

Innovation Article

Development of comprehensive sexual education applications to improve adolescent reproductive health

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ABSTRACT

Background: Adolescence is a period of emotional, mental, and physical change. To improve health-seeking behavior, reduce risky sexual behaviors, and increase knowledge about sexual and reproductive health, adolescents need support and access to services. The increasing availability of mobile apps requires a thorough evaluation of the quality and classification of these mobile apps so that accurate and evidence-based information can reach their users. Because smartphones are a private (intimate) technology, they are a promising means of closing this gap. However, research focusing on sexual health promotion programs delivered through smartphones is still rare.

Purposes: Developing and testing a smartphone and internet-based comprehensive sex education app.

Methods: This study employed Research and Development consisting of 4 stages, namely Literature Study, Development Stage, Validity Expert, and Trial.

Result: The SEMAR app has seven features, ranging from mental health education to human relationships. The convenience score is 70%. The results of the trial show that this application effectively improves health education. 50-83% agree to use it. The sex stigma variable has the most extensive r (r=0.955), which means it has a solid and positive relationship.

Conclusion: This application benefits adolescents in improving health education and adolescent reproductive health.

INTRODUCTION

Adolescent health challenges associated with sexual behavior are at risk more prominent in middle-income countries, including Indonesia. In these countries, more than 38 million women aged 15–19 are sexually active and at high risk of pregnancy.¹ In most lower-middle-income countries (LMICs), young people (adolescents and young adults) aged 10–24 years have very limited, or not at all, access to sexual and reproductive health education and services (SRH). This is mainly due to a lack of awareness, social stigma, policies, and procedures that hinder the provision of contraceptive and abortion services for girls, and the judgmental attitude of health care professionals.^{2,3} As such, young people have specific SRH educational needs that are still unmet, and to address these particular SRH needs, innovative and new approaches are needed to ensure access to safe, effective, affordable, and acceptable SRH services.⁴ mHealth involves using mobile technology and multimedia tools to achieve health goals and support the delivery of health services.⁵

mHealth technology can help overcome most barriers, including provider prejudice, stigmatization, discrimination, fear of rejection, lack of privacy and confidentiality, embarrassment in seeking SRH education and services on susceptible topics, cost prohibitions, and transportation challenges, by providing safe, accurate, cost-effective, timely and tailored sexual and reproductive health (SRH) services for young people.⁶ Similarly, mHealth technology can

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be used in LMICs to reach young populations and engage them to provide acceptable, safe, cost-effective, and accurate SRH services.^{7,8} To harness the potential of mHealth for young people's SRH services, there has been an increase in the number of studies in high-income countries (HICs) in recent years. However, there is little evidence on the use of mHealth interventions to improve SRH among young people in LMICs.⁹

Recent estimates show that about two-thirds of 19-yearolds in Africa have had sexual intercourse.¹⁰ Participating in sexual activity, regardless of marital status, can lead to adverse reproductive health outcomes among adolescents.¹¹ Initiation of sexual intercourse at an early age is associated with a series of risks: more sexual partners for life, an increased risk of infection with the human papillomavirus (cervical cancer predisposition), teenage pregnancy, and death from abortion and complications during childbirth.¹² Unsafe sexual activity before marriage is every day; pregnancy encourages adolescents to get married,¹³ accompanied by social reasons, economy, and culture.¹⁴

Many factors influence sexual behavior according to socioecological models.¹⁵ Socio-cultural factors include taboos, poor parent-child communication, parental influence, and peer norms.¹⁶⁻²⁰ Economic factors,^{20,21} lack of information about sexual and reproductive health,²² and technological advancements including social media,²³ are new predictors of adolescent sexual behavior. This research aims to create and develop a comprehensive Health Education application to improve the quality of adolescent reproductive health.

METHOD

The research and development model used in the research consists of a literature study, development stage, validity expert, and trials.²⁴

Stage 1. Literature Study

The first stage is the initial stage of development preparation, which involves gathering information from a literature review, two practitioners, a psychologist, and a nurse facilitator to prepare materials for the mobile application. This information will be a reference for creating products.

Stage 2. Application Development

Researchers designed a framework application created by information technology experts or application developers. In doing this, the developer of this mobile application is an expert in systems and machine learning.

Stage 3. Expert Validity

The expert validation test was carried out on four experts (two information technology experts, one nurse practitioner, and one psychologist practitioner), validation using a Comprehensive Sexual Education (CSE) questionnaire. The app is tested for its effectiveness in terms of usability, reliability, functionality, efficiency, maintenance, and portability. Researchers revise before testing.

Stage 4. Application Testing

The research used is quantitative research with a crosssectional design. The sample in this study is 164 adolescents in Purwokerto, with the criteria of adolescents aged 17-25 years who have and can operate Android smartphones and are willing to be respondents. The SE-MAR mobile application is an Android mobile application that contains comprehensive sexual education services packaged into a complete package in the form of knowledge about reproductive health. The researchers measured knowledge level and attitude scores using the CSE, a CSE questionnaire included in the mobile app. Data analysis uses chi-square and logistic regression to determine the dominant factors.

RESULTS

Results of the Literature Review

Based on literature reviews, educational materials cover basic things that adolescents need to know, such as gender recognition, reproductive health and HIV, sexual rights and human rights, satisfaction, violence, diversity, and human relationships. The prevention material contains knowledge and attitudes to measure comprehensive sexual health education using a CSE questionnaire. In addition, the CSE educational materials can be accessed independently anytime and anywhere.

Results of Application Development

The SEMAR application has seven features available (Figure 1). Next, users can see the features in the middle of the screen, and then the seven features will appear in the app (Figure 1A). The seven features include Gender, HIV Health, Human Rights, Satisfaction, Violence, Diversity, and Human Relations. Feature 1 (Figure 1B) Sex Education is the starting menu about reproductive health. Feature 2 (Figure 1C) Gender is a menu that contains brief information about gender equality, including definitions, discrimination, power, social norms, and gender-based violence. Feature 3 (Figure 1D) Reproduction health HIV is a menu that contains brief information about pregnancy reproductive health, counseling, and sexually transmitted infections. Feature 4 (Figure 1E) Sexual Rights Human Rights is a menu of information about sexual and human rights. Feature 5 (Figure 1F) Satisfaction is a menu to detect the level of satisfaction with reproductive health. Feature 6 (Figure 1G) Violence is a menu that provides directions on violence prevention. Feature 7 (Figure 1H) Diversity is a menu containing information about introducing diversity in life. Feature 8 (Figure 1I) Human Relations is a menu that explains the variety and recognition of human relationships. Feature 9(Figure 1J) Quizionaire contains a comprehensive list of questions related to sexual health education. This application can be visited at https://semar.ump.ac.id/index.php and downloaded on the google Play Store under Semar UMP.

Application Test Results

Table 1 shows the result of this Android application project, which is to make it easier for users, especially teenagers, to be more informed about the existence of instant messaging media and the latest articles about sex / reproductive health education correctly and precisely. From the survey results, an average of 70% of users indicate that this application is essential and agree that it is easy to use. Data were obtained from filling out the most ex-pressed agreement questionnaire (50-83%). This application can be used in Android version 4.4.

Table 2 shows that all variables are significantly related to using SEMAR applications; the relationship is positive and strong. All variables showed positive and robust relationship traits. All independent variables (gender, sex education, reproductive rights, sex stigma, relation norms) will increase the number/point of independent variable status will increase comprehensive sex education through the use of the SEMAR application. The sex stigma variable (r = 0.955) showed positive and robust relationship traits, which meant that, meaning that each increase in good sex stigma would improve comprehensive sex education through the use of SEMAR applications.

Table 2.	Factors	Related	to	Compre	hensive	Sex	Educa-
tion Thro	ugh the	Use of th	e S	EMAR .	Applicati	on	

Variable	Mean±SD	r	p-value		
Gender	10.67±2.29	0.694	0.0001		
Sex Education	9.68±2.38	0.803	0.0001		
Reproductive Rights	31.49±6.97	0.862	0.0001		
Sex Stigma	6.22±2.12	0.955	0.0001		
Relationship Norms	6.73±1.71	0.881	0.0001		



Figure 1. The SEMAR Application

Table 1. The	e SEMAR Ap	o Instrument	Response	Results

Items Statement	Totally	Agree	Disagree	Strongly
	Agree	•	•	Disagree
Unequal gender power relationships	10(6.1%)	137(83.5%)	15(9.1%)	2(1.2%)
Relationship of Gender-Based Personal Norms, Practices	5(3.0%)	128(78.0%)	29(17.7%)	1(0.6%)
and Values	. ,	. ,	. ,	. ,
Equal rights for men and women	49(29.9%)	87(53.0%)	25(15.2%)	3(1.8%)
Gender-based discrimination violates sexual rights	19(11.6%)	121(73.8%)	19(11.6%)	5(3.0%)
Impact of gender discrimination permanent damage to	27(16.5%)	128(78.0%)	Ò(0%)	9(5.5%)
health and emotional well-being	,	· · · · ·	· · ·	· · ·
One's own decision to have sex is legal and religious	35(21.3%)	105(64.0%)	19(11.6%)	4(2.4%)
Provide the option to use contraception	26(15.9%)	131(79.9%)	5(3.0%)	1(0.6%)
Women must obey the man as the head of the house	8(4.9%)	112(68.3%)	42(25.6%)	2(1.2%)
Women's violence is gender-based violence and a violation	52(31.7%)	96(58.5%)	13(7.9%)	3 (1.8%)
of human rights	(- (,,
Sexuality education and reproductive processes	41(25.0%)	117(71.3%)	4(2.4%)	2(1.2%)
Safe pregnancy choices and information	38(23.2%)	124(75.6%)	2(1.2%)	0(0%)
Avoid Sexually Transmitted Infections (STIs)	65(39.6%)	96(58.5%)	3(1.8%)	0(0%)
Good and timely reproductive health counseling	49(29.9%)	112(68.3%)	2(1.2%)	1(0.6%)
Determining self-esteem and self-empowerment	34(20.7%)	126(76.8%)	3(1.8%)	1(0.6%)
Respect for the body as part of human rights	57(34.8%)	106(64.6%)	0(0%)	1(0.6%)
the right to equality equal legal protection and freedom	41(25%)	120(73.2%)	1(0.6%)	0(0%)
The right to participate for everyone	34(20.7%)	127(77.4%)	3(1.8%)	0(0%)
the right to life liberty and security	80(48.8%)	80(48.8%)	2(1.2%)	1(0.6%)
Everyone has the right to privacy	36(22%)	124(75%)	(3.0%)	0(0%)
The right to personal autonomy and recognition before the	<i>1</i> 1(25%)	127(7/ 1%)	1(0.6%)	0(0%)
	41(2370)	122(14.470)	1(0.070)	0(070)
The right to freedom of thought, opinion and expression	52(31 7%)	111(67 7%)	1(0.6%)	0(0%)
Everyone has the right to health and scientific henefits	50(36.0%)	104(63.4%)	1(0.0%)	0(0%)
Everyone has the right to education and information	45(27.4%)	118(72.0%)	0(0%)	1(0.6%)
The right to choose, plan a family, and to have children:	43(27.470) 26(15.0%)	120(78 7%)	8(4.9%)	1(0.0%)
Sevuality is a healthy and normal part of everyone's life	20(10.5%)	129(70.7%)	3(1.8%)	0(0%)
The need for internersenal communication in new education	32(19.576)	129(70.770)	2(1.070)	0(0%)
The intringuise of drugs and the implications of their use in	33(20.1%)	129(70.7%)	2(1.270)	1(0.69)
and the influcacies of drugs and the implications of their use in	33(20.1%)	120(70.0%)	2(1.270)	1(0.0%)
Sex education	42/26 20/)	110(72 60/)	0(00()	1(0,69/)
Overcoming the slight associated with sex education	43(20.2%)	119(72.0%)	0(0%)	1(0.0%)
	20(17.1%)	127(11.470)	0(4.9%)	1(0.0%)
Wolliell Dreventing gender based newer is an important part of sev	24/20 70/)	101/70.00/)	0(4,00()	1(0,69/)
Preventing gender-based power is an important part of sex	34(20.7%)	121(73.6%)	6(4.9%)	1(0.6%)
	00(000()	404(750()	0(4,00())	4(0,00()
Supporting young people to develop tolerance in sex educa-	36(22%)	124(75%)	2(1.2%)	1(0.6%)
	00(40,40()	400/04 40/)	7(4,00())	0(4,00())
i ne influence of peers and social norms plays a big role in	22(13.4%)	133(81.1%)	7(4.3%)	2(1.2%)
sex education	00/45 00/)		04/40 08/	0(00()
Different types of relationships (family, friends, society) will	28(15.9%)	116(70.7%)	21(12.8%)	0(0%)
easily change	00(40,00()	00(40,00()	0(4,00())	4 (0, 00()
Love, marriage, and sex are not the same	80(48.8%)	80(48.8%)	2(1.2%)	1(0.6%)

DISCUSSION.

The SEMAR app was developed for use by adolescents of years who are at higher risk of unsafe sex behaviours. It is designed to comprehensively improve their general knowledge of sex and attitudes towards disease susceptibility, disease prevention through a healthier lifestyle, and conduct sex education appropriately and purposefully. A smartphone application plus a brief motivational intervention designed to reduce substance use and sexual risk behaviors in young adults.²⁵ The quasi-experimental study was conducted because it was population-based, and it was impossible to randomize at the individual level without

contaminating the control group. The study shows an increase in knowledge about comprehensive sex education among adolescents. This shows that the SEMAR app can be a tool to convey health information about sex education to adolescents.

Smartphone apps were developed based on categories that emerged from content-related data; teens asked for sex education, including information about sexually transmitted infections.²⁶ he application provides information on comprehensive education, sexual rights and obligations, risk factors, prevention, and methods of preventing unsafe behavior, as described in detail in the development publication. Many studies support using mobile phones to increase the knowledge and awareness of users or patients

about diseases. A systematic review of healthcare apps for mobile phones found that more than 15 apps focused on disease management for chronic diseases improved patient knowledge. Thus, mobile applications can be essential in disseminating evidence-based health information and are tools for self-disease management, remote monitoring, and mobile clinical communication.²⁷

A study in China showed that mobile apps can improve user experience, especially regarding accessibility to health information, leading to positive health outcomes.²⁸ In another study involving college students/adolescents, most participants agreed that mobile health apps have great potential in health promotion and are beneficial and help them lead healthy lifestyles.²⁹ Therefore, increasing mobile phone ownership should be fully used in delivering health education and promotion to intended users. It can be an excellent complement to other modalities of health education to enhance the effect of education to change people's behavior.

Of five variables related to using the SEMAR app, the sex stigma variable has the most extensive r (r=0.955), which means it has a solid and positive relationship. Positive relationships have an impact on the higher the sex stigma, the higher the use of the SEMAR application. Sex education can reduce stigma and warn of the risks of wrong sex.³⁰ Less than half of teens appear open to their current healthcare provider, with stigma anticipated to be the most common reason for avoiding disclosure.³¹ Healthcare providers should fully utilize technological advances in disseminating health education messages to the target population. Mobile apps like SEMAR are a step forward in health promotion and education, particularly in comprehensive sex education. The SEMAR app is currently being published on the web. It can be downloaded for free from the Google Play Store.

CONCLUSIONS AND RECOMMENDATION

The application of comprehensive Health Education in adolescents based on artificial intelligence has been built. This application can be used to increase knowledge and improve the quality of adolescent reproductive health. Android-based applications are used as a health education medium to make it easier for users to understand sex education comprehensively. It is essential to disseminate and use this application to teenagers so that sexual knowledge and education increase.

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