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Developing the Sexual Education E-Comic "Serat Widya Pramana" as a Prevention of Early Marriage

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Abstract. *Although various sexual education media have been developed, the number of marriage dispensation applications continues to show a worrying upward trend. This indicates that the existing educational efforts have not been effective in preventing early marriage. Therefore, an innovative approach is needed to produce sexual education media that is more effective and comprehensive. This study aims to develop an alternative medium of child marriage prevention in Surakarta City in the form of Serat Widya Pramana-Based Sexual Education E-comic. The research employed the Research and Development method, covering three out of five stages of the ADDIE model (Analysis, Design, Development). The e-comic development was evaluated for its content, linguistic and media feasibility by experts and potential users. Additionally, pilot testing was conducted on a small-scale research subject using a Quasi-Experimental One-Group Pretest-Posttest design. The e-comic received a score of 68 (good) from the healthy reproduction material expert, 80 (good) from the literature expert, 96 (excellent) from the language experts, 90 (excellent) from the media experts, and 69.3 (good) from prospective users. Subsequently, pilot testing was carried out on 10 (4 females and 6 males) adolescents from SMK "X" Surakarta. Data analysis using the Paired Sample T-Test showed a significant increase in sexual knowledge ($p=0.000$, $p<0.05$) and a significant decrease in adolescents' intention toward early marriage ($p=0.008$, $p<0.05$). Therefore, the Sexual Education E-comic Serat Widya Pramana is deemed suitable as an alternative medium for preventing early marriage in Surakarta City.*

Keywords: *Early marriage, serat widya pramana, e-comic, sexual knowledge*

INTRODUCTION

According to data from the United Nations Children's Fund (UNICEF) in 2023, Indonesia ranks 4th with the highest percentage of early marriage worldwide. It makes Indonesia the country in the ASEAN region with the most cases of early marriage (UNICEF, 2023). According to data from the DP3AP2KB of Surakarta City, from June 2022 to June 2023, there were 158 cases of marriage dispensation applications by teenagers, most of whom were motivated by out-of-wedlock pregnancies. The high number of early marriage cases is one of the reasons because a lack of sexual

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education should be given early by parents. Many parents think that sex education is better given when the child has grown up (Nadar, 2017). As a result, teens seek out other sources of information, such as from school, discussing with peers, and reading books about sex (Kusumastuti, 2017). However, unfortunately, sexual education from other sources, like schools and the community environment, is also not comprehensive because it only focuses on the biological aspects and prevention of infectious diseases (Fitriana & Siswantara, 2019). According to Lumban Gaol & Stevanus (2019), comprehensive sexuality education should include biological, psychological, and social dimensions.

To understand the tendency of adolescents to marry early, this study uses the intention construct in the Theory of Planned Behavior developed by Ajzen (1991). Intention is the motivational factor and the closest antecedent of a behavior. Intention to marry early can be defined as an individual's tendency to marry under 19, according to the minimum age limit stipulated in Law Number 16 of 2019. According to the model Theory of Planned Behavior, there are three predictors of intent: attitudes towards behavior, subjective norms, and perceptions of behavior control. Therefore, in the context of this study, comprehensive sexual knowledge also plays an important role in shaping adolescents' negative attitudes and perceptions of early marriage. Comprehensive sexual education standards, according to World Health Organization Regional Office for Europe (2010), include an understanding of the cognitive, emotional, social, physical, and interactive aspects of individual sexuality. Comprehensive sexuality education provides scientifically correct information about human sexuality in various developmental age ranges.

In developmental psychology, adolescence is a transitional period from childhood to adulthood characterized by hormonal, physical, psychological, and social changes. Adolescents display various emotional turmoils, so achieving independence and identity becomes prominent. Therefore, efforts to improve adolescent sexual understanding are significant (Basri et al., 2022). According to World Health Organization Regional Office for Europe (2010), scientifically accurate sexual education information can prevent the emergence of negative consequences related to sexuality, to improve the well-being of individuals in general (World Health Organization Regional Office for Europe, 2010).

Javanese people have cultural products with the value of local wisdom that support the completeness of the dimension of comprehensive sexual education, according to Lumban Gaol & Stevanus (2019) and World Health Organization Regional Office for Europe (2010), namely Serat Widya Pramana (SWP). Serat Widya Pramana is one of the Javanese poems composed by Begawan Yogiswara and Begawan Parasara in 1904. The potential of SWP has been explored in the preliminary study by Dewantari et al. (2024) and developed in the form of the Serat Widya Pramana Sex Education Application (SERAP). This application has been proven to increase sexual knowledge and reduce the intention of early marriage in adolescents. However, this study has limitations regarding the long-term effectiveness of use. During the follow-up evaluation process, it was revealed that some users no longer actively open the "Serap" application because the memory space on their device is inadequate. Some even delete the "Serap" application because the memory is full. For this reason, there needs to be the development of other media as an alternative that adolescents can choose according to their needs and abilities.

Comics are visual media in the form of stories in pictures that can entertain readers. In addition, comics can also be used as a two-way learning medium, namely, independent learning media and teaching and learning activities (Rahmawati et al., 2023). Research by Manulu et al. (2020) shows that comic media is the most effective in increasing adolescents' knowledge of the dangers of free sex compared to leaflet media and WhatsApp application media. This issue is because

teenagers' interest in comics is still high, and picture comics can be more informative and provide a better understanding. The findings are in line with research by Wulandari et al. (2020), which shows that comic media has an influence on increasing adolescents' knowledge and attitudes about the impact of premarital sex. The development of comics today is also varied, not only in print form, but also in electronic comics (e-comics).

Based on previous research, the Development of Javanese culture-based sexual education media in the form of applications has not been effective in the long term. On the other hand, there has not been a development of sexual education intervention media in the form of e-comics that simultaneously integrates Javanese cultural values, mainly sourced from Serat Widya Pramana. Therefore, the novelty of this research is to integrate Serat Widya Pramana's sexual education in the form of alternative visual media that is attractive, sustainable, and easily accessible to adolescents. E-comic products are expected to be used as a companion to teaching materials in schools or provided in libraries as a medium for adolescent literacy. This study aims to develop and test the feasibility of content, language, media display, and effectiveness of the Serat Widya Pramana e-comic as an alternative medium for preventing early adolescent marriage in Surakarta.

METHOD

The Development of Widya Pramana's Serat Sexual Education E-comic in this study uses the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation (Molenda, 2015). However, this research will focus on only three stages: Analysis, Design, and Development. This research only focuses on the development because the main goal is to produce the initial product, a Sexual education e-comic, that is conceptually and design-feasible. Phase Implementation and Evaluation can be implemented in advanced studies. Phase Analysis: Needs analysis and material analysis were carried out. A needs analysis was carried out through interviews with counseling guidance teachers and the distribution of questionnaires to determine the distribution of the level of intention to marry early in adolescence. A literature study carried out a material analysis. Then, it is continued at the design stage.

In this step, the researcher prepares the material's content and determines the strategies and media used for the learning process. The media selected is e-comic. In this stage, the researcher collects the material's content per the learning modules prepared in the preliminary study by Dewantari et al. (2023) and then prepares an evaluation of knowledge, to be presented through learning media, e-comic. Phase Development is the stage of realizing the product plan made at the Design level, E-comic Sexual Education. However, before the product is tested, it will be tested for validity first by a linguist, a lecturer in the field of Indonesian, a media expert in the field of Visual Communication Design, and potential users to assess their feasibility.

Table 1.
Product Validation Assessment (Akbar, 2013)

Achievement Rate (%)	Validity Categories	Information
81-100	Excellent	Not revised/valid
61-80	Good	Not revised/valid
41-60	Enough	Revision/invalid
21-40	Less	Revision/invalid
0-20	Very Less	Revision/invalid

The choice of a linguist is based on his or her academic background and experience in the field of linguistics. Meanwhile, the selection of media experts is based on their academic background and experience in learning media design and visual aesthetics, which are very important to attract attention and facilitate the understanding of adolescents. Media validation assessment e-comic refers to the criteria (Akbar, 2013) with the value range presented in Table 1.

If the validation results are declared feasible, the next stage is to conduct a small group trial or a trial limited to the research subject, according to the real situation. In this limited trial stage, it will apply a quasi-experimental one-group pretest-posttest design.

The population in this study is adolescents aged 15-18 years in the city of Surakarta. Sampling was conducted on 261 SMK "X" Surakarta City students using the purposive non-random sampling technique. The selection of this research sample was based on some criteria, namely: (1) having an intention of early marriage in the medium to very high category; (2) having never obtained a similar intervention; (3) being able to read and write; and (4) filling informed consent. According to Arikunto (2019), small group trial subjects were conducted on 4-14 respondents. The selection of SMK "X" Surakarta City is based on a preliminary study through interviews with Guidance and Counseling (BK) teachers who know the conditions and behavior of students at the school. The results of the interview show that in the school, there have been cases of out-of-wedlock pregnancies in the last five years. Students in the school environment also exhibit some sexually active behavior. This research was carried out after getting ethical clearance (EC) from Moewardi Hospital with Number 2.379/IX/HREC/2024.

The research instrument used in this study is the Early Marriage Intention Scale developed by the researcher. Instruments based on the theory of Ajzen (2005) state that intention is composed of four aspects: action, goal, context, and time. The Early Marriage Intention Scale consists of 26 items, consisting of 13 items favorable and 13 items unfavorable. The answers are presented on a Likert scale with 5 answer choices: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. This scale has gone through the validity test of the content of Aiken's V based on the assessment of 10 expert panels. The validity results showed that 26 items had a validity value of > 0.75 . Therefore, the item has good content validity and supports the overall validity of the test content. In addition, a scale test was carried out in the field and analyzed with the Pearson Product-Moment test, which compared the r -Table and r -count values at a significance level of 5%. The test was conducted with 175 data subjects and obtained an r -Table value of 0.1476, while the r -calculated value ranged from 0.271 to 0.629.

Furthermore, a reliability test was carried out using the Cronbach's Alpha test, which must meet the requirements as a Cronbach's Alpha > 0.60 value (Purwanto, 2018). The results of the reliability test for the scale used is presented in Table 2.

Table 2.
Reliability Test Results

Cronbach's Alpha	N of Items
0,803	26

The test results showed a value of Cronbach's Alpha coefficient of 0.803. Thus, it can be concluded that this scale has a good level of reliability and meets the criteria with a Cronbach's Alpha > 0.60 value.

The data of this study was analyzed using the Paired Sample T-Test parametric test with the help of SPSS Statistics 25 software to determine if the data met the normality and homogeneity

tests. However, the analysis will use the nonparametric Wilcoxon Test if the data does not meet the assumption test.

RESULTS AND DISCUSSION

Analysis Stage

The needs analysis stage was conducted with a semi-structured interview with one vocational counseling guidance teacher, "X," Surakarta. Based on interviews, it was found that in the last five years, there have been cases of female students who have had an out-of-wedlock pregnancy, which caused them to be forced to resign from school. Although the school has made efforts to control the sexual behavior of students, teachers still find physical interactions between male and female students involving touching sensitive body parts. The findings of this preliminary study indicate the phenomenon of early marriage and active premarital sexual behavior among students of SMK "X" in the city of Surakarta, so intervention through sexual education is needed as a measure to prevent early marriage.

Then, the researcher screened the level of early marriage intention by spreading the scale of early marriage intention. Screening of the level of early marriage intention was carried out on 261 students of SMK "X" Surakarta (15-18 years old). The results showed that 92 out of 261 students (35.34%) had participated in a sexual education program before. However, it is known that there are still 104 students (39.84%) who have moderate early marriage intentions, 58 students (22.22%) have high early marriage intentions, and 15 students (5.74%) have very high early marriage intentions. It is because the sexual education provided is still focused on biological aspects and sexually transmitted diseases only. Therefore, SMK "X" Surakarta students still need more comprehensive educational materials.

Table 3.
Validation Results of Literary Subject Experts

Aspects	Score
Accuracy of content interpretation	4
Easy-to-understand interpretation results	4
Relevance of the content of the manuscript to current science	4
Suitability of the content of the manuscript and the purpose of the activity	4
Average	4
Total Value	16
Percentage	80 (Good)

The material in the Serat Widya Pramana Sexual Education E-comic results from exploring the content of Widya Pramana's Serat, previously carried out in a preliminary study by Dewantari et al. (2024). The material is divided into 6 chapters, namely physical development (*Pupuh Kinanthi*), sexual development (*Pupuh Dhandhanggula*), psychological development (*Pupuh Sinom* and *Dhandhanggula*), sexually transmitted diseases (*Pupuh Kinanthi*), choice of partners (*Pupuh Kinanthi* and *Sinom*), and marriage (*Pupuh Sinom* and *Dhandhanggula*). The exploration results have been validated by literary material experts, namely lecturers of the Regional Literature study program, Faculty of Cultural Sciences, Sebelas Maret University, with a score of 80 (good).

Furthermore, in a preliminary study by Dewantari (2023), Healthy reproductive material has been prepared in the form of modules that have been tested for validity by lecturers of the

Midwifery study program, Faculty of Medicine, Sebelas Maret University, with a percentage value of 68 (good). Therefore, the researcher reuses the material in the module.

Table 4.
Validation Results of Healthy Reproduction Material Experts

Aspects	Score
Material	60
Language	80
Exercises and Evaluations	64
Average Presentation	68 (Good)

Design Stage

The E-comic *Sera & Sora: Exploring the World of Teens* was developed into seven episodes based on the exploration and relevance testing results. These episodes include character introductions and discussions about various aspects of adolescent development, namely physical, sexual, psychological development, sexually transmitted diseases, partner selection, and marriage (Dewantari et al., 2024).

The material presented in the physical development episode includes the early age of physical changes in adolescents according to *Serat Widya Pramana*, physical development characteristics in adolescent boys and girls, and various problems that may arise due to these changes. The episode of sexual development reviews the age at which sexual aspects begin to develop in adolescents and the hormonal changes that occur in both men and women based on the same teachings.

Meanwhile, the episode of psychological development discusses the teachings of *Serat Widya Pramana* regarding the formation of adolescent character and its philosophical values, the important role of parents in accompanying psychological development, and the prohibition of marriage in adolescence and its impact on mental health. The episode of sexually transmitted diseases highlights diseases that can arise due to premarital sex behavior, according to the philosophical view in *Serat Widya Pramana*.

Furthermore, in the episode of choosing a partner, a guide from *Serat Widya Pramana* is explained about the criteria for an ideal partner and its philosophical basis, the risk of diseases that can be inherited, the prohibition of marriage with relatives and the risks, and the ideal age in choosing a partner and the potential risks. Finally, the wedding episode explores the importance of emotional and mental maturity in preparing for marriage, the ideal age for marriage, the need to weigh the motivation for marriage, and the readiness that must be had before entering married life.

Table 5.
Sera & Sora's Story Structure: Exploring the World of Teenagers

Episode	Explanation
Episode Intro	Introduction of the main characters Sera and Sora.
Episode 1	Introduction of the teacher and the classroom setting in a high school; questions and ignorance of adolescent characters about physical development and teachers' explanations; resolution of understanding of adolescent characters.
Episode 2	Introduction of the teacher character and the classroom setting in a high school; the questions and ignorance of the adolescent character about sexual development and the explanation of the teacher character; the resolution of the adolescent's understanding.
Episode 3	Introduction of the parent character and the home setting; questions and ignorance of the adolescent character towards the psychological development and explanation of the parent character; resolution of the adolescent character's understanding.



Second, outline creation. The rough sketches made in the previous stage will be tidied up so they can proceed to the coloring stage. Outlines provide clear boundaries on objects, making them appear more assertive and easy to read. The provision of dialogue sketches is made so that the process of finishing/rendering (after coloring) is more straightforward in the process of typesetting (setting/typography) of the dialogue.



Third, coloring. Coloring starts by coloring all the outlines in a very dark brown color to reduce the roughness of using only black outlines. Then, all characters or objects on the panel

will be given green blocks to mark, making the coloring process easier digitally. Color blocks are functional for clipping techniques on each layer, so nothing comes out of the blocked area when given the next color. Researchers give basic colors such as skin color, hair color, shirt color, etc. Shadow and light colors are then given to give dimension to the image. The color used is saturated.



Figure 4
Coloring Episode 4 page 1
(Source: Primary data)

Fourth, background provision. The background is adapted to the atmosphere and context of the story. The background is not only in the form of a place, but it can also be done by playing with colors to make the comic look attractive and not too crowded.



Figure 5
Background Giving Episode 4 page 1
(Source: Primary data)

Fifth, texting and polishing. This process has entered the text-giving stage by giving and tidying up the location of conversation text bubbles, character words, narrative boxes, and character mind text balloons. After that, the researcher performed the final polish after administering the text.

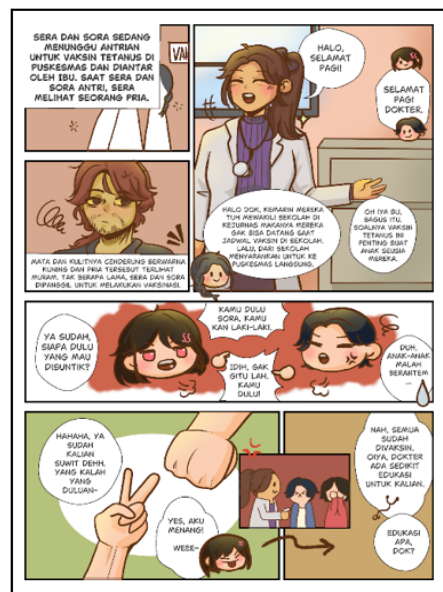


Figure 6
Texting and Polishing Episode 4 page 1 and Episode 5 page 2
(Source: Primary data)

Sixth, rendering. Rendering involves downloading the final episode according to a format adjusted to the appearance of the Google site. The format used is RGB color because comics do not need to be printed as physical books, but in e-comics, 600 px resolution, and A5 size paper.

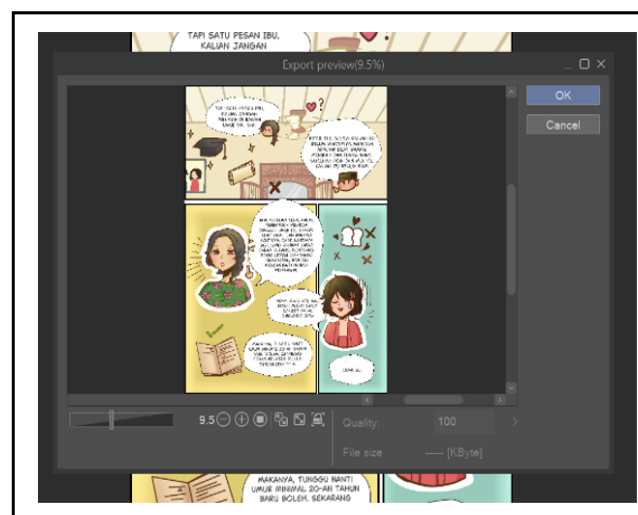


Figure 7
Episode 5 Rendering page 2
(Source: Primary data)

Seventh, uploading. At this stage, the comic is uploaded through a website created by the research team. Because it is still in development, this e-comic website will only be accessible to research subjects and research teams.

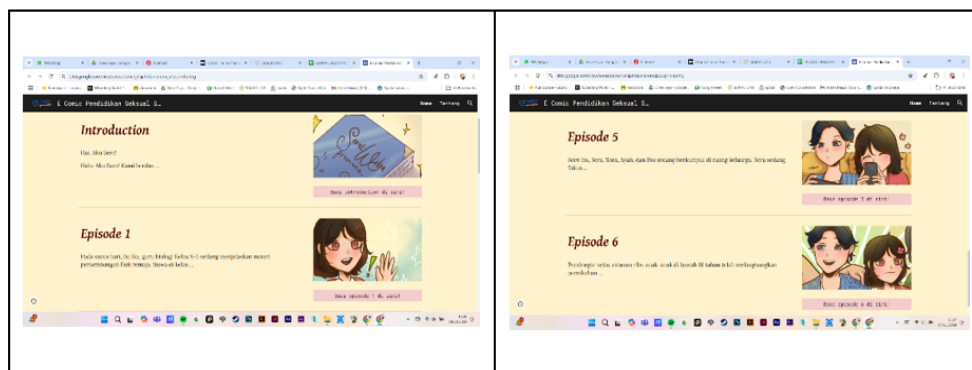


Figure 8
Episode 5 Rendering page 2
(Source: Primary data)

Furthermore, an assessment of the feasibility of e-comic products is carried out in terms of grammar, media, and potential users. The feasibility assessment in grammar is carried out by linguists who have obtained a master's degree in education, with the results seen in Table 6.

Table 6.
Linguist Validation Results

Aspects	Score
The language used is suitable for teenagers	5
Easy-to-understand sentences	5
Sentences do not have double meanings	5
Conformity with the rules of language use	4
Accuracy of the use of terms	5
Average	4,8
Total Value	24
Final Score	96 (Excellent)

In Table 4, it is stated that the assessment by linguists got a score of 24, which was then converted into a scale of 1-100, so that a score of 96 was obtained in the excellent category. Suggestions and improvements are given (Table 5) so that, in terms of language, this is worthy of inclusion, but with minor revisions.

Table 7.
Linguists' Suggestions and Revision Results

Suggestion	Repair
"Haduh Bu, saya masih jomblo." The fix of the word "Jomblo" is not standard.	"Haduh Bu, saya masih Jomlo." Translation: "Come on, ma'am, I am still single."
"Ibu pengen tau aja..." The fix of the words "Pengen" and "Aja" is not standard.	"Ibu pingin tau saja..." Translation: "I just want you to know..."
"...Tapi lebih tepatnya pernikahan remaja sangat beresiko menyebabkan..." The fix of the word "Beresiko" is not standard.	"...Tapi lebih tepatnya pernikahan remaja sangat berisiko menyebabkan..." Translation: "... But more precisely, teen marriage is precarious, causing..."

Suggestion	Repair
“...Mudah mengalami stress dan depresi akibat...” The fix of the word "Stress" is not standard.	“...Mudah mengalami stres dan depresi akibat...” Translation: “... It is easy to experience stress and depression as a result of...”
“...Sesuatu yang buruk sama pernikahanmu.” Non-standard sentences.	“...Sesuatu yang buruk pada pernikahanmu.” Translation: “... Something bad for your marriage.”
“...Jangan menikah dibawah umur ya, nak!” Correcting the writing of "Di" as a preposition is inappropriate.	“...Jangan menikah di bawah umur ya, nak!” Translation: “... Do not marry underage, son!”
“Itu tidak baik mba karena dapat memecah tali persaudaraan...” The fix of the word "Mba" is not standard.	“Itu tidak baik mbak karena dapat memecah tali persaudaraan...” Translation: “That is not good because it can break the bond of brotherhood...”

After going through the validation stage by linguists, the validation stage by media experts continues. The media expert in this assessment is a lecturer in the Visual Communication Design study program, Faculty of Fine Arts and Design, Sebelas Maret University, with the results presented in Table 8.

Table 8.
Validation Results by Media Experts

Aspects	Score
Comic design	27
Contents layout	13
Typography	22
Illustration	28
Final Score	90 (Excellent)

In Table 6, it is stated that the assessment by media experts obtained a score of 90, with the category of very good. Suggestions are given (Table 7) for further research.

Table 9.
Suggestions by Media Members

Suggestion
Visually, it does not matter. It is already visually appealing. Improvements that can be made in the next production may be more about story dramatology, aka storytelling flow. The current storytelling, especially the early episodes (most visible episode 1), is characterized by the absence of the dramaturgy of the story. Information is one-way without any background on the information's urgency. The concept of short story fragments with everyday themes can further highlight the concept of each episode. It seems like it is going in that direction, but it is still bearable.

After media experts carry out the validation stage, potential users carry it out. The validation stage by potential users contains indicators of writing display, image display, comic function, and comic benefits. Ten students become potential user validators with the results that are shown in Table 10.

In Table 8, it is stated that the assessment by ten prospective users obtained a score of 69.3 with a good category (not revised/valid). Suggestions were given to change the form of the media and extend the episode, but it was not done. After the validation stage, the development of the e-comic can be continued to the pilot testing stage. The development of sexual education e-comic

Serat Widya Pramana at the pilot testing stage was applied to 10 subjects, namely 4 women and 6 men. This study consisted of two data pairs: sexual knowledge and early marriage intention.

Table 10.
Validation Results and Suggestions of Potential Users

Name	Final Score	Suggestion	Criterion
NYQS	80	It is good	Good
ANK	79	It is recommended to use print media	Good
AYAP	72	It is recommended to use print media	Good
JNGS	62	It is good	Good
RA	63		Good
NLP	60	Long read	Enough
TAN	69	The reading is too long	Good
YSA	69		Good
NAS	65	Fewer episodes	Good
SCS	74	My suggestions are printed and free	Good
Total	69,3	Good (Unrevised/Valid)	

Before the paired sample t-test, a basic assumption test, including a data normality test, is carried out first. Normality testing of research data was carried out using Shapiro-Wilk analysis because the sample amounted to < 50. If the results show a $p > 0.05$ value, then the research data is distributed normally. The results of the data normality test can be seen in Table 11.

Table 11.
Data Normality Test Results

Category	Pair	Shapiro-Wilk	
		Statistics	Sig.
Pair 1:	Pre-Test	0,929	0,438
Sexual Knowledge	Post-Test	0,914	0,310
Pair 2:	Pre-Test	0,957	0,755
Intention to Get Married Early	Post-Test	0,903	0,235

Based on the results of the test using Shapiro-Wilk, it is known that the pre-test of sexual knowledge has a value of $p = 0.438 > 0.05$ and the post-test of sexual knowledge has a value of $p = 0.310 > 0.05$, so it can be concluded that the data of this study meets the assumption of normality. To determine the significance of the influence of the implementation of the sexual education program through e-comics on students, a paired sample t-test was conducted, with the results of which can be seen in Table 12.

Table 12.
Paired Sample t-test test results for sexual knowledge and early marriage intention

Category		Mean	Std. Dev	Paired t-test		
				t	Df	Sig. (2-tailed)
Pair 1:	Pre-Test	12.9000	2.42441	-15.316	9	0.000
Sexual Knowledge	Post-Test	22.6000	1.89737			
Pair 2:	Pre-Test	58.2000	7.46548	3.425	9	0.008
Intention to Get Married Early	Post-Test	47.9000	13.31207			

Based on the paired sample t-test analysis, the score showed that there was a significant difference between sexual knowledge before reading e-comics ($M = 12.9$; $SD = 2.42$) and sexual knowledge after reading e-comics ($M = 22.6$; $SD = 1.90$) with $p = 0.000$ ($p < 0.05$). Sexual knowledge scores have increased significantly, so that learning with e-comics can increase sexual knowledge in adolescents. In addition, the results of the paired sample t-test analysis also showed that there was a significant difference between the intention to marry early before reading the e-comic ($M = 58.2$; $SD = 7.46$) and intention to marry early after reading e-comics ($M = 47.9$; $SD = 13.31$) with $p = 0.008$ ($p < 0.05$). The score of early marriage intention has decreased significantly, so learning with e-comics can reduce early marriage intentions in adolescents.

The development of this sexual education e-comic has been carried out through several stages. First, needs analysis and material analysis are carried out for the e-comic that will be developed. Analyzing needs is important in designing a product so that the results can be used as the basis for the development process according to the needs in the field (Afifulloh & Cahyanto, 2021). By screening, the level of early marriage intention of SMK "X" students in Surakarta is known. However, 35.24% of students have participated in sexual education programs before; there are still 67.8% of students with moderate-very high levels of intention.

This result shows the need for more comprehensive sexual education materials. Comprehensive sexuality education is not limited to providing information alone, but adolescents need to be allowed to acquire life skills and develop positive attitudes and values (Nadya, 2024). Therefore, culturally-based sexual education is appropriate and needed by adolescents. Culture-based sexual education contains knowledge and skills that should pay attention to the culture that already exists and is formed in society (Nadya, 2024).

After going through the analysis stage, the next stage is design. The design stage in e-commerce development includes planning verbal and visual ideas. The third stage in developing this e-comic is the development of verbal and visual ideas that have been prepared. Then, the e-comic was validated by linguists who were lecturers in the field of Indonesian, a media expert who was a lecturer in the field of Visual Communication Design, and 10 prospective users to assess their feasibility. The results of the linguistic validation obtained a score of 96, or very good. The linguist's assessment gets perfect scores on the aspect of the language used, suitable for teenagers, sentences are easy to understand, sentences do not contain double meanings, and the accuracy of the use of terms is an advantage of this e-comic. Assessments by media experts also received a score of 90 or very good. In addition, the assessment of potential users obtained an average score of 69.3, or good, and did not need revision.

The researcher then conducted a limited-scale trial, or Pilot Testing. Trials are carried out to test the feasibility, effectiveness, and practicality of the product that has been developed (Sutrisno, S., & Puspitasari, 2021). Phase Pilot Testing can bridge the initial development step to wider implementation by evaluating and identifying obstacles and limitations. Based on the results of the data analysis and pilot Testing, it was found that there was a significant difference between the level of sexual knowledge and early marriage intentions before and after reading the e-comic. Adolescents' sexual knowledge levels increase after reading an e-comic with a significance value $p = 0.000$ ($p < 0.05$), while the level of intention for early marriage among adolescents decreased with a significance value of $p = 0.008$ ($p < 0.05$). This result shows that in addition to e-comics, Widya Pramana is validated as worthy by experts in materials, languages, media, and potential users. It was also shown to be effective in increasing sexual knowledge and lowering adolescent early marriage intentions in trials.

The effectiveness of education through this e-comic is attributed to its content, namely sexual education based on the teachings of Serat Widya Pramana, which cover biological, psychological, and social aspects. Sexuality-based education, Serat Widya Pramana, aligns with the findings of Lumban Gaol & Stevanus (2019), who emphasize that thorough sexuality education should include all three dimensions. It is also reinforced by research by Chibuye & Kumatongo

(2022), which shows that comprehensive sexuality education has a significant role in preventing early marriage by providing comprehensive information about sexuality, reproductive rights, and healthy relationships. This understanding equips adolescents to make wiser decisions regarding relationships, while avoiding social pressure to marry at a young age. In addition, comprehensive sexuality education helps them understand the negative consequences of early marriage, such as unplanned pregnancies and health risks, so they are encouraged to postpone marriage until they reach physical and emotional maturity.

The results of this study are also in line with research by Handika (2022), who develops the media e-comic based on local wisdom, Begawi Pepadun, on reproductive system material for Grade XI high school students. The developed e-comic is feasible to use after receiving positive responses from both educators and students. Likewise, research by Wulandari et al. (2020) shows that comic media has an influence in increasing adolescents' knowledge and attitudes about the impact of premarital sex. Comic media can be used to overcome boredom when receiving material. Comics with color illustrations can appeal to all students of all ages (Handika, 2022).

Comics are a visual communication medium that is more than just light-hearted and entertaining stories; they can also be applied as an educational tool and convey information effectively and efficiently (Apriani, 2023). Rapid technological advancements increase the ease of accessibility in comics. Comics no longer need to be printed and can be read anywhere and anytime. Serat Widya Pramana Sexual Education e-comic can be accessed through the website link, so users do not need to download any application on their devices. It can also be accessed and enjoyed from various devices, including mobile phones, Tablets, laptops, or computers, as long as it is connected to the internet.

In addition to the various advantages above, this study has several limitations. First, this study only applies three of the five stages of the ADDIE model, namely Analysis, Design, and Development. Further research is recommended to apply all stages of the ADDIE model to obtain more comprehensive and valid results. Second, design, communication, and visual experts provide input and suggestions to extend the storyline and add dramaturgy in each episode's subsequent comic development. This aspect also aligns with suggestions and input from potential users to extend the story. Third, it was found that one of the students had a higher post-test score compared to the pre-test. The observation results found that students were not serious about working on the scale and often joked with other students. This result can be something that needs to be considered for future research.

CONCLUSION

Serat Widya Pramana Sexual Education E-comic is suitable as an alternative medium to prevent early marriage. The material in the development of the e-comic uses sexual education material, Serat Widya Pramana, which experts in healthy reproductive material and literature have validated. In addition, the e-comic that has been developed also received excellent ratings from linguists and the media, as well as good reviews from potential users. The results of a limited-scale trial show that Serat Widya Pramana Sexual Education E-comic is effective in increasing sexual knowledge and reducing adolescent early marriage intentions. Although it has some limitations, this study significantly contributes to developing alternative media to prevent early marriage. Further research to test the influence of e-comics on a larger scale needs to be done by paying attention to some of the limitations above.

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