

GAMISAFE: Gamification Based Learning Application to Prevent Sexual Harassment in Elementary School

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Abstract

Sexual violence or sexual harassment can occur among children. This issue is not only the responsibility of parents, but also includes teachers and the surrounding environment. This study aims to develop a valid and practical gamification-based learning application to prevent sexual harassment in elementary schools. This study uses a Research and Development (R&D) type of research with the ADDIE model. The subjects in this study consisted of teachers and upper elementary school students at an elementary school in Malang City. The data collection techniques used were interviews, observations, and questionnaires. The data analysis techniques used were descriptive qualitative and descriptive quantitative. The validation results from subject matter experts, media experts, and teaching material experts showed that the learning application was highly valid. In addition, the results of teacher and student trials (small scale and large scale) also showed that it was highly practical. The developed application was declared suitable for use as a learning medium to prevent sexual harassment among elementary school students, both in classroom and outside classroom learning activities.

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INTRODUCTION

Sexual violence, also known as sexual harassment, is one of the most prevalent cases of indecency violations in recent times. Sexual harassment encompasses various forms of behavior that demean, insult, abuse, and attack a person's body or reproductive functions (Permendikbudristek RI, 2023). Sexual harassment is not just offensive behavior, but also a violation of individual rights that disrupts a person's sense of security and comfort. Sexual harassment does not only occur among teenagers and adults, but can also occur among children who are still in elementary school. This condition can occur due to various influencing factors, namely: 1) social factors, such as crime, poverty, social services, and culture, 2) family factors, such as domestic violence, 3) vulnerable children factors, such as disability, rejection, and lack of affection (Dania, 2020).

Sexual harassment can cause suffering for children psychologically, physically, and socially (Octaviani & Nurwati, 2021). Psychologically, it will have an impact on the mental health of the child as the victim. This can lead to depression, phobias, and excessive fear of others. In addition, children who are victims of sexual harassment may experience physical changes, such as delayed brain development and even damage to internal organs. Negative views about sexual harassment in the child's social environment will make it difficult for them to interact with their surroundings.

The Indonesian Child Protection Commission (KPAI) stated that from January to August 2023, cases of violence against children were at an alarming level. In 2023, 487 children were victims of sexual violence (Fahham, 2024). This figure makes it the category with the highest number of cases compared to other forms of violations in educational institutions. Cases of sexual harassment against children in Indonesia cover several topics, one of which is child rape. Child rape is the most common case, with perpetrators ranging from teachers and other individuals to even the child's own parents. This is because the perpetrators are in a position of dominance, so when children are threatened, coerced, or physically abused, they often feel afraid and comply with the perpetrator's demands. The Indonesian Teachers' Union Federation (FGSI) found that from January to April 2023, most cases of sexual harassment in schools (46.67%) occurred at the elementary/MI level. In addition, there was one case of sexual harassment that occurred online. The case involved 36 victims aged 12 years old. The perpetrator got to know the victims through digital platforms such as Facebook and WhatsApp by sending pornographic content and making video calls, as well as asking the victims to take off their clothes (Rosa, 2023). There was also a case of rape of a kindergarten child by three 8-year-old elementary school boys in Mojokerto, where the perpetrators were the victims' own neighbors (Sagita, 2023). The Ministry of Women's Empowerment and Child Protection and Rakimin from Unusia explained that exposure to pornographic content was one of the triggers for this deviant behavior ((Sagita, 2023; Indiraphasa, 2023).

Findings from interviews and observations show that there is one high school student who has experienced sexual violence within the family. This experience has had an impact on the student's behavior, dress style, and social relationships with classmates. The student tended to withdraw, was shunned by friends, and felt uncomfortable at school. In addition, several students also experienced the visual effects of sexual violence due to exposure to inappropriate content while playing games on their cell phones or computers. It is important for children to recognize and understand more about the dangers of sexual harassment. To that end, education on the prevention of sexual harassment is needed in elementary schools.

Issues related to sexual harassment of children are not only the responsibility of parents, but also of teachers and the surrounding environment. Efforts to protect children from violence can be carried out in various ways, such as through the implementation of government policies contained in laws or other regulations. In addition, a good relationship between parents and children can also build children's sensitivity and responsiveness to malicious intentions from others. This enables parents to ensure that the paths taken by their children are safe. Contacts to be reached in an emergency can also provide information and supervision for children. The role of parents also includes providing children with an understanding of their sensitive body parts and the need to protect them (Trilisiana et al., 2020). All acts of violence against children must be

handled and prevented based on Law Number 35 of 2014 concerning Child Protection, which states that “Every child has the right to express and be heard, receive, seek, and provide information in accordance with their level of intelligence and age for their development in accordance with moral and propriety values” (UU RI, 2014). The law explains that every child has the same rights without discrimination. Children should receive information about sex education to prevent further sexual harassment.

Schools can be a potential place to teach students about sexuality and help them avoid crime, violence, and sexual harassment by incorporating sex education into the school curriculum (Joni & Surjaningrum, 2020). One of the tasks of teachers is to provide knowledge and information to their students. Various approaches that can be adapted and applied by teachers are ways to provide early education about the dangers of sexual harassment. Although children's levels of understanding in receiving this material vary, teachers can adjust it based on the characteristics and level of understanding of the students so that their rights are fulfilled and they are protected from various forms of violence that may occur. The interview results showed that teachers helped improve students' understanding by utilizing learning media in the form of pictures and videos, which were considered very helpful in delivering the material concretely. In addition, students showed a high level of enthusiasm for learning that involved games, quizzes, or interactive activities. Students felt more excited and interested in participating in learning that was delivered in a fun way, and found it easier to understand the material when it was presented through visual media and games.

Based on this description, the steps to overcome this problem are to design and develop a product in the form of a gamification-based learning application with an attractive design that meets the needs of teachers and students to prevent sexual harassment in elementary schools. Gamification is an approach that uses elements from games to make something boring more interesting (Carolus & Gormantara, 2022). Gamification was formally defined by Deterding et al. (2011) as the use of game design elements in non-game contexts, a concept that has since gained widespread adoption in educational technology research (Seaborn & Fels, 2015). Empirical evidence confirms that gamification positively influences learning engagement and behavioral outcomes (Hamari et al., 2014). The use of gamification in the learning process is aimed at creating a more interactive, enjoyable, and effective learning experience, so that students are more motivated to participate in learning activities (Pujianingsih et al., 2024). This can increase students' motivation to learn because it encourages them to be active during learning activities, supported by the presentation of interesting and interactive material. Gamification is also considered relevant for sensitive topics such as the prevention of sexual violence because it allows students to learn through safe simulations, controlled role-playing, and learning experiences that do not cause fear or discomfort (Irnawati et al., 2025). Prior international research confirms that gamified approaches improve sexual health knowledge and attitudes among students more effectively than traditional instruction (Weatherspoon et al., 2018). School-based programs that actively engage children through interactive activities have also demonstrated significant improvements in child sexual abuse prevention knowledge, protective skills, and disclosure rates (Walsh et al., 2015; de Wit et al., 2021).

Research relevant to the development of gamification-based learning applications includes a study by Arviana & Prameswari (2023) entitled “Designing an Anti-Sexual Violence Edu-Game

Using the Digital Game Based Learning-Instructional Design (DGBL-ID) Method” with a feasibility test result of 73.95% and classified as feasible. This study designed a role-playing-based educational game for children aged 6-7 years. However, in this game, the integration of play activities with material delivery is still lacking, the structure of material delivery is not yet appropriate, and the explanation of the concepts of grooming and sexual violence is unclear. In addition, the quality of this game has not been thoroughly tested on subjects through playtesting, so revisions are still needed before the game is launched. Furthermore, the study by Purwati & Ningrum (2022) entitled “Development of Android-Based Educational Games to Stimulate Sexual Education Understanding in Children Aged 4-5 Years” obtained a validation score of 92.7% from media experts and a validation score of 82.8% from subject matter experts. However, this game has several shortcomings, namely unclear button navigation in the material session, language that is not suitable for 4-5 year olds, a limited vocabulary in the game, and a lack of explanation of the consequences of actions and the benefits gained. Children are too excited when playing, so they ignore the instructions and often ask questions about how to play the game. Research conducted by Shopia et al. (2023) entitled “User Interface Design for Games to Prevent Sexual Violence Using the Chill Centered-Design (CCD) Method” resulted in a score of 96.7% from language experts, 93.3% from subject matter experts, and a satisfaction parameter score of 96%, which is categorized as very good. However, this game is only applicable for children aged 5-6 years old, and the study only conducted usability testing on 5 children and has not yet evaluated a large number of children. Another study titled “KidSafe Game: An Educational Solution to Introduce Sexual Education to Early Childhood Aged 4-5 Years” obtained a validation score of 96% from subject matter experts, 97% from media experts, and an average user percentage of 95%, which is classified as very feasible (Fadillah et al., 2024). However, this game is only for children aged 4-5 years with material that focuses on the early stages of child development when they begin to realize and feel sexual sensations in their genitals (phallic). In addition, this web-based game requires a stable internet connection to be accessible to users. When the game was implemented, the learning environment related to the readiness of children who were not yet fully independent in playing the game became one of the things that needed to be improved in the future.

Several studies mentioned above have unique and interrelated characteristics. The differences can be seen in the variety of research subjects, grade levels, and learning aspects. Not many studies have developed gamification-based applications related to sexual violence for upper elementary school students that take into account the appropriate level of difficulty, game flow, and cognitive development needs of students. The novelty of the learning application to be developed by combining and adding several features refers to previous studies, such as material tailored to upper elementary school students, role-playing, daily missions containing practice questions, quizzes that can generate scores and correct answers directly, reports, and games. In addition, the learning application can also be accessed online via a website or offline in the form of an APK.

This study aims to develop a gamification-based application as a supporting tool in learning activities that aim to prevent sexual harassment in elementary schools and to determine the validity and practicality of the learning application product. Through this application, students will learn more about the dangers of sexual harassment, starting from its definition, types, impacts, ways to prevent it, and how to deal with it.

METHOD

This study is a research and development (R&D) study that applies the ADDIE model to develop a gamification-based learning application to prevent sexual harassment among elementary school students. This development model was chosen because it has been proven to be systematic and effective in developing technology-based educational products (Syahwinsyah et al., 2025). The ADDIE model is widely adopted in instructional design research, and its five-stage process has been shown to produce effective, technology-based learning materials across diverse educational contexts (Branch, 2009; Cheung, 2016; Aldoobie, 2015). A comparative meta-analysis further demonstrated the ADDIE model's consistent effectiveness in improving learning outcomes in both face-to-face and online educational settings (Vlachopoulos & Makri, 2022).. The ADDIE development model has five stages, including:

1. Analyze, collecting various information about sexual harassment issues in elementary schools by reviewing previous related studies, interviews, and observations.
2. Design, designing important elements in the development of gamification-based learning applications, including content/material, application design, and validity and practicability instruments tailored to the needs of teachers and students.
3. Development, developing finalized design and content, then combining them into the program code used.
4. Implementation, testing the developed learning application by conducting two stages of testing, including small-scale testing and large-scale testing.
5. Evaluation, assessing the practicality of using gamification-based learning applications and providing feedback, suggestions, and comments for further improvement.

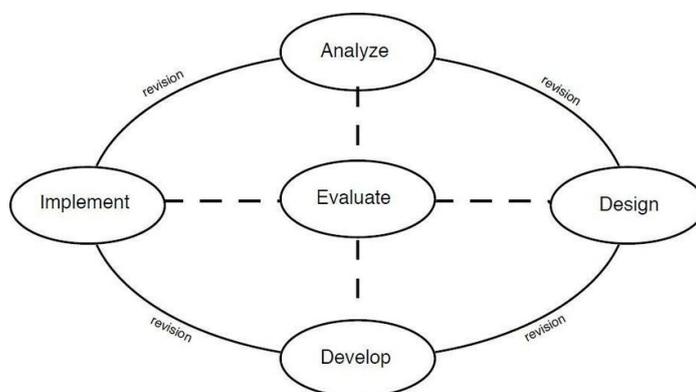


Figure 1. ADDIE Model Flowchart
Source: (Branch, 2009)

This study involved a number of validators consisting of subject matter experts, media experts, and teaching material experts to assess the feasibility of the developed product. In addition to the validation process, a trial of the gamification-based learning application was also conducted, involving two classroom teachers and 35 fifth-grade students at an elementary school in Malang. The pilot test was carried out in two stages, namely a small-scale pilot test involving 9 students and a large-scale pilot test involving 26 students. Data collection in this study was carried out through interviews, observations, and questionnaires to obtain comprehensive information about the quality of the product. The collected data were then analyzed using qualitative and quantitative

approaches. Qualitative data was sourced from suggestions and comments from supervisors, validators, and users as a basis for product improvement, while quantitative data consisted of validation results and user assessment scores obtained through questionnaires. Quantitative data analysis was carried out using the formula proposed by a standard percentage scale to determine the feasibility level of the developed product.

$$P = \frac{\sum x}{N} \times 100\%$$

Description:

P = Validation percentage score

$\sum x$ = Total score obtained

N = Maximum score

Table 1. Criteria and score categories

Criteria Validity	Category Validation
81% - 100%	Very valid, can be used without any modifications
61% - 80%	Valid, can be used with minor modifications
41% - 60%	Less valid, not recommended for use as it requires significant modifications
21% - 40%	Invalid, cannot be used as it requires major modifications
0% - 20%	Highly invalid, cannot be used at all

RESULTS AND DISCUSSION

1. Data Collection Stage (Analyze)

a) Needs analysis

Based on the interview results, it was found that lessons on self-protection and boundaries regarding physical contact had been taught to students with explanations from teachers and the use of visual media such as pictures and videos. Students were assessed to have understood the material, but needed more time because it was still relatively new. In addition, one-way teaching was considered to not fully engage students actively, so interaction in the classroom was still limited.

b) Material Analysis

The material analysis stage focuses on co-curricular learning that is aligned with the Phase C IPAS subject for fifth grade elementary school students on sexuality education. This material relates to understanding self-protection and personal boundaries to prevent sexual harassment.

c) Environmental analysis

Based on observations, the school environment supports learning related to self-protection and sexual violence prevention. The school also provides posters displayed in various corners of the school as educational media on sexual violence prevention and self-protection. Computer facilities and supporting devices such as LCD projectors and loudspeakers available at the school are also considered adequate to support digital-based learning.

2. Planning Stage (Design)

The stage of designing important elements in the development of gamification-based learning applications, including content/material, application design, validity and practicability

instruments tailored to the needs of teachers and students. The material used in development was obtained from various written references, including books, modules, and other library sources. The language in the application is also simplified and adapted to the understanding of high school students. The material is designed so as not to cause fear or trauma in students by focusing on understanding situations and ways to protect themselves. This application also has a feedback system in the form of corrections for wrong answers and rewards such as points as positive reinforcement.

The application development process utilizes several supporting software programs, namely Canva, PowerPoint, iSpring Suite, and APK Builder. Canva is used to design the visual appearance of the application to make it more attractive and suitable for students (Putri & Mudinillah, 2021). The design is then saved in PowerPoint format to facilitate further editing, from feature settings to organizing the application flow. Next, the PowerPoint file is published in HTML format with the help of iSpring Suite so that the content can be accessed interactively. The next step is carried out using APK Builder to convert the HTML file into an Android-based application in the form of an APK (Purnamasari, 2022). Through this series of steps, a gamification-based learning application design is produced, aimed at supporting efforts to prevent sexual harassment in elementary schools.

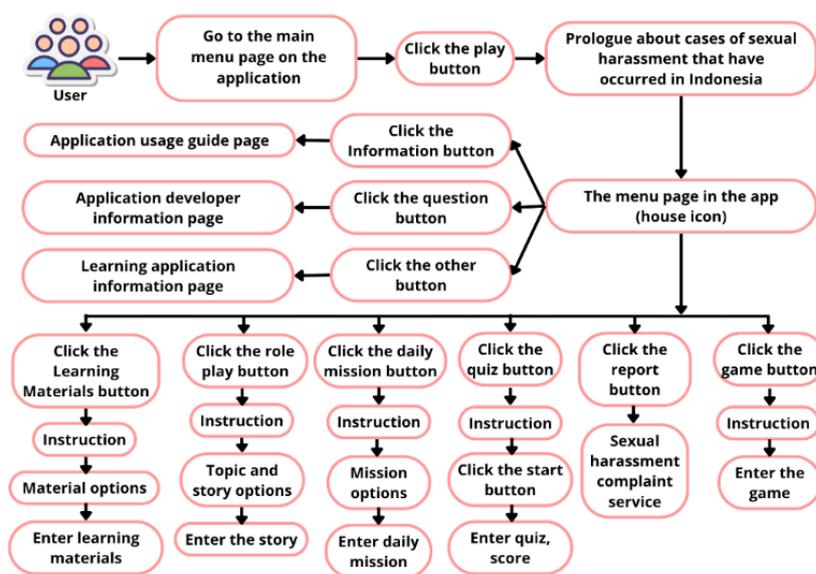


Figure 2. Use case diagram of learning application

Figure 2 is a use case diagram that explains the various menus in the application, including materials, role-playing, daily missions, quizzes, reports, and games. The materials feature contains a collection of learning materials about sexual harassment. The role-playing feature contains a collection of case study-based stories played out by users. Furthermore, the daily missions feature contains exercises related to the sexual harassment material that has been studied. The quiz feature is similar to the daily missions feature, except that in this feature, users will be tested on their understanding with questions and will receive a score. The reports feature contains information on sexual harassment complaints, and the games feature can hone students' creativity and interest in learning.

This application is designed using cartoon animations tailored to the target users of the application. In addition, it is supported by a full-color palette to attract attention and appeal to elementary school children (Olisna et al., 2022). The appearance of the application is also based on the environment surrounding students, such as home, school, and social environment. This is intended to make the material being studied relevant to everyday life. In its distribution, this learning application is supported by the Google Sites platform, which provides easy access to the general public (Firmansyah et al., 2023).

3. Development Stage (Development)

At this stage, the learning application begins to develop the finalized design and content, which is then combined into the program code used.



Figure 3. Learning application display

There are several features in the learning application that can support the learning process, including the following.

a. Materials

This feature contains learning materials presented in the form of animations accompanied by discussions of each material. The materials discussed in this feature include: definitions, types, impacts, and ways to prevent sexual harassment. Each material is also equipped with comprehension exercises aimed at helping students understand the material they have learned.



Figure 4. Material feature

b. Role-playing

This feature contains various case study-based stories and there is a character that must be played by students. The story topics consist of types of sexual harassment and each topic has three story options that can be played by students. Every step taken by students will determine the course of the story. This aims to train students to be able to take appropriate actions to prevent sexual harassment around them.



Figure 5. Role-playing feature

c. Daily missions

The missions to be completed are divided into 6 missions. This feature contains exercises related to the material. The exercises are designed so that students can find the correct answers and then move on to the next question.



Figure 6. Daily mission feature

d. Quiz

This feature contains 10 questions used to measure the level of understanding of material related to sexual harassment, and the score obtained will be displayed.



Figure 7. Quiz feature

e. Report

Students gain an understanding of how to deal with and report cases of sexual harassment that they know about or have experienced.



Figure 8. Report feature

f. Games

This feature contains puzzle games that can sharpen creativity and interest in learning.

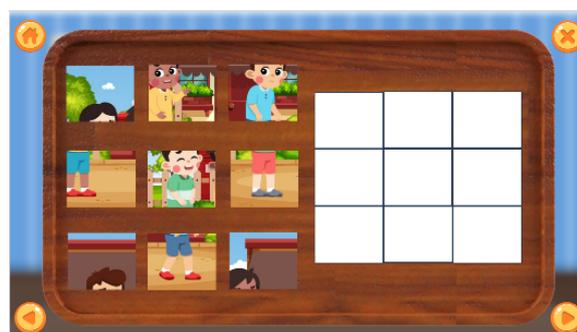


Figure 9. Game feature

Next, the developed learning application underwent a validation process by subject matter experts, media experts, and teaching material experts. The subject matter experts were lecturers specializing in elementary school education and learning, the media experts were lecturers specializing in elementary school language learning technology, and the teaching material experts were teachers with experience and competence in the application of learning technology in elementary schools.

Material Expert Validation Results

This validation was reviewed from several aspects, namely the accuracy of the content, the accuracy of the concepts, the timeliness of the material, the completeness and depth of the material, and the adequacy of references. The following are the results of the material validation that has been processed in tabular form.

Tabel 2. Material Expert Validation Results

Assessment Aspect	Percentage (%)	Category
Accuracy of Content	100	Very valid
Accuracy of Concepts	100	Very valid
Timeliness of Content	100	Very valid
Completeness and Depth of Content	100	Very valid
Adequacy of References	100	Very valid
Average	100	Very valid

Table 2 shows that this learning application is highly valid and suitable for testing without modification.

Media Expert Validation Result

This validation was reviewed from various aspects, such as display design, media content, media programs, ease of use, and the usefulness of the developed learning application products (Triana, 2022). The following are details of the media validation results that have been processed in tabular form.

Table 3. Media Expert Validation Result

Assessment Aspect	Percentage (%)	Category
Display Design	100	Very valid
Media Content	100	Very valid
Media Programs	100	Very valid
Ease of Use	100	Very valid
Product Usefulness	100	Very valid
Average	100	Very valid

Table 3 shows that this learning application is highly valid and suitable for testing without modification.

Teaching Material Expert Validation Result

This validation was reviewed from various aspects, such as the coverage of teaching materials, presentation of teaching materials, readability, and language (Lestari & Puspita, 2023). The following are details of the results of the validation of teaching materials that have been processed in tabular form.

Tabel 4. Teaching Material Expert Validation Results

Assessment Aspect	Percentage (%)	Category
Coverage of Teaching Materials	100	Very valid
Presentation of Teaching Materials	100	Very valid
Readability	100	Very valid
Language	100	Very valid
Average	100	Very valid

Table 4 shows that this learning application is highly valid and suitable for testing without modification.

4. Implementation Stage (Implementatiton)

The product was implemented through a trial of the learning application at an elementary school in Malang. The trial involved two teachers and 35 fifth-grade students divided into two groups: 9 students in the small-scale stage and 26 students in the large-scale stage. During the implementation process, the teachers acted as facilitators who guided the students in accessing the application and provided an initial explanation of the learning objectives to be achieved. The teachers then reinforced the material that the students did not understand and guided them in completing each stage of the game available in the application. At the end of the learning activity, students were asked to take a quiz as a form of feedback to determine their level of understanding of the material they had learned.

5. Evaluation Stage (Evaluation)

The evaluation stage was carried out by distributing practicality questionnaires to users to obtain information related to their responses to the learning application. The results of the questionnaires were used as a reference source, viewed from various aspects, namely ease of use and readability, design and visuals, language and instructions, features, and interactivity. The results of the practicality questionnaire are shown in the following table.

Table 6. Results of the Practicality Questionnaire Assessment by Teachers

Teacher	Percentage (%)	Category
Grade VA teacher	100	Very practical
Grade VB teacher	100	Very practical
Average	100	Very practical

Table 7. Results of the Practical Questionnaire Assessment by Student

Group	Percentage (%)	Category
Small group	88,33	Very practical
Large group	91,15	Very practical

Based on the results of the trial, the learning application developed received an average assessment percentage from classroom teachers of 100% and was categorized as very practical. In the small group trial, the average percentage was 88.33%, which was also categorized as very practical, while the large group trial showed an average percentage of 91.15% with the same category. These achievements indicate that the gamification-based learning application designed to prevent sexual harassment in elementary schools has a high level of practicality, making it suitable for use in learning activities. In addition, these results show that the integration of game elements in digital media can support ease of use while increasing student engagement during the learning process.

The findings of this study are in line with a study on the development of interactive learning media based on websites (Google Sites) for function material at SMA Negeri 15 Medan, which obtained an average score of 4.8 in the teacher trial, 4.38 in the small group, and 4.44 in the large group. All of these scores are in the excellent category ($4.2 < x$) and are considered practical and effective in supporting the learning process (Tambunan & Siagian, 2022). Another study on the development of Android-based learning media on basic geographic information system material in high schools also showed a practicality level of 83.5% in small groups and 83%

in large groups with a very good category (Nuriyanto et al., 2022). This indicates that the media is able to attract students' attention and interest in learning. Another study on the development of Android-based learning media obtained very feasible validation results, namely 96% from subject matter experts and 91.5% from media experts. The results of user trials also showed high percentages, namely 88.6% in individual trials, 92.7% in small groups, and 89.1% in large groups, all of which were in the very feasible category. A significant improvement in students' pretest and posttest results in Sundanese script recognition in elementary schools further strengthened the effectiveness of the developed media (Mutammimah et al., 2024). Overall, these various research results confirm that the development of Android-based learning applications and websites not only demonstrates a high level of practicality but is also proven to be effective in improving the quality of the learning process, strengthening material comprehension, and fostering student interest and active engagement.

This gamification-based learning application has various advantages as a medium for interactive learning activities for students, including 1) a colorful application display through a combination of text, sound, and visuals, 2) an affordable file size that does not require a lot of storage space, 3) easy-to-use learning application for students and equipped with clear instructions, 4) interactive images suitable for elementary school students, 5) language appropriate for elementary school children, 6) communicative sentences, 7) flexible use of media, and 8) many features that can make students more interactive in learning activities. These advantages demonstrate the application of constructivism in the delivery of material, role-playing, and quizzes that encourage students to actively engage in building their own understanding (Lathifah et al., 2024). Constructivist learning theory, rooted in the work of Piaget and Vygotsky, posits that learners actively construct knowledge through interactions with their environment (Jonassen, 1999); this principle underpins the design of role-playing and quiz features within this application (Mayer, 2009). A systematic review of gamification in primary education confirmed positive effects on student engagement, motivation, and self-efficacy through such interactive, game-based learning designs (Ruiz et al., 2024).. The presentation of interactive activities is also in line with Edgar Dale's cone of experience, which emphasizes the importance of concrete experiences to improve students' understanding and memory (Rahayu et al., 2023). This makes learning activities more meaningful and provides direct benefits to students, especially in efforts to prevent cases of sexual harassment. Research also shows that digital applications combining multimedia elements — such as text, animation, sound, and interactivity — significantly enhance comprehension and information retention compared to single-medium instruction (Mayer, 2009; Dicheva et al., 2015). The integration of game elements such as points, missions, and quizzes within this application aligns with the broader empirical literature demonstrating that gamification significantly boosts student motivation and academic engagement (Hamari et al., 2014; Rodrigues et al., 2019). Furthermore, the practicality results obtained are consistent with a meta-analytic study showing that school-based programs with active, hands-on activities produce the strongest effects on children's protective knowledge and skills (de Wit et al., 2021).

In addition to its many advantages, the development of this application also has weaknesses, including 1) the depth of the material presented still contains many important terms that are only presented briefly and require teachers to provide additional explanations directly, 2) in the application, students are not yet able to express their opinions or responses directly to an

event that is presented, 3) some of the application designs may trigger negative curiosity in students towards prohibited actions, 4) the visual appearance of the application for higher grades would be more attractive if videos were added to the learning material to deepen students' understanding, and 5) it facilitates independent use by students, but this is not recommended as it requires supervision from teachers or parents. These issues need to be refined in further research to maximize the learning process in preventing sexual harassment in elementary schools.

CONCLUSION

The development of gamification-based learning applications applies the ADDIE model. The results of validation tests and user trials show that the application is suitable for use as a learning medium to prevent sexual harassment among elementary school students. Teachers can integrate the use of this application into the learning process in the classroom and use it as part of the implementation of child-friendly school programs in order to prevent sexual harassment.

This study has limitations in that the sample was only from one school. Future research should test this learning application with a broader sample to ensure its overall effectiveness. In addition, the application should be developed to enhance the learning experience by adding more in-depth explanations of the material, more vivid images such as three-dimensional (3D) illustrations or short videos, as well as interactive quizzes and “agree or disagree” options that allow students to give brief opinions.

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