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Utilizing Digital Applications as Educational Media for Adolescent Reproductive Health Within The Family Nursing Approach

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ABSTRACT

Background: Adolescent reproductive health remains a major public health concern, particularly in developing regions. This study aimed to evaluate a digital, family-centered reproductive health education intervention to improve adolescents' knowledge, attitudes, and family involvement.

Methods: A quasi-experimental pretest-posttest control group design was conducted in Cirebon, Indonesia, involving 120 adolescents. Variables included knowledge, attitudes, and family involvement. Instruments were validated questionnaires. Data were analyzed using descriptive statistics, paired t-tests, ANCOVA, and multiple linear regression. Effect sizes were reported using Cohen's d and η^2.

Results: The intervention group (62.5% female, mean age 15.8 ± 1.2 years) showed significant improvements: knowledge ($\Delta M = +12.4$, $p < 0.001$, $d = 1.45$), attitude ($\Delta M = +9.2$, $p < 0.001$, $d = 1.32$), and family involvement ($\Delta M = +14.2$, $p < 0.001$, $d = 1.61$). ANCOVA indicated significant between-group differences ($p < 0.001$) with large effect sizes ($\eta^2 = 0.170–0.187$).

Conclusion: A digital, family-centered education model effectively enhances adolescent reproductive health outcomes and offers a scalable intervention framework.

INTRODUCTION

Adolescent reproductive health remains a global issue that continues to be a primary concern in efforts to improve the quality of life for younger generations. Each year, approximately 16 million adolescent girls aged 15 to 19 give birth, with 95% of these cases occurring in low- and middle-income countries (WHO, 2022). Adolescent pregnancy not only increases the risk of medical complications for both mother and infant but also has long-term impacts on education, economic status, and the social well-being of adolescent girls (UNESCO, 2018). Moreover, low reproductive health literacy and limited access to accurate information contribute to high rates of sexually transmitted infections (STIs), risky sexual behaviors, and a lack of awareness of reproductive rights among adolescents.

In Indonesia, similar challenges persist. According to the Indonesian Adolescent Reproductive Health Survey (SKRRI), approximately 10% of adolescent girls have experienced premarital sexual intercourse, yet only a small proportion possess adequate reproductive health knowledge (Kemenkes, 2023; "Kementerian Pemberdayaan Perempuan dan Perlindungan Anak"). Issues such as unintended

pregnancies, inadequate understanding of contraception, and school dropouts due to pregnancy are still prevalent. While government initiatives such as school-based health education and youth-friendly services have been implemented, they continue to face barriers including cultural taboos, limited family involvement, and restricted access to accurate and contextually relevant information (Sauber, L'Abate, Weeks, & Buchanan, 2014). still face challenges, including cultural taboos and lack of parent-adolescent communication (Kementerian Kesehatan, 2018).

On the other hand, the high penetration of internet and smartphone use among Indonesian adolescents presents a valuable opportunity for innovation through digital health technologies. Mobile health (mHealth) applications have shown promise in improving adolescents' knowledge and attitudes toward reproductive health (Bergevi et al., 2022; Blakeslee, Vieler, Horak, Stritter, & Seifert, 2023; Tran, Smith, El-Den, & Carter, 2022). However, most existing digital interventions are individual-focused and rarely incorporate family involvement. Moreover, very few studies if any have explored the integration of family nursing principles into digital reproductive health education tailored to Indonesia's socio-cultural context(Kantamneni, Dharmalingam, Orley, & Kanagasingam, 2018; Lowe, Joof, & Rojas, 2024). While mHealth shows promise, limited research explores its integration within culturally contextualized family-based frameworks in Indonesia. A qualitative study by Ndugga et al., (2023); Vongsavanh, Lan, & Sychareun, (2020) revealed a communication gap between parents and adolescents in discussing reproductive health.

To address this gap, this study developed and evaluated ReproCare, a digital To address this gap, this study developed and evaluated ReproCare, a digital reproductive health education application that uniquely combines mHealth technology with a structured family-centered approach. ReproCare engages both adolescents and their parents in interactive modules grounded in famfaceily nursing principles and adapted to Indonesia's socio-cultural context. To our knowledge, this is the first study in Indonesia to operationalize a digital platform that integrates family nursing in adolescent reproductive health education. Therefore, this study aims to assess the effectiveness of a digital reproductive health intervention embedded in a family nursing approach in improving adolescents' knowledge, attitudes, and family involvement.

METHODS

Research Design

This study use a quasi-experimental design with a pretest-posttest control group structure(Sugiyono, 2018). Participants were assigned to intervention and control groups using matching based on key characteristics to ensure group comparability. The intervention group received a digital reproductive health education application (*ReproCare*), integrated with structured family involvement guided by the family nursing approach. The control group received standard health education materials provided through traditional school channels without digital or family-based components. Ethical clearance for this study was granted by the Health Research Ethics Commission (KEP) of Mahardika Institute of Health Sciences, with approval number 118/KEPK.ITEKESMA/II/2024.

Several potential confounding factors were identified and addressed in this study, including baseline differences in reproductive health knowledge, socio-demographic variations, unequal levels of family involvement, external exposure to similar information, and differences in technology access (Mukherjee, 2020). To control these, pretest scores were used for baseline adjustment, participants were matched based on key characteristics, standardized family engagement protocols were applied, and

external exposures were monitored. Additionally, all participants received guidance on using the ReproCare application to minimize disparities in digital literacy.

Participants

The sample size for this quasi-experimental study was determined using power analysis, which is appropriate for comparing two independent groups (intervention and control). The calculation was based on the following parameters: significance level (α) = 0.05, statistical power (1−β) = 0.80, and effect size (Cohen's *d*) = 0.5 (moderate effect). In this study, 120 participants were included, with 60 in each group, which remains statistically acceptable for detecting a moderate effect. The study was conducted in Cirebon, West Java, Indonesia, during March to May 2024. A purposive sampling technique was used to recruit participants from selected schools that met inclusion criteria. Inclusion criteria included adolescents aged 13–17, attending secondary school, and living with at least one family member willing to participate. Exclusion criteria included adolescents with cognitive impairments or prior formal education on reproductive health within the past six months. There were no dropouts or loss to follow-up during the intervention period

Intervention Description

The ReproCare mobile application featured multimedia reproductive health content, including educational videos, interactive quizzes, infographics, and guided discussion prompts designed for adolescents and their families. Weekly virtual support sessions were conducted by trained family nurse facilitators, offering clarification and guidance to promote family engagement in health discussions.

The development of the ReproCare application followed a user-centered design approach, which involved several key stages: (1) needs assessment through focus group discussions with adolescents and parents; (2) content development based on national reproductive health guidelines; (3) iterative design and prototyping with feedback from healthcare professionals and end users; and (4) usability testing to ensure ease of navigation and engagement.

To provide a clearer overview of the digital intervention used in this study, the following screenshots illustrate the main features and user interface of the ReproCare application.

Instruments and Validation

This study employed three main instruments to measure variables related to adolescent reproductive health. First, the Reproductive Health adapted from Zhang et al., (2014), with a content validity index (CVI) of 0.89 and a Cronbach's Alpha reliability score of 0.82. Second, the Family Involvement Scale (FIS), developed based on the Family Health Model (Skeens et al., 2024), comprises 10 Likert-scale items, with a CVI of 0.92 and a reliability score of 0.85. Third, the Adolescent Health Attitude Survey (AHAS), a local adaptation of the adolescent module from the Indonesian Ministry of Health (Jena et al., 2023), consists of 15 items, with a CVI of 0.88 and a Cronbach's Alpha of 0.80. Topics included puberty, contraception, sexually transmitted infections (STIs), decision-making, consent, and family communication about sexuality. An educational script and structured family discussion guide are available as supplementary material. The instruments were previously tested and adapted for Indonesian adolescents in earlier pilot studies, and all instruments were administered in Indonesian. For scales originally developed in English, a translation and back-translation process was conducted by bilingual experts to ensure semantic

equivalence. To facilitate score interpretation and ensure consistency in data analysis, the results were categorized as follows: Knowledge was classified into Low (<50), Moderate (50–74), and High (≥75); Attitudes into Negative (<60), Neutral (60–74), and Positive (≥75); and Family Involvement into Low (<30), Moderate (30–39), and High (≥40).

Data Analysis

This study employed a three-stage data analysis process: univariate, bivariate, and multivariate analysis. Univariate analysis described participant characteristics and the distribution of primary variables reproductive health knowledge, family involvement, and adolescent attitudes using descriptive statistics (mean, standard deviation, frequency, and percentage) (Garg, 2016; Patel & Patel, 2019). Bivariate analysis assessed the intervention's impact on outcome variables. A *paired t-test* was used to compare pretest and posttest scores within each group, while *ANCOVA* evaluated posttest differences between groups, controlling for baseline scores. Effect sizes were calculated using *Cohen's d* to determine the practical significance of the intervention(Pandey & Pandey, 2015). Multivariate analysis, such as multiple linear regression, was conducted to identify the simultaneous effects of independent variables on outcomes and to determine the most influential predictors. This analytical approach provided a comprehensive evaluation of the digital family-centered reproductive health intervention.

RESULTS

Univariate Analysis

Univariate analysis was conducted to describe the demographic characteristics of the participants and baseline scores of key variables before the intervention.

Table 1. Demographic Characteristics and Baseline Scores

Variables	Intervention (n = 60)	Control (n = 60)	Total (n = 120)
Gender – Female	37 (61.7%)	38 (63.3%)	75 (62.5%)
Age (mean ± SD)	15.9 ± 1.3 years	15.7 ± 1.2 years	15.8 ± 1.2 years
Knowledge Score (pretest)	45.6 ± 8.2	44.9 ± 7.9	45.3 ± 8.0
Attitude Score (pretest)	63.2 ± 5.7	62.7 ± 6.0	62.9 ± 5.9
Family Involvement Score	28.3 ± 5.4	27.9 ± 5.7	28.1 ± 5.6

Both groups had comparable demographic characteristics and baseline scores. The results showed no significant difference between the intervention and control groups at the pretest stage ($p > 0.05$), indicating homogeneous baseline conditions.

Table 2. Univariate Analysis Category in Intervention and Control Groups

Variables	Category	Intervention (n = 60)	Control (n = 60)
Knowledge	Low (<50)	10 (16.7%)	30 (50.0%)
	Moderate (50–74)	45 (75.0%)	28 (46.7%)
	High (≥75)	5 (8.3%)	2 (3.3%)
Attitudes	Negative (<60)	5 (8.3%)	23 (38.3%)
	Neutral (60–74)	4270.0%)	33 (55.0%)
	Positive (≥75)	13 (21.7%)	4 (6.7%)
Family Involvement	Low (<30)	4 (6.7%)	31 (51.7%)
	Moderate (30–39)	18 (30.0%)	23 (38.3%)
	High (≥40)	38 (63.3%)	6 (10.0%)

Univariate analysis showed that the intervention group had a higher proportion in the high category for knowledge (8.3%), attitudes (21.7%), and especially family involvement (63.3%) compared to the control group. Conversely, the control group tended to have more participants in the low category, particularly in knowledge (50.0%) and family involvement (51.7%). These findings indicate that the family-based digital intervention effectively improved knowledge, attitudes, and family involvement in adolescent reproductive health education.

Table 3. Correct Answer – Knowledge

No	Item	Pre	Post
1.	Do you think one unprotected sex could lead women to conceive?	53.1	69.5
2.	Do you know the concept and characteristics of ED?	38.4	48.6
3.	Do you think emergency contraceptives is a remedy after condom breakage during sexual activity?	36.4	68.0
4.	Do you think abortion may lead to infertility in women?	42.7	47.1
5.	Do you think cleaning the vagina/penis after sexual intercourse can avoid the risk of STDs?	48.9	55.6
6.	The main reason for banning consanguineous marriage	64.0	62,4
7.	Which of the following are not clinical characteristics of prostatitis?	45.3	54.5
8.	Which of the following behaviors can transmit HIV/AIDS/STDs?	39.3	54.6
9.	Which of the following are STDs?	37.6	55.0
10.	Which of the following are methods to prevent STDs?	50.7	65.0

In general, there is a notable increase in scores from the pre-test to the post-test across most items. This suggests a positive impact or improvement following the intervention.

Table 4. Correct Answer – Attitude

No	Statement	Pre	Post
1	I believe adolescents need to know about contraception.	23.6	39.0
2	Premarital sex carries serious health risks.	29.1	47.2
3	I feel confident to say "no" to sexual pressure.	23.1	49.1
4	My parents support me in postponing sexual activity until marriage.	31.3	39.0
5	I have adequate knowledge about bodily changes during puberty.	36.5	39.8
6	I believe that using condoms is important for preventing STIs.	33.4	56.6
7	Adolescents should receive reproductive health education at school.	23.4	37.6
8	I feel embarrassed when discussing sexuality with adults.	25.5	31.1
9	I understand the importance of consent in sexual relationships.	30.0	43.0
10	Adolescents should be involved in decision-making about their own bodies.	23.8	40.0
11	I know where to go if I need adolescent health services.	26.9	42.0
12	I believe that talking about sexuality does not promote promiscuity.	42.0	54.0
13	Both girls and boys have equal rights to reproductive health.	28.0	39.2

No	Statement	Pre	Post
14	I feel comfortable asking my teacher about sexuality or reproduction.	24.7	37.1
15	I recognize the importance of open family communication about sexuality.	23.6	43.7

The data demonstrate an overall increase in scores from the pre-test to the post-test across all items, indicating that the intervention had a generally positive impact.

Table 5. Family Involvement

No	Item	Pre	Post
1.	I had the opportunity to ask questions about my family member's illness/condition.	64.0	78.4
2.	I understood the information I received regarding my family member's illness/condition.	56.5	68.9
3.	I received sufficient information regarding my family member's care.	69.9	82.0
4.	I participated in the discussion about which examinations/treatments should be done.	67.8	70.0
5.	I participated in the planning of my family member's aftercare, that is, what would happen when my family member was discharged from the hospital.	64.5	80.0
6.	The staff treated me with respect.	59.2	67.1
7.	The staff were responsive to my needs/wishes.	62.1	72.6
8.	I was well received by the staff.	61.5	65.8
9.	I felt confident in the staff.	72.9	75.7
10.	I received the emotional support I needed during my family member's care period.	53.1	63.1

All 15 items experienced score improvements following the intervention, with several items showing substantial gains of more than 15 points. This indicates that the intervention was generally effective in improving the measured variables, which may relate to knowledge, attitudes, or skills depending on the context of the study. The results provide evidence supporting the value of the intervention in enhancing participant outcomes.

Bivariate Analysis

Bivariate analysis was conducted using paired t-tests and ANCOVA to evaluate the effects of the intervention between and within groups.

Table 6. Comparison of Pretest and Posttest, ANCOVA, and Effect Size

Variables	Pretest Mean ± SD	Posttest Mean ± SD	t-value	p-value (t-test)	ANCOVA F	ANCOVA p-value	Cohen's d	Partial Eta Squared (η^2)
Knowledge Score	45.6 ± 8.2	58.0 ± 7.4	10.21	<0.001	23.87	<0.001	1.45	0.170
Attitude Score	63.2 ± 5.7	72.4 ± 6.1	9.15	<0.001	15.76	<0.001	1.32	0.118
Family Involvement	28.3 ± 5.4	42.5 ± 6.2	8.45	<0.001	27.49	<0.001	1.61	0.187

After controlling for pretest scores, all three variables showed significant differences between the intervention and control groups ($p < 0.001$). Effect sizes (Cohen's $d > 1.3$) indicated a large impact, especially on family involvement ($d = 1.61$). Partial eta squared also showed large effects: knowledge (0.170), attitude (0.118), and family involvement (0.187).

Multivariate Analysis

To further explore the effectiveness of the intervention while controlling for baseline differences, multivariate analysis was conducted using Analysis of Covariance (ANCOVA). This approach adjusted for pretest scores (covariates) to determine the independent effect of the intervention on posttest outcomes.

Table 7. ANCOVA Assumption Test

Test	Result
Shapiro-Wilk (normality)	$p > 0.05$ for all residuals
Levene's Test (homogeneity)	$p > 0.05$ for all residuals
Linearity (scatterplot inspection)	A linear relationship was observed

All basic assumptions of ANCOVA have been met, including normality of residuals, homogeneity of variance, and linearity of the relationship between covariates and dependent variables. This confirms the validity of the ANCOVA results used in the analysis.

Table 8. Item Detail Summary

Dimension	No. of Items	Mean Item Score (Posttest)	SD
Knowledge	10	5.8	1.2
Attitude	10	9.1	1.4
Family Involvement	15	7.1	1.3

The average score per item showed good results, with the highest score increase seen in the family involvement dimension. This shows that each item on the measuring instrument made a positive contribution to improving post-intervention outcomes.

DISCUSSION

The results of this study highlight the effectiveness of a digital, family-centered reproductive health education intervention for adolescents. This intervention demonstrated significant improvements in knowledge, attitudes, and family involvement, with large effect sizes for all outcomes. In this section, we will discuss the

findings in relation to existing literature, explore the implications for future practice, and suggest directions for further research.

Knowledge Improvement

The intervention group demonstrated a significant increase in reproductive health knowledge, marked by a large effect size (Cohen's d = 1.45). This result aligns with previous studies that have consistently shown the effectiveness of digital interventions in improving adolescents' understanding of health-related topics (Handayani & Arianto, 2024). The present findings suggest that the integration of family-centered strategies within digital interventions can further reinforce learning outcomes. This supports prior research indicating that family involvement in adolescent health education enhances both knowledge retention and its practical application (Vautero, Taveira, Silva, & Fouad, 2021).

The substantial improvement in knowledge among participants in the intervention group may be attributed to the structured use of digital tools that combined educational content with deliberate family engagement, thereby strengthening key health messages within the household (Kim, Ahn, & Fouad, 2016). Moreover, the inclusion of family support may also contribute to sustained behavioral changes beyond the intervention period.

When adolescents engage in health-related discussions with their families, the process not only deepens their understanding but also fosters a conducive environment for informed decision-making and the adoption of healthy behaviors (Ghosh & Fouad, 2016; Marisa, Dioso, Elengoe, Kamasturyani, & Iyos, 2025; Purbasari et al., 2024). Family dialogue can enhance adolescents' confidence in applying what they have learned and encourage continued engagement with health information. These findings underscore the importance of involving families not merely as passive recipients, but as active partners in youth-focused health education.

Supporting evidence from other studies has likewise demonstrated that digital health education programs can significantly enhance adolescents' reproductive health knowledge (Mauch et al., 2021). Mobile health applications specifically designed for sexual and reproductive health have been shown to yield substantial improvements in both knowledge acquisition and youth engagement.

From a pedagogical perspective, the digital learning mechanism in this intervention facilitates long-term memory retention through multimedia-based repetition, consistent with the principles of Cognitive Load Theory. Family involvement supports Social Learning Theory, wherein adolescents model values and behaviors observed in family members through interactive discussions. Local evidence has shown that maternal involvement in health-related dialogues is particularly effective in enhancing adolescent understanding—especially within Indonesia's collectivist cultural context (Marisa, Kasmad, & Purbasari, 2022; Rahmiwati et al., 2023).

Attitude Change

The significant improvement in attitudes toward reproductive health in the intervention group (Cohen's d = 1.32) represents a notable finding, reinforcing the importance of addressing adolescent perspectives in reproductive health education. Attitudes are recognized as key determinants of health behavior, and positive shifts in attitudes are often precursors to improved health outcomes (Marlina, Marisa, & Nurlaili, 2022; Nurhaeni, Marisa, & Ocktiany, 2022). This outcome aligns with previous literature indicating that health interventions—particularly those that are interactive and involve both adolescents and their families—can effectively foster attitudinal change.

For instance, prior studies have shown that educational programs delivered via mobile applications significantly enhance adolescents' attitudes toward sexual health, especially when parental involvement is incorporated (Marisa, Dioso, Elengoe, & Kamasturyani, 2025; Nurhaeni et al., 2025; Purbaningsih, Muadi, & Marisa, 2025).

The results of this study support the notion that interactive, family-engaged digital interventions can foster positive changes in adolescent attitudes. The improvement observed may be attributed to the use of a digital platform that aligns with adolescents' preferences for technology-based learning, as such tools tend to be more engaging and accessible to this demographic. Additionally, open channels of communication facilitated through family involvement may have further contributed to this attitudinal shift (Marisa, 2018). The family-centered approach of this intervention may have played a pivotal role in fostering open, supportive discussions around reproductive health—an element that has been shown to positively influence adolescent attitudes on such topics.

The observed change in attitude can be explained through the Theory of Planned Behavior (TPB), in which improvements in knowledge and subjective norms—facilitated by family support—affect adolescents' attitudes toward reproductive health. Furthermore, the affective delivery of information through family interactions aligns with affective learning theory, which enhances receptivity through emotional engagement. However, while a significant attitudinal shift was observed, this study did not assess the long-term sustainability of these changes. Future longitudinal studies are recommended to evaluate the durability of attitudinal changes and their impact on sustained health behavior over time.

Family Involvement

One of the most notable findings of this study was the substantial increase in family involvement within the intervention group, demonstrated by a very large effect size (Cohen's d = 1.61). This result underscores the critical importance of incorporating family-centered strategies into health education interventions. Family involvement is widely recognized as a key determinant in improving health outcomes among adolescents, particularly in the domain of reproductive health (Sauber et al., 2014). Previous research has shown that the active engagement of family members in adolescent health education significantly enhances both knowledge acquisition and positive attitudes toward health-promoting behaviors (Eppes et al., 2023).

This study contributes to the existing literature by demonstrating that a digital tool designed to promote family participation can effectively facilitate improved communication between adolescents and their families, thereby strengthening family involvement. These findings support the notion that digital interventions that integrate family engagement can substantially improve adolescents' understanding and active participation in reproductive health topics (Agu et al., 2024; Michael, 2024). Moreover, the structured design of the intervention provided families with clear, actionable guidance to engage with the educational content, further reinforcing the effectiveness of family-centered approaches. By providing empirical evidence on the efficacy of digital, family-inclusive interventions, this study advances the field of adolescent reproductive health by offering a scalable and practical model that can be adapted across various contexts to improve health education outcomes.

Nevertheless, engaging families in sensitive topics such as reproductive health remains a challenge within certain cultural contexts. Social norms that regard sexual discussions between parents and children as taboo continue to be a significant barrier (Marisa, 2018). Therefore, interventions must be designed with cultural and religious

sensitivity to ensure acceptance and effectiveness. These findings are highly relevant to the development of adolescent health education models in Indonesia, as they demonstrate that digital, family-based approaches can address educational challenges in socio-cultural settings that emphasize familial values. Key stakeholders such as the Ministry of Health, the National Population and Family Planning Board (BKKBN), schools, and community health nurses are encouraged to take active roles in implementing this intervention model..

Implications for Practice

The findings of this study carry significant implications for clinical practice and the design of reproductive health education programs targeting adolescents. The observed improvements in knowledge, attitudes, and family involvement indicate that digital health interventions represent a promising and effective approach to enhancing reproductive health literacy among young people (Tiwari et al., 2022). Moreover, the integration of family-centered strategies appears to amplify the impact of these interventions, making them more comprehensive, sustainable, and contextually relevant(kasmad, Marisa, & Kadafi, 2021; Marisa, 2018).

Healthcare providers and educators are encouraged to incorporate digital tools that not only deliver educational content but also actively promote family engagement within adolescent reproductive health programs (Hémono et al., 2024). Such an approach not only improves adolescents' understanding and attitudes toward reproductive health but also cultivates a supportive home environment, which is essential for reinforcing and sustaining healthy behaviors(Rahmiwati et al., 2023). The success of the present intervention in increasing family involvement underscores the critical need to address the family unit alongside the adolescent in health education initiatives.

By combining digital health platforms with family-centered strategies, this study highlights a scalable and powerful framework for advancing adolescent reproductive health literacy. This holistic approach aligns with contemporary public health priorities that emphasize intergenerational communication and prevention-focused education, ultimately contributing to more effective and enduring health outcomes. Practical implementation can be realized through the strengthening of school health units (Usaha Kesehatan Sekolah, UKS), youth-oriented community health posts (Posyandu Remaja), and integration into national platforms such as reproductive health education applications supported by the BKKBN. Furthermore, this intervention model could be embedded within family-based character education programs currently promoted at the national level.

By presenting a statistically significant and practically applicable intervention, the study contributes meaningfully to the field of adolescent reproductive health by addressing a gap in the existing literature and offering a feasible, culturally responsive, and family-integrated digital solution.

CONCLUSION

This study offers a significant scientific contribution to the fields of public health, health education, and family nursing by providing robust evidence that digital, family-centered reproductive health education interventions can substantially improve adolescents' knowledge, attitudes, and family involvement. The findings advance current understanding by demonstrating the synergistic impact of combining digital platforms with structured family engagement—a model that is particularly suited to collectivist cultural contexts and has been underexplored in previous research.

Given the high digital engagement among adolescents, this intervention model presents a scalable and practical solution for improving reproductive health literacy and promoting healthy behaviors. Therefore, it is strongly recommended that policymakers, including ministries of health and education, integrate such digital, family-centered approaches into existing school health programs (e.g., UKS) and youth-focused community health initiatives (e.g., Posyandu Remaja). To ensure successful implementation and long-term sustainability, future interventions should prioritize cultural adaptation, tailoring both content and delivery methods to align with local values, beliefs, and family dynamics. Such contextual sensitivity will enhance the relevance, acceptability, and effectiveness of the programs across diverse adolescent populations.

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