

Reproductive health education model for university students utilizing social media channels: Designing and testing

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ABSTRACT

Background: Adolescent growth encompasses physical, biological, psychological, and social aspects, including interest in the opposite sex. Providing information and support related to reproductive health helps adolescents make proper and safe decisions.

Objectives: This study aims to design and validate a reproductive health education model for university students.

Methods: The study is a mixed method with a multi-stage design using the 4-phase Research and Development design approach (need assessment, model development, implementation, expert validation, and final product). This research involved 221 university students (online survey), 5 managers of adolescent education programs, 6 university students (in-depth interviews), and 10 peer educators (Focus Group Discussion). Data analysis was descriptive and content analysis.

Results: The generated reproductive health education model consists of 1)educators (competent, trustworthy, peer, young, survivors, and good-looking), 2)recipients (late adolescents), 3)education methods (two-way, private, repetitive,), 4)education media (social media platforms), 5) educational content (all topics needed by late adolescents), 6)duration (30 seconds/topic), and 7)goals (to increase knowledge, attitudes, and behaviors regarding reproductive health among university students). Expert validity testing: the model was highly accepted and deemed suitable for implementation (94.7%).

Conclusion: The educational model developed is encouraged for implementation among university students. Introducing and implementing the model requires support from relevant stakeholders (NGOs, students, faculty, and university stakeholders). Implementation is necessary to prove the model's effectiveness in increasing knowledge, attitudes, and behaviors regarding reproductive health among university students.

INTRODUCTION

Adolescence is one of the phases of human development. According to data from the Central Bureau of Statistics, in 2023, there were 64.16 million people in Indonesia's population aged between 16 and 30. This number represents 23.18% of the total population of Indonesia. The age group that dominates this number is the 19-24 age group (39.78%).¹ Adolescence is characterized by physical and biological changes, leading to the development of secondary sexual characteristics and reaching sexual maturity.² Changes in adolescents include an interest in the opposite sex, which can tend towards risky sexual behavior.

Issues related to risky sexual behavior include adolescents starting dating at a young age (15 years old). Behaviors in dating involve holding hands, hugging, kissing, and touching. Adolescents engage in premarital sex for the first time at ages 15-19 (59% in females and 74% in males). Reasons include curiosity (30%), spontaneous occurrence (16%), and peer pressure or influence (3%). Nine out of ten adolescent girls have heard about Human Immunodeficiency Virus



(HIV)/acquired immunodeficiency syndrome (AIDS). Still, only about 58% of boys and girls know that condoms can reduce the risk of HIV. Knowledge about Sexually Transmitted Infections (STIs) among adolescents is relatively low. Sixty-four point six percent of unmarried women do not know the symptoms of STIs in men, and 61.2% of unmarried men do not know the symptoms of STIs in men.³ Previous research has revealed low knowledge about reproductive health in general among university students.⁴⁻⁵ Risky sexual behavior has physical impacts: pregnancy outside of marriage, abortions, and STIs,⁶ social impacts: ostracism, damaged reputation, and declining family status,⁷ and psychological impacts: guilt, shame, anxiety, fear, sinfulness, and depression.⁸

Education and understanding of the importance of maintaining reproductive health among adolescents are necessary to anticipate and prevent them from engaging in risky sexual behavior.⁹ In Indonesia, reproductive health education is provided in elementary, junior high, and senior high schools. However, the results of the Indonesia Demographic and Health Survey (IDHS) survey show a low percentage of adolescents receiving information related to reproductive health: a) human reproductive health (59% females and 55% males), b) family planning (12% females and 11% males), HIV/AIDS (48% females and 46% males). At the university level, reproductive health education is not adequately provided. It's reflected in the knowledge and attitudes towards reproductive health, especially among non-health students (61% and 42%) compared to health students (78% and 68%).¹⁰ The primary source of information on reproductive health has been primarily from community health centers (34%).³

A literature review by Haruna et al. identified 31 reproductive health education programs proven effective in reducing teenage pregnancies and STIs.¹¹ Traditional educational approaches are abandoned because they hinder students' ability to express themselves, provide feedback, and only engage some students as active listeners, giving the impression that students only learn by listening. Innovative reproductive health education programs (through film screenings, video presentations, and role-playing) effectively increase knowledge, attitudes, and skills to support reproductive health.¹² Additionally, the rapid advancement of technology has led to an increasing number of teenagers seeking health information online.¹³ Digital reproductive health education is acknowledged for its appeal through animations, 3D anatomical illustrations, and targeted content for teenagers in a concise, accessible format.¹⁴ It is effective in achieving its goals.¹⁵ This technology also eliminates time constraints and the need to visit healthcare facilities to obtain information.

The use of social media (Twitter, YouTube, Instagram, and Facebook) among young adults today is a preferred means of receiving sexual health information.¹⁶ Social media can influence students' perceptions of the importance of maintaining reproductive health. According to the agenda-setting theory, the stages in which students consider reproductive health to be important are 1) media agenda setting (media selection) and public agenda setting (selection of material that becomes a need and concern). This theory is related to Rogers' Diffusion of Innovation theory, where the subsequent process involves how students can accept and adopt information about reproductive health. Information disseminated through social media has a significant opportunity to be accepted and adopted as the diffusion process is faster and broader. Novelty and innovation are key to adopting an idea, behavior, and information. Social media is an innovation familiar to adolescents. Disseminating reproductive health information through social media is a new and appealing approach. However, an individual's decision to adopt or reject innovation follows stages: knowledge, persuasion, decision, implementation, and confirmation.¹⁷

Several previous studies on the effectiveness of health education using social media include a review study by Isaact, which found that digital technology, including social media, has been proven effective in increasing reproductive health knowledge and attitudes among young adults in high- and middle-income countries.¹⁸ Social media has also been shown to have a significant impact on knowledge of sexual health, pregnancy, contraceptive methods, and HIV/AIDS among educated adolescents living in urban areas of India.¹⁹ The trend of using mobile applications as a reproductive health service medium is convenient for young adults in Ghana²⁰ and Uganda.²¹ Social media presents an opportunity to improve adolescent reproductive health. This research aims to design and test a reproductive health education model for university students. This model

is an educational strategy to enhance knowledge, attitudes, and behaviors regarding reproductive health among university students.

METHODS

Study design

This study employs a multi-stage methods approach with a simplified Research and Development (R&D) design. It aims to systematically examine findings to generate data to serve as the basis for designing and developing a student reproductive health education model. The research was conducted from December 2023 to January 2024 in West Semarang District, Semarang City, Central Java, Indonesia. All the stages carried out in this study are illustrated in Figure 1.

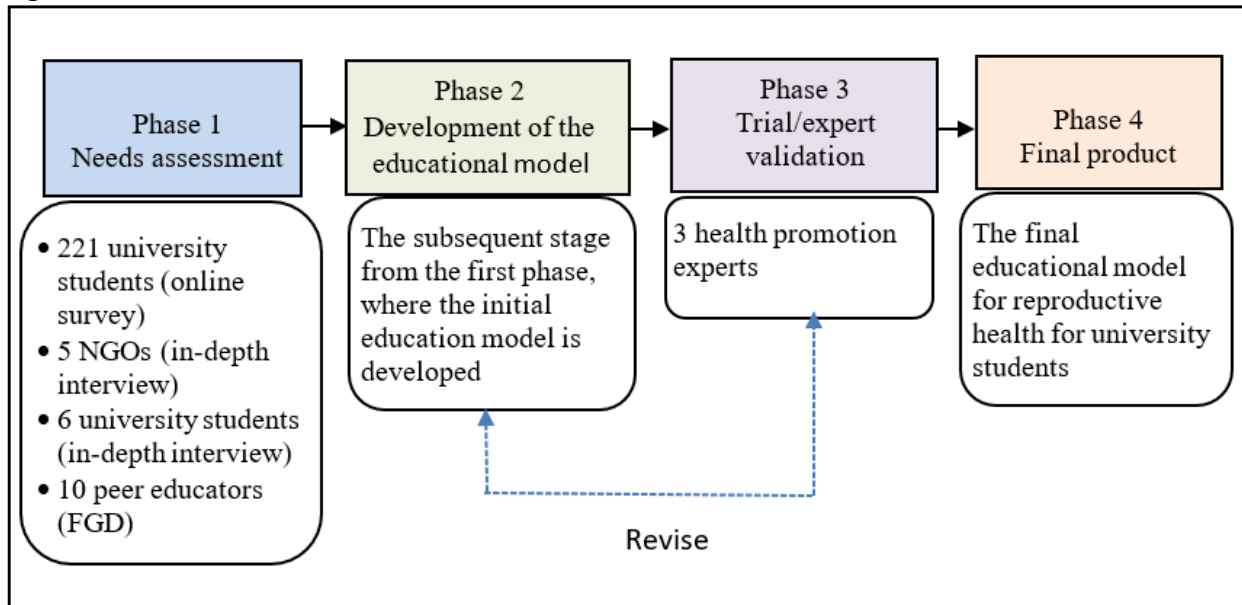


Figure 1. Multi-stage design of Research and Development

Phase 1

Sample and Technique Sampling

The quantitative needs analysis was carried out through an online survey involving 221 students from across Indonesia. The sample size calculation was based on the Lammeshow formula for an unknown population with a 95% confidence level. The calculation indicated a minimum sample size of 96, with an additional 10% added to accommodate incomplete data, resulting in a total sample of 106 respondents. In this study, 221 respondents were considered sufficient to represent the population. The qualitative needs assessment was conducted with 5 managers of youth education programs from NGOs in Semarang. Six students from 3 universities in Semarang were also included. One Focus Group Discussion (FGD) was conducted, involving 10 peer educator informants from 5 public and private universities in Semarang City.

The sampling technique for the needs analysis was purposive sampling. The quantitative needs analysis focused on recipients of the education model with inclusion criteria: active students enrolled in universities in Indonesia who were willing to participate in the study. For the qualitative needs analysis, the focus was on: 1) program managers of youth education programs with inclusion criteria: individuals who have been involved in managing reproductive health education programs for at least one year and were willing to participate in the study; 2) education recipients with inclusion criteria: active students who were willing to participate in the study; 3) peer educators with inclusion criteria: peer educators of adolescent reproductive health programs with at least one year of experience and willing to participate in the study.

Data collection

Quantitative data collection was conducted using Google Forms distributed via WhatsApp. Qualitative data was collected from informants managing youth education programs through face-to-face, in-depth interviews and teleconferences by WR, AA, and MK. WR, AA, and AFDP conducted face-to-face, in-depth interviews with university students. Peer educators' data was collected through FGDs.

Instruments and Variable

The instrument used in the quantitative survey for the recipients of the education model (students) was a Google Form consisting of questions on respondent characteristics (gender, status, religion, semester, age). The needs assessment questions for the education model (methods, materials, presenters, educational media, and duration) are based on previous research and have been tested for validity and reliability. These questions were closed-ended with yes/no answer options. The qualitative needs assessment for the managers of youth education programs used an interview guide with open-ended questions that included questions about characteristics (institution/department, age, gender, years of service) and the needs assessment for the education model (methods, materials, presenters, educational media, and duration). The in-depth interviews explored their experiences as creators and managers of youth education programs on reproductive health at the city and provincial levels. The focus group discussions with peer educators used an interview guide with open-ended questions. The questions were similar to those used to explore the desired needs for a reproductive health education model.

Data analysis

Quantitative data from the needs assessment were analyzed descriptively. Qualitative data were recorded, transcribed, and made into transcripts. Data reduction was performed by selecting, focusing, simplifying, discarding unnecessary information, abstracting, and managing the data in such a way as to reach a verified conclusion. Validation techniques were carried out through source triangulation and data collection method triangulation. This study used source triangulation by asking program managers, students, and peer educators the same questions. Data collection method triangulation was done through in-depth interviews, online surveys, and focus group discussions (FGD). These techniques also served as reliability measures to assess data credibility, consistency of responses, and the alignment of informants' experiences with the findings.²²

Phase 2

The aim of Phase 2 is to design and develop a reproductive health education model for students based on the data obtained in Phase 1. The education model to be developed will refer to the health communication model with the following indicators: source, message, channel, audience, and purpose.²³ The research questions are directed toward these health communication indicators. Designing the education model involves gathering responses from Phase 1 and cross-checking a question asked to multiple informants. We do not base our conclusions solely on the most common responses but rather consider other answers before concluding. For example, when asked about the most exciting method for reproductive health education, most respondents preferred face-to-face methods; however, we concluded that educational methods should be delivered via social media after considering qualitative analysis and implementing Roger's diffusion of innovation theory. The next step is to fill in and complete each indicator, placing, organizing, and combining them into a cohesive reproductive health education model.

Phase 3

Sample and Technique Sampling

Expert validation assesses whether the reproductive health education model developed in Phase 2 is appropriate and suitable in practice. The sampling technique was purposive, with the inclusion criteria being an expert competent in managing adolescent reproductive health education programs. Experts and qualified professionals in the field of reproductive health education and counseling are individuals who actively contribute to reproductive health education, provide counseling services to individuals or groups, design comprehensive sexual education programs, develop tailored curricula, and engage in advocacy and training initiatives to promote reproductive health awareness and well-being. We involved 3 out of the 5 respondents we recruited in Phase 1. The respondents were from NGOs active in adolescent reproductive health education.

Procedure

The assessment of the model began with sending two items to the respondents: 1) an image of the reproductive health education model accompanied by a descriptive explanation of the image, and 2) a list of questions. The materials were distributed as soft files online and returned to us once the responses were fully completed.

Instruments and Data Analysis

The assessment of the education model was based on previous research that included questions about the model's structure (8 items), the model's implementation procedures (7 items), and the organization's performance forecast (6 items).²⁴ The questions were closed-ended with a Likert scale (strongly agree, agree, disagree, and strongly disagree). This section also included open-ended questions to provide written feedback for improving the educational model. The data were analyzed descriptively to determine the model's acceptance. The acceptance criteria were: 1) highly accepted: 76-100%; 2) moderately accepted: 56-75%; 3) less accepted: 40-55%; and 4) not accepted: 0-39%.²⁵ Feedback in the form of expert input and suggestions was highly valuable for this research. We then followed up on the feedback and suggestions by refining the model.

Phase 4

The final phase of this research is the creation of the final model, which is the main objective of this study. This model was developed through needs analysis, development, and expert assessment stages. The final model represents the completed version expected to be ready for implementation in the field.

Ethical statement

The research was approved by Dian Nuswantoro University's ethics committee, with an Ethical Clearance Letter number 000522/UNIVERSITAS DIAN NUSWANTORO/2023.

RESULTS

Phase 1 and 2: Needs Assessment and Model Development

Quantitative data from the needs assessment of the reproductive health education model for university students collected 226 responses. Five respondents did not meet the inclusion criteria, resulting in 221 eligible respondents. The majority of respondents are female (81.4%), unmarried (100%), Muslim (90.5%), in their third semester of college (57.9%), and have an average age of 19.5. Details of the respondents' characteristics are provided in supplementary material 1.

Table 1 presents the quantitative needs assessment results of the reproductive health education model from 221 active university students in Indonesia. Most respondents prefer two-way reproductive health education methods (89.6%), private methods (65.6%), and face-to-face interactions (47.5%). Most respondents agree that reproductive health education should be

provided in universities (98.2%) and should be repeated (77.8%). All reproductive health education materials are needed by university students, including STIs, HIV/AIDS, reproductive organ health, fertility in men and women, early marriage, pregnancy knowledge, family planning (FP) knowledge, and marriage laws. Most respondents choose healthcare professionals as speakers/facilitators (45.2%). Most university students prefer interactive/two-way media (94.1%), easily accessible media (98.6%), and virtual education media (68.3%). The most popular reproductive health education media chosen is TikTok (79.2%).

Table 1. Needs assessment of reproductive health education model for university students

Statement	n= 221 (100%)			
	Yes		No	
	n	%	n	%
A. Education Method				
1. Two-way reproductive health education method	198	89.6	23	10.4
2. Private reproductive health education method	145	65.6	76	34.4
3. The most appealing reproductive health education method				
a. Two-way interactive discussion via WhatsApp group	8	3.6	213	96.4
b. Face-to-face meetings	105	47.5	116	52.5
c. Education through social media (TikTok, YouTube, Instagram)	80	36.2	141	63.8
d. Exposition through virtual meetings	2	0.9	219	99.1
e. Reproductive health education campaign	7	3.2	214	96.8
f. Reproductive health education workshop	19	8.6	202	91.4
B. Educational Materials				
1. Reproductive health education materials that are presented without repetition make me forgetful	172	77.8	49	22.2
2. Reproductive health education materials need to be provided in universities.	217	98.2	4	1.8
Statement	n	%		
3. Types of reproductive health education materials that need to be provided (multiple answers):				
a. Fertility period in men and women	161	72.9		
b. Pregnancy knowledge	125	56.6		
c. Reproductive organ health	161	72.9		
d. Marriage Laws	63	28.5		
e. Early Marriage	127	57.5		
f. Family planning knowledge	89	40.3		
g. Sexually Transmitted Infections (STIs)	192	86.9		
h. HIV/AIDS	167	75.6		
C. Facilitator				
Informants who provide reproductive health education materials (single answer):				
a. Healthcare professionals	100	45.2		
b. Faculty lecturers with expertise in reproductive health	70	31.7		
c. Celebrities/ influencers	15	6.8		
d. Reproductive health activists	30	13.6		
e. Peers	6	2.7		
Statement	Yes		No	
	n	%	n	%
D. Education media/channels				
1. I like interactive/two-way reproductive health education media	208	94.1	13	5.9
2. I like easily accessible reproductive health education media	218	98.6	3	1.4
3. I like virtual reproductive health education media	151	68.3	70	31.7

Table 1. Needs assessment of reproductive health education model for university students (continued)

Statement	n	%
4. The most appealing reproductive health education media (single answer)		
a. Instagram	24	10.9
b. TikTok	175	79.2
c. WhatsApp Group	9	4.1
d. Twitter/ X	11	5.0
e. Skype	2	0.9
E. Duration		
a. < 1 hour	74	33.5
b. 1 hour	128	57.9
c. > 1 hour	19	8.6

The characteristics of the informants in the qualitative needs assessment (21 informants: 5 managers of adolescent education programs from NGOs, 6 university students, and 10 peer educators) are provided in supplementary material 2. Table 2 summarizes qualitative data from the needs assessment of the model obtained from managers of adolescent education programs, university students, and peer educators. The qualitative needs assessment results identified 5 themes (Table 2): a) education methods (sub-themes: two-way interaction, private, repeated delivery, and social media), b) facilitator (sub-themes: competence, survivor, trustworthy, peer, young, and good looking), c) educational content (sub-themes: needs to be provided at universities and types of educational content), d) educational media/channels (sub-theme: TikTok), and e) education duration (maximum 1 minute).

Table 2. Results of the needs assessment of the reproductive health education model among adolescent program coordinators, university students, and peer educators

Quotation	Sub Theme	Theme
"... Two-way communication ... makes them not bored" (I1) "Two-way interaction ... when there are likes, comments, Instagram DMs, and Q&A sessions." (I1) "... Two-way interaction is better, and all participants can share and exchange opinions" (I3)	Two-way communication	Education Method
".. the comment column is rarely filled in, many communicate through direct messages, maybe they are shy" (I14) "... we have special access .. in connection with the risks they face" (I4)	Private	
"Perhaps at the beginning, they don't know, but after several uploads, people will get to know it, can educate" (I2)	Given repeatedly	
"The program at our place is more effective using social media. TikTok and Instagram are highly favored by the audience" (I3) "Based on experience, we create Instagram live streaming for a topic.." (I18) "..I enjoy educational content on TikTok; if the material is interesting and the content is good, it's very engaging." (I7)	Education through social media	
".. having competence can increase the trust and interest of the audience" (I15) "Survivors... a positive response, as it comes directly from someone who has experienced it firsthand." (I3)	Competent, survivor, trustworthy, peer, young, good-looking	Facilitator
"Close friends of the same age make me trust more ." (I10)		
"The audience tends to be interested in speakers who are young, good looking...." (I18)		

Table 2. Results of the needs assessment of the reproductive health education model among adolescent program coordinators, university students, and peer educators (continued)

Quotation	Sub Theme	Theme
"It should be provided because they are in late adolescence for the prevention of risky sexual behavior, so they know the dangers and consequences" (I3)	Needs to be given at universities.	
"Our experience., sexual harassment needs to be addressed, victims don't know where to report, so it needs to be prevented.." (I11)		
"Education of health reproduction is necessary because we are far from our parents.." (I19)		Education Material
"All topics needed by late adolescents, including dating violence, unintended pregnancy, relationship in dating, cyber harassment" (I2)	Education topics for late adolescents	
"Reproductive health is sensitive... language should not be vulgar or seem explicit ... Use animations for sensitive images" (I1)	Using non-vulgar language and animated images	
"Popular video reels (TikTok), following youth trends, for example, dance challenges" (I20)	TikTok	Media/educational channels
"Prefer small videos (TikTok), light snack videos, and infographics, but TikTok has the most followers" (I3)		
"Short, around 30 seconds. Up to 1 minute at most. If it's too long, people get bored and switch to other content" (I18)	Up to 1 minute at most	Duration
"30-minute TikTok videos are typically in the form of short dramas" (I2)		

Education Method: The research findings indicate that the desired description of reproductive health education methods includes two-way interaction between the audience and the facilitator, private education, and repeated education on social media. Peer educators and adolescent education program managers expressed similar opinions regarding two-way interaction. The informants stated that the audience requires a private channel to ask questions or seek consultation for sensitive topics. The audience needs the educational method of repeatedly broadcasting themes to simultaneously introduce and provide a deeper understanding of specific topics. The education method about reproductive health that received a positive response from the audience is the method that uses social media according to adolescent trends.

Facilitator: The results of in-depth interviews with the informants reveal that facilitators in reproductive health education are competent survivors, trustworthy young peers, and good-looking individuals.

Education Material: The depiction of educational materials in this study emphasizes the importance of reproductive health education in universities with topics that address the needs of late adolescents, using non-vulgar language and animations for sensitive images. Content about reproductive health carries a taboo impression for some people. Therefore, it is necessary to use language and select images that are acceptable to all audiences.

Education media/Channels: Most informants stated that the most preferred educational media is education in line with teenage trends through TikTok, whether through short videos or slides. Informants feel that watching videos on TikTok is enough because they simultaneously enjoy the visuals, audio, and information. The youthful language and a short storyline appeal to university students.

Duration: Most informants stated that the duration of education on each topic should be 30 to 60 seconds.

Phase 3 Testing/Expert Validation

Table 3 presents the results of the education model's validation testing by 3 experienced

health promotion experts in adolescent reproductive health education. The validation testing results for the adolescent reproductive health education model indicate an average of 94.7%. This number means that the education model design is highly accepted and suitable for implementation.²⁵ Written responses from the respondents include: 1) consulting service facilities in the education method section to accommodate audiences who want to consult, and 2) education media use not only TikTok but also Instagram, Twitter, YouTube, and podcasts.

Table 3. Validation of the education model by experts

Variable	Result	Average
Model Structure	95.2%	94.7%
Model Implementation Procedure	94.4%	
Organization Performance Forecast	94.4%	

Phase 4 Final Product

The final product of the model, developed based on phases 1 to 3, is a finished reproductive health education model for university students. Figure 2 shows university students' reproductive health education model, consisting of facilitators, recipients, education methods, educational media, educational content, and duration. The creation of this educational model aims to improve knowledge, attitudes, and behaviors regarding reproductive health among university students.

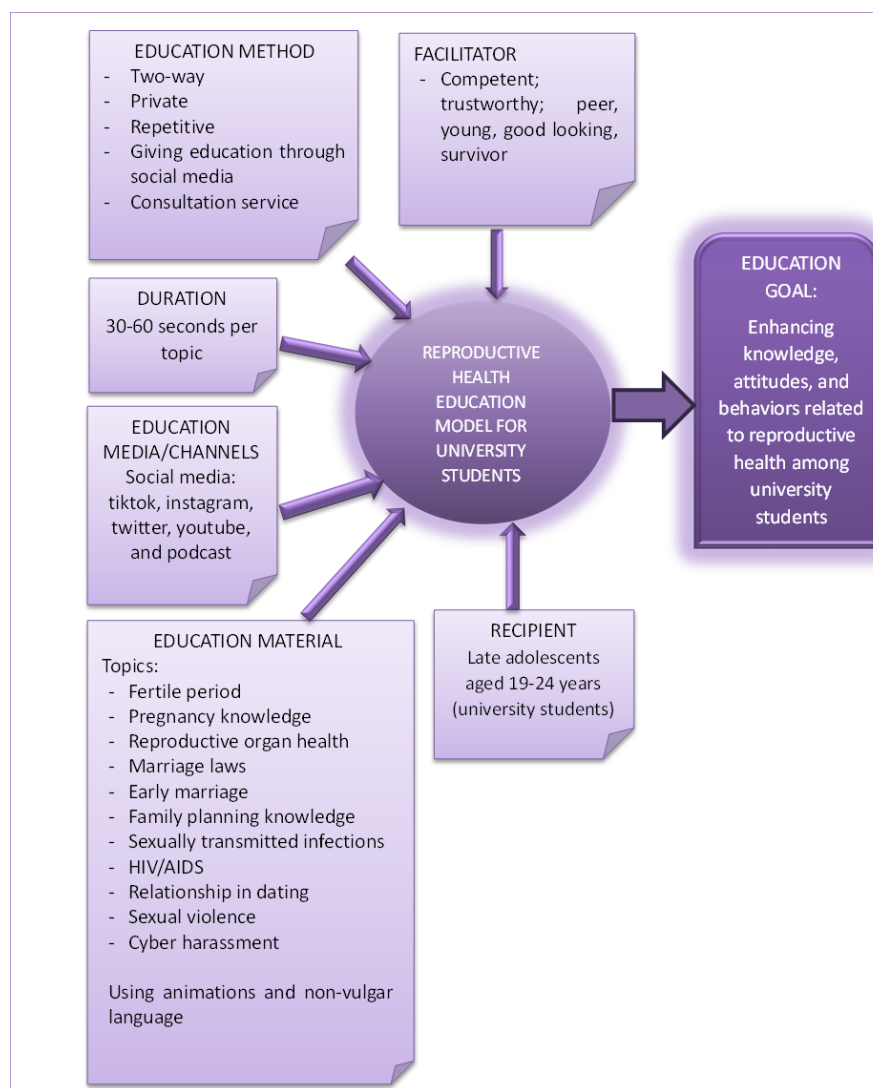


Figure 2. Final product: Reproductive Health Education Model

DISCUSSION

The assessment of needs, both quantitatively and qualitatively, in this study indicates a necessity for an educational model that assists university students in acquiring all necessary information regarding reproductive health. The primary reason is that the majority of students reside far from their parents and lack knowledge about reproductive health, as highlighted in previous research on students' low awareness of reproductive health.¹⁰

A two-way educational method was preferred by a significant proportion of respondents (89.6%). FGD and in-depth interviews support this proportion, indicating that two-way education prevents boredom and encourages sharing experiences, discussions, and questions. Two-way education allows for a complete flow of information between the communicator and the audience and vice versa. Feedback from the audience is possible during this communication process,²⁶ making two-way communication more engaging. Private education is also preferred by respondents (65.6%). Interviews revealed that the audience still requires private information, especially on sensitive topics such as HIV/AIDS, STIs, and other sensitive matters. Experiences from peer educators show that some audience members contact them through private channels provided.

Respondents (36.2%) relatively favor the use of social media. This result is supported by qualitative data indicating that the use of social media is popular because it aligns with youth trends, is engaging, easily accessible, effective, and has a broad reach. The respondents are of average age of 19, indicating that Generation Z has an advantage in using social media. Social media is integral to Generation Z's education, socialization, and entertainment.²⁷ Conversely, healthcare practitioners and researchers are interested in using social media because it effectively conveys health messages to the public. The presence of social media has even replaced the use of traditional media.^{28,29} The power of social media is also recognized for its effectiveness in sharing experiences and providing sexual education.³⁰ Some advantages of social media according to the diffusion of innovation theory are: 1) relative advantage, meaning social media is considered better and more innovative compared to previous traditional media, 2) compatibility, meaning social media is valuable and meets the needs, 3) low complexity, meaning the use of social media is not considered difficult, 4) trialability, meaning the use of social media has been tested for its effectiveness, and 5) observability, meaning everyone can observe the results obtained.¹⁷

Most respondents (45.2%) in this study chose healthcare professionals as facilitators in reproductive health education. This choice is consistent with the interviews conducted with reproductive health education program managers, indicating that healthcare professionals, particularly doctors and midwives, have expertise in reproductive health. Lecturers and survivors of certain diseases, such as STIs, are also considered competent and experienced. Similar studies in Nepal emphasize the need for facilitators who have competence, experience, and skills in providing sexual education for adolescents.³¹ Competent facilitators are more trusted, making health messages more straightforward to understand the audience. This study also highlights the role of peers as facilitators, with the rationale that peers of the same age group and frequency are perceived as more familiar, creating a sense of safety and trust when discussing reproductive health. Previous research has shown that using peers as facilitators in reproductive health education is a strategy that has a positive impact.^{32,33} Peers effectively improve reproductive health knowledge among students and adolescents in France.³⁴ The good-looking and young facilitators are also identified as one of the essential components found in this research. Appearance is important and serves as an appeal for reproductive health education.

This study highlights the importance of providing reproductive health education tailored to the age and needs of adolescents. The target of the education model in this study is university students in the late adolescent phase, so the information needed is related to planning for marriage. The FGD with peer educators underscores the need for topics such as dating violence, unintended pregnancy, healthy relationships in dating, and cyber harassment. Cyber harassment includes threats or online abuse that leads to messages that are rude, pornographic, and so on. Cyber harassment tends to increase in the technology era.³⁵ The negative impacts of cyber

harassment include mental health issues, anxiety, depression, and even suicidal thoughts.³⁶ Therefore, information about these issues is necessary to develop reproductive health education models. Other findings from this research regarding the use of language and images in educational materials. Reproductive health information is sensitive, especially when presented online. Using language and images as they are written can create negative perceptions that are misleading, inaccurate, and obscene.³⁷ Therefore, writing and illustrating techniques that do not create negative perceptions are needed. For example, it depicts the male genitalia with a banana image, using the term "male genitalia" instead of "penis," etc. The use of animation is an alternative option in this study. Previous research has shown that using animation significantly improves knowledge about reproductive health.^{38,39} The selection of material and its presentation are implementations of the Agenda Setting function in the stages of media agenda setting and public agenda setting. Consistent selection of reproductive health-related content presented through social media will make students perceive this topic as necessary. Social media, in turn, will influence their knowledge, attitudes, and behavior.⁴⁰

This study's most preferred educational media/channel is social media, particularly the TikTok platform (79.2%). This finding is reinforced by the findings from FGD and participant interviews. The reason for choosing this educational channel is that education can be presented in video reels, which can be enjoyed audio-visually, making it more appealing to the digital generation. Most participants acknowledge education through TikTok to have a positive response, and most have followers. In China, TikTok is used by health centres to provide health education and communication to the public, proving to have a positive impact.⁴¹ TikTok has also been proven to be an effective new educational medium for improving knowledge and attitudes towards reproductive health.⁴²

The study by Zhu et al. regarding the use of TikTok as a platform for interacting and communicating health-related information with the local community aligns with the findings of this research, which highlight the preference for content durations of less than 60 seconds.⁴¹ The participants in this study emphasized that the duration of educational content should be brief, preferably around 30 to 60 seconds, to prevent audience boredom. Based on the experiences of peer educators in creating content, educational content with such durations includes easy-to-digest video reels (snack videos) that can be in the form of drama, infographics, and dance challenges.

The validation results of the education model, assessed from the model structure, implementation procedures, and organizational performance forecast, indicate that the model is acceptable and recommended for implementation (94.7%). According to respondents, there is a need for private consultation services and broader education channels such as Instagram, Twitter, YouTube, and podcasts. Consultation services are needed to accommodate audiences who want to learn more about educational topics privately. Social differences between the audience and facilitator, norms, and Eastern culture in Indonesia make the audience reluctant to play an active role in open media. Research by Kim states that providing a dedicated space for consulting on reproductive health can boost confidence in seeking consultations more openly.⁴³ In conclusion, this study presents a final product designed based on a lengthy process that has undergone testing stages and expert input. The Final Product of the student reproductive health education model is shown in Figure 2. This research contributes to science, particularly in providing an alternative model for adolescent reproductive health education to prevent hypertension. However, this study still has limitations, namely the lack of representativeness of the data obtained from qualitative needs assessments, as all the respondents involved were from the same area, namely the city of Semarang.

The findings of this study could serve as an alternative model for reproductive health education for students that is both accepted and feasible for implementation. The implications of this study highlight those involving stakeholders in the development of the reproductive health education model is crucial. This involvement can enhance the likelihood of influencing changes in reproductive health policies. Additionally, the model aligns with technological advancements, is practical, engaging, and has significant potential to positively impact students' reproductive

health.

CONCLUSION

The design of the education model involves stakeholders such as university students, reproductive health program coordinators/NGOs, faculty, and peer educators. The outline of the reproductive health education model for adolescents includes: a) methods (two-way, private, repetitive, education via social media, available consultation services), b) facilitators (individuals with criteria such as competence, trustworthiness, peers, youth, good looking, and survivors), c) media (social media: TikTok, Instagram, Twitter, YouTube, and podcasts), d) content (covering all adolescent needs, presented in animation with non-vulgar language), e) duration (video reels: 30-60 seconds per content), f) recipients (late adolescents aged 19-24 years old (university students), and g) education objectives (to improve knowledge, attitudes, and behaviors related to reproductive health among students). The reproductive health education model meets the needs of students, is acceptable, and is feasible for implementation. This study demonstrates that social media, as a component of the model, is expected to impact students' understanding of reproductive health positively. Further research is needed to provide educational material through flyers, videos, etc. Implementation is required to assess the effectiveness of this education model in enhancing students' knowledge, attitudes, and behaviors regarding reproductive health.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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DATA AVAILABILITY

The research data are available upon request via email.

SUPPLEMENTAL DATA

No additional supplemental data are provided for this study. All relevant data supporting the findings of this research are included within the main article.

AUTHOR CONTRIBUTIONS

RW: Conceptualize, data analysis, drafted the manuscript, and carried out revisions. AA: Conducted data collection, literature review, and data analysis. KM: Conducted data collection and data analysis. FDPA: Conducted data collection and translated the manuscript.

DECLARATION OF USING AI IN THE WRITING PROCESS

The authors affirm that artificial intelligence (AI) tools were used to assist in the writing process solely for language enhancement purposes, such as grammar checking, paraphrasing, and improving clarity. No AI tools were employed to generate original content, conduct data analysis, or interpret research findings. The authors take full responsibility for the content, interpretations, and conclusions presented in this manuscript.

LIST OF ABBREVIATIONS

NGOs: Non-Governmental Organizations; FGD: Focus Group Discussion; HIV: Human Immunodeficiency Virus; AIDS: Acquired Immunodeficiency Syndrome; STIs: Sexually Transmitted Infections; IDHS: Indonesia Demographic and Health Survey; R&D: Research and Development.

REFERENCES

1. Rizati M. Data jumlah pemuda di Indonesia pada 2023. DataIndonesia.id. 2024.
2. World Health Organization. Key issues in the implementation of programmes for adolescent sexual and reproductive health. 2024.
3. Badan Pusat Statistik, Badan Kependudukan dan Keluarga Berencana Nasional KK. Survei demografi dan kesehatan Indonesia 2017 buku remaja. 2018.
4. Kene C, Geta G. Knowledge of sexual and reproductive health rights among university students: A cross-sectional study in Southeast Ethiopia. 2023;14:1–12. DOI: 10.2147/AHMT.S394883
5. Ayelotan M, Adebay AM OF. Perception and intention to use reproductive life plan among female final year undergraduates of the University of Ibadan, Nigeria. *Journal of Obstetrics and Gynaecology*. 2022;42(6):2449–55. DOI: 10.1080/01443615.2022.2070839.
6. Ojukwu EN, Okoye HU, Saewyc E. Social correlates of HIV-risky behaviours among African Canadian adolescents living in British Columbia, Canada: A secondary data analysis. *International Journal of Environmental Research and Public Health*. 2023;20(11):1–15. DOI: 10.3390/ijerph20116031.
7. Waliyanti E, Amrina Y. Adolescents' perception of risky sexual behavior: An impact in rural area. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*. 2022;7(S2):57–64. DOI: 10.30604/jika.v7is2.1406.
8. Chaerani E. Hermeneutic phenomenology study: Impact of risky sexual behavior on psychological adolescents in the coastal areas of Rajik village, Bangka Belitung Islands in 2019. *Indian Journal of Public Health Research & Development*. 2020;11(8):263–268. DOI: 10.37506/ijphrd.v11i8.10933
9. Odii A, Atama CS, Igwe I, Idemili-aronu NJ, Onyeneho NG. Risky sexual behaviours among adolescent undergraduate students in Nigeria: Does social context of early adolescence matter? *Pan African medical journal*. 2020;37:188. DOI: 10.11604/pamj.2020.37.188.22968
10. Respati Wulandari, Aprianti DEW. Differences in levels of knowledge and attitudes about reproductive health among students of the faculty of health and non-health faculties in Semarang city. *Visikes*. 2023;22(1):66–73. DOI: 10.33633/visikes.v22i1Supp.7680
11. Haruna H, Hu X, Kai S, Chu W. Adolescent school-based sexual health education and training: A literature review on teaching and learning strategies. *Global Journal of Health Science*. 2018;10(3):172–83. DOI: 10.5539/gjhs.v10n3p172.
12. Goesling B, Colman S, Trenholm C, et al. Programs to reduce teen pregnancy, sexually transmitted infections, and associated sexual risk behaviors: A systematic review. *Journal of Adolescent Health*. 2014;54(5):499–507. DOI:10.1016/j.jadohealth.2013.12.004.
13. Roberts DH, Newman LR, Schwartzstein RM. Twelve tips for facilitating millennials' learning. *Medical Teacher*. 2012;34(4):274–8. DOI:10.3109/0142159X.2011.613498.
14. Castle M, Kick L, Haseley H, Wallach H, Woodruff TK. Introduction to reproduction : Online education for the millennial learner. *Biology of Reproduction*. 2016;95:1–3. DOI:10.1095/biolreprod.116.140004.
15. Wulandari R, Suwandono A, Kartasurya MI. Postpartum care behavior improvement during COVID-19 pandemic in Indonesia using mobile-health interactive message. *Ethiopian Journal of Health Sciences*. 2022;32(2):243–54. DOI:10.4314/ejhs.v32i2.4.
16. Burns J, Johnstone K, Chavanduka T, Jamison C, Pena V, Stephenson R, et al. Evaluation of the sexual health behaviors of black male adolescents and young adults through social media platforms: Web-based survey study. *JMIR Public Health and Surveillance*. 2020;6(3):e19219. DOI: 10.2196/19219.
17. Rogers EM, Singhal A, Quinlan MM. Diffusion of innovations. In: *An Integrated Approach to Communication Theory and Research*, Third Edition. 2019. p. 415–33. DOI:10.4324/9780203710753-35.
18. Isaacs N, Ntinga X, Keetsi T, Bhembe L, Mthembu B, Cloete A, et al. Are mHealth interventions effective in improving the uptake of sexual and reproductive health services among adolescents? A scoping review. *International Journal of Environmental Research and Public*

- Health. 2024;21(2). DOI: 10.3390/ijerph21020165.
19. Saha R, Paul P, Yaya S, Banke-Thomas A. Association between exposure to social media and knowledge of sexual and reproductive health among adolescent girls: Evidence from the UDAYA survey in Bihar and Uttar Pradesh, India. *Reproductive Health*. 2022;19(1):178. DOI:10.1186/s12978-022-01487-7.
 20. Alhassan RK, Abdul-Fatawu A, Adzimah-Yeboah B, Nyaledzigbor W, Agana S, Mwini-Nyaledzigbor PP. Determinants of use of mobile phones for sexually transmitted infections (STIS) education and prevention among adolescents and young adult population in Ghana: Implications of public health policy and interventions design. *Reproductive Health*. 2019;16(1):120. DOI:10.1186/s12978-019-0763-0.
 21. Nalwanga R, Nuwamanya E, Nuwasiima A, Babigumira JU, Asiimwe FT, Babigumira JB. Utilization of a mobile phone application to increase access to sexual and reproductive health information, goods, and services among university students in Uganda. *Reproductive Health*. 2021;18(1):95. DOI:10.1186/s12978-020-01037-z.
 22. Miles MB, Huberman AM SJ. *Qualitative data analysis: Method source book*. Fourth eds. America: SAGE Publications, Inc; 2014. 211–212 p.
 23. Rice RE, Atkin CK. *Public communication campaigns*. 2nd ed. Rice RE AC, editor. Public Communication Campaigns. SAGE Publication, Inc; 2017. 43–65 p. DOI: 10.4135/9781544308449.
 24. Wulandari R, Suwandono A, I. Kartasurya M, Sri A. N. Development of m-health promotion in postpartum care. *European Journal of Molecular & Clinical Medicine*. 2020;7(1):3834–43.
 25. Sukardi. *Evaluasi pendidikan*. Vol. 3, Jakarta: Bumi Aksara. Jakarta: Bumi Aksara; 2008. 3 p.
 26. Muslim IF, Salsabila F, Priyono P. Urgensi model komunikasi dua arah pada proses pendidikan. *Intelektium*. 2022;3(2):147–51. DOI:10.37010/int.v3i2.892.
 27. Mude G US. Social media usage. *International Journal of E-Business Research*. 2023;19(1):1–20. DOI:10.4018/ijebr.317889.
 28. Bannor R, Asare AK, Bawole JN. Effectiveness of social media for communicating health messages in Ghana. *Health Education*. 2017;117(4):342–71. DOI: 10.1108/HE-06-2016-0024.
 29. Parackal M, Parackal S, Mather D, Eusebius S. Dynamic transactional model: A framework for communicating public health messages via social media. *Perspectives in Public Health*. 2021;141(5):279–86. DOI: 10.1177/1757913920935910.
 30. Manduley AE, Mertens AE, Plante I, Sultana A. The role of social media in sex education: dispatches from queer, trans, and racialized communities. *Feminism and Psychology*. 2018;28(1):152–70. DOI:10.1177/0959353517717751.
 31. Goli S, Rahimi F, Goli M. Experiences of teachers, educators, and school counselors about the sexual and reproductive health of educable intellectually disabled adolescent girls: A qualitative study. *Reproductive Health*. 2022;19(1):96. DOI: 10.1186/s12978-022-01397-8.
 32. Ukropina S, Mijatovic Jovanovic V, Kapamadziya A, Zotovic Kostic M, Dragnic N. Evaluation of the peer-education program 'Health education on reproductive health' in Serbia: Snezana Ukropina.' *European Journal of Public Health*. 2015;25(suppl_3):ckv176.124. DOI:10.1093/eurpub/ckv176.124.
 33. Benton AD, Santana A, Vinklerek AJ, Lewis CM, Sorensen JM HA. Peer-led sexual health education: multiple perspectives on benefits for peer health educators. *Child and Adolescent Social Work Journal*. 2020;37(5):487–496.
 34. Nuttall A, Mancini J, Lizin C, Hamzaoui S, Mariotti S, Louesdon H, Tardieu S, Viton J, Delotte J BF. Multidisciplinary peer-led sexual and reproductive health education programme in France, a prospective controlled-study. *BMC Public Health*. 2022;22(1):2239. DOI: 10.1186/s12889-022-14583-x.
 35. Chahal R, Kumar L, Jindal S RP. Cyber stalking: Technological form of sexual harassment. *International Journal on Emerging Technologies*. 2019;10(4):367–373. DOI: 10.13140/RG.2.2.27772.90246

36. Stevens F, Nurse JRC, Arief B. Cyber stalking, cyber harassment, and adult mental health: A systematic review. *Cyberpsychology, Behavior, and Social Networking*. 2021;24(6):367–76. DOI:10.1089/cyber.2020.0253.
37. Mwaisaka J, Gonsalves L, Say L, Gichangi P. “What’ s that on your phone ?” The aftermath of parents finding sexual and reproductive health messages on their children’s phone in Coastal Kenya. *Journal of Health and Social Sciences*. 2018;3(2):147–56. DOI:10.19204/2018/whs5.
38. Agustina SH, Latifah L, Setiawati N. The effect of reproductive health education with animation video on the knowledge and motivation of young women in preventing early marriage. *Annals of Tropical Medicine and Public Health*. 2021;7(2):133–40. DOI:10.36295/AOTMPH.2021.7220.
39. Putri HA, Satriani SS, Runjati. Efektivitas pendidikan kesehatan video animasi tentang pernikahan dini terhadap pengetahuan remaja putri. *Jurnal Ilmu Kebidanan (Journal of Midwifery Science)*. 2023;11(1):11–8. DOI:10.36307/jik.v11i1.242.
40. McCombs ME, Shaw DL. The agenda-setting function of mass media. *The Public Opinion Quarterly*. JSTOR. 1972;36(2):176–87.
41. Zhu C, Xu X, Zhang W, Chen J, Evans R. How health communication via tik tok makes a difference: A content analysis of tik tok accounts run by Chinese provincial health committees. *International Journal of Environmental Research and Public Health*. 2020;17(1):1–13. DOI:10.3390/ijerph17010192.
42. Haninuna GY, Nayoan CR. Effect of tik-tok and leaflet media in increasing adolescents. Knowledge. *Journal of Public Health for Tropical and Coastal Region*. 2023;6(1):30–36. DOI: 10.14710/jphtcr.v6i1.17709
43. Kim YM, Putjuk F, Basuki E, Kols A. Increasing patient participation in reproductive health consultations: An evaluation of “smart patient” coaching in Indonesia. *Patient Education and Counseling*. 2003;50(2):113–22. DOI:10.1016/S0738-3991(02)00193-3.