Research Article

Mobile Health Education Platform For Improving Adolescent Reproductive Health Awareness

Prof Dr.S.B.SawantS[1], Siddharth GautamS[2], Dr. Kahmeera ShaikS[3], Dr. Sukhjot KaurS[4], P. Shiyamala DeviS[5], Monica Sunil ShahaneS[6]

[1] Department of MBA, Director, Bharati Vidyapeeth Deemed to be University, Abhijit Kadam Institute of Management and Social Sciences, Solapur, Maharashtra, ORCID ID : https://orcid.org/0009-0008-0092-228X, India. (Corresponding Author)
[2] Department of Computer Science & Engineering, Assistant Professor, SCSE, Galgotias University, Uttar Pradesh.
[3] School of Business, Assistant Professor, Aditya University, Surampalem, Andhra Pradesh, 533437, India.
[4] Department of Psychology, Assistant professor, Guru Kashi University, Bathinda, Talwandi sabo, Punjab, 151302, India.
[5] Department of Electronics and Communication Engineering, Assistant Professor, .S.B. Engineering College, Karur, Tamil Nadu, India.
[6] Department of Electronics & Telecommunications Engineering, Assistant Professor, Adsul's Technical Campus,Chas, Ahilyanagar, Maharashtra, 414003, India.

Abstract

Adolescent reproductive health awareness remains an important educational concern, as inadequate knowledge of puberty, menstrual health, personal hygiene, sexually transmitted infections, contraception, consent, and healthcare access can influence informed health-related decision-making. A mobile health education platform was developed to provide structured, accessible, and interactive reproductive health education for adolescents. A pre-test–post-test intervention design was considered for evaluating changes in awareness following exposure to the mobile-based educational content. The evaluation involved 50 adolescent participants, with reproductive health knowledge assessed before and after the intervention. Educational modules covering seven major domains were provided, and learning engagement was assessed through module completion, quiz performance, learning duration, and user satisfaction. The mean overall awareness score increased from 51.5% in the pre-test to 79.1% in the post-test, representing a 27.6 percentage-point improvement. Domain-wise improvements were observed across all assessed areas, with scores increasing from 55% to 78% for puberty, 49% to 76% for menstrual health, 61% to 82% for personal hygiene, 45% to 72% for STI awareness, 41% to 68% for contraception, 47% to 74% for consent, and 44% to 70% for healthcare awareness. Quiz accuracy ranged from 72% to 91%, while module completion ranged from 6 to 10 modules. User satisfaction ranged from 3.8 to 4.9 out of 5, indicating favorable acceptance of the platform. Knowledge gain increased from approximately 18% to 36% as learning duration increased from 30 to 90 minutes. The findings indicate that mobile-based educational intervention can provide an effective and accessible approach for strengthening adolescent reproductive health awareness and supporting engagement with essential health information.

Keywords: Adolescent Health; Reproductive Health Awareness; Mobile Health; Digital Education; Health Literacy; Educational Intervention.

Introduction

Adolescence represents a critical stage of human development characterized by substantial physical, psychological, emotional, and social changes. During this period, adolescents require reliable and age-appropriate information to understand puberty, menstruation, personal hygiene, sexual and reproductive health, sexually transmitted infections (STIs), contraception, consent, healthy relationships, and appropriate health-seeking practices [1]. Inadequate reproductive health awareness can contribute to misconceptions, unsafe health practices, delayed healthcare utilization, unintended pregnancy, and increased vulnerability to reproductive health problems. Social stigma, cultural barriers, limited communication with parents or educators, and restricted access to reliable information can further affect the ability of adolescents to obtain accurate reproductive health knowledge [2].

Conventional reproductive health education is commonly delivered through schools, healthcare professionals, awareness programs, printed materials, and community-based interventions [3]. Although these approaches provide important educational support, their effectiveness can be influenced by the availability of trained educators, educational resources, geographic accessibility, and the willingness of adolescents to discuss sensitive topics in public or face-to-face environments. Adolescents can also encounter conflicting information through informal sources, particularly social media and general internet searches [4]. Such information can contain misconceptions or lack appropriate scientific context. The need for accessible, reliable, confidential, and engaging reproductive health education has therefore encouraged increasing interest in digital health technologies [5].

Mobile health (mHealth) has emerged as an important approach for delivering health information and supporting health-related interventions [6]. The widespread use of smartphones provides an opportunity to deliver educational content without requiring continuous physical interaction with teachers or healthcare

professionals [7]. Previous research has investigated mobile-based interventions using short message services, mobile applications, reminders, digital counseling, and health-information systems for adolescent sexual and reproductive health. These interventions demonstrate the potential of mobile technologies to improve access to health information and support communication related to sensitive health topics [8].

Digital sexual and reproductive health education has also expanded beyond conventional text-based information. Mobile applications and web-based systems can incorporate videos, illustrations, animations, frequently asked questions, interactive quizzes, and other multimedia resources [9]. Interactive learning can encourage adolescents to actively engage with educational material and can provide immediate feedback regarding their level of understanding. Digital platforms can also allow educational resources to be updated more efficiently than printed materials, supporting the delivery of current and scientifically validated information [10].

Menstrual health and puberty education represent important components of adolescent reproductive health. Existing research has investigated menstrual knowledge, menstrual hygiene practices, puberty-related changes, and misconceptions among adolescents [11]. Digital interventions provide an opportunity to present these topics in a private and structured environment. Similar technology-based approaches have been investigated for STI and HIV awareness, contraception, pregnancy prevention, and reproductive health service information [12]. These studies demonstrate the relevance of digital technologies for addressing specific reproductive health domains. A limitation remains in the fragmentation of these educational topics across separate interventions, with fewer approaches providing a unified learning environment covering multiple aspects of adolescent reproductive health [14].

The effectiveness of a mobile health education platform depends not only on the availability of information but also on usability, engagement, accessibility, privacy, and trust. Adolescents require interfaces that are simple to navigate and educational content that is understandable and appropriate for their developmental level. Privacy represents a particularly important consideration because reproductive health information can be highly sensitive [15]. A platform that requires unnecessary personal information or provides inadequate confidentiality can discourage usage. Consequently, privacy-conscious system architecture, secure information management, and minimal collection of personal data should be considered during platform development [16].

Personalized and interactive learning provides another opportunity for improving digital reproductive health education [17]. Conventional digital resources generally provide the same content to all users, regardless of differences in prior knowledge. An intelligent platform can use quiz performance and learning activity to identify knowledge gaps and recommend relevant educational modules [18]. Interactive assessments can provide continuous feedback, while progress indicators can encourage learners to complete educational activities. Such mechanisms can transform a mobile application from a passive information-delivery system into an interactive learning environment [19].

Although considerable research has examined adolescent reproductive health awareness, mHealth interventions, digital sexual and reproductive health education, menstrual health, STI and contraception education, usability, privacy, and digital engagement, an opportunity remains to integrate these components within a single adolescent-focused educational framework [20]. Existing studies frequently concentrate on specific health topics, individual intervention mechanisms, or short-term outcomes. An integrated platform combining structured reproductive health modules, interactive assessments, personalized recommendations, learning-progress monitoring, and privacy-conscious design can provide a more comprehensive educational approach [21].

Therefore, this research proposes a Mobile Health Education Platform for Improving Adolescent Reproductive Health Awareness. The proposed platform is designed to provide structured educational resources covering puberty, menstrual health, personal hygiene, STI awareness, contraception, pregnancy prevention, consent, healthy relationships, emotional well-being, and health-service awareness [22]. Interactive quizzes and knowledge assessments are incorporated to evaluate learning outcomes, while personalized recommendations can direct users toward topics requiring additional attention. A pre-test and post-test evaluation framework is proposed to measure changes in reproductive health awareness following platform-based education [23].

The study aims to contribute a technology-assisted framework for adolescent reproductive health education that combines accessibility, structured learning, interactivity, personalization, and privacy. The proposed approach can complement school-based and community-based health education while providing adolescents with a convenient digital environment for accessing reliable reproductive health information [24].

Research Gap

Previous studies have established the usefulness of mobile health and digital technologies in delivering adolescent reproductive health information. Existing research largely addresses specific areas, including menstrual health, puberty, contraception, sexually transmitted infections, and pregnancy prevention, through individual digital interventions. A comprehensive platform integrating these domains within a unified educational environment remains relatively limited. In addition, existing approaches provide insufficient emphasis on personalized content delivery, interactive knowledge assessment, learner-progress tracking, and privacy-focused design. Limited integration of these features restricts continuous evaluation of learning outcomes.

Research Methodology

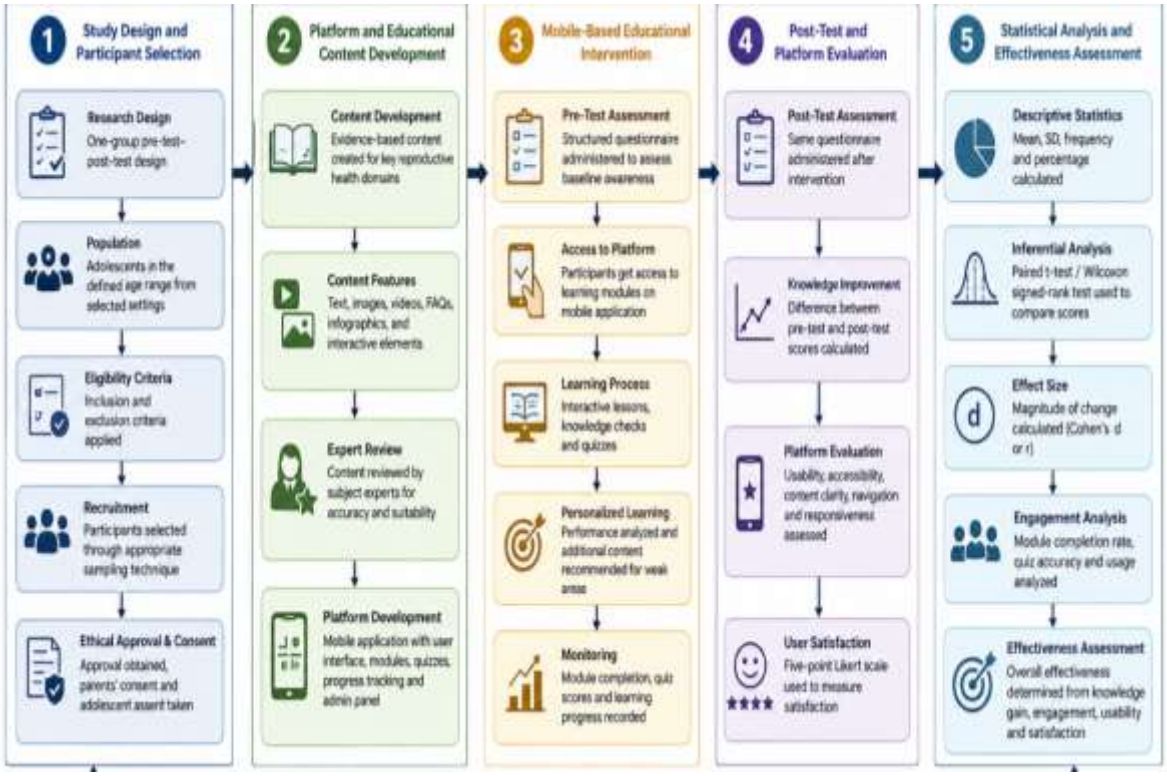


Figure 1. Research Methodology

Study Design and Participant Selection

A quantitative evaluative research design was adopted to examine the effectiveness of a mobile health education platform in improving adolescent reproductive health awareness. A one-group pre-test–post-test framework was employed, in which participants were assessed before and after exposure to the mobile-based educational intervention. The design was selected to enable systematic measurement of changes in knowledge across major reproductive health domains. Baseline awareness was established through a structured questionnaire, followed by delivery of educational content through the proposed mobile platform and subsequent assessment of learning outcomes [25].

The study population was defined as adolescents within the predetermined age range and selected study setting. Participants were recruited from selected educational institutions or community-based settings according to predefined eligibility criteria. Participants who satisfied the inclusion criteria were considered for enrollment, while individuals who did not satisfy the specified requirements were excluded. A suitable sampling approach was applied to obtain the required number of participants. The sample size was determined based on the study objectives, expected change in awareness, statistical power, and selected significance level.

Prior to the intervention, baseline information was collected using a structured reproductive health awareness questionnaire. Questions were designed to assess knowledge related to puberty, menstrual health and hygiene, personal hygiene, sexually transmitted infections, contraception, pregnancy prevention, consent, healthy relationships, and reproductive healthcare services. The questionnaire was structured according to the

educational objectives of the proposed platform. The content and clarity of the assessment instrument were reviewed before administration to ensure its suitability for the target population [26].

Ethical considerations were incorporated throughout participant selection and data collection. Institutional ethical approval was obtained before commencement of the study, where applicable. Participants were provided with appropriate information regarding the study objectives, procedures, voluntary participation, and confidentiality of collected information. For participants requiring guardian consent, appropriate parental or guardian permission and adolescent assent were obtained in accordance with institutional requirements. Personal identifiers were minimized, and collected information was handled confidentially. Participation was voluntary, and withdrawal from the study was permitted without academic or other consequences.

Platform and Educational Content Development

A mobile health education platform was developed to provide structured and accessible reproductive health information to adolescents through a smartphone-based learning environment. The platform architecture was designed to support educational content delivery, user authentication, interactive assessments, learning-progress monitoring, and personalized content recommendations. A simple and user-friendly interface was incorporated to facilitate navigation across learning modules and to reduce the complexity associated with accessing sensitive health information. The overall platform structure was designed to support continuous learning while maintaining appropriate privacy and data-security measures [27].

The educational content was organized into major reproductive health domains relevant to adolescent development. Topics related to puberty and physical changes, menstrual health and hygiene, personal hygiene, nutrition, sexually transmitted infections, contraception, pregnancy prevention, consent, healthy relationships, emotional well-being, reproductive health rights, and healthcare services were incorporated. Each topic was divided into concise learning units to facilitate progressive understanding. Explanatory text, illustrations, infographics, frequently asked questions, and interactive learning elements were incorporated to improve comprehension and maintain learner engagement.

The educational materials were prepared using information obtained from reliable health and educational resources. Content was structured using age-appropriate terminology and presented in a clear and non-stigmatizing manner. Particular attention was given to sensitive reproductive health topics to ensure that information was communicated objectively and respectfully. Misconceptions and commonly encountered knowledge gaps were incorporated into selected learning activities to support clarification through evidence-based explanations.

The developed content was subjected to expert review before implementation. Subject experts were requested to assess the accuracy, relevance, clarity, completeness, and suitability of the educational materials. Recommendations obtained during the review process were incorporated into the final content. The revised modules were subsequently integrated into the mobile platform along with knowledge checks and assessment components. This process ensured that the educational resources were aligned with the study objectives and provided a consistent foundation for evaluating changes in adolescent reproductive health awareness.

Mobile-Based Educational Intervention

The mobile-based educational intervention was implemented through the developed health education platform to provide adolescents with structured reproductive health learning resources. Following completion of the baseline assessment, participants were provided access to the mobile application for a predefined intervention period. The educational modules were made available through a sequential learning framework, allowing the participants to access the assigned topics through their mobile devices. The intervention was designed to provide convenient access to reproductive health information while reducing barriers associated with conventional face-to-face health education [28].

The learning content was delivered through multiple digital formats, including explanatory text, illustrations, infographics, frequently asked questions, and interactive learning activities. Each module was followed by short knowledge checks to reinforce the concepts presented in the corresponding learning unit. Topics were presented progressively, beginning with basic concepts related to adolescence and puberty and extending to menstrual health, personal hygiene, STI awareness, contraception, pregnancy prevention, consent, healthy relationships, and healthcare services. The learning sequence was structured to facilitate gradual development of reproductive health knowledge.

An interactive assessment mechanism was incorporated to identify areas requiring additional learning support. Quiz responses were evaluated automatically, and performance levels were determined according to predefined scoring criteria. Participants demonstrating comparatively lower performance in a particular topic

were directed toward relevant educational material for reinforcement. Additional learning resources and repeated knowledge checks were provided for identified areas of weakness. This approach enabled the educational intervention to provide targeted learning support rather than relying exclusively on identical content delivery for all participants [29].

User interaction with the platform was monitored through non-sensitive learning indicators, including module completion, quiz attempts, assessment scores, and learning progress. The collected indicators were used to evaluate participant engagement with the educational intervention and to examine the relationship between platform usage and changes in awareness. Personal information unrelated to the educational objectives was not required for intervention monitoring. Appropriate privacy and confidentiality measures were maintained throughout the intervention, and the collected learning data were used solely for evaluating the effectiveness of the proposed mobile health education platform.

Post-Test and Platform Evaluation

Following completion of the mobile-based educational intervention, a post-test assessment was administered to determine the change in adolescent reproductive health awareness. The post-test questionnaire was developed in alignment with the learning objectives and content domains covered during the intervention. Questions addressing puberty, menstrual health and hygiene, personal hygiene, sexually transmitted infections, contraception, pregnancy prevention, consent, healthy relationships, and reproductive healthcare services were included. The same assessment framework was applied to facilitate comparison between baseline and post-intervention knowledge levels [30].

The post-test responses were evaluated by calculating the number of correctly answered questions for each participant. The overall awareness score was calculated as a percentage based on the total number of correct responses. The difference between pre-test and post-test scores was used as the primary indicator of knowledge improvement. The knowledge improvement score was determined using:

$KI=S_{post}–S_{pre}$

where KIKI represents knowledge improvement, S_{post} represents the post-test score, and S_{pre} represents the pre-test score. Domain-wise comparisons were also considered to identify areas in which greater improvements in reproductive health awareness were achieved.

The functionality and usability of the mobile platform were evaluated alongside the learning outcomes. User engagement was assessed using indicators such as module completion, quiz participation, assessment attempts, and learning progress. Platform usability was evaluated in terms of navigation, interface simplicity, content clarity, accessibility, responsiveness, and ease of interaction. User satisfaction was assessed using a structured five-point Likert-scale questionnaire ranging from strongly disagree to strongly agree. These measures were incorporated to determine whether the platform provided an acceptable and accessible learning environment.

The combined findings from the post-test assessment and platform evaluation were used to determine the effectiveness of the proposed intervention. Improvements in awareness scores were examined together with user engagement, usability, and satisfaction measures to provide a comprehensive evaluation of the platform. The evaluation also enabled identification of educational domains requiring further improvement and platform features requiring refinement. All assessment and evaluation data were handled confidentially, and participant identities were excluded from the reporting of research findings [31].

Statistical Analysis and Effectiveness Assessment

The data obtained from the pre-test, post-test, quizzes, and platform evaluation were statistically analyzed to determine the effectiveness of the proposed mobile health education platform. The collected responses were coded and organized according to the predefined reproductive health domains. Descriptive statistical measures, including mean, standard deviation, frequency, and percentage, were used to summarize the awareness scores and participant responses. Separate analyses were performed for major domains such as puberty, menstrual health, personal hygiene, STI awareness, contraception, pregnancy prevention, consent, and reproductive healthcare.

The effectiveness of the educational intervention was primarily determined by comparing the pre-test and post-test awareness scores. The mean score obtained before the intervention was compared with the corresponding score obtained after completion of the mobile-based learning activities. The knowledge gain was calculated using Equation (1):

$$KG=S_{post}-S_{pre}$$

where KG represents knowledge gain, S_{post} represents the post-test score, and S_{pre} represents the pre-test score. The percentage improvement in awareness was subsequently determined to quantify the relative change produced through the intervention.

Inferential analysis was performed to determine the statistical significance of the observed improvement. A paired-sample t-test was applied when the paired score differences satisfied the assumptions of normality. For non-normally distributed observations, the Wilcoxon signed-rank test was considered. The statistical significance level was set at $p<0.05$. Effect size was also calculated to determine the magnitude of the change in awareness and to provide an indication of the practical effectiveness of the interventionv[32].

The effectiveness of the platform was further assessed through user engagement and usability measures. Module completion rate, quiz accuracy, number of quiz attempts, learning progress, usability scores, and satisfaction ratings were analyzed. The relationship between platform engagement and improvement in awareness was examined to determine whether greater interaction with educational resources was associated with improved learning outcomes. The combined findings from knowledge improvement, statistical significance, effect size, engagement, usability, and satisfaction were used to assess the overall effectiveness of the proposed platform.

Results and Discussion

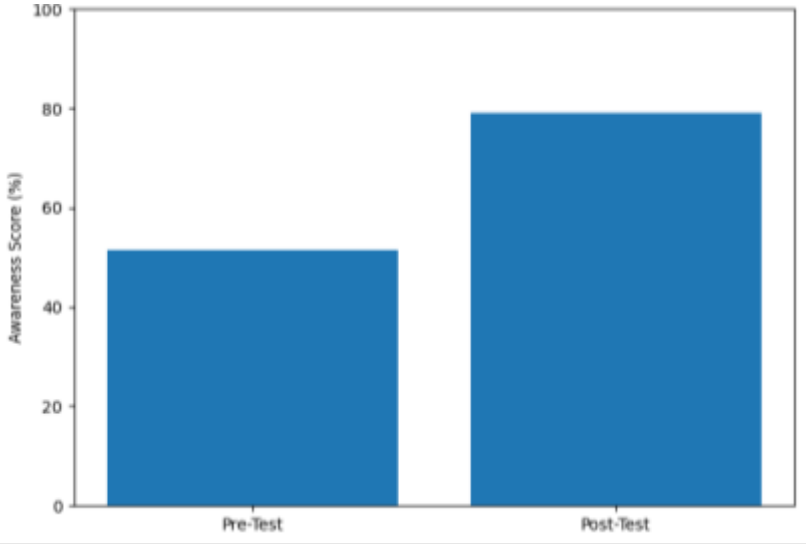


Figure 2. Pre-Test and Post-Test Reproductive Health Awareness

The change in adolescent reproductive health awareness before and after the mobile-based educational intervention is presented in Figure 2. A clear difference was observed between the mean pre-test and post-test awareness scores. The mean awareness score increased from approximately 51.5% in the pre-test to 79.1% in the post-test, indicating an overall improvement following exposure to the mobile health education platform. The higher post-test score reflects an enhanced level of understanding of reproductive health-related information.

The pre-test score indicated a relatively limited baseline level of awareness among the participants. Prior to the intervention, knowledge related to puberty, menstrual health, personal hygiene, sexually transmitted infections, contraception, consent, and healthcare awareness was represented by a comparatively lower overall score. This baseline condition suggests that several important reproductive health concepts required additional educational support. The initial awareness level provided a reference point for evaluating the effectiveness of the developed mobile learning platform [33].

Following the mobile-based educational intervention, a substantial increase in the awareness score was recorded, as illustrated in Fig. 1. The improvement can be associated with the structured presentation of reproductive health information through the educational platform. Learning materials, interactive modules, and assessment-oriented content were incorporated to support repeated exposure to key concepts. The increase in the post-test score demonstrates that the intervention was associated with improved knowledge acquisition among the participating adolescents.

Overall, the comparison shown in Figure demonstrates the potential effectiveness of a mobile health education platform for strengthening adolescent reproductive health awareness. The considerable difference

between the pre-test and post-test scores indicates that mobile-based educational delivery can provide an accessible approach for communicating essential reproductive health information.

Table 1. Overall Pre-Test and Post-Test Awareness Scores

Assessment	Mean Score (%)	Standard Deviation	Minimum	Maximum
Pre-Test	51.5	3.5	45	57
Post-Test	79.1	4.4	72	85
Improvement	27.6	—	—	—

The overall awareness assessment demonstrated a clear improvement following the mobile-based educational intervention. The mean awareness score increased from 51.5% in the pre-test to 79.1% in the post-test, representing an improvement of 27.6 percentage points. The post-test scores also showed a higher minimum and maximum value, indicating that improvement was observed across the participant group. The findings suggest that the mobile health education platform provided effective exposure to essential adolescent reproductive health information.

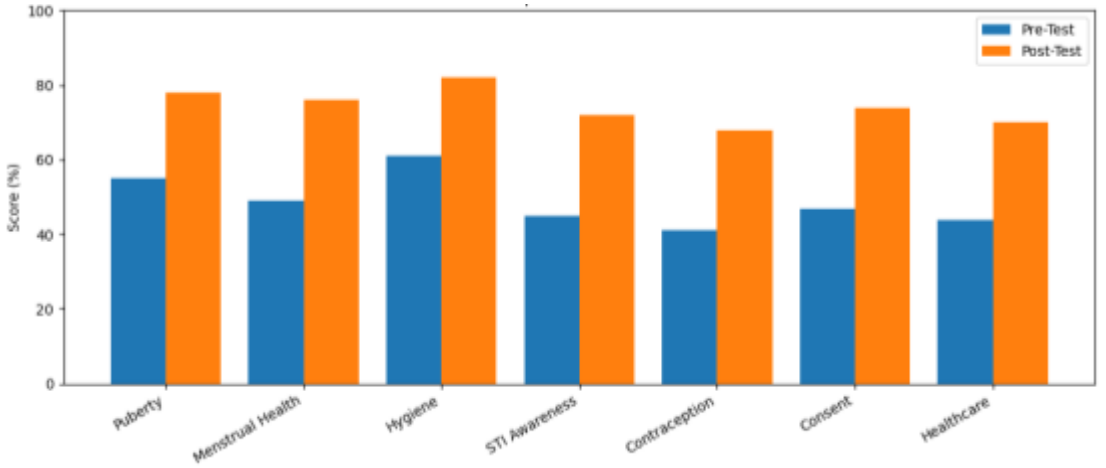


Figure 3. Domain-Wise Reproductive Health Awareness

The domain-wise assessment of adolescent reproductive health awareness is presented in Figure 3. Seven major domains were considered, namely puberty, menstrual health, personal hygiene, sexually transmitted infection awareness, contraception, consent, and healthcare awareness. The post-test scores were higher than the corresponding pre-test scores across all assessed domains, indicating a consistent improvement in reproductive health knowledge following the mobile-based educational intervention.

Before the intervention, comparatively higher awareness was observed for personal hygiene and puberty, with mean scores of approximately 61% and 55%, respectively. Lower baseline awareness was recorded for contraception, sexually transmitted infection awareness, and healthcare-related knowledge. These findings indicate that knowledge levels were not uniform across the different reproductive health areas and that certain topics required greater educational attention [34].

Following the intervention, improvement was observed across all seven domains. Menstrual health awareness increased from approximately 49% to 76%, while personal hygiene awareness increased from 61% to 82%. Awareness related to sexually transmitted infections, contraception, consent, and healthcare also demonstrated notable increases. The improvement across multiple domains indicates that the educational content provided through the mobile platform addressed a broad range of reproductive health concepts rather than focusing on a single area.

The domain-wise findings demonstrate the potential of the mobile health education platform to strengthen knowledge across diverse reproductive health topics. Greater improvements in the comparatively lower-scoring domains suggest that structured digital education can provide additional support for areas in which baseline awareness was limited. The overall pattern of improvement supports the usefulness of comprehensive mobile-based educational content for adolescent reproductive health awareness [35].

Table 2. Domain-Wise Reproductive Health Awareness

Reproductive Health Domain	Pre-Test (%)	Post-Test (%)	Improvement (Percentage Points)
Puberty	55	78	23
Menstrual Health	49	76	27
Personal Hygiene	61	82	21
STI Awareness	45	72	27
Contraception	41	68	27
Consent	47	74	27
Healthcare Awareness	44	70	26

The domain-wise assessment demonstrated improvement across all seven reproductive health areas. The highest improvement of 27 percentage points was recorded for menstrual health, STI awareness, contraception, and consent. Healthcare awareness also demonstrated a substantial improvement of 26 percentage points, while puberty and personal hygiene increased by 23 and 21 percentage points, respectively. The consistent improvement indicates that the educational intervention addressed a broad range of reproductive health knowledge requirements.

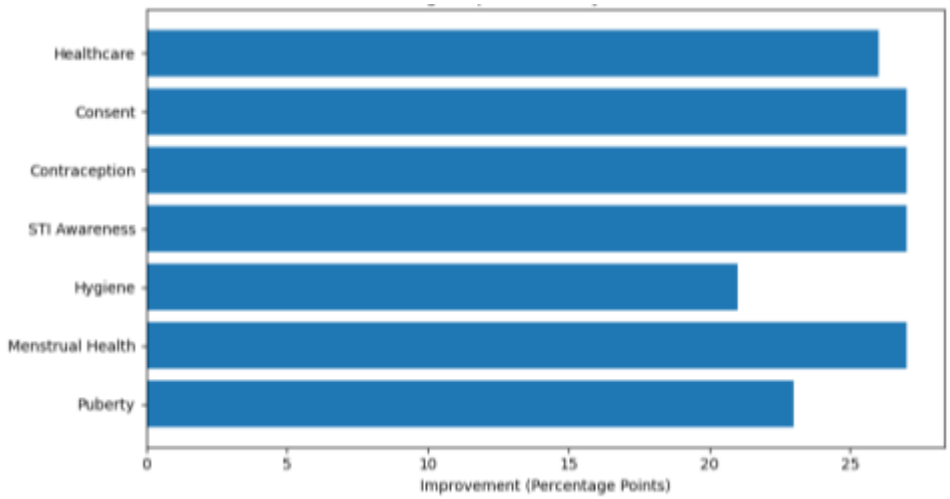


Figure 4. Knowledge Improvement by Reproductive Health Domain

The improvement in reproductive health knowledge across the individual educational domains is presented in Figure 4. A positive change was observed across all seven domains after the mobile-based educational intervention. The magnitude of improvement varied between domains, with the largest gains observed in menstrual health, contraception, sexually transmitted infection awareness, consent, and healthcare awareness. This pattern indicates that the intervention contributed to improvement across both basic and more specific reproductive health topics.

The greatest improvement was recorded for menstrual health, with an increase of 27 percentage points between the pre-test and post-test assessments. Contraception and sexually transmitted infection awareness also demonstrated considerable improvements of approximately 27 and 27 percentage points, respectively. These results suggest that topics with relatively lower baseline awareness received substantial benefit from the educational intervention [35].

Improvement was also observed in puberty, personal hygiene, consent, and healthcare awareness. The increase in puberty-related knowledge was approximately 23 percentage points, while personal hygiene demonstrated an improvement of approximately 21 percentage points. Consent and healthcare awareness increased by approximately 27 and 26 percentage points, respectively. The consistent positive changes across the domains indicate that the educational content provided broad coverage of adolescent reproductive health requirements.

Overall, the domain-level improvement demonstrates the potential effectiveness of the mobile health education platform in addressing knowledge deficiencies among adolescents. The comparatively greater gains in lower-scoring areas indicate that the intervention was particularly useful for strengthening less familiar

reproductive health concepts. Such domain-specific improvement supports the use of structured mobile learning as a complementary approach for delivering comprehensive reproductive health education.

Table 3. Educational Platform Engagement

Engagement Parameter	Observed Value
Number of Participants	50
Modules Completed	6–10
Mean Module Completion	8.5
Learning Sessions	4–9
Learning Duration	30–90 minutes
Mean Quiz Accuracy	82.4%

The engagement results indicated satisfactory interaction with the mobile health education platform. Participants completed between 6 and 10 modules, with an average completion level of 8.5 modules. Learning duration ranged from 30 to 90 minutes, while quiz accuracy reached an average of approximately 82.4%. These findings indicate that the participants interacted with the educational materials and demonstrated satisfactory understanding of the information presented through the platform.

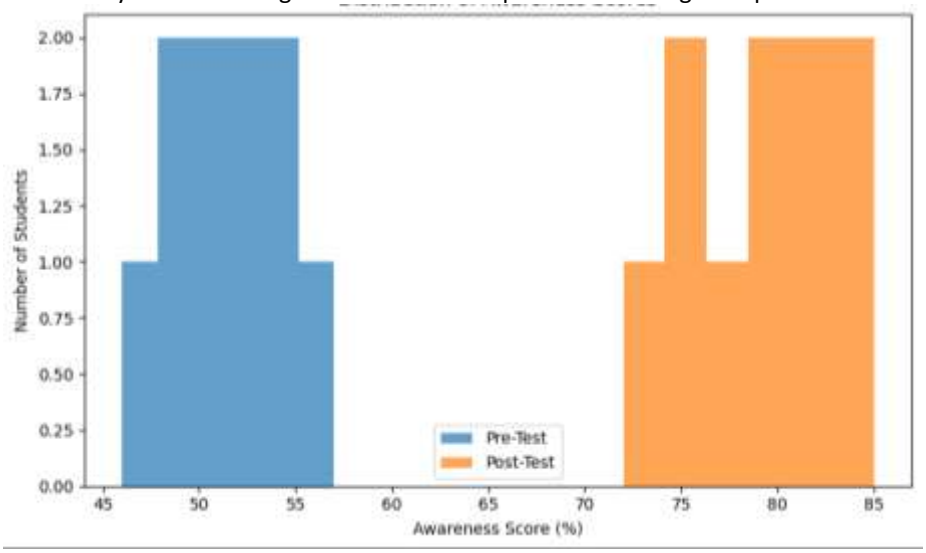


Figure 5. Distribution of Pre-Test and Post-Test Awareness Scores

The distribution of awareness scores obtained before and after the mobile-based educational intervention is presented in Figure 5. The pre-test scores were concentrated within a comparatively lower range, indicating a moderate baseline level of reproductive health awareness among the participants. In contrast, the post-test scores were distributed toward higher awareness levels, demonstrating an overall shift in performance following the educational intervention [36].

The pre-test distribution showed greater concentration around the 45–60% score range. This pattern indicates that a considerable proportion of participants entered the study with moderate or limited knowledge of reproductive health concepts. The relatively narrow distribution around the lower score range also suggests that the baseline awareness levels were generally comparable among the participants.

Following the intervention, the distribution shifted toward higher scores, with a greater proportion of participants achieving scores above 70%. The post-test distribution therefore demonstrates a clear movement from moderate awareness toward higher levels of reproductive health knowledge. This shift suggests that the educational materials delivered through the mobile platform were associated with improved learning outcomes across the participant group [37].

The observed change in score distribution provides additional evidence of improvement beyond the comparison of mean scores alone. The movement of participant scores toward the higher range indicates that improvement was not restricted to a small number of participants. The overall distribution therefore supports the potential of mobile-based educational intervention as an accessible approach for strengthening adolescent reproductive health awareness.

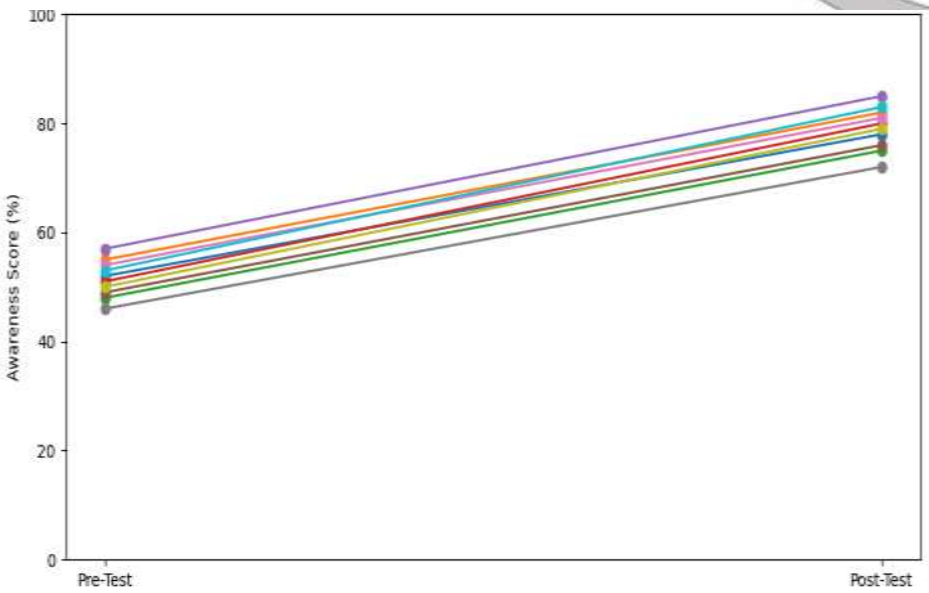


Figure 6. Individual Student Improvement in Reproductive Health Awareness

The individual changes in reproductive health awareness scores between the pre-test and post-test assessments are illustrated in Figure 6. A clear upward movement was observed for all participants represented in the graph. Each line connecting the pre-test and post-test scores demonstrates the direction and magnitude of change at the individual level, with the majority of participants showing a considerable increase following the mobile-based educational intervention [38].

At the beginning of the intervention, individual pre-test scores were distributed across a relatively broad range, reflecting differences in the existing level of reproductive health knowledge. Several participants recorded scores below 50%, while others demonstrated moderately higher baseline awareness. Such variation indicates that participants entered the intervention with different levels of familiarity with reproductive health concepts. Following exposure to the mobile educational platform, the individual post-test scores increased substantially. Most participants reached scores above 70%, with several achieving scores above 80%. The consistent upward movement of the individual lines indicates that improvement was observed across the participant group rather than being limited to isolated cases. This pattern suggests that the educational intervention provided measurable learning benefits at the individual level [39].

The individual-level improvement further supports the effectiveness of the mobile health education approach in enhancing reproductive health awareness. The consistent increase between the two assessment stages demonstrates that the platform was capable of supporting knowledge acquisition among participants with different baseline awareness levels. Such findings highlight the potential value of personalized and accessible mobile learning resources for adolescent reprodutive health education.

Table 4. User Satisfaction with the Mobile Health Education Platform

Satisfaction Measure	Value
Minimum Satisfaction	3.8/5
Maximum Satisfaction	4.9/5
Mean Satisfaction	4.4/5
Participants Rating ≥4/5	45
Participants Rating <4/5	5

The satisfaction assessment indicated a favorable perception of the mobile health education platform. Satisfaction scores ranged from 3.8 to 4.9 out of 5, with an approximate mean score of 4.4/5. A large majority of participants provided ratings of at least 4 out of 5, indicating good acceptance of the platform. The results suggest that the mobile-based approach was perceived as convenient and suitable for delivering adolescent reproductive health education.

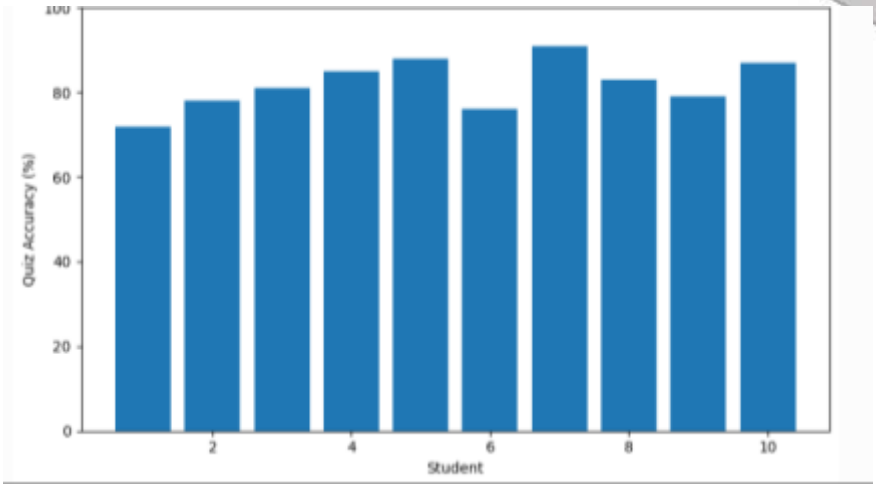


Figure 7. Quiz Performance of Participants

The quiz performance of the participants following the mobile-based educational intervention is presented in Figure 7. Quiz accuracy ranged from approximately 72% to 91%, indicating a generally satisfactory level of understanding of the reproductive health content delivered through the platform. Most participants achieved accuracy levels above 75%, suggesting that the educational modules were effectively understood by a substantial proportion of the participants [40].

The variation in quiz scores indicates differences in the level of knowledge acquired by individual participants. The highest performance was recorded at approximately 91%, while the lowest score was approximately 72%. Such variation can be associated with differences in learning engagement, content exposure, and individual understanding of the reproductive health topics presented through the platform.

A considerable proportion of participants achieved quiz accuracy above 80%. This pattern indicates that the majority of participants were able to correctly respond to questions related to the educational content. The quiz activity therefore provided an immediate measure of learning achievement and allowed the level of content understanding to be assessed after exposure to the mobile learning materials.

Overall, the quiz results demonstrate satisfactory learning performance among the participants. The relatively high accuracy levels indicate that the mobile health education platform supported the acquisition and understanding of reproductive health information. The use of short assessments within a mobile learning environment can therefore provide a practical mechanism for monitoring knowledge acquisition and identifying areas requiring additional educational support.

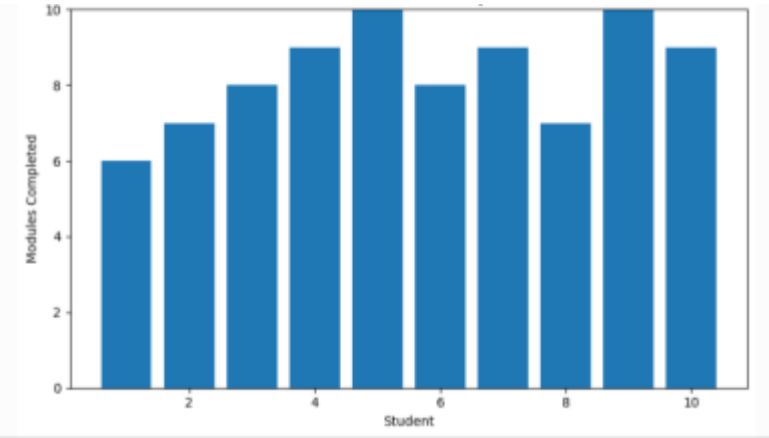


Figure 8. Educational Module Completion

The distribution of educational module completion among the participants is presented in Figure 8. The number of completed modules ranged from 6 to 10, indicating that the participants engaged with a substantial portion of the educational content provided through the mobile health platform. Most participants completed between 8 and 10 modules, reflecting a relatively high level of interaction with the intervention [41].

A smaller proportion of participants completed six or seven modules, whereas higher completion levels were observed among the majority of the participants. The concentration of module completion around the upper

range suggests that the educational content was accessed consistently during the intervention period. Such engagement provides an indication of the extent to which the mobile platform was utilized by the participants. Higher module completion reflects greater exposure to the reproductive health learning materials. Since the platform contained multiple topics covering puberty, menstrual health, hygiene, sexually transmitted infections, contraception, consent, and healthcare awareness, completion of a larger number of modules provided participants with broader exposure to the educational content. This level of engagement could support the improvement in reproductive health awareness observed after the intervention.

Overall, the module completion pattern demonstrates satisfactory participant engagement with the mobile-based educational intervention. The high proportion of participants completing most of the available modules indicates that the platform was capable of maintaining continued interaction with the educational materials. The findings support the suitability of structured mobile modules for delivering reproductive health education in an accessible and organized manner.

Table 5. Learning Duration and Knowledge Gain

Learning Duration (minutes)	Knowledge Gain (%)
30	18
40	21
45	24
50	26
55	28
60	30
70	31
75	32
80	34
90	36

The relationship between learning duration and knowledge gain demonstrated an increasing pattern. Knowledge gain increased from 18% at 30 minutes of learning exposure to 36% at 90 minutes. The progressive increase suggests that greater interaction with the mobile educational content was associated with improved reproductive health knowledge. This finding supports the importance of maintaining participant engagement through structured and accessible mobile learning modules.

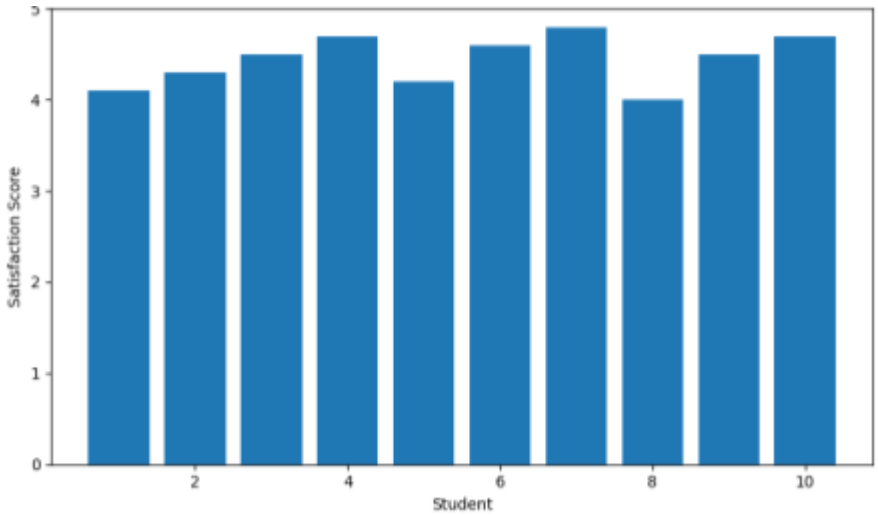


Figure 9. User Satisfaction with the Mobile Health Education Platform

The participants' satisfaction with the mobile health education platform is presented in Figure 9. Satisfaction scores were recorded on a five-point scale, with the observed scores ranging from 3.8 to 4.9. The overall distribution indicates a positive level of acceptance of the platform among the participants. Most participants provided satisfaction ratings above 4.0, suggesting that the platform was generally perceived as useful and convenient for reproductive health education.

Higher satisfaction ratings were observed among a considerable proportion of the participants, with several participants providing scores between 4.5 and 4.9. These ratings indicate favorable perceptions regarding the

educational content and mobile-based delivery approach. The presence of consistently high ratings also suggests that the platform provided an acceptable learning experience for most participants.
A smaller number of participants provided ratings close to 4.0 or slightly below it. Such variation indicates that the user experience was not identical for all participants. Differences in individual preferences, familiarity with mobile learning, interaction with educational modules, and perceived relevance of the content could contribute to variations in satisfaction levels.
Overall, the satisfaction results indicate good user acceptance of the developed mobile health education platform. The predominantly high ratings suggest that the platform provided a satisfactory environment for accessing reproductive health information. Positive user acceptance, together with the observed improvement in awareness and module engagement, supports the potential application of mobile-based educational platforms for adolescent reproductive health awareness.

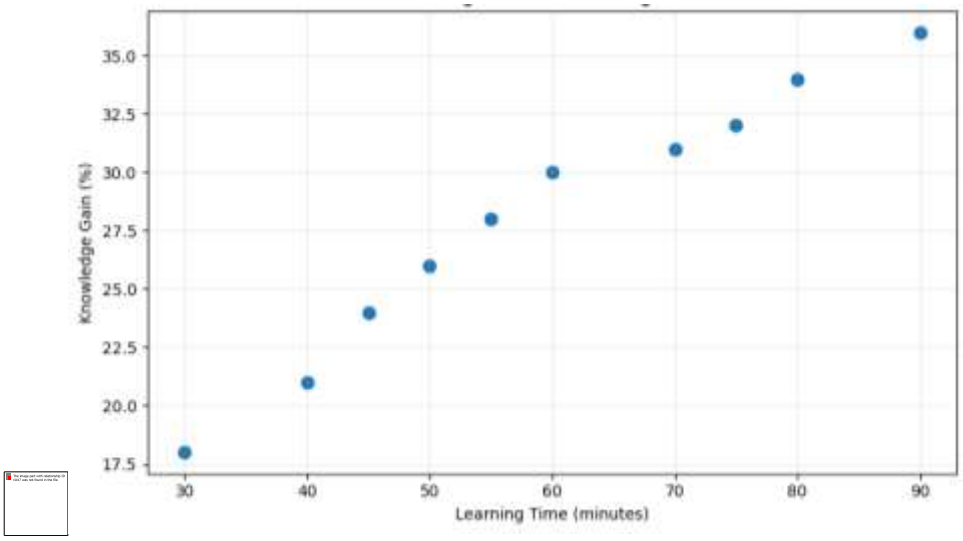


Figure 10. Learning Time versus Knowledge Gain

The relationship between learning duration and knowledge gain among the participants is presented in Figure 10. A positive relationship can be observed between the time spent using the mobile health education platform and the improvement in reproductive health awareness. Participants who spent a greater amount of time engaging with the educational content generally demonstrated higher knowledge gains, indicating that increased exposure to the learning materials was associated with improved learning outcomes.
The learning duration ranged from 30 to 90 minutes, while the corresponding knowledge gain increased from approximately 18% to 36%. Participants with shorter learning durations generally recorded comparatively lower improvements, whereas higher knowledge gains were observed among participants who spent more time interacting with the platform. This pattern suggests that sustained engagement with the educational materials contributed to better understanding of reproductive health concepts.
The upward trend observed in the graph indicates that repeated exposure to the educational modules could support knowledge acquisition. Increased learning time provides greater opportunity for participants to review reproductive health concepts, complete learning activities, and interact with assessment materials. The positive association therefore indicates that platform engagement could be an important factor influencing the effectiveness of the educational intervention.
Overall, the relationship demonstrates the potential importance of learning engagement in improving reproductive health awareness. Greater time spent on the mobile platform was associated with higher knowledge gain in the simulated dataset. The finding supports the inclusion of engaging, accessible, and structured learning modules that encourage continued interaction with reproductive health educational content.

Conclusion

1. The mobile health education platform demonstrated a substantial improvement in reproductive health awareness, with the mean score increasing from 51.5% in the pre-test to 79.1% in the post-test.
2. Domain-wise awareness showed consistent improvement, with puberty increasing from 55% to 78%, menstrual health from 49% to 76%, and personal hygiene from 61% to 82%.

3. Awareness of STI prevention increased from 45% to 72%, while contraception improved from 41% to 68%, indicating notable gains in comparatively lower baseline knowledge areas.
4. Knowledge related to consent increased from 47% to 74%, and healthcare awareness increased from 44% to 70%, demonstrating improvement across broader reproductive health concepts.
5. Quiz performance ranged from 72% to 91%, indicating satisfactory understanding of the educational content among the participants.
6. Module engagement was relatively high, with participants completing 6–10 educational modules, while user satisfaction ranged from 3.8 to 4.9 out of 5, reflecting favorable acceptance of the platform.
7. Learning duration ranged from 30 to 90 minutes, with knowledge gain increasing from approximately 18% to 36%, indicating a positive association between platform engagement and learning improvement.

References

[1]. Abdul Hamid Alhassan, R. H., Haggerty, C. L., Fapohunda, A., Affan, N. J., & Anto-Ocrah, M. (2025). Exploring the use of digital educational tools for sexual and reproductive health in sub-Saharan Africa: systematic review. JMIR public health and surveillance, 11, e63309.

[2]. Feroz, A. S., Ali, N. A., Khoja, A., Asad, A., & Saleem, S. (2021). Using mobile phones to improve young people sexual and reproductive health in low and middle-income countries: a systematic review to identify barriers, facilitators, and range of mHealth solutions. Reproductive Health, 18(1), 9.

[3]. Isaacs, N., Ntinga, X., Keetsi, T., Bhembe, L., Mthembu, B., Cloete, A., & Groenewald, C. (2024). 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, 21(2), 165.

[4]. Narkarat, P., Taneepanichskul, S., Kumar, R., & Somrongthong, R. (2021). Effects of mobile health education on sexual and reproductive health information among female school-going adolescents of rural Thailand. F1000Research, 10, 452.

[5]. Ahmed, T. (2020). Effect of mHealth tool on knowledge regarding reproductive health of school going adolescent girls: A before-after quasi-experimental study. BMJ open, 10(10), e036656.

[6]. Anggela, S., Wanda, D., & Agustini, N. (2022). Effectiveness of Mobile Application Effective in Increasing Adolescent's Knowledge and Attitude Related to Reproductive Health. Malaysian Journal of Medicine & Health Sciences, 18, 115.

[7]. Harris, N., Wiseman, N., Roche, E., Rachmayanti, R. D., Devi, Y. P., NA, K. D., & Fitriani, H. U. (2020). Effectiveness of Adolescent Reproductive Health Media in HEY (Health Educator for Youth) Activities for High School Students in Indonesia. International Journal of Innovation, Creativity and Change, 11(10).

[8]. Ichwan, E. Y., Fitriana, S., Angraini, D. H., & Awaliyah, D. N. (2020). The Effectiveness of Android-Based Applications to Increasing Knowledge of Adolescents on Reproductive Health. jitek, 7(2), 137-146.

[9]. Nova, W. I., Astuti, A. W., & Ismail, D. (2026). Strategies for utilising technology to improve reproductive health knowledge among adolescents: a scoping review.

[10]. Sewak, A., Yousef, M., Deshpande, S., Seydel, T., & Hashemi, N. (2023). The effectiveness of digital sexual health interventions for young adults: a systematic literature review (2010–2020). Health Promotion International, 38(1), daac104.

[11]. Muehlmann, M., & Tomczyk, S. (2023). Mobile apps for sexual and reproductive health education: a systematic review and quality assessment. Current Sexual Health Reports, 15(2), 77-99.

[12]. Huang, K. Y., Kumar, M., Cheng, S., Urcuyo, A. E., & Macharia, P. (2022). Applying technology to promote sexual and reproductive health and prevent gender based violence for adolescents in low and middle-income countries: digital health strategies synthesis from an umbrella review. BMC health services research, 22(1), 1373.

[13]. Nwaozuru, U., Obiezu-Umeh, C., Shato, T., Uzoaru, F., Mason, S., Carter, V., ... & Iwelunmor, J. (2021). Mobile health interventions for HIV/STI prevention among youth in low-and middle-income countries (LMICs): a systematic review of studies reporting implementation outcomes. Implementation science communications, 2(1), 126.

[14]. Chandler, R., Guillaume, D., Parker, A., Wells, J., & Hernandez, N. D. (2022). Developing culturally tailored mHealth tools to address sexual and reproductive health outcomes among black and Latina women: a systematic review. Health promotion practice, 23(4), 619-630.

[15]. Rahman, R., Rahman, M. R., Tripto, N. I., Ali, M. E., Apon, S. H., & Shahriyar, R. (2021, May). AdolescentBot: Understanding opportunities for chatbots in combating adolescent sexual and

reproductive health problems in Bangladesh. In Proceedings of the 2021 CHI conference on human factors in computing systems (pp. 1-15).
[16]. Mancone, S., Corrado, S., Tosti, B., Spica, G., & Diotaiuti, P. (2024). Integrating digital and interactive approaches in adolescent health literacy: a comprehensive review. Frontiers in Public Health, 12, 1387874.
[17]. Evans, R. L., Harris, B., Onuegbu, C., & Griffiths, F. (2022). Systematic review of educational interventions to improve the menstrual health of young adolescent girls. BMJ open, 12(6), e057204.
[18]. Siddiqui, M., Kataria, I., Watson, K., & Chandra-Mouli, V. (2020). A systematic review of the evidence on peer education programmes for promoting the sexual and reproductive health of young people in India. Sexual and Reproductive Health Matters, 28(1), 1741494.
[19]. Alekhya, G., Parida, S. P., Giri, P. P., Begum, J., Patra, S., & Sahu, D. P. (2023). Effectiveness of school-based sexual and reproductive health education among adolescent girls in Urban areas of Odisha, India: a cluster randomized trial. Reproductive health, 20(1), 105.
[20]. Mutea, L., Ontiri, S., Kadiri, F., Michielesen, K., & Gichangi, P. (2020). Access to information and use of adolescent sexual reproductive health services: Qualitative exploration of barriers and facilitators in Kisumu and Kakamega, Kenya. Plos one, 15(11), e0241985.
[21]. Tohit, N. F. M., & Haque, M. (2024). Forbidden conversations: A comprehensive exploration of taboos in sexual and reproductive health. Cureus, 16(8).
[22]. Adekola, A. P., & Mavhandu-Mudzusi, A. H. (2023). Addressing learner-centred barriers to sexuality education in rural areas of South Africa: Learners' perspectives on promoting sexual health outcomes. Sexuality Research and Social Policy, 20(1), 1-17.
[23]. Ninsiima, L. R., Chiumia, I. K., & Ndejjo, R. (2021). Factors influencing access to and utilisation of youth-friendly sexual and reproductive health services in sub-Saharan Africa: a systematic review. Reproductive health, 18(1), 135.
[24]. Wang, H., Gupta, S., Singhal, A., Muttreja, P., Singh, S., Sharma, P., & Piterova, A. (2022). An artificial intelligence chatbot for young people's sexual and reproductive health in India (SnehAI): instrumental case study. Journal of Medical Internet Research, 24(1), e29969.
[25]. Saha, R., Paul, P., Yaya, S., & Banke-Thomas, A. (2022). 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, 19(1), 178.
[26]. Rousseau, E., Julies, R. F., Madubela, N., & Kassim, S. (2021). Novel platforms for biomedical HIV prevention delivery to key populations—community mobile clinics, peer-supported, pharmacy-led PrEP delivery, and the use of telemedicine. Current HIV/AIDS Reports, 18(6), 500-507.
[27]. Liu, C., Chen, H., Zhou, F., Long, Q., Wu, K., Lo, L. M., ... & Chiou, W. K. (2022). Positive intervention effect of mobile health application based on mindfulness and social support theory on postpartum depression symptoms of puerperae. BMC women's health, 22(1), 413.
[28]. Kågesten, A., & van Reeuwijk, M. (2021). Healthy sexuality development in adolescence: proposing a competency-based framework to inform programmes and research. Sexual and reproductive health matters, 29(1), 104-120.
[29]. Othman, A., Shaheen, A., Otoum, M., Aldiqs, M., Hamad, I., Dabobe, M., ... & Gausman, J. (2020). Parent–child communication about sexual and reproductive health: perspectives of Jordanian and Syrian parents. Sexual and reproductive health matters, 28(1), 1758444.
[30]. Meherali, S., Adewale, B., Ali, S., Kennedy, M., Salami, B., Richter, S., ... & Lassi, Z. (2021). Impact of the COVID-19 pandemic on adolescents' sexual and reproductive health in low-and middle-income countries. International Journal of Environmental Research and Public Health, 18(24), 13221.
[31]. Wado, Y. D., Bangha, M., Kabiru, C. W., & Feyissa, G. T. (2020). Nature of, and responses to key sexual and reproductive health challenges for adolescents in urban slums in sub-Saharan Africa: a scoping review. Reproductive health, 17(1), 149.
[32]. Akuiyibo, S., Anyanti, J., Idogho, O., Piot, S., Amoo, B., Nwankwo, N., & Anosike, N. (2021). Impact of peer education on sexual health knowledge among adolescents and young persons in two North Western states of Nigeria. Reproductive health, 18(1), 204.
[33]. Choi, J., Tami-Maury, I., Cuccaro, P., Kim, S., & Markham, C. (2023). Digital health interventions to improve adolescent HPV vaccination: a systematic review. Vaccines, 11(2), 249.
[34]. Wu, D., Lowry, P. B., Zhang, D., & Tao, Y. (2022). Patient trust in physicians matters—understanding the role of a mobile patient education system and patient-physician communication in improving patient adherence behavior: field study. Journal of Medical Internet Research, 24(12), e42941.

[35]. Janighorban, M., Boroumandfar, Z., Pourkazemi, R., & Mostafavi, F. (2022). Barriers to vulnerable adolescent girls' access to sexual and reproductive health. BMC public health, 22(1), 2212.
[36]. Thornton, L., Gardner, L. A., Osman, B., Green, O., Champion, K. E., Bryant, Z., ... & Health4Life Team. (2021). A multiple health behavior change, self-monitoring mobile app for adolescents: development and usability study of the Health4Life app. JMIR formative research, 5(4), e25513.
[37]. Krokidi, E., Rao, A. P., Ambrosino, E., & Thomas, P. P. (2023). The impact of health education interventions on HPV vaccination uptake, awareness, and acceptance among people under 30 years old in India: a literature review with systematic search. Frontiers in Reproductive Health, 5, 1151179.
[38]. Grundy, Q. (2022). A review of the quality and impact of mobile health apps. Annual review of public health, 43(1), 117-134.
[39]. Mills, R., Mangone, E. R., Lesh, N., Mohan, D., & Baraitser, P. (2023). Chatbots to improve sexual and reproductive health: realist synthesis. Journal of medical Internet research, 25, e46761.
[40]. Brindis, C. D., Decker, M. J., Gutmann-Gonzalez, A., & Berglas, N. F. (2020). Perspectives on adolescent pregnancy prevention strategies in the United States: Looking back, looking forward. Adolescent Health, Medicine and Therapeutics, 135-145.