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# E-Flashcard Media as an Innovative Approach to Adolescent Reproductive Health for the Prevention of Unwanted Pregnancy

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## ABSTRACT

Unwanted pregnancy (UP) among adolescents is a serious issue that affects health, social, and economic aspects. One of the main contributing factors to the high incidence of UP is the lack of adolescent knowledge regarding reproductive health. Interactive educational media such as e-flashcards can serve as effective tools to improve adolescent knowledge. This study aims to examine the effect of health education using e-flashcard media on adolescent girls' knowledge about UP.

This study employed a quasi-experimental design with a one-group pretest-posttest approach. The sample consisted of 52 adolescent girls aged 15–18 years from SMA Negeri 18 Bandung, selected using multistage random sampling, which combined simple and stratified random sampling techniques. The instrument used was a questionnaire on unwanted pregnancy, administered before and after the educational intervention using e-flashcards. Data were analyzed using the Wilcoxon test.

The results showed a significant effect of health education about unwanted pregnancy on adolescents through e-flashcard media, with a p-value of 0.000 ( $<0.05$ ).

These findings indicate that e-flashcards, as an interactive visual medium, are effective in improving adolescent girls' understanding of unwanted pregnancy. The interactivity and visualization features of e-flashcards help adolescents absorb and retain information more easily, thereby enhancing engagement and knowledge retention after the education. Therefore, e-flashcards can be utilized as an alternative educational medium for adolescents

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## **INTRODUCTION**

Adolescence was a crucial transitional phase from childhood to adulthood, marked by simultaneous biological, psychological, and social changes. During this stage, adolescents began to build their identity, explore new values, and experienced an increased curiosity about sexuality. However, amid these changes, many adolescents had not been equipped with adequate knowledge and life skills to make responsible decisions. This lack of preparedness made them vulnerable to various risky behaviors, including premarital sexual activity, which could lead to unwanted pregnancy.[1]

Teenage pregnancy was not merely a personal issue but had become a complex global concern. According to the World Health Organization (2024), teenage pregnancy had significant impacts on the physical and mental health of young mothers, disrupted educational continuity, and increased the risk of intergenerational poverty. Although global trends showed a decline in adolescent birth rates, the numbers remained high in developing countries, including Indonesia. This condition was associated with disparities in education, unequal access to healthcare services, and the lack of evidence-based sexual education.[2] Surveys revealed that many Indonesian adolescents did not fully understand the biological processes of puberty and the function of the reproductive system,[3] which was one of the major factors contributing to the high prevalence of unwanted pregnancy among adolescent girls.

Unwanted pregnancy (UP) could be prevented through comprehensive, accurate health education tailored to adolescents' cognitive development and needs. However, conventional approaches were often perceived as boring and irrelevant, prompting the need for innovation in learning methods and media. One such innovation was the use of e-flashcards, a form of interactive digital media that combined visual information, concise text, and narration accessible via electronic devices. E-flashcards effectively delivered engaging information with the advantage of flexibility in learning time and place.[4]

Several studies indicated that e-flashcards could improve understanding and retention of lesson content, particularly on complex topics such as reproductive health.[5] E-flashcards were also considered suitable for adolescents' current learning styles, which tended to be visual, fast-paced, and drawn to interactive content.[6] Additionally, this media was easily adaptable to cultural context, language, and literacy levels of its target audience. These characteristics made e-flashcards an effective educational strategy to bridge information gaps and help adolescents understand key concepts related to pregnancy, fertile periods, contraception, and the risks of unprotected sexual activity.[7]

Increasing knowledge was not the sole goal of educational interventions; attitude change was also an essential component. Adolescents' attitudes toward reproductive health issues significantly influenced their future choices and behaviors. Instilling

positive values and attitudes regarding the importance of maintaining reproductive health, delaying sexual activity, and understanding pregnancy risks was an integral part of effective sex education.[8] With visually appealing designs and relevant content, e-flashcards not only increased knowledge but also shaped adolescents' attitudes and perceptions regarding reproductive health issues.[9]

However, the use of e-flashcards in reproductive health education had not yet been widely implemented in formal or non-formal educational institutions. In fact, this media had great potential to be applied in health promotion programs targeting adolescents, particularly in the context of unwanted pregnancy prevention. Therefore, scientific research was needed to evaluate the effectiveness of this media in increasing adolescent girls' knowledge about unwanted pregnancy.

This study aimed to determine the effect of health education using e-flashcard media on improving adolescent girls' knowledge regarding unwanted pregnancy. The results of this study were expected to contribute to the development of effective health communication strategies that were adaptive to the needs of today's adolescents. Furthermore, the findings were intended to serve as a foundation for schools, health professionals, and policymakers in designing reproductive health education programs for adolescents that are more innovative, engaging, and technology-based.

## METHOD

The research method used in this study was a quasi-experimental design, specifically the one-group pretest-posttest design. This design was selected to evaluate the effectiveness of e-flashcard educational media in increasing adolescent girls' knowledge regarding unwanted pregnancy (UP). In this design, respondents were given a pretest before receiving the intervention in the form of education through e-flashcards, followed by a posttest after the intervention. This design allowed the researcher to compare changes in knowledge levels within the same group without involving a control group. Although it did not include a comparison group, this design was effective in assessing the direct impact of the intervention on the observed variable.

The study was conducted in the Bojongloa Kaler District, Bandung City. This location was chosen due to its relatively large adolescent population and its representativeness of urban social and cultural conditions. The research was carried out from February to April 2025, covering the preparation phase, intervention implementation, and data analysis.

The study population consisted of all adolescent girls aged 15 to 18 years living in the Bojongloa Kaler District, Bandung City. This age range was chosen because adolescents in this stage undergo significant cognitive development, making them an appropriate target for reproductive health education interventions. The sample included 52 adolescent girls who met the inclusion criteria. Sampling was conducted

using a multistage random sampling technique, which combined simple random sampling and stratified random sampling methods. The first stage involved randomly selecting schools or educational institutions within the research area, followed by the random selection of students from specific age groups and education levels. This technique was chosen to obtain a heterogeneous sample while maintaining population representativeness.

The instruments used in this study included e-flashcard media as an educational tool and a knowledge questionnaire as a measurement tool. The e-flashcards were developed digitally and tailored to meet adolescents' information needs concerning unwanted pregnancy. The content of the e-flashcards was based on scientific literature and relevant health guidelines and was presented in an interactive and engaging format to enhance student involvement. The knowledge questionnaire consisted of multiple-choice questions assessing adolescents' basic understanding of unwanted pregnancy. The questionnaire was validated by experts and tested for reliability using Cronbach's Alpha to ensure the accuracy and consistency of the instrument.

This study obtained ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Bandung under letter number 02/KEPK-PoltekkesBDG/II/2025. The study followed ethical research principles, including autonomy, beneficence, non-maleficence, and justice. All respondents received a detailed explanation of the study's objectives, benefits, and potential risks through an informed consent form and were given full freedom to participate voluntarily. The identities and personal information of the respondents were kept strictly confidential to ensure data privacy.

Data obtained from the pretest and posttest were analyzed using the non-parametric Wilcoxon Signed-Rank Test, as the data were ordinal and not normally distributed. The analysis was conducted using SPSS version 16.0, and the level of significance was set at  $p < 0.05$ . The results of this analysis were used to determine whether there was a significant difference in adolescent girls' knowledge levels before and after receiving health education using e-flashcard media.

## **RESULT AND DISCUSSION**

### **Result**

This study was conducted on 52 adolescent female respondents. There were no dropouts during the study. The distribution of respondents based on demographic data was presented in Table 1. This demographic data included categories such as age, grade level, sources of reproductive health information, parents' last education level, and parents' occupation.

**Table 1. Frequency Distribution of Respondents' Characteristics**

| No | Variable                                          | Frequency (n) | Percentage (%) |
|----|---------------------------------------------------|---------------|----------------|
| 1. | <b>Age Category</b>                               |               |                |
|    | 15 years old                                      | 4             | 7.7            |
|    | 16 years old                                      | 28            | 53.8           |
|    | 17 years old                                      | 18            | 34.6           |
|    | 18 years old                                      | 2             | 3.8            |
| 2. | <b>Grade Level</b>                                |               |                |
|    | GradeX                                            | 17            | 32.7           |
|    | GradeXI                                           | 18            | 34.6           |
|    | GradeXII                                          | 18            | 32.7           |
| 3. | <b>Sources of Reproductive Health Information</b> |               |                |
|    | Internet                                          | 25            | 48.1           |
|    | Parents                                           | 10            | 19.2           |
|    | Never received information about UP               | 17            | 32.7           |
| 4. | <b>Parents' Last Education</b>                    |               |                |
|    | Primary School                                    | 6             | 11.5           |
|    | Junior High School                                | 9             | 17.3           |
|    | Senior High School                                | 21            | 40.4           |
|    | Diploma (D1/D2/D3)                                | 6             | 11.5           |
|    | Bachelor's/Master's/Doctoral (S1/S2/S3)           | 10            | 19.2           |
| 5. | <b>Parents' Occupation</b>                        |               |                |
|    | Merchant                                          | 6             | 11.5           |
|    | Private Employee                                  | 4             | 7.7            |
|    | Entrepreneur                                      | 16            | 30.8           |
|    | Housewife                                         | 4             | 7.7            |
|    | Civil Servant/Military/Police                     | 5             | 9.6            |
|    | Daily Laborer                                     | 17            | 32.7           |

Table 1. This demographic data included categories such as age, grade level, sources of reproductive health information, parents' last education level, and parents' occupation

**Table 2. Overview of Adolescent Girls' Knowledge about Unwanted Pregnancy Before and After Receiving Education Using E-Flashcards**

| Knowledge Level of UP | Before Education |                | After Education |                |
|-----------------------|------------------|----------------|-----------------|----------------|
|                       | Frequency (n)    | Percentage (%) | Frequency (n)   | Percentage (%) |
| Good                  | 39               | 75.0           | 52              | 100.0          |
| Moderate              | 12               | 23.1           | 0               | 0.0            |
| Poor                  | 1                | 1.9            | 0               | 0.0            |
| Total                 | 52               | 100.0          | 52              | 100.0          |

Table 2. The overview of adolescent girls' knowledge level regarding unwanted pregnancy (UP) before and after being given education using e-flashcards was presented in Table 2.

**Table 3. The Effect of Health Education Through E-Flashcard Media on Adolescent Girls' Knowledge About Unwanted Pregnancy**

| Difference in Knowledge (Posttest – Pretest) | N  | Mean Rank | Sum Of Ranks | Z-Score | p-value |
|----------------------------------------------|----|-----------|--------------|---------|---------|
| Negative Ranks                               | 0  | 0.00      | 0.00         | -6.300  | 0.000*  |
| Positive Ranks                               | 52 | 26.50     | 1378.00      |         |         |
| Ties                                         | 0  |           |              |         |         |
| Total                                        | 52 |           |              |         |         |

Table 3. Based on the results of the Wilcoxon Signed-Rank Test presented in Table 3, a p-value of 0.000 was obtained. With this p-value being far below the significance threshold of 0.05 ( $p < 0.05$ ), the Null Hypothesis ( $H_0$ ) was rejected and the Alternative Hypothesis ( $H_a$ ) was accepted. This indicated a statistically significant difference in adolescent girls' knowledge about unwanted pregnancy (UP) before and after receiving health education using e-flashcard media. These results strongly proved that health education through e-flashcards had a positive and significant impact on improving adolescent girls' knowledge about UP.

## Discussion

The demographic characteristics of the study respondents were presented in Table 1. Based on age, the majority of respondents (53.8%) were 16 years old. The distribution of respondents by class level (Grades X, XI, and XII) showed a relatively balanced proportion—32.7% in Grade X, 34.6% in Grade XI, and 32.7% in Grade XII. This reflected the use of stratified random sampling techniques in the study.

In terms of sources of reproductive health information, most adolescent girls (48.1%) reported obtaining information from the internet, while 32.7% stated that they had never received any information about Unwanted Pregnancy (UP). The majority of respondents' parents had a senior high school (SMA) educational background (40.4%). Furthermore, the most common parental occupation was that of daily laborers (32.7%).

Based on the research findings, the majority of respondents were 16-year-old adolescent girls enrolled in Grade XI of senior high school. Age is an important factor that influences a person's level of knowledge. As individuals grow older, their ability to think critically and understand information becomes more advanced.[10] Adolescents aged 15–18 experience rapid cognitive development, making them a strategic target group for educational interventions on health issues, including unwanted pregnancy (UP). The World Health Organization reported that this age group accounted for approximately 21 million pregnancies annually in developing countries, half of which were classified as unwanted pregnancies.[11]

The study results showed that 48.1% of respondents received reproductive health information from the internet, while 32.7% had never received any information related to UP. This reliance on the internet reflected a shift in adolescents' information-seeking behavior. However, a study by Fitri et al. (2025) highlighted that online information is often not scientifically verified, which can lead to misconceptions. This emphasized

the importance of providing trustworthy information through schools, healthcare professionals, and validated digital educational media.[12]

Moreover, the educational level of parents (40.4% with senior high school education) and the majority occupation as daily laborers (32.7%) also influenced access to and the quality of reproductive health education received by their children. Stated that an authoritative parental communication style helps reduce the risk of deviant sexual behavior. Low socioeconomic status limits access to information and parental supervision, thereby increasing adolescents' vulnerability to unwanted pregnancies. Adolescents from low-income families were more likely to experience UP.[13]

Before the intervention, 75% of respondents already had good knowledge of UP, 23.1% had moderate knowledge, and 1.9% had poor knowledge. Although the majority were in the good category, there was still a knowledge gap that indicated the need for educational intervention. This imbalance was attributed to differences in access to information, the quality of learning resources, and the involvement of families and schools in providing sexual education.[14]

Studies emphasized that partial or incomplete knowledge still had the potential to lead to risky sexual behavior, as adolescents might feel sufficiently informed when in fact the information they received was fragmented.[15] Therefore, there was a need for systematic and comprehensive education so that the knowledge acquired was not only theoretical but could also be applied in making responsible decisions.[16]

After the intervention, all respondents (100%) showed improved knowledge categorized as good. This indicated that e-flashcards were highly effective as a tool for reproductive health education. The advantages of this media lay in its appealing visual design, easy accessibility, and flexible learning schedule, which supported adolescents' learning styles.[17] Other studies showed that the use of e-flashcards could enhance information retention through active recall and spaced repetition mechanisms, strengthening long-term memory.[18]

Digital media-based education also supported the development of healthy decision-making skills, including communication, critical thinking, and problem-solving skills in a reproductive context. Therefore, e-flashcards served not only as a learning aid but also as a health education strategy relevant to the digital era.[19]

The significant difference before and after the intervention demonstrated that e-flashcards were effective in increasing adolescent girls' knowledge about UP.[20] Previous also showed that this medium significantly enhanced students' comprehension.[20]

This finding aligned with Lawrence Green's theory in the PRECEDE-PROCEED model, which stated that knowledge is a predisposing factor influencing health behavior. Increased knowledge encouraged changes in attitude and behavior toward preventing UP.[21] The effectiveness of educational media depends on the alignment between media characteristics and the target audience. E-flashcards, with their visual and digital approach, were well-suited for adolescents as a generation highly connected to technology.[21]

Thus, this study reinforced the evidence that education through e-flashcard media was effective in improving adolescent girls' knowledge about UP and had the potential to become an educational solution in addressing reproductive information challenges in the digital era.

The improvement in adolescent girls' knowledge of UP through e-flashcards was also supported by Albert Bandura's social cognitive learning theory. This theory explained that learning occurred in a social context through observation, imitation, and modeling. When adolescents learned material from interactive media such as e-flashcards, they did not rely solely on text but also gained visual experiences that shaped perception and reinforced understanding. E-flashcards designed with animations and contextual visuals enabled adolescents to recognize and retain information better than by reading conventional text alone. This media's ability to present information through a multisensory approach allowed for deeper and more meaningful learning.[23]

This study also supported a participatory approach in health education. E-flashcard media facilitated active learning in which adolescents were not merely passive recipients of information but could explore the material independently, choose suitable study times, and review information as needed. This aligned with the principles of andragogy, which emphasized active participation, autonomy, and relevance to learners' experiences. As digital natives, adolescents responded more positively to flexible, visual, and practice-oriented learning methods. Thus, e-flashcards bridged the need for engaging, contextual, and practical health education.

The local context of Bojongloa Kaler District provided a real picture of the urgency of this intervention. According to data from the Bandung City Office of Women's Empowerment, Child Protection, and Family Planning (DP3AKB), this area had one of the highest rates of child marriage, with 90% triggered by out-of-wedlock pregnancies. This phenomenon was closely linked to low adolescent literacy on reproductive health and limited access to comprehensive education tailored to their characteristics. Moreover, social and cultural norms in the area still regarded discussions on sexuality as taboo, further limiting adolescents' learning space to understand risks and responsibilities in sexual relationships.[24]

The study's findings also strengthened the argument that media-based educational interventions must be adapted to local cultural contexts and demographic characteristics. The use of e-flashcards allowed for flexible material delivery that could be tailored in terms of language, illustrations, and contextual case examples,[25] this media could be used widely across various regions with diverse cultures and literacy levels, provided the content was designed to be adaptive and inclusive.[25]

The effectiveness of e-flashcard media was not only evident in knowledge improvement but also in its potential to support changes in attitudes and behaviors. Increased knowledge paved the way for building adolescents' critical awareness in addressing social challenges related to sexuality. With better understanding, adolescents were expected to make healthier and more responsible decisions, such as

delaying sexual activity, using contraception if sexually active, and building healthy communication with partners and parents.[26]

This discussion also emphasized the importance of multi-stakeholder involvement in adolescent health education efforts. Schools, as formal educational institutions, needed to integrate reproductive health into the curriculum and extracurricular activities. These could include interactive discussion sessions, peer educator training, or collaboration with health professionals to provide comprehensive material. Parents also played a crucial role in reinforcing educational messages received at school. Therefore, training and counseling for parents on how to communicate effectively with adolescents about sexuality should be part of broader interventions.[27]

In addition, the results of this study supported the view that technological innovation must be an integral part of public health promotion strategies, especially in facing challenges in the digital era. E-flashcards and similar interactive media were not only efficient in distributing and delivering materials but also environmentally friendly and cost-effective in the long term. This media could be collaboratively developed by health institutions, educational technology developers, and educational institutions to ensure content quality and behavioral impact on adolescents.[27]

In an academic context, this research enriched the literature on the effectiveness of digital media in improving adolescent health literacy. Most previous studies focused on print media or face-to-face approaches, while the use of interactive technology-based media was still limited, particularly in critical urban areas such as Bojongloa Kaler.[28] These findings offered a new direction for researchers and practitioners to develop more appropriate and widely applicable technology-based intervention models.

One of the strengths of this study was the use of a quantitative design with a pre-post test approach and the Wilcoxon method to statistically measure changes. With a  $p\text{-value} < 0.05$ , the validity of the findings was strengthened, showing that e-flashcards were not just an alternative but a reliable solution for improving adolescent health literacy.[28] However, like other studies, this research had limitations, such as the short one-week intervention duration and the lack of evaluation of its long-term sustainability.

Therefore, the synthesis of this discussion pointed to an understanding that effective health education requires a collaborative, continuous, and contextual approach. Increasing knowledge through interactive media such as e-flashcards was an important starting point but needed to be supported by changes in education systems, public policies, and social environments that are conducive to adolescents.[29]

Ultimately, this study affirmed that e-flashcards were not merely learning aids but part of a broader strategy in transforming reproductive health education. Moving forward, the development of similar digital media should be encouraged with inclusive, sustainable, and evidence-based principles. Further studies are needed to

evaluate the long-term impacts of this intervention on behavior and attitude changes, as well as to explore its integration into national programs such as GenRe, PIK-R, or formal school curricula.[30].

## CONCLUSION

Hese findings showed that education using e-flashcards had a significant effect on adolescent girls' knowledge about unwanted pregnancy. As an interactive visual medium, e-flashcards served as an effective innovation in delivering reproductive health education to adolescents.

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