) cases nowadays and the negative effects CSA victims face, it is essential to provide knowledge about self-safety from sexual abuse to children by using appropriate learning programs. Although, at school, children are taught about personal safety in the subject of physical and health education, at their age, learning about safety should be delivered in a relaxed and entertaining but effective way. Therefore, this research aims to review appropriate game-based learning elements in designing a persuasive game-based learning model to create safety awareness for children from sexual abuse. A thorough study of concepts, existing related studies, elements, processes, and methods involved in game-based learning and persuasive technology have been carried out. Then, the information gathered has been analysed to formulate the persuasive GBL model for CSA safety. As a result, identified elements of learning, GBL and persuasive elements are then integrated and visualised in the suggestion model.

Keywords: Game element · persuasive game-based learning model · child sexual abuse

1 Introduction

Currently, games designed for implementation in education show an increase [1]. Many books and journals dealing with game-based learning (GBL) were published, numerous seminars and conferences were organised, and many scholars have been involved in this research topic over the years. GBL offers a new way of learning that implements game elements in the learning environment.

Educating children to protect themselves from sexual abuse has become a global issue. [2] stated that children are at risk of all kinds of abuse because of their lack

of knowledge about danger and self-protection. Several efforts has been arranged and implemented to protect children, especially from abuse. However, in Malaysia, most prevention programs focus more on public awareness; there is minimal knowledge on research and prevention to develop an appropriate culturally sensitive application [3]. While digital generation children nowadays exposed to various computer technologies and gadgets. They require technology-based learning methods that encourage them to actively engage in learning in a relaxing, entertaining, and stimulating environment. In addition, there is a growing need for children to learn using current methods and technology instead of the traditional way of conveying information in the teaching and learning environment.

Realizing that providing knowledge about safety to children using appropriate learning methods is essential, there is a need to find an alternative way for children to learn and understand easily. In this computer technology era, learning can be supported by GBL and persuasive technology to make the learning process and understanding of the complex concept more effortless and effective. Game elements such as rewards, challenges, and feedback in GBL will help motivate children to interact and engage with the game so to enjoy learning while gaining more knowledge. Further, integrating persuasive elements into the implementation will affect children's behavior. Fogg introduce model for easy understanding human behavior in general namely Fogg Behavior Model (FBM) [25]. According to FBM, behaviour only occurs, if all elements in FBM which are motivation, ability and prompt are present. Therefore, the FBM as the underpinning model of this research aims to formulate and integrated elements of GBL in designing a persuasive GBL model for children's safety from sexual abuse.

This paper reviews related works and the activity of identifying GBL and elements and persuasive technology in designing a persuasive GBL model for children's safety from sexual abuse.

2 Literature Review

Recent studies show that GBL can potentially educate and increase children's safety awareness from sexual abuse. This section discusses related works on GBL, persuasive, and child sexual abuse issue.

2.1 Game-Based Learning

Several researchers have general definitions of GBL. GBL is a real-life situation setting in an in-game environment [4–6] with identified game principles [6] to enhance players'/learners' knowledge and skills in the game activities, involving problem-solving and challenges that provide players and learners with a sense of achievement [5] and engagement [6] with a defined learning outcome [4].

GBL offers a new way of learning by integrating game elements into learning. Many recent studies applied GBL in school subjects for assist in learning such as in mathematics, science and safety education. Lost Boy Calculic Adventure develop for help year 1 dyscalculic children to learn mathematic [7], Fun Learning Game for Autism

Table 1. Learning elements for game-based learning

Learning elements	Description
Motivation	Rewards such as points and badges in the game motivate learners to move up to higher levels.
Practice	Trying iteratively in the game enables learners to solve or achieve the game goal.
Reinforcement	Repetition in the game helps strengthen the learner's memory, replicate the real-world risk in the context and help learners retain the information longer.
Feedback	Immediate feedback in the game helps the learner to know the current state and further action to achieve the goal.

Learner (FunAut) design for autism children with mild learning disabilities [8] and SCIFUNZY, a mobile game-based application create for Year 1 to year 3 children in learning primary Science [9]. The motivational psychology involved in GBL allows students to engage with educational materials playfully and dynamically. GBL is designing learning activities that can incrementally introduce concepts and indirectly guide users toward defined learning outcomes in the games they play. GBL gives practical value to students by incorporating active learning, promoting students' interest and engagement, and offering immediate feedback on achievement.

A significant amount of research suggests that GBL can increase student learning. [10] claims that the learning principle games utilise to experience the game world provides learners to try, practice, and learn from failure without concern for real-life effects. Another study by [11] claims learning performance, such as critical thinking and problem-solving skills can be accessed by observing students while playing games and looking at performance data.

In order to impart knowledge and skills effectively, [12] shared four learning elements for game-based learning: motivation, practice, reinforcement, and feedback. The description of each element is summarised in Table 1.

2.2 Game Elements Implemented in Previous Study

In order to support the learning process, GBL offers integration of game elements in a learning environment which can increase learner engagement and sustain motivation. Game elements are the design elements used in a hedonic game [13]. According [14], the elements of the game mechanism refer to the functional part and the rule of the game. Previous studies that implement game elements in their studies have been reviewed. Table 2 summarises all game elements implemented in their studies. Twelve (12) identified elements in the reviewed studies include story/narrative/content, point/score, incentive/reward, rule, goal/objective, level, feedback, achievement/assessment, challenge/competition, control/navigation, player and

time. Most studies implement story/narrative/content, achievement/assessment and feedback elements. All these elements also revived to consider for integrated in this study.

2.3 The Fogg Behavior Model (FBM)

Technology has persuaded users to change their attitudes and behaviour [24]. The overlapping of persuasion (increasing awareness, influence, motivation, behaviour change, and others) and computing technologies have been explored by this study. *Persuasive technology* is defined as the application of persuasion strategy through computing technology. Persuasive technology focuses on computers and persuasion combined with assistive tools.

The Fogg Behavior Model (FBM) [25] is a model for easier understanding of human behavior in general. The FBM helps turn behaviour change from a mass of psychological theories into something organized and systematic. FBM consist of three principal elements and every element has its subcomponents. In detailed, the FBM outlines Core Motivator (Motivation), Simplicity Factors (Ability), and the types of Prompts. The subcomponents define the detail elements of principle elements. FBM is helpful in the analysis and design of persuasive technology. The FBM shows that three elements - Motivation, Ability, and Prompts, must converge simultaneously for behavior to occur, as shown in Fig. 1.

Referring to Fig. 1, firstly, FBM shows how behaviour results appear together with three specific elements; Motivation, Ability and Prompts at one moment. Then, it describes the subcomponents of each element. After that, it shows that element Motivation and Ability can be manipulated. For example, if motivation is very high, then, the ability can be low. It is means that Motivation and Ability have an opposite relationship. Lastly, the FBM applies most directly to practical issues of designing for behaviour change. If no behaviour occur, at least one of those three elements is absent.

In this study, FBM is important as a based in designing a persuasive game-based learning model. According to FBM, behaviour only occurs, if all those three elements are present. Identified elements in learning and GBL component are integrated into the model based on elements of FBM; motivation, ability, and prompts, and must converge simultaneously for behaviour to occur. As a result, this model helps in the learning process, and understanding the concept of children's safety from sexual abuse in more effortless and effective.

2.4 Child Sexual Abuse

Child Sexual Abuse (CSA) is defined by [26] as exposing or subjecting a child to inappropriately sexual contact, activity, or behaviour. High cases and adverse effect of CSA victims call for urgent research on educating children about safety from potential sexual abuse. Therefore, for children to know safety from potential sexual abuse situation is necessary. In addition, appropriate learning strategies should be identified so that children will easily understand and be aware of this issue. If the children have awareness, it could facilitates them to take necessary actions when facing uncomfortable situation.

Table 2. The game elements in several related studies.

Study	Application Develop	GAME ELEMENT											
		Story/Narrative / Content	Points/score	Incentive / reward	Rules	Goals /Objective	Level	Feedback	Achievement/ Assessment	Challenge / competition	Control/ Navigation	Player	Time
[15]	Reading Performance of Dyslexic Children	/	/	/	/	/	/	/	/				
[16]	Model for comprehending the effectiveness of DGBL systems				/	/		/	/	/	/		
[17]	Fire Safety for Preschool children	/		/				/				/	/
[18]	Fundamental GBL attribute in existing design model	/	/	/			/	/					
[19]	Cybersecurity, privacy, and digital Literacy Game for Tweens	/	/					/	/		/	/	
[20]	Children's Safety Education					/		/				/	
[21]	GBL for STEM Application	/					/	/	/	/		/	/
[22]	Gamified Instructional technology and material development course	/	/	/					/	/			
[23]	Game-based learning design model	/				/				/	/		

Child sexual abuse prevention education (CSAPE) is not a new program. It is a school-based programs implemented in many countries' school education systems. This program is very effective in transmitting information to children. In Malaysia, primary

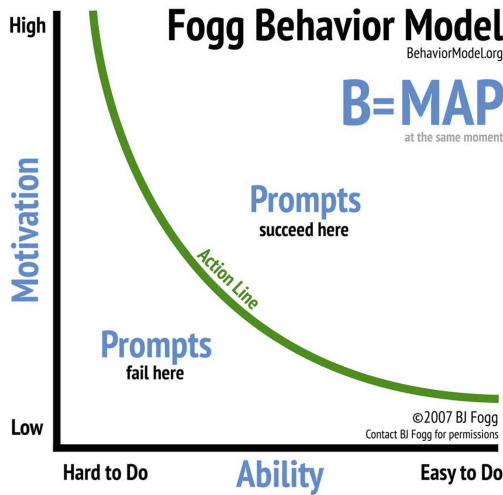


Fig. 1. Fogg Behavior Model. Source: <https://behaviormodel.org/>

school children aged 7 to 12 are taught self-safety in subtopics in *Pendidikan Jasmani dan Kesehatan*. The topics cover identify private parts, safe and unsafe situations, appropriate and inappropriate touches, respecting our body and how to protect it, not keeping secrets from trusted people, the danger of strangers, and how to say no to uncomfortable situations. However, educating children about self-safety from sexual abuse is not easy. They are hard to understand and practice such topics in real life.

In addition, [27] stated that efforts to educate children by NGOs in Malaysia are still ineffective due to environmental factors. She stated that the primary difficulty is the taboo and social stigma surrounding discussing child sexual abuse cases by conservative adults. Many effort has been done by government, NGOs and community regarding this issues. This efforts should be made continuously. New research and approach in educating children regarding CSA should be expended according to the current situation.

2.5 Previous Work of Child Sexual Abuse and Game-Based Learning

Recent studies reveal that digital games can increase knowledge of children's safety from sexual abuse.

Study by [3] developed a sociocultural appropriate mobile-based game named HappyToto to educate children under five years old, parents and caretakers in Tanzania on sexual abuse prevention. The HappyToto is a children's game co-designed with parents/caretakers of children and child experts in Tanzania to complement previous efforts in CSAPE in culturally appropriate way. Two main cartoon-type characters are selected to represent Tanzanian children in the game - Ibra as a boy and Elly as a girl. The game integrates the social-cultural perspectives of the target community in its design and activities. The findings of this study support that the game is effective as a technology-based intervention for improving knowledge and skill in CSAPE for both parents and children.

Another games-based approach to CSA prevention in Australia was developed by [28]. Orbit is an online, free equal-access offer for children aged 8–10. The design of Orbit aims to overcome several challenges identified in other CSA prevention programs. It is created to engage and educate children, their parents, and the broader community about the issues of sexual abuse. This study finding indicates that developing CSA prevention games required interdependence between gameplay and content. The study suggests that in order to develop effective and practical sexual abuse prevention skill, the prevention program should be designed well and game elements included in the game should facilitate to overcoming identified challenges in CSA prevention.

3 Method

The theories and concepts, existing related models, attributes, components, processes, and methods involved in game-based learning and persuasive multimedia applications have been thoroughly studied in developing the persuasive game-based learning model. In addition, current issues related to CSA have also been investigated. Once the information had been gathered, critical analysis and comparative study were conducted, identifying the components of persuasive multimedia and game-based learning for CSA.

Then, identified components and relationships of the components that will be integrated into the persuasive multimedia model for game-based learning to enhance children’s awareness of CSA have been visualised. The process was done rigorously to ensure we covered and identified all the appropriate components and their relationships.

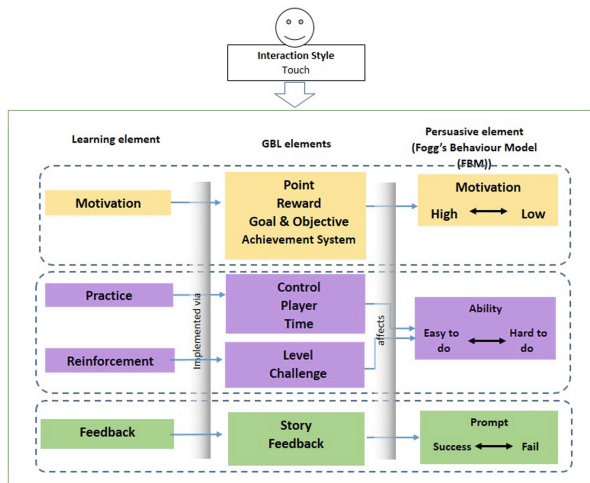


Fig. 2. The Persuasive Game based Learning Model for Child Sexual Abuse Safety (PGBL4CSASafety)

Table 3. Identification elements for learning, GBL and Persuasive

Learning Elements	GBL Elements	Persuasive Elements
Motivation	Challenge	Ability
Practice	Point	Prompt
Reinforcement	Goal & Objective	Motivation
Feedback	Achievement System	
	Player	
	Time	
	Feedback	
	Control	
	Story	
	Level	
	Rules	

4 Results and Discussion

This section presents the result, focusing on identified elements of learning, GBL, and persuasive technology from the literature reviewed. Table 3 summarises the finding. Four elements for learning (motivation, practice, reinforcement and feedback) as suggested by [9], twelve elements for GBL (from several studies), and three persuasive elements from Fogg behaviour model have been chosen since they are related and appropriate for our model.

The relationship between the identified learning, GBL and persuasive elements has been analysed and synthesized. The identified elements then have been integrated and visualized in the initial complete version of persuasive game-based learning model for child sexual abuse safety as shown in Fig. 2. Rules element not include under any category since rules element considered as essential element in designing overall storyline of the game.

The identified learning and game elements have been categorized, grouped and implemented in a game environment. The integration of learning and GBL elements then will contribute to the effect of children's behaviour through persuasive elements. For the next phase, this model will be validated using expert review.

5 Conclusion

The development of entertainment and interactive way of learning led to continuous innovation in teaching and learning practice. Apparently, the technology itself stimulates creativity and often draws the attention and engagement of children. GBL give an

alternative approach in providing knowledge to children about safety from sexual abuse. Identified appropriate learning, GBL and persuasive elements are major aimed of this study. Integration identified elements and how it is relationship will contribute to the development of persuasive game-based learning model for children safety from child sexual abuse.

Acknowledgments. This research was supported by Ministry of Higher Education (MOHE) of Malaysia through The Fundamental Research Grant Scheme for Research Acculturation of Early Career Researchers (RACER/1/2019/ICT01/UUM//2).

References

1. Neto, L. V., Fontoura Junior, P. H. F., Bordini, R. A., Otsuka, J. L. & Beder, D. M. Design and implementation of an educational game considering issues for visually impaired people inclusion. *Smart Learning Environments*, 7:4, 2020, DOI: <https://doi.org/10.1186/s40561-019-0103-4>
2. G. Hitrec, Teaching Children to Protect Themselves from Sexual Abuse. *Protecting Children from Sexual Violence*, 2011, pp. 165-174.
3. M. P. Malamsha, E. Sauli, E. T. Luhanga Development and Validation of Mobile Game for Culturally Sensitive Child Sexual Abuse Prevention Education in Tanzania: Mix Methods Study. *JMIR Serious Game*, 9(4), 2021.
4. Pan, L., Tili, A., Jiang F., Shi, G., Yu, H. & Yang, J. How to implement Game-based Learning in a Smart Classroom? A Model based on a Systematic Literature Review and Delphi Method. *Front. Psychol*, 12:749837. 2021 DOI: <https://doi.org/10.3389/fpsyg.2021.749837>.
5. M. Qian, K. R. Clark, Game-based learning and 21st century skills: A review of recent research, *Computers in Human Behavior*, 63, 2016, pp. 50-58.
6. J. Trybus, Game-based learning: What it is, why it works, and where it's going. Miami: New Media Institute, 2015, <http://www.newmedia.org/game-based-learning-what-it-is-why-it-works-and-where-its-going.html>.
7. A. Subashini, D. P. Anand I. Ramli, Lost boy calculic adventure (LBCA): A game based learning app for year 1 dyscalculia children. *Proceeding of the International University Carnival on e-Learning (IUCEL) 2021, UTLC UUM*. 537-540.
8. C. O. Azizah, C. W. Leen, H. S. San, Expert review on fun learning games for autism learners (FunAut) application, in: *e-Proceeding of Seminar Kebangsaan Teknologi Multimedia dan Komunikasi (NSMTCom)*, 2021, pp. 192-201.
9. A. Subashini, H. Harryizman, E. J. Yen, H. Y. Ying, SCI-FUNZY: Design and development of mobile game-based application for learning primary science year 1, 2, and 3, in: *e-Proceeding of Seminar Kebangsaan Teknologi Multimedia dan Komunikasi (NSMTCom)*, 2021, pp. 167-173.
10. J. P. Gee, *What Video Games Have to Teach Us About Learning and Literacy*. New York: Palgrave Macmillan, 2003.
11. T. Kaya, A stealth assessment turns to video games to measure thinking skills. *The Chronicle of Higher education*, 2010, <http://chronicle.com/article/A-stealth-Assessment-Turns/125276/>
12. S. Chakraborti, 4 Components of Game-based Learning. *CommLab*, 2016, India. <https://blog.commlabindia.com/elearning-design/game-based-learning-components-infographic>
13. A. L. Beck, S. Chitalia, V. Rai, Not so gameful: A critical review of gamification in mobile energy applications. *Energy Reseach & Social Science* 51, 2019, pp. 32-39.

14. J. Kim, J. Jung, S. Kim, The relationship of Game Elements, Fun and Flow. *Indian Journal of Science and Technology*, 8(S8), 2015, pp. 405-411
15. R. Bigueras, Mobile Game-Based Learning to Enhance the Reading Performance of Dyslexic Children. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(1.3), 2020, pp. 332-337
16. Y. C. Liu, W. T. Wang, T. L. Lee, An integrated view of information feedback, game quality, and autonomous motivation for evaluating game-based learning effectiveness. *Journal of Educational Computing Research*, 59(1), 2021, pp. 3-40.
17. Z. Nur Atiqah, M. N. Siti Fadzilah, T. W. Tengku Siti Mariam, The model of game-based learning in fire safety for preschool children. *International Journal of Advanced Computer Science and Application*, 10(9), 2019, pp. 167-175.
18. R. Tahir, A. I. Wang, Insights into Design of Educational Games: Comparative Analysis of Design Models. In: Arai K., Bhatia R., Kapoor S. (eds) *Proceedings of the Future Technologies Conference (FTC) 2018, Advances in Intelligent Systems and Computing*, 880, 2018, Springer, Cham. DOI: https://doi.org/10.1007/978-3-030-02686-8_78.
19. S. Maqsood, S. Chiasson, Design, development, and evaluation of a cybersecurity, privacy, and digital literacy game for tweens. *ACM Transactions on Privacy & Security*, 24 (1), 2021
20. Y. Yang, D. Zang, X. Mou, Y. Yang, Changing children's behaviour based on persuasive game: design for children safety education. In: S. Nazir, T. Z. Ahram, W. Karwowski, (eds). *Advance in Human Factors in Training, Education, and Learning Sciences. AHFE 2021. Lecture Notes in Networks and Systems*, vol 269, 2021, Springer, Cham. DOI: https://doi.org/10.1007/978-3-030-8000-0_17.
21. J. Aisyah Nadhirah, A. B. Mimi Hani, Popular Game Elements used in Designing Game-Based Learning STEM Application for School Student – A Review, *Jurnal Kejuruteraan* 32(4), 2020, pp. 559-568.
22. T. Aldemir, B. Celik, G. Kaplan, Aqualitative investigation of student perceptions of game elements in a gamified course. *Computers in Human Behavior* 78, 2018, pp. 235-254.
23. Y-R. Shi, J-L. Shih, Game Factors and Game-based Learning Design Model. *International Journal of Computer Games Technology*, 2015. DOI: <https://doi.org/10.1155/2015/549684>
24. B. J. Fogg, *Persuasive Technology: Using Computer to change what we think and do*. Morgan Kaufmann Publisher, USA, 2003.
25. B. J. Fogg, A behaviour model for persuasive design. *Persuasive '09: Proceeding of the 4th International Conference on Persuasive Technology*. 40, 2009, pp. 1-7. DOI: <https://doi.org/10.1145/1541948.1541999>.
26. Prevent Child Sexual Abuse America, *Prevent Child Sexual Abuse*, 2005. Available: <http://preventchildabuse.org>
27. A. Azira, *Child Sexual Abuse Prevention in Malaysia*. Working Paper, 2016.
28. L. Scholes, C. Jones, C. Stieler-Hunt, B. Rolfe, *Serious Games for Learning: Game-based Child Sexual Abuse Prevention in Schools*. *International Journal of Inclusive Education*, 18, 2014, pp. 934-956.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

