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Building Adolescents' Confidence in Understanding Puberty through Interactive Educational Media

Jumli Sabrial Harahap[1]*, Masril[2], Darimis[3], Elsadina Susandra[4]

[1,2,3,4]*Mahmud Yunus State Islamic University Batusangkar, West Sumatra, 22742, Indonesia*

Abstract. Adolescents often experience uncertainty and discomfort when discussing puberty due to limited knowledge, social stigma, and the lack of safe learning environments. Interactive visual media offers potential to simplify complex biological concepts while encouraging open communication. This community service program aimed to enhance adolescents' understanding of puberty and their confidence in discussing related topics through an engaging, interactive educational intervention. The program employed a participatory pretest–posttest design involving 14 adolescents aged 12–15 years. Activities included visual flash cards, scenario discussions, group-based learning tasks, and reflection sessions. A structured questionnaire measured knowledge and confidence before and after the intervention. Quantitative data (pretest–posttest scores and N-gain) were analyzed descriptively, while qualitative observations captured behavioral and communicative changes during sessions. Findings showed a substantial improvement in puberty knowledge, with mean scores increasing from 66.71 to 108.42 and an N-gain of 0.50. Observational data also indicated enhanced confidence, greater willingness to speak, improved peer interaction, and reduced hesitation when discussing sensitive issues. Participants reported feeling more supported and emotionally prepared to understand puberty-related changes. The integration of visual-interactive media supported cognitive processing in line with multimedia learning theories, while collaborative activities aligned with social constructivist principles. The safe learning environment created by facilitators also helped reduce emotional barriers, consistent with adolescent psychosocial development literature. These factors collectively strengthened both cognitive and psychosocial outcomes. Interactive visual media effectively improved adolescents' understanding and confidence regarding puberty.

Keywords: Adolescent Confidence; Puberty Education; Interactive Learning Media; Flash Cards; Health Literacy

1. Introduction

Adolescence is ideally a developmental stage in which individuals begin to build self-awareness, confidence, and a healthy understanding of the physical and emotional

*Corresponding author's email: jumlisabrial02@gmail.com, Telp. -

changes they experience (Chaku & Davis-Kean, 2024; Mastorci et al., 2024; Sahi et al., 2023). During this period, access to clear, accurate, and age-appropriate information regarding puberty becomes essential to support positive growth. In an ideal setting, adolescents are equipped with adequate knowledge that enables them to recognize bodily changes, respond to them properly, and engage in open communication with trusted adults or peers. Educational interventions that are engaging, relatable, and sensitive to their developmental needs are therefore crucial to ensure that adolescents transition into adulthood with confidence and wellbeing (Ashrafi et al., 2025; Estrela et al., 2025; Koota et al., 2024).

Literature on adolescent development emphasizes that puberty is not merely a biological process but also a psychological and social transition that shapes identity formation. Watts (2024), Papalia and Martorell (2021) highlight that well-informed adolescents demonstrate higher self-esteem, better coping mechanisms, and improved emotional regulation during puberty. Studies in educational psychology also note that interactive and visual learning strategies increase comprehension, reduce anxiety, and strengthen conceptual retention, particularly when addressing sensitive topics such as reproductive health (Janighorban et al., 2022; Kistiana et al., 2023). Thus, effective educational media becomes a determinant factor in helping adolescents navigate puberty with confidence.

Empirical studies show that many adolescents still lack adequate knowledge about puberty and often experience confusion or discomfort when discussing it. Research by the World Health Organization (2020) reports that more than 40% of adolescents in developing countries feel unprepared for physical changes due to limited access to reproductive health education. Similarly, a study by Sialubanje et al. (2016) highlights that culturally sensitive issues, taboos, and limited parental communication often prevent adolescents from seeking accurate information. These findings suggest that adolescents' confidence is strongly influenced by the availability of safe learning spaces and the quality of educational materials provided.

In many Indonesian communities, including small neighborhoods and informal community groups, discussions about puberty remain restricted, resulting in adolescents having limited opportunities to ask questions or express concerns. Observations conducted in Community X revealed that adolescents often feel embarrassed, hesitant, or afraid of giving wrong answers when asked about bodily changes. Several participants admitted that they rely on fragmented information from peers or the internet, which may not always be accurate. This factual condition underscores the need for structured, guided, and interactive educational activities that encourage adolescents to speak openly without fear of stigma.

Although numerous studies highlight the importance of puberty education, relatively few community-based programs incorporate interactive educational media tailored specifically to adolescent developmental needs. Existing programs often rely on lecture-based approaches that do not fully engage students or address their emotional responses. Moreover, previous initiatives seldom evaluate adolescents' confidence levels as an outcome, even though confidence is a critical psychological aspect in successfully navigating puberty. This gap indicates a need for community service programs that combine interactive learning methods with psychosocial support to build both understanding and confidence simultaneously.

The significance of this community engagement program lies in its ability to provide

adolescents with an inclusive, enjoyable, and psychologically supportive learning experience. By using interactive educational media (Bahtiar & Nursasi, 2019; Syahidi et al., 2020), such as flash cards, structured discussions, and visual prompts, the program introduces sensitive concepts in a more approachable and less intimidating manner. This approach not only improves adolescents' cognitive understanding but also fosters emotional readiness, encourages peer learning, and strengthens their communication skills. Such an initiative aligns with national priorities on adolescent wellbeing and supports broader goals of community-based health education (Lai et al., 2020).

Therefore, this PKM initiative aims to build adolescents' confidence in understanding puberty through the use of interactive educational media. Specifically, the program seeks to enhance their knowledge of physical and emotional changes, reduce anxiety associated with discussing puberty, and create a supportive learning environment where adolescents feel safe to express questions and concerns. The intervention also aspires to empower local educators and community leaders with practical educational tools that can be sustained beyond the program implementation.

2. Methods

This community service program employed a participatory educational intervention using a pretest–posttest approach to measure changes in adolescents' understanding and confidence regarding puberty (Khafsoh & Riani, 2024; Lestari et al., 2022; Situmeang et al., 2024). The intervention was designed to be interactive, learner-centered, and sensitive to adolescent developmental needs. A combination of visual flash cards, guided discussions, and group-based learning activities formed the core strategy of the program. This design ensured that participants were not only passive recipients of information but active contributors to the learning experience, allowing them to openly discuss issues related to puberty within a safe and supportive environment.

The program was conducted in Community X and involved 14 adolescents aged 12–15 years, selected through purposive sampling based on their availability and parental consent. The activities were implemented in three main stages: (1) a pretest session to assess baseline knowledge and confidence; (2) an interactive learning session using educational flash cards, facilitated discussions, and participatory games; and (3) a posttest session to evaluate improvements after the intervention. Throughout the program, facilitators encouraged open communication, allowing participants to express questions, clarify misconceptions, and engage with peers. All sessions were conducted in small-group settings to maintain comfort and ensure meaningful interaction.

Data were collected using a structured questionnaire composed of items assessing knowledge of puberty and self-confidence in discussing related topics. The instrument demonstrated acceptable validity and reliability based on previous adaptation and expert review. Quantitative data were analyzed by comparing pretest and posttest mean scores and calculating the normalized gain (N-gain) to assess the magnitude of improvement. Descriptive observations were also recorded to capture behavioral and communicative changes during the sessions. Ethical considerations included obtaining informed consent from parents or guardians, ensuring anonymity of participants, and creating a supportive environment where adolescents felt comfortable and respected.

Table 1 Detailed Implementation Stages of the Community Education Program

Stage	Activities	Objectives	Tools / Media	Expected

	Conducted		Used	Outcomes
Preparation Stage	• Coordination with community leaders • Selection of adolescent participants • Development and validation of flash cards • Preparation of questionnaires (pretest–posttest)	To ensure logistical readiness, finalize participant lists, and validate learning materials	Flash cards, questionnaire drafts, facilitator guidebook	Program readiness, validated materials, confirmed participant list
Pretest Session	• Administration of pretest • Brief explanation of program flow • Ice-breaking activity	To assess initial knowledge and confidence levels; to build comfort and trust among participants	Pretest questionnaire, attendance list	Baseline data obtained; participants feel relaxed and ready to learn
Educational Material Delivery	• Explanation of puberty concepts • Demonstration of flash cards • Visual storytelling using images	To introduce key puberty concepts using simple, visual, and adolescent-friendly explanations	Flash cards, puberty concept visuals, facilitator explanation sheet	Participants understand basic concepts before interactive activities
Interactive Learning Session	• Group discussions using question prompts • Matching games: "identify the puberty signs" • Scenario-based conversation	To increase engagement, encourage communication, and strengthen understanding through active participation	Discussion cards, scenario cards, matching cards, whiteboard	Increased participation, improved communication confidence, active peer interaction

	practice			
5. Reflection and Sharing Session	• Participants express questions, experiences, or concerns • Facilitators provide supportive feedback	To help adolescents process emotional experiences and reduce anxiety about puberty	Reflection cards, open discussion circle	Participants feel heard, supported, and more confident discussing puberty
Posttest Session	• Administration of posttest • Short evaluation and feedback collection	To measure improvement in knowledge and confidence after the intervention	Posttest questionnaire, evaluation form	Improvement scores obtained; participant perceptions recorded
Closing Stage	• Summary of key lessons • Distribution of educational flash cards to community leaders • Documentation and appreciation	To reinforce learning and provide sustainable tools for future education	Flash cards set, certificates (optional), documentation tools	Community receives resources; adolescents retain key messages; program concluded smoothly

Table 1 outlines the comprehensive flow of the community education program, detailing each implementation stage from preparation to closing, all designed to enhance adolescents' understanding and confidence regarding puberty through interactive learning media. The preparation stage includes coordinating with community leaders, selecting participants, and developing validated learning tools to ensure the program's readiness. The pretest session then measures baseline knowledge while creating a comfortable atmosphere through brief explanations and ice-breaking activities. Educational material is delivered using flash cards and visual storytelling to simplify puberty concepts in an adolescent-friendly manner. The interactive learning session featuring group discussions, matching games, and scenario-based conversations encourages active engagement and strengthens communication confidence. In the reflection stage, participants share questions, experiences, and concerns while receiving supportive feedback, helping them process emotional responses to puberty. The posttest session measures improvements in knowledge and confidence following the intervention. Finally, the closing stage reinforces key lessons, provides educational materials to

community leaders, and documents the activity to ensure sustainability and long-term program impact.

3. Results and Discussion

3.1. Improvement in Adolescents' Understanding of Puberty

The findings of the community education program reveal a marked improvement in adolescents' understanding of puberty after participating in the interactive intervention. Prior to the program, many participants demonstrated limited knowledge about the physical and emotional changes associated with puberty. Their responses on the pretest indicated misconceptions and uncertainty, reflecting a lack of access to reliable information and the presence of discomfort in discussing sensitive developmental topics. This baseline condition is consistent with broader literature highlighting knowledge gaps among young adolescents in similar community settings.

Following the implementation of the educational intervention, the posttest results showed a substantial increase in understanding, with mean scores rising from 66.71 to 108.42. This improvement signifies not only increased factual knowledge but also greater clarity in interpreting the various signs of puberty. Students demonstrated the ability to correctly identify developmental changes, understand their causes, and differentiate between normal variations in the onset of puberty. The rise in scores reflects improved cognitive processing facilitated by the program's structured and interactive learning approach.

The normalized gain (N-gain) score of 0.50 further strengthens the interpretation that the intervention was effective. Classified as a moderate improvement, this score suggests that the learning process meaningfully bridged the gap between the participants' initial and potential maximum understanding. A moderate N-gain is particularly significant in early adolescent education, where topics related to reproductive health often require gradual, supportive, and repetitive reinforcement to achieve conceptual mastery.

Qualitative observations during the sessions provide additional depth to the numerical findings. Facilitators noted that participants became increasingly responsive as the program progressed. Initially quiet and hesitant students began asking questions, contributing to discussions, and demonstrating curiosity about topics they once found uncomfortable. This behavioral shift suggests that the program successfully created a psychologically safe environment that encouraged engagement and learning.

The integration of interactive media particularly flash cards and visual storytelling played a crucial role in enhancing comprehension. These tools presented complex concepts in a simplified, relatable format that matched adolescents' developmental needs. By visually representing bodily changes and pairing them with guided explanations, the media facilitated deeper understanding and helped participants retain information more effectively. This aligns with educational theories emphasizing the importance of multimodal learning in promoting cognitive development.

The improvement in posttest scores, combined with increased engagement and clarity expressed by participants, demonstrates the effectiveness of the interactive educational approach. The findings affirm that incorporating visual, participatory, and discussion-based strategies can significantly elevate adolescents' knowledge of puberty. This outcome underscores the importance of adopting innovative, learner-centered educational tools when addressing sensitive yet crucial developmental topics within community settings.

Table 2 Pretest–Posttest Improvement in Adolescents' Understanding of Puberty

Assessment Component	Pretest Mean Score	Posttest Mean Score	Increase	N-gain	Interpretation
Understanding of Puberty	66.71	108.42	+41.71	0.50	Moderate Improvement

Table 2 illustrates a clear improvement in adolescents' understanding of puberty following the educational intervention. The pretest mean score of 66.71 indicates limited initial comprehension, while the posttest mean score rose significantly to 108.42, showing an increase of 41.71 points. This substantial gain is further supported by an N-gain value of 0.50, which falls into the category of moderate improvement, suggesting that the learning approach effectively enhanced participants' grasp of key puberty concepts. Overall, the table demonstrates that the interactive educational media used in the program successfully strengthened adolescents' cognitive understanding of puberty.

3.2. Increased Confidence and Active Engagement in Discussions

The community education program produced not only cognitive improvements but also significant gains in adolescents' confidence when discussing puberty. At the beginning of the intervention, many participants displayed discomfort, shyness, and reluctance to express their thoughts. These behavioral indicators such as minimal responses, avoidance of eye contact, and quiet participation reflected common psychological barriers adolescents face when navigating sensitive developmental topics. Such initial hesitation is consistent with previous research showing that puberty discussions often evoke embarrassment due to social norms, lack of prior exposure, and limited safe spaces for open dialogue.

As the sessions progressed, the interactive structure of the program began to positively influence students' communicative behavior. Elements such as small-group discussions, question prompts, and scenario-based conversations encouraged adolescents to engage more actively in the learning process. Participants slowly transitioned from passive listeners to active contributors, voicing their thoughts, asking questions, and sharing personal reflections. This increased participation demonstrated a growing sense of comfort and trust within the learning environment.

The use of interactive tools particularly flash cards, matching games, and scenario cards played an essential role in fostering engagement. These tools reduced the formality often associated with reproductive health education and replaced it with playful, relatable, and less intimidating activities. As adolescents interacted with the visual materials, they became more expressive and willing to articulate their understanding of puberty. The combination of fun and educational elements proved effective in reducing the stigma and anxiety surrounding the topic.

Facilitators also observed improved peer-to-peer interactions as participants gained confidence. Adolescents began collaborating more effectively, helping each other interpret scenarios, discussing answers, and affirming one another's ideas. This collaborative behavior indicated that confidence building extended beyond individual expression to group-level communication dynamics. The social learning environment enabled participants to realize that their peers shared similar concerns and experiences, reducing feelings of isolation often associated with puberty.

The reflection session provided further evidence of increased confidence. During this session, many participants openly shared their concerns and asked questions they previously hesitated to express. They reported feeling more supported, less embarrassed, and more prepared to talk about their experiences. The supportive feedback provided by facilitators reinforced this confidence, helping adolescents internalize the understanding that discussing puberty is normal, healthy, and necessary for their development.

The behavioral shift observed throughout the program illustrates that interactive educational media effectively fosters psychosocial readiness in adolescents. By creating a safe, engaging, and culturally sensitive learning environment, the intervention empowered participants to communicate more openly about sensitive issues. These findings highlight the importance of integrating participatory and visual strategies into puberty education to cultivate not only knowledge but also confidence, emotional resilience, and social competence.

Table 3 Indicators of Increased Confidence and Active Engagement

Behavioral Indicator	Before Intervention	After Intervention	Observed Change
Willingness to speak	Low; participants hesitant and quiet	High; participants voluntarily contributed	Increased verbal engagement
Eye contact	Limited; frequent avoidance	Improved; more consistent eye contact	Greater confidence and comfort
Asking questions	Rare; questions asked only when prompted	Frequent; participants asked spontaneously	Enhanced curiosity and openness
Peer interaction	Minimal group collaboration	Active discussion and teamwork	Strengthened peer communication
Expression of concerns	Hesitant and withheld	Openly shared during reflection session	Reduced stigma and emotional anxiety

Table 3 highlights a clear progression in adolescents' confidence and engagement throughout the intervention, evidenced by noticeable behavioral changes from before to after the program. Initially, participants were reluctant to speak, avoided eye contact, rarely asked questions, and showed minimal interaction with peers, patterns typical of discomfort when discussing sensitive topics like puberty. However, after the interactive sessions, these behaviors shifted significantly. Adolescents began speaking voluntarily, maintained better eye contact, asked spontaneous questions, and engaged actively in group discussions. They also felt more comfortable expressing personal concerns during the reflection session. Collectively, these changes indicate a substantial increase in confidence, reduced emotional barriers, and strengthened communication skills fostered by the supportive and interactive learning environment.

3.3. Enhancing Adolescents' Cognitive Understanding Through Interactive Visual Media

The findings of this community education program demonstrate a significant improvement in adolescents' understanding of puberty, evidenced by the increase in mean scores from 66.71 to 108.42 and an N-gain of 0.50. This outcome aligns with Paivio's Dual Coding Theory (Clark & Paivio, 1991), which argues that combining verbal explanations with visual representations enhances cognitive processing and memory retention. Flash cards used in the intervention allowed adolescents to visualize biological

changes, making abstract concepts more concrete and less intimidating. This result is also consistent with Mayer's Multimedia Learning Theory (Mayer, 2024), which asserts that people learn better through integrated verbal–visual instructional formats.

The increased understanding among participants can also be attributed to their active involvement during interactive sessions. Constructivist theorists such as Vygotsky (2000) emphasize that learning occurs through social interaction and active engagement rather than through passive listening. During the PKM activities, group discussions, matching games, and scenario-based tasks encouraged participants to construct knowledge collaboratively, clarify misconceptions, and connect new information with personal experiences. Previous studies confirm that participatory learning boosts conceptual understanding in adolescent health education (Brame, 2016).

A notable behavioral shift was observed as adolescents became increasingly confident discussing puberty-related topics. Initially, participants displayed hesitance, embarrassment, and avoidance, conditions commonly described in the literature on adolescent communication about sensitive issues (Somers & Surmann, 2004). However, as the intervention progressed, adolescents showed higher willingness to engage, ask questions, and speak openly. This improvement aligns with Erikson's theory of psychosocial development, which notes that adolescents require supportive environments to navigate the identity vs. role confusion stage (Munley, 1977). A psychologically safe space provided through the program played a crucial role in lowering emotional barriers.

The program's success was further strengthened by the deliberate creation of a supportive learning environment. Research by Sawyer et al. (2018) highlights that adolescents learn sensitive content more effectively when they feel validated, respected, and protected from judgment. The reflection session where participants openly shared concerns demonstrates that the program successfully fostered a safe space that encouraged honesty and emotional expression. This setting is known to reduce anxiety and stigma surrounding puberty, leading to greater learning readiness (Blakemore & Mills, 2014).

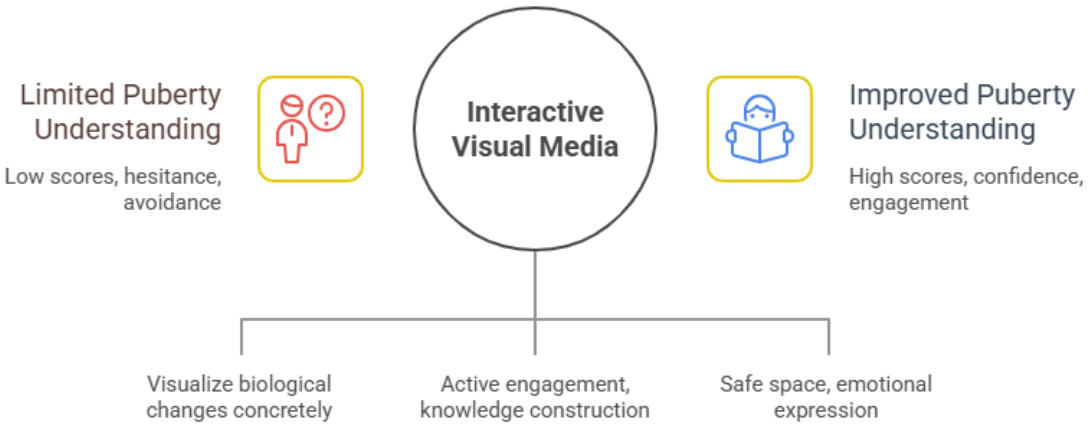

Figure 1 Enhancing Adolescents' Understanding of Puberty

Figure 1 illustrates how interactive visual media serves as an effective bridge for enhancing adolescents' understanding of puberty. On the left side, it depicts the initial condition of adolescents who exhibit limited knowledge, characterized by low test scores, hesitation, and avoidance when discussing puberty. At the center, interactive visual media

functions as the core intervention, enabling three key processes: concretely visualizing biological changes, promoting active engagement and knowledge construction, and creating a safe space for emotional expression. These processes collectively lead to the improved outcomes shown on the right side of the figure, where adolescents demonstrate higher understanding, increased confidence, and greater engagement. The figure highlights that a visual-interactive approach not only strengthens cognitive comprehension but also supports emotional readiness and active participation when learning sensitive developmental topics.

The use of flash cards proved particularly effective for early adolescents, who are highly responsive to visual cues and concrete representations. Mayer (2024) notes that multimedia-based learning reduces cognitive load and supports information retention, especially for learners navigating unfamiliar or sensitive content. The flash cards used in this PKM activity simplified complex biological concepts, supported visual reasoning, and provided culturally appropriate learning materials. This method aligns with findings by McClean and Crowe (2017), who argue that visual tools in health education increase comprehension and engagement among young learners.

The findings indicate that interactive educational media not only enhances cognitive understanding but also builds psychosocial readiness among adolescents facing pubertal changes. The combined improvements in knowledge, confidence, and engagement highlight the value of integrating visual tools, collaborative learning, and safe-space principles into reproductive health education. These results support recommendations from the World Health Organization (2023), which advocates for participatory, age-appropriate, and community-based approaches in adolescent health promotion. Thus, the PKM model implemented here serves as an effective, replicable framework for future programs targeting adolescent well-being.

4. Conclusions

The community education program demonstrated clear and meaningful improvements in adolescents' understanding of puberty and their confidence in discussing sensitive developmental topics. Quantitative results showed a substantial increase in knowledge, with scores rising from 66.71 to 108.42 and an N-gain of 0.50, indicating moderate yet significant learning gains. Qualitative observations reinforced these findings, as participants became increasingly responsive, asked more informed questions, and engaged more actively in discussions. These results affirm that interactive visual media particularly flash cards provides an effective and developmentally appropriate tool for facilitating puberty education.

The discussion highlighted that the success of the intervention was strongly supported by theories of multimedia learning, social constructivism, and adolescent psychosocial development. The integration of visual learning tools aligned with the Dual Coding and Multimedia Learning principles, enabling adolescents to process complex biological information more easily. Simultaneously, collaborative activities and scenario-based tasks fostered deeper engagement, consistent with Vygotsky's emphasis on social interaction in knowledge construction. A safe and supportive learning environment also proved essential in reducing embarrassment and enhancing confidence, echoing key insights from Erikson's developmental framework. Together, these theoretical connections strengthen the interpretation that the program effectively addressed both cognitive and psychosocial aspects of puberty education.

Despite its positive impact, the program had certain limitations. The sample size was small, limited to 14 participants, which restricts the generalizability of the findings. The intervention was also short-term, making it difficult to assess long-term retention of knowledge or sustained changes in confidence. Future research or community programs should involve larger and more diverse adolescent groups, incorporate follow-up assessments, and explore additional media formats such as digital tools or peer-led modules. Expanding the program into school curricula or broader community networks may also enhance its long-term impact and applicability.

Conflict of Interest

The authors declare no conflict of interests.

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