



# User Experience Evaluation of a Gamified Puberty Education Application Among Elementary School Students: A UEQ-Based Study

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## ABSTRACT

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**Background:** Adolescence is a critical developmental stage marked by physical, psychological, and social changes related to puberty and reproductive health. However, many adolescents still have limited understanding of puberty, which may increase risky behaviors. Gamified digital media may provide an engaging approach to puberty education. This study evaluated the user experience of the Pubertas Cerdas application, a gamified educational platform designed for elementary school students.

**Method:** A quantitative descriptive study with user testing was conducted among 140 elementary school students in Palembang, Indonesia. User experience was assessed using the User Experience Questionnaire (UEQ), covering attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. Data were analyzed descriptively using a scale ranging from -3 to +3.

**Result:** The Pubertas Cerdas application demonstrated positive results across all UEQ dimensions. The highest mean score was stimulation (2.20), followed by attractiveness (2.12) and efficiency (2.05), indicating that the application was engaging, appealing, and easy to use. Perspicuity (1.95), dependability (1.88), and novelty (1.76) also showed favorable evaluations, suggesting that the application was understandable, reliable, and innovative enough for users.

**Conclusion:** The Pubertas Cerdas application provides a positive user experience and shows potential as a digital learning medium for puberty education among adolescents. The application may support school-based health education through interactive and accessible learning. Further development is needed to enhance the application's innovative features and strengthen user engagement.

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## INTRODUCTION

Adolescence is a critical developmental period characterized by rapid biological, psychological, and social changes, particularly during puberty. These changes not only affect physical development but also influence cognitive processes, emotional regulation, and social interactions (S.-J. Blakemore & Mills, 2014; Dorn et al., 2019). Early adolescence represents a sensitive developmental stage in which individuals begin to develop autonomy, explore identity, and experience increasing peer influence, all of which may shape long-term health behaviors (Blum et al., 2017; van Hoorn et al., 2016).

However, puberty and reproductive health education among adolescents remains inadequate in many educational settings. Limited understanding of puberty may contribute to risky behaviors, including poor reproductive health practices, early sexual activity, and unintended pregnancy. Globally, approximately 23 million adolescents experience pregnancy each year, highlighting the urgency of strengthening reproductive health education for young people. In addition, adolescents continue to face preventable health risks, with an estimated 1.2 million deaths annually associated with behavioral and environmental factors (Mmari et al., 2021).

In Indonesia, discussions related to puberty and reproductive health are often considered sensitive, which may limit adolescents' access to accurate and age-appropriate information (Mahendra et al., 2020). Conventional educational approaches are also frequently perceived as less engaging for young learners. Therefore, innovative educational strategies are needed to deliver puberty education in ways that are interactive, accessible, and developmentally appropriate for early adolescents.

With the rapid advancement of digital technology, digital health education and gamification have emerged as promising strategies for adolescent learning. Gamification, defined as the use of game elements in non-game contexts, has been shown to improve motivation, engagement, and learning outcomes (Bozkurt & Durak, 2018). Previous studies have demonstrated that game-based learning environments can facilitate interactive and experiential learning experiences that encourage adolescents to participate more actively in educational activities (Qian & Clark, 2016). In the context of health education, gamified interventions have been associated with improved knowledge retention, engagement, and behavioral outcomes among adolescent users (Haruna et al., 2018, 2019; Ronimus et al., 2019).

Several digital applications have been developed to support adolescent reproductive and sexual health education. However, previous studies have predominantly focused on learning outcomes and behavioral changes rather than user experience aspects. Therefore, understanding how adolescents perceive and interact with digital educational applications remains an important issue. Based on this gap, the Pubertas Cerdas gamified digital application was developed to provide puberty education for early adolescents, and this study aims to evaluate its user experience using the User Experience Questionnaire (UEQ) among elementary school students in Palembang, Indonesia.

## METHOD

### Research Design

This study employed a quantitative descriptive study with a cross-sectional user testing approach to evaluate the user experience of the Pubertas Cerdas application among early adolescent users.

### Participants

The participants consisted of 140 fifth-grade elementary school students in Palembang, Indonesia. Participants were generally aged between 10 and 12 years, representing early adolescents who are entering the puberty phase. Fifth-grade students were specifically selected because this developmental stage is considered appropriate for introducing puberty and reproductive health education, as adolescents begin to experience physical, psychological, and social changes related to puberty.

A total sampling technique was applied, in which all eligible students who met the inclusion criteria were included in the study. The inclusion criteria were: (1) registered as fifth-grade students, (2) able to use mobile devices independently, and (3) willing to participate in the study with parental or guardian consent. Students who were absent during data collection or unable to complete the application testing session were excluded from the study.

### Ethical Considerations

This study was conducted in accordance with ethical research principles involving human participants. Ethical approval was obtained from the Health Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (Ethical Clearance No: 003-01A/111-22/EP-FKIK-UMY/IV/2023). Prior to data collection, informed consent was obtained from the participants and/or their guardians.

### Instrument

User experience was assessed using the User Experience Questionnaire (UEQ), a standardized instrument developed for evaluating user experience in interactive systems. The UEQ consists of 26 items grouped into six dimensions: attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. Each item is measured using a 7-point semantic differential scale ranging from negative to positive evaluations.

The UEQ has been widely applied in previous studies and has demonstrated good validity and reliability in assessing user experience of digital applications (Abdillah, 2019; Kushendriawan et al., 2021). Previous studies reported satisfactory internal consistency, with Cronbach's alpha values generally above 0.70 across UEQ dimensions, indicating acceptable reliability (Schrepp et al., 2017). In addition, the UEQ is recognized as a multidimensional instrument capable of evaluating both pragmatic quality (perspicuity, efficiency, and dependability) and hedonic quality (stimulation and novelty), as well as overall attractiveness of digital applications.

In this study, the Indonesian version of the UEQ was used to assess participants' subjective experiences after interacting with the Pubertas Cerdas application. The questionnaire items were reviewed to ensure linguistic clarity and suitability for elementary school students.

### Procedure

The study was conducted after the Pubertas Cerdas application had passed expert validation involving experts in nursing, psychology, health education, and information technology. Data collection was carried out in a controlled classroom environment using Android-based mobile devices.

Participants were first introduced to the application and provided with instructions on how to use its features and menus. They were then allowed to interact with the application

independently for approximately 20–30 minutes under researcher supervision to ensure that participants understood the testing procedures and completed all required activities. After the interaction session, participants completed the UEQ questionnaire based on their experiences while using the application.

### Data Analysis

Data were analyzed using descriptive statistics. The original UEQ responses, measured on a 7-point scale, were transformed into a standardized scale ranging from -3 to +3 by subtracting 4 from each response. Negatively worded items were reversed according to UEQ guidelines.

Mean scores and standard deviations were calculated for each UEQ dimension. The results were interpreted based on standard UEQ benchmark categories, where values above 0.8 indicate positive evaluation, values above 1.5 indicate good user experience, and values above 2.0 represent excellent user experience. Higher positive values indicate better user experience across the evaluated dimensions.

## RESULTS AND DISCUSSION

### Results

The characteristics of respondents are presented in Table 1. All participants in this study were fifth-grade elementary school students (100%), representing early adolescents. Based on gender, the respondents consisted of 70 male students (50.0%) and 70 female students (50.0%), indicating a balanced distribution between male and female participants.

**Table 1. Characteristics of Respondents**

No	Variable	Category	Frequency (n)	Percentage (%)
1	Gender	Male	70	50.0
		Female	70	50.0
2	Grade	Grade V (Elementary School)	140	100

The results of the User Experience Questionnaire (UEQ) analysis are shown in Table 2. Overall, the Pubertas Cerdas application demonstrated positive user experience across all six dimensions. The highest mean score was observed in the stimulation dimension (2.20), followed by attractiveness (2.12) and efficiency (2.05), indicating that the application is engaging, appealing, and easy to use. Meanwhile, perspicuity (1.95), dependability (1.88), and novelty (1.76) also showed positive evaluations, suggesting that the application is understandable, reliable, and sufficiently innovative.

**Table 2. User Experience Questionnaire (UEQ) Results**

No	Dimension	Mean	SD	Min	Max	Benchmark Category
1	Attractiveness	2.12	0.58	0.80	3.00	Excellent
2	Perspicuity	1.95	0.62	0.40	3.00	Good
3	Efficiency	2.05	0.55	0.60	3.00	Excellent
4	Dependability	1.88	0.60	0.20	3.00	Good
5	Stimulation	2.20	0.51	1.00	3.00	Excellent
6	Novelty	1.76	0.66	0.00	3.00	Good

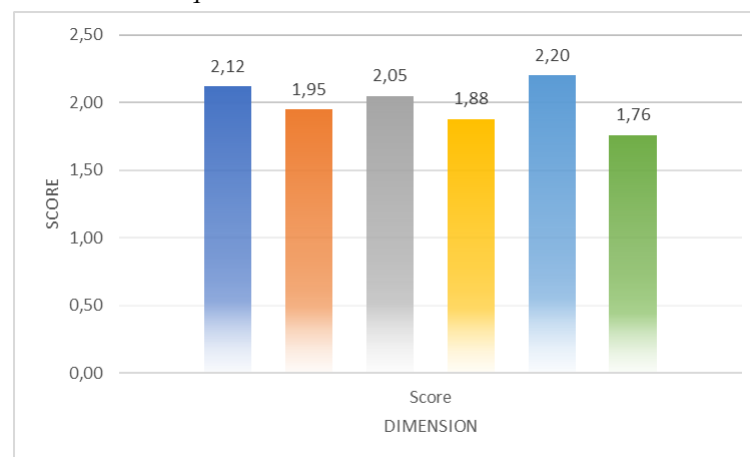
According to the official UEQ benchmark interpretation, values above 0.8 indicate positive evaluation, values above 1.5 represent good user experience, and values above 2.0 indicate excellent user experience (Schrepp et al., 2017). As presented in Table 2, all UEQ dimensions

obtained positive mean scores, indicating favorable user evaluations of the Pubertas Cerdas application.

The dimensions of stimulation ( $M = 2.20$ ;  $SD = 0.51$ ), attractiveness ( $M = 2.12$ ;  $SD = 0.58$ ), and efficiency ( $M = 2.05$ ;  $SD = 0.55$ ) reached the excellent benchmark category, suggesting that participants perceived the application as engaging, visually appealing, and easy to use. Meanwhile, perspicuity ( $M = 1.95$ ;  $SD = 0.62$ ), dependability ( $M = 1.88$ ;  $SD = 0.60$ ), and novelty ( $M = 1.76$ ;  $SD = 0.66$ ) were categorized as good, indicating that the application was considered understandable, reliable, and sufficiently innovative by users.

The relatively low standard deviation values across all dimensions indicate that participants' responses were generally consistent, reflecting similar perceptions regarding the usability and overall user experience of the application. In addition, the minimum and maximum scores demonstrate that all dimensions remained within the positive evaluation range.

The distribution of UEQ scores across dimensions is further illustrated in Figure 1. The figure demonstrates consistently positive evaluations across all dimensions, with stimulation achieving the highest score and novelty the lowest. This pattern suggests that the application was successful in creating an engaging learning experience, although there remains an opportunity to further enhance innovative and unique interactive features.



**Figure 1. User Experience Questionnaire (UEQ) Scale Results**

Figure 1 demonstrates a consistently positive trend across all UEQ dimensions, with stimulation showing the highest score among all dimensions. This finding suggests that the gamification elements and interactive features of the application were effective in creating an engaging learning experience for early adolescent users.

Meanwhile, novelty showed the lowest score, although it remained within the positive benchmark category. This pattern may indicate that participants perceived the application as useful and enjoyable, but not substantially different from other digital applications commonly used by adolescents.

## Discussion

The findings of this study demonstrate that the Pubertas Cerdas application provides a positive user experience across all UEQ dimensions, indicating that gamified digital approaches can be effectively utilized in puberty education among early adolescents. Beyond functioning as a medium for delivering information, the application appears to create an interactive and user-centered learning environment that supports adolescents' engagement and participation in educational activities. These findings reinforce previous evidence suggesting that digital gamified

learning environments can improve motivation, participation, and learning experiences among adolescent users (Bozkurt & Durak, 2018; Haruna et al., 2018).

The stimulation dimension achieved the highest score, suggesting that participants perceived the application as motivating and enjoyable. This finding may be associated with the integration of gamification elements, interactive activities, and visually engaging educational content that align with the developmental characteristics of early adolescents. At this age, students generally prefer exploratory, activity-based, and visually stimulating learning experiences rather than conventional lecture-based approaches (S. J. Blakemore & Mills, 2014). Gamified environments may therefore increase intrinsic motivation and sustain users' attention during learning activities. Recent studies have also shown that interactive digital learning environments can positively influence adolescents' emotional engagement and willingness to continue learning (Huang et al., 2023; Zainuddin et al., 2020).

The high attractiveness score further indicates that participants responded positively to the visual design, interface layout, and overall presentation of the application. Attractive educational applications are important because adolescents are more likely to engage with digital platforms that provide enjoyable and visually appealing experiences. In the context of health education, positive first impressions and pleasant interactions may contribute to greater acceptance and repeated use of educational applications (Kushendriawan et al., 2021). This finding suggests that visual and interactive design should be considered essential components in the development of adolescent digital health interventions.

Efficiency and perspicuity also demonstrated positive evaluations, indicating that participants were able to understand and navigate the application without substantial difficulty. This finding highlights the importance of simplicity and clarity in designing educational applications for younger users. Early adolescents are still developing cognitive processing abilities and digital literacy skills; therefore, intuitive navigation and understandable instructions play an important role in supporting positive user experiences (S. J. Blakemore & Mills, 2014). The relatively consistent responses across participants also suggest that the application interface was sufficiently understandable for users with potentially varying levels of digital familiarity.

Although the novelty dimension obtained the lowest score among all UEQ dimensions, it still remained within the positive benchmark category. This finding may indicate that participants perceived the application as useful and engaging, but not substantially different from other digital applications they commonly use. Children and adolescents today are highly exposed to mobile games, social media platforms, and interactive applications, which may increase their expectations regarding innovation and uniqueness in digital platforms (Sumaryani et al., 2024). Consequently, users may compare educational applications not only with other learning media, but also with commercial digital applications that provide highly immersive and sophisticated experiences.

Another possible explanation relates to the participants' digital literacy and technological exposure. As younger users become increasingly familiar with interactive technologies, standard gamification elements such as quizzes, badges, or point systems may no longer be perceived as highly innovative. This suggests that future development of the Pubertas Cerdas application may benefit from incorporating more adaptive and personalized features, such as interactive storytelling, dynamic feedback systems, or immersive multimedia components. Previous studies have shown that innovative digital features can increase long-term engagement, curiosity, and emotional involvement among adolescent users (Huang et al., 2023; Qian & Clark, 2016; Ronimus et al., 2019).

The dependability dimension also demonstrated positive evaluations, suggesting that participants generally felt comfortable and sufficiently in control while interacting with the application. Consistency in navigation, content organization, and system responsiveness may contribute to users' confidence in independently using the application (Parisod et al., 2017). In

digital health education, perceived reliability and ease of control are important because they influence user trust and continued engagement with educational technologies.

From a broader perspective, the findings support the growing evidence that digital and gamified educational approaches can contribute positively to adolescent health education (Sumaryani et al., 2024). In Indonesia, puberty and reproductive health discussions are often considered sensitive, and adolescents may experience barriers in accessing accurate information through conventional educational settings. Digital educational applications therefore offer an alternative learning approach that is more flexible, accessible, and aligned with adolescents' technological preferences (Blum et al., 2017).

The findings of this study also have important practical implications for the development of adolescent digital health education programs. Developers and educators should not only focus on educational content accuracy but also consider user experience aspects such as engagement, attractiveness, usability, and innovation. Applications that are interactive and developmentally appropriate may improve adolescents' willingness to access reproductive health information independently. In addition, incorporating user experience evaluation frameworks such as the UEQ can support evidence-based improvement of digital educational technologies.

Theoretically, this study contributes to the growing body of literature on gamified digital health education by demonstrating the applicability of the User Experience Questionnaire (UEQ) in evaluating puberty education applications among elementary school students. Unlike many previous studies that focused primarily on knowledge outcomes or usability testing, this study provides a more comprehensive evaluation of both pragmatic and hedonic aspects of user experience in adolescent digital learning environments.

Despite these positive findings, this study has several limitations. The participants were limited to fifth-grade elementary school students in one geographic area, which may restrict the generalizability of the findings to broader populations. In addition, the study focused only on subjective user experience evaluation and did not assess long-term educational outcomes such as knowledge retention or behavioral change. Future studies are recommended to involve more diverse populations and combine user experience evaluation with effectiveness testing to provide a more comprehensive assessment of digital puberty education applications.

### **Implications**

The findings of this study suggest that the Pubertas Cerdas application has strong potential as a digital educational tool for puberty education among early adolescents. The positive user experience indicates that the application can be effectively used to support health education programs in schools. Additionally, the results provide valuable insights for developers to further improve the application, particularly in enhancing its innovative features.

### **Research Contribution**

This study contributes to the growing body of research on digital health education by providing empirical evidence on the user experience of a gamified puberty education application using a standardized instrument (UEQ). It also highlights the importance of evaluating user experience as a key factor in the success of digital health interventions.

### **Limitations**

This study was conducted among a specific group of participants, namely fifth-grade elementary school students in Palembang, which may limit the generalizability of the findings. Additionally, the study relied on subjective user evaluations, which may be influenced by individual perceptions and experiences.

## Suggestions

Future studies are recommended to involve a more diverse sample and to explore the effectiveness of the application in improving knowledge and behavioral outcomes. Further development of the application may also focus on enhancing innovative features and interactivity to improve user engagement.

## CONCLUSION

This study demonstrated that the Pubertas Cerdas application provides a positive user experience across all UEQ dimensions among elementary school students in Palembang, Indonesia. The findings indicate that the application is engaging, easy to use, and well accepted by early adolescent users, with stimulation identified as the strongest dimension.

These results highlight the potential of gamified digital applications as effective tools for puberty and reproductive health education among early adolescents. The study also emphasizes the importance of user experience evaluation in developing digital health education applications that are interactive, user-friendly, and developmentally appropriate for young users.

Future research is recommended to evaluate the effectiveness of the application in improving knowledge and behavioral outcomes and to explore its implementation in broader educational settings.

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## AUTHOR CONTRIBUTION STATEMENT

MU, SS, and YN contributed to the study conception and design. MU, SS, and MHRR were responsible for data collection and analysis. YN and MHRR contributed to data interpretation and manuscript drafting. MU, SS, YN, and MHRR reviewed and approved the final version of the manuscript.

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