



Empowering Youth through Play: Promoting Awareness of Sexual Grooming among Schoolchildren through Game-based Learning

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ABSTRACT

Sexual grooming is engaging with a child to build a relationship with intentions of sexual exploitation. In some cases, it precedes child sexual abuse. The need for child sex education can be further illustrated by the severity of the trauma that results from the abuse. Hence, it is ideal to recognise the signs of grooming to reduce the risk of child sexual grooming. This project aims to develop an age-appropriate game to assess game-based learning to educate children on preventing sexual grooming. The methodology implemented in this project is the outcome-based methodology. First, a survey was distributed to guide the design of the game and to identify the relevant learning outcomes relating to sex education the respondents wish their children to learn. Based on the results, there are four learning outcomes to be achieved. Second, the genre of the game was determined to be a visual novel. Third, the premise of the game was written. Fourth, assets to enhance the playing experience were either created or sourced online. Fifth, the game mechanics were developed using Godot Engine. Sixth, the game mechanics were play tested iteratively, before and after integration with one another. Seventh, all the mechanics and non-mechanic elements were integrated to complete development. Eighth, the game was play tested online. Pre- and post-test results from the playtest were recorded and evaluated. Using paired samples t-test with a 95% confidence interval, the calculated t-value 12.011 was more significant than the critical t-value of 2.042, and the p-value 0.00001 was lesser than the significance level of 0.05. The result suggests that using the game to create awareness of physical and online grooming towards children was effective.

1. Introduction

Sexual grooming commonly shortened to grooming is an act of emotionally engaging with a child to build a relationship with them with the intention of sexual exploitation [1,2]. It can happen both offline and online, by people the child may or may not know. Grooming does not exclusively happen between adults and children, as child-to-child grooming has also been reported, albeit being under-investigated [3]. The authors state that the general grooming process involves three stages: earning the trust of the victim; commencing and maintaining abuse, and keeping the abuse hidden. This

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process may be years in the making. In some cases, grooming precedes child sexual abuse (CSA). Wolf and Pruitt [4] found that the grooming experience is a co-factor in determining the severity of trauma symptoms in CSA survivors in their adulthood. Their study on trauma prediction measured anxiety, depression, sexual abuse trauma, sleep problems, sex problems, and disassociation in CSA survivors based on three types of grooming: (1) verbal coercion, (2) drugs/alcohol grooming, and (3) threatening/violent grooming. Of these, they found that threatening/violent grooming has a significantly positive predictive effect on trauma symptoms in CSA survivors. The severity of these symptoms may have devastating effects in their later life stages, such as difficulties in setting boundaries with others and being in a state of constant fear. Hence, it is ideal to be able to recognise the signs of grooming to reduce the risk of child sexual grooming. Such intervention falls under sex education.

Planned Parenthood [5] defines sex education as the teaching and learning about a wide range of topics concerning sex and sexuality, as well as examining the attitudes and views about those topics and building the skills needed to navigate relationships and maintain one's sexual health. However, comprehensive sexuality education (CSE) may be a more appropriate approach. They note that while sex education refers to "a broad variety of topics related to sex and sexuality", CSE also includes topics related to human development, relationships, personal skills, sexual behaviour, sexual health, and society and culture. The United Nations Educational Scientific and Cultural Organization (UNESCO) [6] highlights the importance of CSE at a young age by using age-appropriate approaches that match their development level to ensure that they are equipped with specific knowledge and skills to make well-informed decisions. They add that the lack of CSE may predispose children to sexual exploitation. UNESCO *et al.*, [7] structured their guidance into eight key concepts and identified the four age groups of learners. The age groups are ages 5 to 8; ages 9 to 12; ages 12 to 15, and ages 15 to 18 and above. Each concept includes learning objectives that differ by age group. As implied by the age groups, knowledge gained from CSE is meant to increase in complexity as learners grow older. CSE can be applied in both physical and online scenarios. Therefore, the learning experience should not be restricted to physical scenarios only.

The need for CSE applicable to online scenarios can be illustrated by several reports. The Malaysian Communications and Multimedia Commission (MCMC) [8] conducted a survey and reported an 18.5% increase in the usage of the Internet among child users from ages 5 to 17 (2020: 47%; 2018: 28.5%). Of them, 0.4% were found to be below age 15. They also found that only 53.3% of parents were aware of parental control – a decline compared to 62.4% in 2018. Additionally, it was found that only up to 34.4% utilized the parent control services on their children's devices. Coupling the increased child Internet user population and decreased parental control spells great concern for the online safety of children. Zulkarnain Mohd Yasin emphasised that efforts must be made to educate the public on the positive and ethical Internet use to keep children safe from digital technology-related adversities without infringing on their rights to the Internet [9].

In 2019, the Royal Malaysia Police (PDRM) reported that up to 20,000 IP addresses in the country were involved in the distribution of child pornography in Southeast Asia [10]. The number of IP address holders partaking in the sexual exploitation of children is greatly distressing and worrisome, as among these contents were found to be child grooming. In 2016, R.AGE released an investigative documentary titled PREDATOR IN MY PHONE, exposing sex predators who preyed on their undercover reporters who posed as underage girls. The documentary led to a discussion on the lack of laws against child sexual grooming in the country, as the absence of such laws meant that police were only able to act if physical sexual assault was committed [11]. This implied that groomers could get away with exploiting young children. A survey conducted jointly by R.AGE and U- found an alarming 67% of those polled stated that they had been subjected to online grooming [12]. Months

following the release of the documentary, R.AGE announced a collaboration with UNICEF as part of their movement to advocate for anti-grooming laws [13]. The support they gained from the movement helped provide the groundwork for the Sexual Offences Against Children Act 2017 in Malaysia [14].

The Sexual Offences Against Children Act 2017 includes sexually communicating with a child as an offence relating to child grooming. It is described in two ways: any part of the communication relates to sexual activity, or any reasonable person finds any part of it to be sexual. Meaning that if the predator has sexual intentions with the child, regardless of if any physical contact has been made, they can be punished upon conviction. Otherwise, none shall be convicted if it is for educational, scientific, or medical purposes.

With the passing of the Act now in place, parents and educators must not be complacent in educating children on sexual grooming. It can be prevented if a child is well-equipped with knowledge on identifying the signs through comprehensive sex education. However, teaching sex education to children proved to be a challenge in Malaysia. Dorasamy *et al.*, [15] found that 40% of the parents interviewed did not know and never heard of online grooming. However, they did not divulge whether the interviewed parents of grooming victims have heard of online grooming before the incident happened to their children. Adding on, they also found that parents in our country agree that sex education is good at the secondary education level but inappropriate to study in school, implying that it is improper to be taught in a formal education setting. Furthermore, they also note that some families believe that it is inappropriate to teach CSE to their children below the age of 10, and some find it to be a difficult topic to talk about with their children. Their reluctance is a shared sentiment amongst many Malaysian parents [16]. In tragic cases, the sentiment would lead to children satiating their curiosity through groomers.

To combat child sexual grooming, an efficient method must be implemented to ensure that children fully understand their rights to protect themselves from groomers. Among the many approaches to equip young children with such knowledge is game-based learning (GBL). A study has proved GBL to be a fruitful approach to help students learn [17] and this extends to CSE [18,19]. Jan & Gaydos [20] conceptualises GBL in three ways: a learning approach driven by game technologies, a learning approach driven by both game technologies and corresponding pedagogies, and a pedagogical approach informed by game design concepts. Generally, the application of GBL responds to the needs of children who are born as Digital Natives. Prensky [21] divides the students of today and students of the past into Digital Natives and Digital Immigrants. He states that Digital natives are “native speakers” of the digital language of computers, video games, and the Internet” (p.1) whereas Digital Immigrants are those “who were not born into the digital world but have, at some later point in our lives, become fascinated by and adopted many or most aspects of the new technology are, and always will be compared to them,” (p.1). The significance behind this distinction is that Digital Immigrants have their own “accents” which meant that despite adapting to modern changes, they still retain habits from their past. He further emphasized the need for a change in teaching approach, asserting that “our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language” (p.2).

Plass *et al.*, [22] expressed those games whether digital or non-digital, have long been used to support the learning process. From playing with sensory toys as an infant to digital games as a young child, there is no shortage in variety that children can benefit from. Digital games are the latest variety of influences on the childhood of Malaysia’s younger generation. It is no surprise that efforts were and are still made to assess the suitability of using digital games in teaching and learning.

For a generation of students learning in interactive online environments, effective implementation of digital games in education can yield innovative and positive changes [23]. The

authors state that serious games are often the preferred subgenre of digital games to be used in education. They describe it as “any game-based initiative which focuses more on primary purposes than just pure entertainment and it mostly refers to the use of digital games in education and various industries” (pp. 139-140). They also added that students in the digital era deal with digital information daily, use mobile technologies to be connected, engage in collaborative work, frequently multi-task, and find games more fun and worthwhile. Moreover, games have the benefit of attracting their attention and interest, leading to active student engagement in achieving specific learning goals and outcomes [23].

According to Kiel [24], educational media content may be used as a complement to reinforce prior knowledge, provide in-depth information, and provide a relatively safe environment for young people to explore sensitive issues. Hence, the GBL approach often employs the use of serious games to complement traditional pedagogical approaches. Its implementation aims to encourage students to be more creative and to make learning concepts more fascinating to them [25].

Games used in effective GBL approaches exhibit several shared characteristics in their design: immediate feedback [23,24,26], repetition [24,27], fun and engagement [23,24,27-29], and motivation [24,27,28,30]. For learning to be effective, Rugelj and Lapina [26] state that learners go through a cycle comprising four stages: (1) possessing the prior experience, then (2) observing, and reflecting on the said experience, leading to (3) the creation of analyses and conclusions, which are then (4) utilised to test hypotheses in future scenarios. Consequently, this leads to new experiences. This falls in line with the constructivist learning theory, which posits that humans recursively conceptualise knowledge and meaning based on prior experiences and knowledge [26]. Games can simulate real-world scenarios that enable constructivist learning to take place.

Valenza *et al.*, [31] conducted a systematic review of GBL-related studies and delineated common guidelines that may prove beneficial in designing games for children. They categorised them into input guidelines, output/interface guidelines, content guidelines, and control guidelines. Among the common guidelines for children from ages seven to nine are: (1) simplifying mouse usage, (2) using readable typefaces, (3) clearly defining goals, (4) providing accurate and fast feedback, and (4) including different game levels. Rugelj and Lapina [26] express those certain elements are crucial to the game to keep the player motivated and engaged while enjoying themselves. The key elements of the game are: (1) the game is built on lore, which serves as the framework and ties the many elements of the game together into a cohesive whole; (2) players in the game attempt to complete objectives connected to the lore and challenges; (3) while adhering to existing rules of the game, new challenges are added to it; (4) player actively interact with other people in the game or inside the gaming environment; (5) they typically have a tense connection with them or content with them; (6) the game’s interactivity gives the players a sense of autonomy over events and possibilities to influence its outcome; (7) a game’s environment usually provides the players with feedback that allows them to evaluate the correctness of their choices and the effectiveness of his progress towards the game’s goals at any time [26].

Sex education and CSE can be difficult topics to discuss between a parent and their child, a caregiver and the child, or a teacher and their student. The reluctance may lead to a lack of awareness about sexual grooming on the child’s end. If the child is unable to recognise the signs of sexual grooming, they may fall victim to sexual exploitation. Sexual grooming can take place in both physical and offline environments, in many forms, and can span over long periods. From acquiring access to the victim and gaining their trust to desensitising them to sexual activity through touch and material depicted [32,33], children may fall victim to groomers if they end up complying with their seemingly harmless requests. This further emphasises the need for parents, caregivers, or teachers to provide sex education and CSE to children.

Due to the nature of games, Kiel [24] states that a game-based intervention can make way for a conversation about sexual health between children and their parents. Depending on the content, both parents and children may even play and explore the topic together. In addition to that, Kiel (2020) states that teachers who find it difficult to discuss the topic may use games as an alternative to traditional pedagogical approaches, keeping in mind that they are complements rather than replacements of other educational approaches. The author states that children may also benefit from sex education using the GBL approach, as it allows them to experiment with choices—without fear—and experience varying consequences under the guidance of a trusted adult in simulated, virtual scenarios. However, for it to be effective, it must comprise age-appropriate content, content that encourages both children and caregivers to learn, and an evaluation of the children’s learning progress [34].

The existing Malaysian curriculum for primary school addresses the need for sex education by including several related topics in the *Pendidikan Jasmani dan Kesihatan* syllabus, which are set in the Malay language. Presently, the syllabus includes content on reproductive organs, inappropriate touches, private body parts, puberty, self-esteem, cyber exploitation, sexual harassment, pregnancy, sexually transmitted infections and diseases, and porn addiction; however, sexual grooming is only covered extensively in *Pendidikan Jasmani dan Pendidikan Kesihatan Tahun 4 Unit 11*. Its absence in most of their primary school years may leave them unequipped for dangerous situations. Concerningly, child sexual grooming is eerily similar to the child sex trafficking recruitment process [35]. This further emphasises the need for an intervention. With the growing child Internet user population and the decline in parental control awareness [10], this poses a great threat to the online safety of children. Global technological changes have resulted in a paradigm shift in both the victims’ online exposure and the groomer’s capacity to share child sexual exploitation and abuse (CSEA) material and communicate with children and other groomers online under an anonymous identity [10]. This means more children will be left vulnerable to grooming and its consequences.

Our study aims to answer this research question: How do we assess game-based learning (GBL) to educate children on preventing sexual grooming? To answer this question, we aim to evaluate the effectiveness of using a game, Red Flag, to create awareness of sexual grooming towards children. We employed the international technical guidance on sexuality education [7] to address the gap and limitations in the Malaysian curriculum for Primary 3 to Primary 6 students. Moreover, we adopt the outcome-based methodology proposed by Sison et al. [36] to develop a game with player autonomy and relevant feedback, as well as an assessment of the GBL approach as a viable tool for creating sexual grooming awareness. We will explain further on the methodology in the next section.

2. Methodology

2.1 Designing the GBL Environment

The outcome-based methodology is a 9-step methodology proposed for developing a GBL environment [36]. The steps in the methodology are carried out in the following order: (1) determine the learning outcomes (LOs) to be achieved, (2) determine the genre of the game, (3) write the premise of the game, (4) design the LO mechanic to achieve the LOs, (5) design the elements related to the mechanic, (6) implement the mechanic and its related elements, and integrate the previous mechanics, (7) playtest and evaluate the mechanics, (8) integrate all the elements, and (9) playtest and evaluate the game as a whole.

For the first step, the selection of the intended LOs in the Red Flag game is collated from an earlier survey from parents, guardians, and teachers of Primary 3-6 in their care. As there were no written LOs sources from the students’ copy of the *Pendidikan Jasmani dan Kesihatan* textbooks for

Primary 3 to 6, the LOs for the game (see Table 1) were based on the UNESCO's international technical guidance on sexuality education [7].

Table 1

LOs for the Red Flag game

LOs	Explanation
LO1	Understand that social media and the Internet need to be used with special care especially when sharing information
LO2	Understand and recognise the different ways and times to express appreciation and gratitude
LO3	Recognise troubling situations and demonstrate seeking assistance from various sources
LO4	Recognise verbal and non-verbal ways of communicating discomfort and needs, and respond to unwanted sexual attention directed towards one's own body and others

The second step comprise determining the game genre, which are educational and visual novel genres. Next, we write the premise of the game. The game follows the player, a primary school student who eventually realises something is amiss with their friend. During specific conversations, the player may need to choose an action. The earlier choices do not affect the storyline but represent an acceptable or poor action. Only the final question concerns the ending of the story. A choice representing a suitable action will congratulate the player for their choice and inform them what they have done right. A choice representing a poor action will alert the player on why their choice is lacking and what they could have done. Steps 4 to 7 are implemented iteratively to build the GBL environment incrementally. Here, we developed the game mechanics using Godot Engine, and published it on itch.io. After having integrate all elements into the game, we then playtest and evaluate Red Flag in consecutive steps: (1) pre-testing, (2) playtesting, and (3) post-testing.

2.2 Participants

To evaluate the game, we recruited 34 participants via opportunity sampling. These participants were recruited through their parents and guardians' WhatsApp groups and Facebook. The 34 participants are in Primary 3 to 6: 14.7% in Primary 3, 35.3% in Primary 4, 20.6% in Primary 5, and 29.4% in Primary 6. There were 18 male students (52.9%) and 16 female students (47.1%).

2.3 Material

Red Flag is a 2D educational and visual novel game, that uses a narrative storytelling set in the Malay language to deliver its content on sexual grooming. The player plays as a young child whose friend is a victim of grooming by their English language teacher. The player will receive advice from the player's mother to guide the player in making the right choices. Certain texts are coloured in green, denoting that they are important terms (see Figure 1(a)), whereas texts in red denote that they are the appropriate actions to take (see Figure 1(b)).



Fig. 1. LO1 mechanic text colours

Each LO mechanic is presented as a question with two choices (see Figure 2(a)). The player will be informed if the player has made the correct or wrong choices, followed by an explanation (See Figure 2(b)).



Fig. 2. Choices and answers for LO1 mechanic

2.4 Procedure

Before the study started, the parents and guardians of the primary school students are asked to read and sign a consent form detailing the purpose, procedure, risk, and confidentiality of the study. After having signed the form, the participants proceed to the pre-test, which is the *Kuiz A*, in the quiz section of the game. Then, the participants playtest where they encountered four LO mechanics in the Red Flag game. After that, the participants proceed to the post-test, which is the *Kuiz B*. There are 10 questions in *Kuiz A* and *Kuiz B* respectively, which are adopted from the *Pendidikan Jasmani dan Pendidikan Kesihatan Tahun 4 Unit 11* textbook. *Unit 11* of the textbook covers social and reproductive health education which includes sexual grooming activities and the prevention strategies. Some of these questions have more than one answer and that selecting any of the answers will reward the participant one mark. The participants are advised to select the most accurate answer. The maximum score that the participants can get is 10 and the minimum score is 0. After answering *Kuiz B*, the participants then gave their feedback on the study.

3. Results

There are 10 questions in both *Kuiz A* and *Kuiz B*, with the maximum score in each test is 10. The marks they obtained in the pre-and post-tests were collected. The marks are shown in Table 2.

Table 2
 Pre-test and post-test marks of participants, P

P	Pre-test	Post-test	P	Pre-test	Post-test	P	Pre-test	Post-test
1	5	8	13	3	6	25	7	10
2	4	7	14	3	7	26	3	5
3	8	10	15	5	8	27	3	8
4	7	9	16	4	8	28	5	8
5	5	9	17	5	10	29	3	7
6	4	6	18	5	10	30	5	8
7	8	8	19	4	9	31	3	7
8	9	10	20	6	10	32	5	8
9	9	9	21	6	10	33	6	7
10	4	6	22	5	10	34	4	5
11	3	4	23	2	5			
12	5	8	24	4	9			

We conducted hypothesis testing using the scores in Table 2 to evaluate whether the Red Flag game is effective in creating awareness of sexual grooming towards children. The hypotheses are as follows

- i. Null hypothesis, H_0 :
 Using Red Flag as a tool has no effect in creating awareness of sexual grooming towards children, $\mu = 0$
- ii. Alternative hypothesis, H_a :
 Using Red Flag as a tool has an effect in creating awareness of sexual grooming towards children, $\mu \neq 0$

The hypotheses were tested using a paired samples t-test, and the IBM SPSS software was used. The paired t-test formula used is shown in Eq. (1)

$$t = \frac{\frac{(\sum d)}{n}}{\sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{(n-1)n}}} \tag{1}$$

From the tests, we have a sample size, $n = 34$, degree of freedom, $df = 33$, mean difference, $\mu_d = 3$, and standard deviation, $s = 1.456$. The paired samples t-test uses a 95% confidence interval (CI), and $\alpha = 0.05$. Based on the t-table, the critical t-value, $t_{33,0.05}$ is 2.042. The decision rule is that the null hypothesis is rejected if $|t| > t_{33,0.05}$ or p-value < 0.05 . The calculated t-value is 12.011 and the two-sided p-value obtained is < 0.001 . Since $|t| > t_{33,0.05}$ and p-value < 0.05 , the null hypothesis is rejected. There is sufficient evidence to support the H_a that the improvement in marks is statistically significant. H_a is also supported by the CI as μ is (2.492, 3.508) where there is no zero in the interval.

3.1 Participants' Feedback

After the participants had answered *Kuiz B*, we gathered their feedback on their experience playing the Red Flag game. Although there were many positive remarks regarding the artwork and gameplay, there was some feedback on the narrative and language. Some participants find the character dialogues too long for the game that they lose sight of the gameplay. There was even a recommendation for the game to be in English as well. This recommendation is not surprising as the

Ministry of Education in Malaysia has established the Dual Language Programme, in which primary and secondary school students can learn Science, Mathematics, ICT, and Design and Technology subjects in English or Malay.

4. Conclusions

In conclusion, the Red Flag study has yielded compelling evidence supporting the efficacy of utilizing games as a potent tool for raising awareness about child sexual grooming. However, the research is constrained by the limited sample size, and absence of a control group. In order to enhance the robustness and generalizability of these findings, it is imperative to conduct further research involving a broader demographic of students, particularly those in Primary 3, 4, 5, and 6. This expansion of the participant pool will contribute to a more comprehensive understanding of how this approach impacts children of various age groups. Future studies would also benefit from a larger and more diverse sample, thereby amplifying the relevance and applicability of the results. To build upon the current research framework and enhance its validity, it is recommended that future studies incorporate a controlled experimental design with two distinct groups: a control group and an experimental group. Such an approach will enable a more rigorous assessment of the game's impact by providing a baseline for comparison.

Furthermore, there are several avenues for improving the overall player experience and the assimilation of educational content within the game. Suggestions include the addition of voiceovers to enhance engagement and comprehension, the incorporation of a save feature to accommodate different playstyles and schedules, and the introduction of a feature allowing players to switch the in-game language to English, thereby increasing accessibility for a wider audience. Additionally, a potential evolution of the game's format from an educational visual novel to a top-down or side-scrolling role-playing game holds promise in terms of fostering deeper player involvement and engagement. By immersing players in a more dynamic and interactive gaming experience, this shift in format may yield more fruitful results in terms of knowledge retention and overall impact. With regards to the assessment of long-term information retention, conducting further evaluations within a 1-to-2-month period could prove beneficial for assessing the level of retention concerning the obtained information about sexual grooming awareness.

In summary, the Red Flag study marks a significant step in harnessing the potential of games as a means to educate and raise awareness about critical issues such as child sexual grooming. Integrating GBL for awareness and learning has the potential to increase students' understanding, higher learning retention, interest and focus on the subject [37]. By expanding the scope of research, incorporating controlled experiments, and implementing enhancements to the gaming experience, future work can further advance this important field, ultimately contributing to the protection and well-being of children in our society.

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