



Digital Education for Early Marriage Prevention among Adolescents: Implementation and User Evaluation of the PEDE Application

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ABSTRACTS

Introduction: This community service program aimed to provide education on early marriage prevention through the PEDE application and assess adolescents' perceptions of its usability.

Method: The program was implemented at SMAN 2 Bandung and SMPN 2 Parongpong in Bandung City and West Bandung Regency, West Java, Indonesia. Activities included digital education through application demonstrations and guidance on application use. User evaluation employed the 10-item System Usability Scale (SUS). Thirty respondents participated, with 15 from each school. Data were analyzed descriptively after verification of the reverse-coded responses. **Results:** The mean SUS score was 82.08 (SD = 7.57), the median was 82.50, and scores ranged from 65.00 to 95.00. The mean scores were 80.50 at SMAN 2 Bandung and 83.67 at SMPN 2 Parongpong. These findings describe generally favorable perceived usability while indicating variation across respondents.

Conclusion: PEDE can serve as a digital learning tool within adolescent early marriage prevention education. Further user feedback and outcome evaluation are needed to guide refinement and assess learning and sustained application use.

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1. INTRODUCTION

Child marriage prevention requires attention to adolescents' educational opportunities, access to relevant information, and participation in decisions affecting their lives. Family expectations, social conditions, and economic constraints shape marriage-related decisions, so information provision should be considered one component of prevention rather than a sufficient intervention on its own. A systematic review of evaluations conducted over two decades found the clearest pattern of success among interventions supporting girls' schooling, alongside promising evidence for targeted livelihood and life-skills approaches (Malhotra & Elnakib, 2021). This evidence provides a broader context for educational community service activities without implying that a short program will itself change marriage timing.

In Indonesia, Law Number 16 of 2019 establishes a minimum marriage age of 19 for women and men and includes provisions for court dispensation (Republic of Indonesia, 2019). Educational materials need to explain the applicable legal requirements clearly. In this program, early marriage prevention describes the educational theme; neither marriage incidence nor changes in marital status were measured.

Schools offer a practical setting for introducing reproductive health, puberty, and future planning. However, sensitive topics may be difficult to discuss through conventional classroom delivery alone. A previous PEDE report described embarrassment in discussing reproductive health and the need for accessible educational materials (Darmawati et al., 2025). Such findings support providing guided information access while recognizing that students differ in digital familiarity, learning needs, and willingness to ask questions.

Digital resources offer an additional educational channel, but their contribution must be evaluated using appropriate outcomes. A systematic review of digital interventions addressing school-age adolescent sexual risks identified educational benefits while finding less consistent sustained behavioral effects (Aguilar-Quesada et al., 2025). Although this evidence is not specific to early marriage, it supports examining applications as educational resources rather than assuming that digital delivery establishes behavioral prevention effectiveness.

The World Health Organization (WHO, 2020) emphasizes designing and implementing digital interventions with and for young people, accounting for context and user needs. This

perspective directs attention to whether adolescents can engage with the application, not merely whether content is available. Demonstrations, access arrangements, and guidance may influence application use during a community service session and should be described alongside user evaluation.

PEDE, an abbreviation of Pencegahan Pernikahan Dini, is an existing educational application associated with Universitas Pendidikan Indonesia. Darmawati and Dharmansyah (2024) describe an Android-based application developed in 2022 and registered under copyright number 000378357. Published descriptions include adolescent reproductive health and puberty information, educational videos on sexual behavior and child marriage, and an online consultation or chat function. The application was used here as an existing educational resource rather than developed as a new product.

Previous PEDE reports establish an implementation background. Darmawati and Dharmansyah (2024) focused on community health volunteers, whereas Darmawati et al. (2025) described school-based reproductive health education with demonstrations and assistance. Those reports emphasized educational roles, descriptive knowledge outcomes, and participant responses. Neither supplied publication reported standardized SUS results. Structured user evaluation can therefore complement earlier reports by assessing perceived usability without equating interest in the educational activity with ease of application interaction.

Perceived usability differs from usefulness, educational attainment, and behavioral impact. Brooke (1996) introduced SUS as an overall subjective assessment following system use, and Bangor et al. (2008) examined its application across diverse products. SUS was selected here to summarize perceived usability, not to measure intrinsic motivation or establish educational effectiveness.

This program aimed to deliver early marriage prevention education through PEDE at SMAN 2 Bandung and SMPN 2 Parongpong and assess perceived usability among 30 adolescent respondents. The report links educational implementation to a descriptive user evaluation intended to inform future refinement and delivery arrangements.

2. METHODS

2.1. Program approach and setting

The community service program combined digital education, application demonstration, guidance on use, and a descriptive post-use evaluation. Activities took place at SMAN 2 Bandung in Bandung and SMPN 2 Parongpong in Kabupaten Bandung Barat, West Java, Indonesia.

2.2. Participants

Thirty adolescent respondents participated: 15 from SMAN 2 Bandung and 15 from SMPN 2 Parongpong. The recruitment mechanism, eligibility criteria, and participant ages were 10-19 Years old. All 30 provided complete responses to the 10 SUS items. School-specific records were assigned distinct identifiers to avoid conflating respondent numbers that restarted at each school. Every students should joined the health education, download and try PEDE application minimum once.

2.3. Application and educational delivery

PEDE was introduced through demonstrations and guidance on using the application. Published application descriptions include reproductive health information, puberty-related content, videos, and consultation functions (Darmawati & Dharmansyah, 2024; Darmawati et al., 2025). The facilitator demonstrates how to use the application and provides health education regarding early marriage; subsequently, the students use the PEDE application on their respective mobile phones. The educational topics presented can be accessed through the app. An evaluation is conducted for each student after they have tried the PEDE application, using a printed SUS (System Usability Scale) questionnaire.

2.4. Instrument and coding

The SUS consists of 10 statements rated on a five-point agreement scale. In the standard scoring method, 1 is subtracted from the responses to positively worded statements, while the responses to negatively worded statements are subtracted from 5; the resulting values are then summed and multiplied by 2.5 (Brooke, 1996). The final score ranges from 0 to 100 and does not represent a percentage.

For this analysis, the authors ensured that the negatively worded statements—items 2, 4, 6, 8, and 10—were recoded onto a 1–5 scale consistent with the scoring of the positive statements. These items were not recoded a second time. The 10 values, now aligned in a

positive direction, were each reduced by 1, summed, and then multiplied by 2.5. Thus, the formula is: $SUS = 2.5 \times \Sigma(\text{recoded statement value} - 1)$.

3. RESULTS AND DISCUSSION

All 30 respondent records were included, with equal representation from SMAN 2 Bandung and SMPN 2 Parongpong (15 respondents; 50.0% each). The overall mean SUS score was 82.08 (SD 7.57), with a median of 82.50 and range of 65.00–95.00. SMAN 2 Bandung had a mean of 80.50 (SD 9.36), median of 80.00, and range of 65.00–95.00. SMPN 2 Parongpong had a mean of 83.67 (SD 5.08), median of 82.50, and range of 75.00–90.00.



Figure 1. PEDE Implementation and User Evaluation

The difference in school means was 3.17 points, with SMPN 2 Parongpong showing a numerically higher mean. This was a descriptive comparison; statistical significance and reasons for the difference were not evaluated. The SMAN 2 Bandung records had a wider spread than the SMPN 2 Parongpong records.

Table 1. SUS results by school and overall

Group	n	Mean	SD	Median	Min	Max
Overall	30	82.08	7.57	82.50	65.00	95.00
SMAN 2 Bandung	15	80.50	9.36	80.00	65.00	95.00
SMPN 2 Parongpong	15	83.67	5.08	82.50	75.00	90.00

After all items had been oriented in the favorable direction, item 8 had a mean of 5.00 with identical scores across all 30 respondents, while item 1 had the lowest mean of 3.37. Item 10 had a mean of 3.80.

Table 2. Item's exploratory descriptive summary

Item	Mean	SD	Min	Max
I think I'll use this app often.	3.37	0.89	1	5
I think this app is too complicated	4.53	0.73	2	5
I think this app is easy to use.	4.20	1.00	1	5
I feel I need help from a technical expert to use this app.	4.37	1.00	1	5
I feel that the features in this app are well integrated.	4.50	0.68	3	5
I feel there are many inconsistencies in this app.	4.47	0.73	3	5
I think others will quickly figure out how to use this app	4.33	0.71	3	5
I find this app very confusing.	5.00	0.00	5	5
I feel very confident using this app.	4.27	0.64	3	5
I need to learn a lot before I can use this app.	3.80	0.81	3	5

The present evaluation showed generally favorable perceived usability of the PEDE application among adolescent respondents, with an overall SUS score of 82.08 (SD = 7.57) and a median of 82.50. These results suggest that participants generally perceived the application as manageable within the educational activity. However, individual scores ranged from 65.00 to 95.00, indicating that favorable perceptions were not shared equally by all respondents. The overall score should therefore be considered alongside the variation in individual experiences.

The school-specific findings provide further context for this overall result. SMAN 2 Bandung had a mean score of 80.50, while SMPN 2 Parongpong had a mean of 83.67. Although the latter was numerically higher by 3.17 points. These findings do not establish that PEDE is more suitable for younger students or that school level determines usability. Differences in prior digital experience, application exposure, and the assistance received during the activity might be relevant, but these factors were not measured.

The item-level results help describe the pattern underlying the overall assessment. After negatively worded items had been reverse-coded, the favorable-direction means for unnecessary complexity, inconsistency, and confusing interaction were 4.53, 4.47, and 5.00, respectively. These values indicate favorable responses rather than agreement that the application was complicated, inconsistent, or confusing. The integration item also received a relatively high mean of 4.50, while the direct ease-of-use statement had a mean of 4.20. Taken together, these responses suggest that participants generally perceived PEDE as coherent and manageable. This pattern is relevant to adolescent digital education because well-organized information and straightforward navigation can support access to health content, whereas cluttered interfaces and unclear navigation may impede interaction (Reen et al., 2019). However, the present data do not establish which design elements produced these perceptions.

Despite the favorable item means, the direct ease-of-use statement ranged from 1 to 5, demonstrating that some respondents reported substantially less favorable experiences. This variation reinforces the importance of examining individual difficulties even when the overall score is high. The uniform favorable score of 5.00 on item 8 should also be interpreted cautiously. If confirmed against the original questionnaires, it represents a ceiling response that provides no differentiation among respondents for that particular item. It does not prove the absence of usability problems elsewhere in the application. This interpretation is consistent with the role of SUS as an overall measure of perceived usability (Lewis, 2018).

The responses concerning learning and confidence provide another perspective on application use. The statement about how quickly others would learn to use PEDE had a mean of 4.33, while confidence during use had a mean of 4.27. The favorably oriented technical-assistance item also received a high mean of 4.37, suggesting that participants generally did not perceive a strong need for specialist support. Nevertheless, the item concerning the amount of learning required before use had a comparatively lower mean of 3.80. These findings suggest that favorable overall perceptions can coexist with some initial learning demands. They do not establish a distinct learnability score, but they identify the introductory stage of use as a reasonable focus for further observation.

This interpretation must account for the implementation context, as participants received application demonstrations and guidance. The scores therefore reflect perceptions following supported exposure rather than necessarily describing independent use outside the

educational session. Demonstrations may have helped participants recognize available functions and understand navigation, but the contribution of this assistance cannot be separated from the application's design in the present evaluation. The WHO framework for youth-centred digital interventions emphasizes understanding users' needs and the conditions under which technology is implemented. For PEDE, this supports retaining appropriate introductory guidance while subsequently examining whether adolescents can complete relevant activities without assistance. Such evaluation could include locating an educational topic, returning to previously viewed information, opening available multimedia content, and identifying a source of further support. These would be additional assessment activities rather than outcomes already demonstrated by the present findings.

The frequent-use statement had the lowest mean, at 3.37, despite the favorable overall usability assessment. This finding should not automatically be interpreted as rejection of PEDE or dissatisfaction with its interface. As an application addressing a specific educational purpose, PEDE may be perceived as a resource to consult when relevant questions arise rather than an application requiring daily use. However, this explanation remains a possibility because the questionnaire did not investigate participants' reasons for their ratings. The result highlights the need to distinguish perceived usability, anticipated use, and actual engagement. Digital health engagement encompasses both observable interaction and users' subjective experiences, and no single intention item can establish subsequent use patterns or meaningful engagement with educational content.

For this reason, future evaluation should define meaningful use in relation to PEDE's educational objectives rather than assume that more frequent access is always preferable. Relevant questions include whether adolescents return when they need information, revisit material they did not initially understand, or complete an intended educational activity. Usage records and follow-up feedback would be needed to investigate these patterns. In addition, the comparatively lower frequent-use rating should not be used to justify adding features solely to increase screen time. Any revision should respond to an identified educational or usability need and involve adolescent users in determining whether the proposed change would be useful. This approach aligns with WHO guidance on developing and implementing digital interventions with and for young people.

Within a community service setting, these findings provide a practical basis for reviewing the technological component of educational delivery. Previous PEDE reports described its use in strengthening community health volunteers' educational roles and delivering reproductive health education to students. The current evaluation complements those reports by adding a structured assessment of perceived usability among adolescents from two schools. However, the earlier reports' knowledge outcomes and participant responses should not be treated as outcomes of the present evaluation. The relationship between educational implementation and usability is complementary: the former concerns how the program is delivered, while the latter describes users' perceptions of interacting with its digital resource.

The distinction is particularly important when considering PEDE's contribution to early marriage prevention. A systematic review of adolescent digital sexual health interventions identified educational benefits but less consistent sustained behavioral effects, illustrating why favorable interaction cannot substitute for direct measurement of learning or behavior. Similarly, the broader evidence on child marriage prevention emphasizes educational opportunities and other structural supports, rather than information provision alone. PEDE should therefore be positioned as an educational resource within wider school, family, and community efforts. Its usability results support further implementation review, but do not establish that the application changes marriage-related decisions or reduces the occurrence of early marriage.

Several limitations should guide interpretation. The evaluation included 30 respondents from two schools, restricting transferability to other populations and delivery settings. It relied on self-reported perceptions and did not measure independent task completion, long-term use, or educational outcomes. The demonstrations and guidance provided during implementation may also have shaped participants' experiences. Furthermore, the item-level findings do not identify the causes of lower ratings, and the identical responses to item 8 warrant verification against the original records. Future evaluation should combine SUS with task observation and adolescent feedback, while documenting the language version used and the extent of facilitator assistance. Such an approach would provide a stronger basis for targeted refinement and help ensure that changes respond to demonstrated user needs rather than assumptions. Overall, the findings support PEDE's role as a usable educational resource in the reported setting while identifying the need for continued user-centred assessment and a clear separation between usability, learning, and prevention outcomes.

4. CONCLUSION

PEDE was implemented for early marriage prevention education at SMAN 2 Bandung and SMPN 2 Parongpong. Thirty respondents reported a mean SUS score of 82.08 (SD 7.57), median of 82.50, and range of 65.00–95.00. School-specific means were 80.50 and 83.67, respectively, with no inferential comparison performed. The findings support PEDE's role as a digital educational resource with generally favorable perceived usability in this setting. Further assessment should investigate individual user needs, learning outcomes, and sustained use without equating usability with prevention effectiveness.

5. CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this study.

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