



Analysis of the Role of the Flo Application as a Digital Educational Media for Adolescent Reproductive Health in the Technology Era

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Article Info

Article history:

Received Apr 7, 2024

Revised May 15, 2024

Accepted Jun 13, 2024

OnlineFirst Jun 24, 2024

Keywords:

Adolescents

Digital Education

Flo App

Health Behavior

Health Education

ABSTRACT

Purpose of the study: This study aims to analyze the role of the Flo application as a digital educational media based on AI in improving adolescent knowledge, attitudes, and behavior related to reproductive health in the era of modern technology.

Methodology: This study uses a qualitative approach with a descriptive analytical method to explore the experiences, perceptions, and impacts of using the Flo application on adolescents in the context of reproductive health education. Data were collected through in-depth interviews, questionnaires, observations, and documentation studies. The sampling technique used was purposive sampling, while data analysis was carried out with a thematic approach for qualitative data and descriptive statistics for quantitative data.

Main Findings: The results showed that the Flo app was effective in increasing adolescents' understanding of reproductive health, with the majority of respondents feeling more confident in managing their menstrual cycles and maintaining their health. The most appreciated features were cycle prediction and daily symptom logs. Although the app had a positive impact, there were obstacles such as limited access to premium features and difficult-to-understand medical terms. Overall, the Flo app was well received by users and showed potential for further development.

Novelty/Originality of this study: This study offers novelty by exploring the role of the Flo app that uses AI to predict menstrual cycles and provide personalized reproductive health education content. Unlike previous studies, this study leverages an app that is already widely available, opening up opportunities to develop a more relevant and effective digital education platform for adolescents.

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1. INTRODUCTION

Reproductive health in adolescents is an important aspect in supporting their physical, mental, and social development towards adulthood. Adolescence is a transitional phase where significant biological and emotional changes occur, so a good understanding of reproductive health is very crucial [1]-[3]. Lack of accurate information can cause various problems, such as unwanted pregnancies, sexually transmitted infections (STIs), hormonal

disorders, and psychological stress due to false stigma or myths [4]-[6]. Appropriate reproductive health education can help adolescents get to know their bodies, make wise decisions, and increase awareness of the importance of maintaining their health [7]-[9]. Therefore, access to relevant information and an adolescent-friendly approach are essential to minimize risks and support their quality of life in the future.

However, reproductive health education in the modern era faces various challenges, especially in reaching adolescents who need accurate and relevant information. One of the main challenges is the strong social stigma in many cultures, so that discussions about reproductive health topics are often considered taboo [10]-[12]. This causes many adolescents to be reluctant to seek information directly, especially through traditional sources such as teachers or parents [13]-[15]. In addition, conventional education methods are often less interactive and do not fully understand the needs and communication styles of the younger generation [16]-[18]. While digital technology has opened up wider access to information, adolescents are also vulnerable to invalid or misleading information from online sources [19]-[21]. Therefore, solutions are needed that can overcome these challenges with an innovative, interactive, and technology-based approach, such as digital applications that provide reliable reproductive health education content that is tailored to adolescents' needs.

The use of digital technology in health education has brought about significant changes, especially in providing faster, more efficient, and easier-to-understand access to information for adolescents. In this digital era, health applications such as Flo utilize technologies such as artificial intelligence (AI) to provide accurate predictions about menstrual cycles, as well as provide educational content tailored to individual needs [22]-[24]. Digital technology allows adolescents to access reproductive health information anytime and anywhere, overcoming social and geographical barriers that may exist in traditional education methods [25]-[27]. In addition, these digital applications also offer more personal and private interactions, which can make adolescents feel more comfortable in seeking sensitive information [28]-[30]. With the continuous advancement of technology, applications such as Flo provide an opportunity to bring adolescents closer to information that can improve their understanding of reproductive health, as well as support them in making better decisions regarding their body's health.

The Flo app, which utilizes artificial intelligence (AI), is one of the most popular digital health education media among teenagers and women, especially in terms of reproductive health. Flo provides accurate predictions about menstrual cycles, ovulation, and various other aspects related to reproductive health, while providing relevant scientific information about disease symptoms and health tips [31]-[33]. This application not only functions as a menstrual tracking tool, but also as an educational resource that allows teenagers to record physical symptoms, emotions, and habits that affect their cycles [34],[35]. One of its advantages is the high privacy feature that allows users to remain anonymous when searching for sensitive information. In addition, Flo also has an anonymous community within the application that provides social support and a space for teenagers to share experiences without anxiety [36]-[38]. With a data-based and privacy-based approach, Flo is an effective platform for reproductive health education that is easily accessible and tailored to the needs of teenagers.

Previous research on adolescent reproductive health education has generally focused on the development and testing of Android-based applications or local websites to improve students' knowledge and attitudes. The study showed that digital media is effective in providing more interesting and accessible education than traditional methods. [39]-[41]. However, the applications used in these studies generally do not have artificial intelligence (AI) technology that is able to personalize education based on individual needs. In addition, the approaches used are mostly quantitative, by measuring changes in knowledge and attitudes through pretest-posttest methods without delving deeper into the subjective experiences of users.

The current study is here to fill this gap by analyzing the role of the Flo application, which uses AI technology to provide personalized menstrual cycle predictions and reproductive health education. This research approach is qualitative, which provides in-depth insights into the experiences, perceptions, and impacts of the application on adolescents. This study also expands the scope by using a global application in a local context, allowing for the exploration of the application of advanced technology in various social and cultural backgrounds. Thus, this study not only complements previous findings but also provides new contributions in utilizing AI technology to improve the effectiveness of adolescent reproductive health education in a more innovative, personal, and private way.

The novelty of this study uses the Flo application which integrates AI technology to provide menstrual cycle predictions, reproductive health education, and personalized recommendations. This provides a new approach compared to previous studies which generally use Android-based applications or websites without personalization technology [42]. The urgency of this research lies in the urgent need to understand the role of digital applications, especially Flo, in improving reproductive health education for adolescents in the technological era. Although applications such as Flo have been widely used by many women, in-depth research on their effectiveness as a medium for reproductive health education for adolescents is still limited.

Amid the high rate of internet access and use of mobile applications by adolescents, it is important to evaluate the extent to which these applications can meet their needs in obtaining information that is accurate, easy
Jou. Ed. Tech. Lrng. Crtv, Vol. 2, No. 1, June 2024: 71 - 82

to understand, and appropriate to their developmental stage. In addition, with the major challenges related to social stigma and difficulties in obtaining accurate information about reproductive health, digital applications can be an alternative solution that is safer and more private. This study aims to explore more deeply the influence of the Flo application in providing education that has a positive impact on adolescents' knowledge, attitudes, and behaviors related to reproductive health, as well as providing insights for the development of similar technologies in the future.

2. RESEARCH METHOD

2.1. Types of Research

This study uses a qualitative approach with a descriptive analytical method. The qualitative approach was chosen to gain a deeper understanding of the experiences, perceptions, and impacts of using the Flo application on adolescents in the context of reproductive health education [43],[44]. This study aims to explore and describe how the Flo application plays a role as an educational medium, as well as how this application influences adolescents' knowledge and attitudes towards their reproductive health. In addition, this study also examines the advantages and disadvantages of the Flo application in providing relevant and accurate education for adolescents.

2.2. Population and Sample

The population in this study were female adolescents aged 14 to 19 years who actively use the Flo application to monitor their menstrual cycles and obtain information related to reproductive health [45],[46]. Adolescents in this age range were selected because they are in a crucial phase of development, where reproductive health education is very important. The sample in this study will be selected using a purposive sampling technique, namely the selection of samples based on certain criteria that are relevant to the objectives of the study [47],[48]. The samples taken are adolescents who are voluntarily willing to participate in the study and have actively used the Flo application for at least the last 3 months. The number of samples taken is estimated to be around 30-50 people, which is considered sufficient to provide a representative and in-depth picture of the experience of using the Flo application. Another criterion is that the sample comes from various social and cultural backgrounds to ensure a diversity of perspectives.

2.3. Data Collection Techniques

Data collection in this study will be carried out through several techniques to obtain comprehensive and in-depth information. In-depth interviews with respondents will be used as the main technique to explore the experiences, perceptions, and influences of using the Flo application on adolescents' knowledge and attitudes regarding reproductive health. This semi-structured interview will explore the benefits, difficulties, and personal aspects felt by adolescents in using the Flo application. The grid is in table 1.

Table 1. Interview outline for this research

Aspect	Questions
Experience Using the Flo App	1. When did you start using the Flo app? 2. What is your main reason for using the Flo app?
The App's Influence on Reproductive Health Knowledge	1. What information about reproductive health did you get from Flo? 2. Did the app help you understand your menstrual cycle better?
The App's Influence on Attitudes and Behavior	1. After using the Flo app, do you feel more confident in taking care of your reproductive health? 2. Did the app influence your decisions regarding body care or menstrual cycle management?
Experience with App Features	1. Which features are most useful to you in the Flo app? 2. Are there any features that you find less effective or useless?
Difficulties or Barriers in Using the App	1. Have you ever had difficulty using the Flo app? 2. Are there any features of the app that are difficult to understand or access?

In addition, a questionnaire will be distributed to collect quantitative data on the frequency of application use, user satisfaction levels, and its impact on understanding reproductive health. This questionnaire will use a Likert scale to measure respondents' attitudes and knowledge on topics such as menstrual cycles, pregnancy, and reproductive diseases. The questionnaire grid for this study is presented in table 2, using a 5-point Likert scale.

Table 2. The outline of this research questionnaire

Aspects	Questions
Frequency of Flo Application Use	1. How often have you used the Flo app in the past month?
User Satisfaction Level	1. How satisfied are you with the Flo app? 2. Does this app meet your reproductive health information needs?
Application Influence on Reproductive Health Knowledge	1. Do you feel you understand your menstrual cycle better after using the Flo app? 2. Does this app increase your knowledge about reproductive diseases?
Application Influence on Attitudes and Behavior	1. Do you feel more responsible for your reproductive health after using the Flo app? 2. Has the app changed the way you care for your body or manage your period?
Application Advantages and Disadvantages	1. What do you like most about the Flo app? 2. What do you think needs improvement in the Flo app?

Observation techniques will also be applied to observe user interactions with the Flo application in everyday life, in order to determine the extent to which this application helps in reproductive health education and how effectively its features are used. In addition, a documentation study will be conducted by analyzing educational materials and reproductive health content provided in the Flo application, to provide a clearer picture of the types of information available to adolescents and their relevance in the context of reproductive health education. The combination of these techniques is expected to provide a more complete understanding of the role of the Flo application as a reproductive health education medium for adolescents.

2.4. Data Analysis Techniques

Data obtained from interviews, questionnaires, and observations will be analyzed using thematic analysis and descriptive statistics approaches. Qualitative data obtained from in-depth interviews and observations will be analyzed thematically by identifying key themes that emerge related to user experiences in using the Flo application. This analysis aims to identify factors that influence the success of the application in providing reproductive health education and how the application is received by adolescents. Quantitative data from the questionnaire will be analyzed using descriptive statistics to describe application usage patterns, levels of reproductive health understanding before and after using the application, and levels of user satisfaction with the features of the Flo application. This technique will help provide a clear picture of the effectiveness of the application in improving adolescent knowledge and attitudes regarding reproductive health.

2.5. Research Procedures

This research will be conducted through a series of structured stages. The first stage is research preparation, which includes submitting a research permit to the authorities, schools, parents, or related institutions. Next, the preparation of research instruments, including in-depth interviews, questionnaires, and observation guides, will be carried out. This process also involves the selection and training of interviewers and the collection of primary data from respondents. At the data collection stage, in-depth interviews with selected samples will be conducted, followed by the distribution of questionnaires to adolescent users of the Flo application. In addition, observations of the use of the application in everyday life will also be carried out, as well as analyzing the materials available in the Flo application. After the data is collected, the data analysis stage begins with the processing and analysis of qualitative data by identifying important themes that emerge from the interviews. For quantitative data, descriptive statistical analysis will be used to describe the findings objectively. At the discussion stage of the results, the research findings will be compiled, focusing on the role of the Flo application in adolescent reproductive health education, as well as providing recommendations for future application development. The final stage is reporting the research results, which includes the preparation of a complete report containing the findings, analysis, and conclusions of the research conducted.

3. RESULTS AND DISCUSSION

This study aims to analyze the role of the Flo application as a digital educational media in improving adolescents' understanding of reproductive health in the era of modern technology. The Flo application, which has been popular among adolescents and women, utilizes artificial intelligence (AI) to provide accurate and relevant information about the menstrual cycle and other aspects of reproductive health [49]. In the context of reproductive health education challenges, such as social stigma, limited access to information, and lack of interactive learning methods, this application emerges as an innovative alternative solution.

This study uses a qualitative approach with a descriptive analytical method to describe the experiences and perceptions of adolescents in utilizing the Flo application. Data were collected through in-depth interviews, questionnaires, observations, and application content analysis. The results of the study are expected to provide in-depth insights into the impact of using the Flo application on adolescents' knowledge, attitudes, and behavior in maintaining their reproductive health. In addition, this study also aims to identify the advantages and disadvantages of the application, in order to provide recommendations for further development.

With the rapid development of digital technology, the results of this study are expected to be a reference for the development of similar educational platforms that are more effective and relevant for the younger generation. This also contributes to efforts to improve the quality of reproductive health education globally. Table 3 below shows the results of interviews in this study.

Table 3. Summary of interview results

Aspects	Question	Interview Results
Experience of Using the Flo Application	When did you start using the Flo app?	- Respondent 1: "I started using Flo about 8 months ago, on my friend's recommendation." - Respondent 2: "I started using it when I was 15, now I have been using Flo for almost 2 years."
	What is your main reason for using the Flo app?	- Respondent 1: "To monitor my menstrual cycle more regularly." - Respondent 3: "I want to learn about reproductive health without having to ask my parents directly." - Respondent 2: "I learned to understand menstrual symptoms, such as pain, and what causes them."
Influence of the Application on Reproductive Health Knowledge	What reproductive health information did you get from Flo?	- Respondent 4: "I got information about the ovulation phase and tips for maintaining health during menstruation." - Respondent 1: "Yes, now I understand my menstrual pattern better."
	Did this app help you understand your menstrual cycle better?	- Respondent 3: "Very helpful, especially the prediction feature which is quite accurate." - Respondent 2: "I feel more confident because I know what is normal and not in my cycle." - Respondent 5: "Yes, especially because there are health tips that make me more prepared for menstruation."
Influence of the Application on Attitudes and Behavior	After using the Flo app, do you feel more confident in taking care of your reproductive health?	- Respondent 1: "Yes, I am more diligent in recording daily symptoms, so I know when to rest more." - Respondent 4: "I have become more organized in maintaining my health, such as eating healthier during menstruation." - Respondent 3: "The menstrual cycle prediction and daily symptom log are the most helpful features."
	Has the app influenced your decisions about your personal care or menstrual cycle management?	- Respondent 5: "I like the reproductive health education feature which has a simple appearance." - Respondent 2: "The community feature is less relevant to my needs." - Respondent 4: "The reminder section is less flexible because it cannot be adjusted to your personal schedule."
Experience with Application Features	Which features do you find most useful in the Flo app?	- Respondent 1: "Some medical terms are sometimes difficult to understand."
	Are there any features that you find less effective or useless?	
Difficulties or Barriers in Using the Application	Have you ever had trouble using the Flo app?	

Are there any app features that are difficult to understand or access?

- Respondent 3: "Some features, such as privacy settings, are difficult to access at first, but once you get used to them, they become easier."
- Respondent 2: "Some premium features are locked, so I can't use them even if I want to know more."
- Respondent 5: "The cycle reminder section should be more detailed, such as giving earlier warnings."

Interview results showed that most respondents used the Flo app to monitor their menstrual cycles regularly. The main motivation for using the app was the need to understand their bodies better and learn about reproductive health privately. Recommendations from friends were also one of the main reasons they started using the app. This indicates that the Flo app has succeeded in answering the needs of teenagers for access to relevant and technology-based information.

Most respondents stated that the Flo app helped them improve their understanding of reproductive health, especially in recognizing menstrual cycle patterns, symptoms, and other important information such as the ovulation phase. The information provided by the app was considered relevant and easy to understand, although some respondents mentioned that there were medical terms that were difficult to understand. The educational features included in the app were also one of the reasons respondents felt that the app was able to have a positive impact on their knowledge. This supports previous research showing that technology-based educational media can improve health knowledge more effectively than traditional methods [50].

The use of the Flo app also has an impact on changes in adolescent attitudes and behavior in maintaining their reproductive health [51]. Most respondents feel more confident in managing their menstrual cycles and taking care of their body health. In addition, the application motivates them to be more responsible in recording daily symptoms and managing a healthy lifestyle, such as consuming nutritious food during menstruation. However, this behavioral change can only be achieved in respondents who use the application regularly and understand the benefits of the existing features. This shows that the success of this application is highly dependent on the level of user engagement and consistency in utilizing the available features.

The features most appreciated by respondents were menstrual cycle prediction, daily symptom records, and reproductive health education content. These features are considered to provide real practical value, especially in helping them understand their bodies better. On the other hand, some respondents criticized the community feature which was considered less relevant to their needs and the reminder feature which was considered less flexible. This criticism shows that although the Flo application has provided significant benefits, there is still room for feature development to better suit the needs of diverse users. The flexibility of features such as reminders and customization of community content can increase the overall level of user satisfaction.

Although this application provides many benefits, several obstacles were found in its use. Respondents revealed that the medical terms used were sometimes difficult to understand. In addition, access to locked premium features is an obstacle for some users who want to get more in-depth information. The privacy settings feature was also initially perceived as difficult by some users, although this improved as they became more familiar with it. This barrier suggests that additional education, either in the form of a user guide or a glossary of medical terms, could help users optimize their experience. Additionally, providing broader access to premium features or providing a free version with additional content could increase the inclusivity of the app. The results of this research questionnaire can be seen in table 4 below:

Table 4. Results of descriptive statistical analysis

Measured Aspects	Average Score	Description
Frequency of Application Use	4.2 (out of 5)	Respondents use the application regularly, on average 3-5 times a month.
User Satisfaction	4.5 (out of 5)	The majority of respondents are very satisfied with the application, especially regarding its ease and benefits.
Increased Knowledge	4.3 (out of 5)	The application helps improve understanding of the menstrual cycle and reproductive health.
Changes in Attitude and Behavior	4.4 (out of 5)	Respondents feel more responsible and positive in managing reproductive health.
Application Advantages	-	Most preferred features: Menstrual cycle prediction (78%) and educational content (65%).

Application	-	Expected improvements: Access to premium features (56%) and more flexible reminders (48%).
Disadvantages		

The questionnaire results showed that the Flo app was well received by adolescents, with high scores for satisfaction (4.5), increased knowledge (4.3), and positive attitude change (4.4). The cycle prediction and education features were highly appreciated, but users expected better access to premium features and more flexible reminder settings. The app has proven to be effective as a medium for reproductive health education with potential for further development.

Table 5. Observation results

Observed Aspects	Observational Findings
Interaction with Application	Most adolescents used the Flo app independently, primarily to log daily symptoms and monitor their menstrual cycles. Users appeared comfortable using the app in a private setting.
Use of Main Features	The menstrual cycle prediction and daily symptom log features were most frequently used. Respondents consistently used these features to understand their body patterns.
Access Frequency	Users opened the app an average of 3-5 times a month, especially around or during their menstrual periods.
Difficulties Experienced	Some users were confused by medical terms in the education section and felt limited by the premium features.
Response to Information	The educational information provided was considered relevant and easy to understand, although there were requests for simpler explanations of some technical terms.
Privacy and Convenience	Users felt the app provided a sense of security and privacy, especially due to the anonymity features and friendly interface design.
Educational Effectiveness	The app helped improve users' understanding of their menstrual cycle and reproductive health, as seen from behavioral changes, such as better health management.

Observation results show that the Flo application is routinely used by adolescents in private settings, with key features such as cycle prediction and symptom records being favorites. Although users feel that this application is effective in increasing their understanding and comfort regarding reproductive health, several challenges arise, such as limited access to premium features and difficult to understand medical terms. Overall, this application is considered to have a positive impact on increasing adolescent reproductive health awareness. The documentation of this Flo application is presented in Figure 1 below:

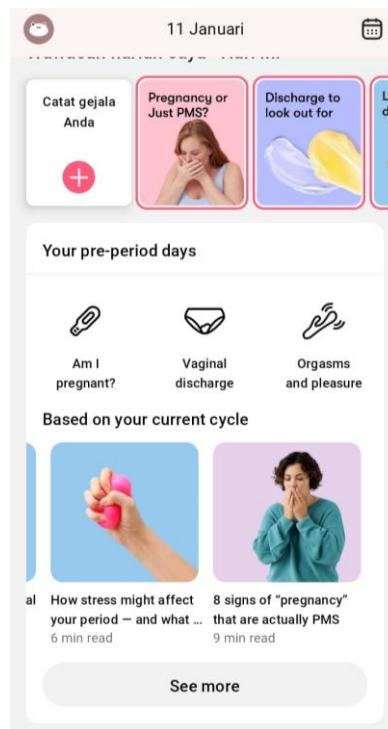


Figure 1. "Today" interface

The “Today” page on the Flo app serves as a hub for users’ menstrual cycle information, where users can log symptoms through the “Log your symptoms” feature and access popular educational content such as “Pregnancy or Just PMS?” and “Discharge to look for.” Additionally, articles on topics relevant to the user’s cycle phase, such as “How stress might affect your period” and “8 signs of ‘pregnancy’ that are actually PMS,” help teens understand their body’s changes. A simple navigation interface at the bottom, including “Today,” “Insights,” “Messages,” and “Partners,” tabs, allows users to easily navigate between features within the app. Next, Figure 2 shows the “insights” interface.

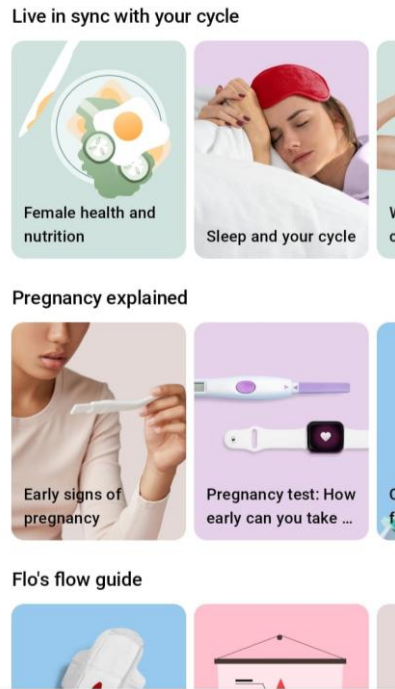


Figure 2. The “insight” interface

The Flo app’s “Insights” page contains a collection of articles designed to help users “Live in sync with your cycle,” with topics such as “Female health and nutrition,” “Sleep and your cycle,” and “Pregnancy explained.” The interface design uses engaging images and icons to make it easy for users to choose topics that are relevant to their needs. Additionally, information on “Pregnancy testing” and other guides provide useful education, especially for teens who want to learn more about reproductive health and pregnancy.

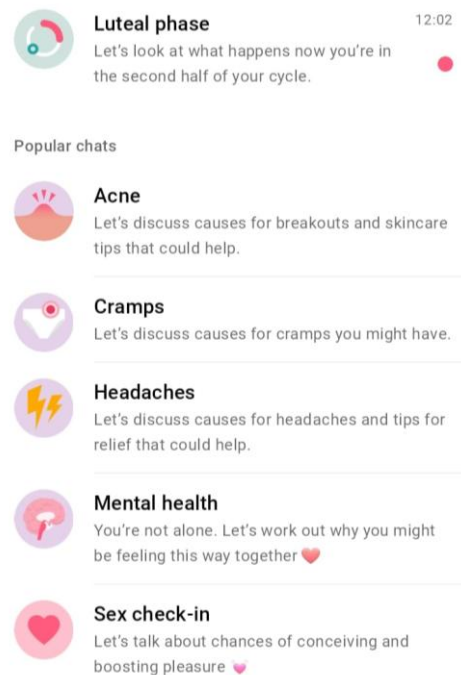


Figure 3. "Messages" interface

This page organizes discussion topics by categories such as "Luteal phase," "Acne," "Cramps," "Mental health," and "Sex check-in." These messages are designed to help users understand the causes of specific conditions (such as acne or headaches) and provide relevant treatment advice. Topics such as "Mental health" and "Sex check-in" are important to teens looking for a trusted source of information about reproductive health and psychological well-being. These three screenshots demonstrate the Flo app's ability to provide educational, personalized, and easy-to-understand reproductive health information. Education based on user cycle data and engaging visual content helps improve reproductive health literacy, especially for teens. With a simple and structured interface, the Flo app is able to bridge the need for information that is often difficult to access through other sources.

This study is in line with several previous studies in integrating digital technology to improve adolescent reproductive health education. Such as previous research conducted by Fety et al., showed that Android-based modules can significantly improve adolescent knowledge, attitudes, and behaviors towards reproductive health [52]. This technology-based approach emphasizes the importance of interactive elements in reproductive health learning, as found in previous research conducted by Huang et al., recommending digitalization as a solution to overcome social, cultural, and geographic barriers [53]. In addition, this study also supports the findings of previous research conducted by Andika et al., which showed the potential of Android-based media in providing relevant and easily accessible health education [54]. Similar to the third previous study, this study acknowledges the importance of content personalization, but with the added advantage of integrating artificial intelligence (AI)-based technology to provide accurate menstrual cycle predictions and content tailored to the individual needs of users. Thus, this study complements and extends previous findings by providing a new perspective on the use of digital technology-based applications as a more innovative and effective reproductive health education medium.

This study offers novelty by exploring the role of the Flo application, which uses artificial intelligence (AI) to provide menstrual cycle predictions and personalized reproductive health education content, in improving adolescent knowledge, attitudes, and behavior. Unlike previous studies that only used specially designed Android modules, this study utilizes applications that are already widely available in the community, allowing analysis on a platform that has been integrated with privacy features and user communities. With a more holistic approach, this study provides new insights into the effectiveness of technology-based applications in addressing reproductive health education challenges, such as social stigma and lack of access to reliable information.

In the short term, this study provides practical recommendations for utilizing the Flo application as a reproductive health education medium that is easily accessible, attractive, and relevant for adolescents. The results of this study can be directly applied by educators, parents, and policy makers to improve adolescent reproductive health literacy quickly and effectively. In the long term, this study opens up opportunities for further development of digital education platforms, with features that are increasingly tailored to individual needs. In addition, this

study can encourage the integration of digital technology into national health programs, increase awareness and better behavior of adolescents towards reproductive health, and support risk reduction such as unwanted pregnancy and sexually transmitted diseases. This study is limited to the use of the Flo application as the main media, so it does not compare its effectiveness with other applications or educational methods.

4. CONCLUSION

This study shows that the Flo application, as a digital education media based on artificial intelligence, is effective in improving adolescent knowledge, attitudes, and behaviors related to reproductive health. This application offers a personal and interactive approach, provides accurate menstrual cycle predictions, and educational content that is relevant and easy to understand by users. With high privacy features and a user community, this application is able to overcome obstacles such as social stigma and limited access to information that are often experienced by adolescents. The results of this study confirm that digital technology can be an innovative solution to improve adolescent reproductive health literacy and support more positive behavioral changes. Further research is recommended to compare the effectiveness of the Flo application with other educational applications or methods, such as school-based programs or other reproductive health education applications, to determine the relative advantages of each method.

ACKNOWLEDGEMENTS

The authors would like to express their deepest gratitude to the respondents who participated in this study and provided invaluable data and insights. We would also like to thank the schools, teachers, and parents who supported the implementation of this study. Special appreciation goes to the Flo application development team who provided an innovative platform that was an essential part of this study.

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