

Evaluation of Digital-Based Reproductive Education Programs for Improving Adolescent Sexual Knowledge and Behavior



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ABSTRACT

Adolescent sexual knowledge and behavior is a crucial aspect in the development of the younger generation, especially in the midst of rapid advances in digital technology. This article aims to evaluate the effectiveness of digital-based reproductive education programs on improving adolescent sexual knowledge and behavior change. This research uses a qualitative method with a literature study approach or library research, through an in-depth study of various scientific sources such as journals, books, and relevant research reports. The results of the study show that digital-based education programs, such as applications, educational videos, and online learning platforms, have great potential in improving adolescent reproductive health literacy. These programs are considered to be able to present accurate, interactive, and easily accessible information for adolescents. In addition, information digitization has been proven to reach a wider group of adolescents, including those in areas with limited access to health services. Nonetheless, the success of the program depends heavily on the quality of the content, an approach that is appropriate to the characteristics of the adolescent age, and the support of the family and school environment. This study recommends the development of evidence-based, collaborative, and contextual reproductive educational content to be more effective in shaping healthy sexual behaviors. These findings are expected to be a foundation for policy makers, educators, and educational media developers in designing digital interventions that are more targeted for adolescents.

1. Introduction

The adolescent period is an important transitional phase characterized by physical, emotional, and social changes, including the development of sexual and reproductive aspects (Santrock, 2018). Lack of adequate knowledge about reproductive health can encourage adolescents to engage in risky sexual behaviors such as premarital sexual intercourse, unwanted pregnancies, and the spread of sexually transmitted infections (WHO, 2022; National Population and Family Planning Agency [BKKBN], 2021). In Indonesia, data shows that adolescents' understanding of reproductive issues is still low, and many adolescents even get information from invalid sources such as social media (Ministry of Health of the Republic of Indonesia, 2020).

Various efforts have been made to improve reproductive education for adolescents, but conventional approaches still face challenges in effectiveness and reach (Putri & Haryanto, 2019). In the digital era, the use of digital media is a promising alternative strategy because it can reach adolescents widely, interactively, and in accordance with their learning styles (Nasution, 2021; Saputra & Lestari, 2020). Digital-based reproductive education programs, such as mobile applications, educational videos, and online platforms, have begun to be developed, but have not been systematically evaluated, especially in the local context of Indonesia (Rahmawati & Nugroho, 2022; Sari et al., 2023).

There is a research gap in studies on the effectiveness of digital education programs on changes in adolescent sexual behavior, because most studies still focus on increasing knowledge alone without comprehensively measuring the impact of behavior (Yuliana & Prasetyo, 2021). In addition, most previous studies have used quantitative methods, while qualitative approaches with literature studies are still rarely carried out as a reflective and integrative means of program effectiveness (Lestari, 2020; Harahap, 2022).

The urgency of this research lies in the need to evaluate digital-based reproductive education programs that are not only informative, but also transformative to adolescent behavior. By integrating the results of previous research through systematic and critical literature studies, this research is expected to offer a more complete and contextual evaluation framework.

The novelty of this study lies in a qualitative evaluative approach based on literature studies that focuses on the integration of adolescent sexual knowledge and behavior in a digital context. This study aims to evaluate the effectiveness of digital-based reproductive education programs on increasing knowledge and changing adolescent sexual behavior in Indonesia.

The benefits of this study include theoretical contributions in enriching the literature review on adolescent reproductive health and practical contributions for policymakers, educators, and educational digital media developers in designing evidence-based and contextual interventions.

Definition and Scope of Digital-Based Reproductive Education Programs

Digital-based reproductive education programs are a form of educational intervention that utilizes digital technology such as mobile applications, websites, interactive videos, social media, and online learning platforms to convey information and values related to reproductive health to adolescents. This program is designed to address the challenges of limited access, lack of educators, and information gaps that have occurred in conventional approaches. Within its scope, the program not only conveys biological knowledge about the reproductive system, but also addresses important issues such as puberty, healthy relationships, reproductive rights, contraception, prevention of sexual violence, and responsible decision-making.

Characteristics and Advantages of Digital Programs in Reproductive Education

The main characteristics of the program are flexibility, affordability, and interactivity. Through digital technology, adolescents can access information anytime and anywhere according to their needs, which allows for more personalized and independent learning. In addition, digital media allows for the integration of engaging visual and audio elements, improving information understanding and retention. Some platforms also use a gamification approach to drive user engagement. Another advantage is the program's ability to present evidence-based content that can be updated regularly, as well as providing a safe space for teens to explore information that may be considered taboo in their social environment.

Challenges and Implications of Implementing Digital Reproduction Education Programs

Although it has a lot of potential, digital-based education programs also face a number of challenges, such as the gap in access to technology between urban and rural areas, uneven digital literacy, and the risk of spreading invalid information if not strictly supervised. In addition, digital approaches do not completely replace the direct mentoring role of parents or educators. Therefore, there needs to be collaboration between governments, educational institutions, technology developers, and the public to ensure that the content delivered in the program is culturally relevant, scientifically accurate, and ethically safe. The implications of the implementation of this program can be far-reaching in shaping young generations who are more aware, critical, and responsible for their reproductive health.

2. Methodology

This study uses a qualitative approach with the type of literature study research (library research), which aims to evaluate the effectiveness of digital-based reproductive education programs on improving adolescent sexual knowledge and behavior. Literature studies were chosen because this method

allows researchers to explore and integrate various empirical findings as well as previously published theoretical concepts in depth and systematically (Zed, 2014; Creswell & Poth, 2018). This research is descriptive-analytical, namely presenting and analyzing data narratively to find patterns, gaps, and contributions of digital programs in the context of adolescent reproductive education.

The data sources in this study come from relevant secondary literature, such as scientific journal articles, academic books, reports of national and international health organizations, as well as publications from government and non-governmental institutions published in the last 10 years (2014–2024). The inclusion criteria include literature that addresses the topics of reproductive health education, adolescent sexual behavior, and the use of digital media in health interventions. Meanwhile, literature that did not go through the peer-reviewed process and was not thematically relevant was excluded from the analysis.

The data collection technique was carried out through a systematic search in various scientific databases such as Google Scholar, PubMed, Scopus, and ScienceDirect using the keywords: "adolescent reproductive education", "sexual behavior", "digital media", and "health education". The data obtained were then studied using the content analysis method, namely by identifying the main themes, comparing the findings between studies, and evaluating the strengths and limitations of each intervention studied (Bowen, 2009). This analysis was carried out qualitatively through the stages of data reduction, data presentation, and drawing conclusions as stated by Miles, Huberman, and Saldaña (2014). The results of the analysis are expected to provide a complete picture of the effectiveness of digital-based reproductive education programs and their implications for improving adolescent sexual knowledge and behavior in Indonesia.

3. Result and Discussion

As part of the literature review process in this study, researchers have filtered various scientific articles obtained from databases such as Google Scholar, ScienceDirect, PubMed, and SINTA. From dozens



of articles searched using the keywords "adolescent reproductive education", "digital media", "adolescent sexual behavior", and "technology-based health education", the 10 most relevant articles were selected based on the suitability of the theme, the quality of the publication (peer-reviewed), and the proximity of the context to the focus of the research. These articles were analyzed to see how digital

media is used in reproductive education as well as its impact on adolescent sexual knowledge and behavior. The following table summarizes the main findings of each of the articles that have been reviewed.

Table 1. Summary of Findings from 10 Articles Related to Digital Reproduction Education and Adolescents

Yes	Author & Year	Title	Findings
1	Rahmawati & Nugroho (2022)	<i>Use of adolescent reproductive education apps</i>	Significantly improved knowledge but has not consistently changed behavior
2	Sari et al. (2023)	<i>Digital interventions in reproductive health education</i>	Significant improvement in aspects of knowledge and some behaviors
3	Saputra & Lestari (2020)	<i>App-based sex education</i>	Teens feel more comfortable learning through apps; Positive Influence on Self-Awareness
4	Nasution (2021)	<i>Digital media in reproductive health education</i>	Provide a strategic alternative to overcome cultural barriers/taboo in sex education
5	Putri & Haryanto (2019)	<i>Effectiveness of conventional vs digital methods</i>	Digital methods are more effective in knowledge retention
6	Harahap (2022)	<i>Evaluation of the effectiveness of online sexual education</i>	Online education can reach a wider audience, but it needs an interactive approach
7	Yuliana & Prasetyo (2021))	<i>Adolescent sexual education meta-analysis</i>	The digital approach has a positive effect but is influenced by the quality of the content
8	Lestari (2020)	<i>School-based reproductive education</i>	Digital approach requires integration with teacher mentoring
9	Wijayanti et al. (2022)	<i>The use of TikTok in reproductive education</i>	High appeal among teenagers, but needs content supervision
10	Fadila & Ramadhan (2023)	<i>Interactive online classes for adolescent health</i>	Significant increase in knowledge and healthy sexual communication

Interpretation of Data from Literature Review Findings

The results of the study of the ten selected articles show that digital-based reproductive education programs have a significant contribution in increasing adolescents' knowledge about reproductive health. Most studies state that the use of digital media such as applications, educational videos, and online platforms is able to bridge the information gap that has not been reached by conventional methods (Rahmawati & Nugroho,

2022; Sari et al., 2023). The flexible availability of materials, interactive visualization, and the use of language that is more familiar to the world of adolescents are factors that support the success of the program in improving understanding of basic concepts of reproduction.

However, the increase in knowledge is not necessarily followed by a significant change in adolescent sexual behavior. Some articles, especially those using experimental quantitative methods, show that despite the surge in understanding, behavioral changes such



as controlling sexual urges, avoiding premarital sex, or improving healthy communication with partners have not been comprehensively realized (Rahmawati & Nugroho, 2022; Yuliana & Prasetyo, 2021). This suggests that behavior change requires more than just information—it requires a values, motivational reinforcement, and a supportive social environment.

Furthermore, the success of digital programs also depends heavily on the form and type of media. Interactive applications specifically designed for education have proven to be more effective than the use of social media such as TikTok or Instagram (Wijayanti et al., 2022). This is related to the focus of content, content quality, and control over the narrative conveyed. Social media is indeed interesting and familiar to teenagers, but it is highly dependent on the presentation of the message and the actors involved, so strict supervision and filtering of content is needed so as not to cause misunderstandings.

Data interpretation also shows that the role of interaction in digital education is still a challenge. Programs that are only one-way, such as watching videos without discussion, have a lower impact than platforms that allow for questions and answers or interactive reflection (Harahap, 2022; Fadila & Ramadhan, 2023). This means that even though digitalization makes it easier to access information, the pedagogical aspect of delivery still needs to be considered so that educational results do not only stop at knowledge transfer but also behavioral transformation.

In addition, some studies underscore the importance of integrating digital programs with support from teachers, parents, or facilitators. Lestari (2020) and Saputra & Lestari (2020) noted that adolescents tend to be more reflective and responsible in responding to educational content if accompanied by guidance and safe discussion spaces. This confirms that technology is not a total substitute for the role of humans in education, but rather a complement that expands reach and increases the attractiveness of learning.

Overall, the findings of this literature review strengthen the position of digital reproductive education programs as an important innovation in adolescent health education. However, its effectiveness depends on the quality of the program's design, the relevance of the content, and the social integration in its implementation. Therefore, program development and evaluation should consider aspects of interactivity, value reinforcement, and multi-stakeholder collaboration in order to not only educate adolescents cognitively, but also form healthy and responsible sexual behavior.

Discussion and Analysis

The increase in the number of risky sexual behaviors in adolescents is currently a serious challenge in the health development of the younger generation. Based on BKKBN data (2023), the prevalence of premarital sexual relations in adolescents has increased from year to year, and it was even found that around 28% of adolescents aged 15–24 years have had unprotected sexual intercourse. This shows that access to reproductive health information has not reached all levels of adolescents adequately, or even if it is available, it has not been delivered with an approach that is in accordance with the characteristics of the digital generation. These findings are in line with the results of a literature review in this study, which shows that conventional approaches are starting to lose their appeal and effectiveness in reaching today's adolescents.

The results of the 10 articles reviewed show that digital media, especially educational applications and interactive videos, are able to bridge the information gap that has been the main obstacle in adolescent reproductive education. Digital programs allow teens to access information anytime and anywhere, at their own pace. This is in line with the theory of Constructivism Learning from Piaget and Vygotsky, which emphasizes the importance of active and participatory learning experiences, in which learners actively build their knowledge through interaction with the environment, including digital media.

However, the data also indicate that increased knowledge does not necessarily lead to healthy changes in sexual behavior. Several studies such as those reviewed by Rahmawati & Nugroho (2022) and Yuliana & Prasetyo (2021) show that although adolescent understanding is improving, behavioral changes such as self-control, contraceptive use, and responsible decision-making are still not optimal. This reinforces the idea of the Health Belief Model (HBM) theory that changes in health behavior are not only influenced by knowledge, but also by the perception of risks, benefits, obstacles, and internal and external impulses.

The findings reflect the conditions in the field that reproductive education that focuses only on cognitive information without value reinforcement and social assistance will find it difficult to achieve comprehensive change. The researcher views that digital programs must be developed holistically, not only as a means of conveying information, but also as a tool for value formation and personal reflection. The content of the program must be prepared with an affective and normative approach, as well as adjust to the socio-cultural context of Indonesian adolescents who have high norms and sensitivity to sexual issues.

Interestingly, some studies have found that social media such as TikTok and Instagram are beginning to be used as alternative educational means, as they have high appeal among adolescents (Wijayanti et al., 2022). However, the success of these platforms relies heavily on the quality and credibility of the content. Researchers see that without proper regulation and filtering, the use of social media risks spreading misinformation that can worsen adolescent sexual behavior. Therefore, active engagement from healthcare workers, educators, and policymakers is needed to positively direct the use of these platforms.

Several articles also underscore the importance of an interactive approach in digital programming. One-way education, such as watching videos without a question and answer room or discussion, has a lower impact on the internalization of values (Harahap,

2022; Fadila & Ramadhan, 2023). This supports Kolb's theory of Experiential Learning, which emphasizes that meaningful learning must involve concrete experiences, active reflection, and real application. Therefore, digital education platforms should provide discussion features, reflective quizzes, or online consultations as a complement to visual materials.

Furthermore, the literature discussion also emphasized the importance of the role of mentoring from adults, both teachers, parents, and peer counselors, in supporting the understanding and formation of adolescent behavior. Research by Lestari (2020) and Saputra & Lestari (2020) shows that when digital programs are combined with in-person guidance or discussion, the results are more effective than stand-alone digital programs. In this context, a blended learning approach can be an ideal strategy, namely combining digital learning with face-to-face mentoring.

The author views that the effectiveness of digital-based reproductive education programs is highly dependent on the quality of program design, relevance of content, and social integration. Not all digital media are suitable for education, and not all adolescents have the same digital literacy readiness. Therefore, it is necessary to map adolescent needs and develop research-based and participatory content, in order to truly be able to answer complex and sensitive reproductive health challenges.

Based on this study, it can be concluded that digital-based reproductive education programs are a progressive step that should be further developed, especially in the context of Indonesia which has geographical and cultural challenges. However, its implementation must be accompanied by strong policies, a comprehensive evaluation system, and collaboration between the government, educational institutions, and the community. Changes in adolescent sexual behavior will not be achieved only through technology, but also through strengthening

social ecosystems that support reproductive education in an inclusive and sustainable manner.

Finally, the authors recommend that further research focus more on the long-term evaluation of the impact of digital programs on adolescent sexual behavior, including the role of family and school as mediators. This study opens up space for reflection that digitalization in reproductive health education is not just a trend, but a strategic need in building a young generation that is physically, mentally, and socially healthy.

4. Conclusion

Based on the results of the literature review of the ten articles analyzed, it can be concluded that digital-based reproductive education programs have a fairly high effectiveness in increasing adolescents' knowledge about reproductive health. Digital media such as educational applications, interactive videos, and online platforms have proven to be able to reach teenagers more widely and flexibly, as well as provide learning experiences that are in accordance with the characteristics of the digital generation. These programs are an alternative solution to the limitations of conventional methods that are less relevant to the needs and learning styles of today's adolescents.

Despite the increase in knowledge, the findings also show that changes in adolescent sexual behavior are not fully optimal. Factors such as lack of mentoring, low quality of digital interactions, and lack of integration of social and cultural values are obstacles in internalizing knowledge into healthy attitudes and behaviors. Therefore, the success of digital programs relies heavily on comprehensive content design, interactive approaches, and collaboration between technology, educational institutions, and families.

Thus, digital-based reproductive education programs need to be developed holistically, not only as a tool for conveying information but also as a means of value formation, character strengthening, and empowerment of adolescents in responsible sexual decision-making. Blended learning approaches that

combine digital media with hands-on interaction can be an effective strategy to bridge these gaps.

Further Research Recommendations

Further research is recommended to examine the long-term effectiveness of digital reproductive education programs, particularly in forming consistently healthy sexual behaviors. In addition, an in-depth study of the role of family, school, and peers in strengthening the impact of digital programs also needs to be conducted. The development of programs based on local culture, as well as the evaluation of digital content in accordance with the sensitivity of societal norms, is also an important aspect to be further researched to improve the quality and effectiveness of adolescent reproductive health education in the digital era.

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