

## Digital Peer Cadre Empowerment to Enhance Mental and Reproductive Health Literacy Among Adolescent Girls: A Community Partnership Program

Luh Putu Widiastini<sup>1\*</sup>, I Gusti Agung Manik Karuniadi<sup>2</sup>, I Made Pradipta<sup>3</sup>

<sup>1,2</sup> Midwifery Study Program, STIKES Bina Usaha Bali, Bali, Indonesia

<sup>3</sup> ITB STIKOM Bali, Bali, Indonesia

\*Corresponding author: [enick.dilaga@gmail.com](mailto:enick.dilaga@gmail.com)

### ABSTRACT

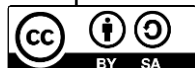
Adolescent girls are vulnerable to mental and reproductive health problems during early adolescence, while schools may lack structured peer cadre programs and educational support. This community service program aimed to establish adolescent girls' peer cadres and improve their knowledge related to becoming and functioning as peer cadres, particularly in cadre orientation and leadership roles. The program involved 15 adolescent girls at a junior high school in Bali. A one-group pre-test–post-test evaluation design was used. The program consisted of four structured training sessions and two mentoring sessions using lectures, group discussions, demonstrations, role-playing, and practical exercises. An electronic book and web-based platform were provided as supporting educational resources. Knowledge was assessed before and after the program using the Orientation and Leadership Questionnaire for Adolescent Girls' Peer Cadres, consisting of 15 multiple-choice questions assessing knowledge related to becoming and functioning as a peer cadre. Correct answers were scored 1 and incorrect answers 0. Data were analyzed using descriptive statistics and the Wilcoxon signed-rank test. The mean pre-test score was  $8.20 \pm 2.18$  (range: 4–12), increasing to  $14.73 \pm 0.59$  (range: 13–15) at post-test. A statistically significant difference was observed between pre-test and post-test scores ( $Z = -3.417$ ;  $p = 0.001$ ). The findings indicate increased knowledge following the program and achievement of the targeted indicator for peer cadre knowledge. The program also established peer cadres prepared to undertake cadre roles within the school setting. Program sustainability requires ongoing monitoring and school support.

**Keywords** : Adolescent Girls, Digital Health Education, Mental Health Promotion, Peer Cadre, Reproductive Health, School-Based Community Service.

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### INTRODUCTION

Adolescent girls represent a vulnerable population undergoing rapid biological, psychological, and social changes during early adolescence. This developmental stage is characterized by puberty, identity formation, increased emotional sensitivity, and greater

dependence on peer relationships (Bonnie & Backes, 2019). Without adequate health literacy and psychosocial support, adolescent girls are at greater risk of developing mental health problems and experiencing difficulties in understanding reproductive health. Consequently, schools play a strategic role in promoting healthy behaviors through preventive, promotive, and community-based empowerment programs (Quiroz-Cárdenas & López-Gil, 2025; World Health Organization (WHO), 2024).

Adolescent mental health has become a major public health concern worldwide. Previous studies have identified several contributing factors, including inadequate family support, ineffective parenting, bullying, social pressure, and socioeconomic inequality, while interventions are often hindered by mental health stigma, limited health literacy, and restricted access to health services, particularly in semi-rural areas (Tran et al., 2023). These findings are consistent with the Indonesia National Adolescent Mental Health Survey, which reported that 34.9% of Indonesian adolescents aged 10–17 years experienced at least one mental health problem during the previous 12 months, with a higher prevalence among adolescent girls (Diatmika, 2025; Pusat Kesehatan Reproduksi, 2022). These findings highlight the need for accessible school-based preventive and promotive interventions targeting adolescent girls.

The partner school, SMP Negeri 2 Abiansemal, Badung Regency, Bali, faces a similar and more specific challenge: the high mental health needs of adolescent girls are not yet adequately supported by a structured school-based peer empowerment system. The school is located in a semi-rural area with relatively good access to smartphones and the internet; however, these resources have not been optimally utilized for mental and reproductive health promotion. Previous studies conducted by the authors at this school revealed that approximately 90.0% of participants experienced moderate to extremely severe anxiety, including 51.7% with extremely severe anxiety. Furthermore, 66.7% experienced stress above the normal level, while 90.0% experienced mild to extremely severe depression (Widiastini, Karuniadi, et al., 2025). Additional studies found that adolescents' mindfulness remained at a moderate level ( $3.20 \pm 0.37$ ) and self-esteem was relatively moderate ( $25 \pm 4$ ), indicating the need for structured interventions to strengthen psychological resilience (Widiastini, Saraswati, et al., 2025).

Qualitative findings further demonstrated that bullying, family conflict, parental expectations, and the tendency to suppress emotional problems were common psychosocial challenges among adolescent girls. Most participants preferred seeking support from peers or digital media, which may not always provide accurate health information or appropriate psychological assistance. These conditions indicate that the partner school's problem is not only the high prevalence of psychological difficulties, but also the limited availability of trained peer support and reliable, accessible health information to help adolescents respond to these problems. Mental health problems were also closely associated with reproductive health. Prolonged stress and anxiety may disrupt hormonal balance and menstrual health, while a previous study at the partner school found that 36.8% of adolescent girls experienced severe dysmenorrhea, with 31.6% experiencing mild and another 31.6% moderate dysmenorrhea (Karuniadi et al., 2024). Moreover, inadequate reproductive health literacy may increase risky reproductive behaviors, which can further worsen adolescents' psychological well-being. Therefore, the partner school requires an integrated approach that simultaneously strengthens mental health literacy, reproductive health literacy, peer support, and adolescents' capacity to access appropriate information and assistance (Alhussaini et al., 2025).

Despite these challenges, the partner school has considerable potential for adolescent empowerment. Students are familiar with digital technology, demonstrate strong interest in peer learning, and are receptive to digital educational media. However, this potential has not

yet been translated into a structured peer cadre system supported by continuous mentoring and integrated digital educational resources. Thus, the key problem to be addressed is the gap between the substantial mental and reproductive health needs of adolescent girls and the school's limited capacity to provide sustainable, peer-based, and digitally supported health promotion. This gap highlights the necessity of developing an innovative school-based empowerment program (Meherali et al., 2021; Oskarita & Arasy, 2024).

To address these challenges, this community service program implemented a digital technology-based adolescent girls' peer cadre empowerment program through leadership training, continuous mentoring, and digital educational resources, including an e-book and a web-based platform. The program aimed to strengthen adolescents' mental and reproductive health literacy, develop peer leadership competencies, and establish a sustainable peer support system within the school (Wahid et al., 2024). By empowering adolescent girls as peer educators, this program is expected to create a healthier, more supportive, and inclusive school environment. Furthermore, the program contributes to the achievement of the Sustainable Development Goals, particularly Goal 3 (Good Health and Well-being), Goal 4 (Quality Education), and Goal 5 (Gender Equality), while supporting research-based community engagement through digital innovation.

## METHOD

The community service program was implemented through a multicomponent approach consisting of six phases: (1) pre-test, (2) preparation and socialization, (3) development and validation of digital educational media, (4) training and peer cadre development, (5) mentoring and digital technology implementation, and (6) post-test. Training served as the primary capacity-building component, while mentoring, the educational e-book, and the web-based platform supported and reinforced learning.

### 1. Pre-test Phase

Before the training, participants completed a pre-test using the Orientation and Leadership Questionnaire for Adolescent Girls' Peer Cadres, consisting of 15 multiple-choice questions assessing knowledge related to becoming and functioning as a peer cadre. The questionnaire covered knowledge of cadre orientation, roles and responsibilities, leadership, communication, teamwork, and peer support in promoting adolescent health. Participants selected the single best answer for each question and completed the questionnaire in approximately 15 minutes. Each correct answer was awarded one point and each incorrect answer zero points. The total score was calculated by summing the correct responses, with higher scores indicating a higher level of knowledge related to becoming and functioning as a peer cadre.

### 2. Preparation and Socialization Phase

The program began with coordination meetings involving the school principal, guidance and counseling teachers, homeroom teachers, and participants. The objectives, procedures, participant roles, and expected outcomes were explained to obtain school support. Before data collection, participants received standardized instructions regarding the purpose and procedures of the assessment, how to complete the questionnaire, the estimated completion time, the requirement to select one best answer for each question, and the confidentiality of their responses. Participants were also informed that there were no consequences for incorrect answers and were encouraged to complete the questionnaire independently based on their own knowledge. A preliminary needs assessment was conducted to identify participants' psychosocial conditions, digital literacy, and available school resources, which informed the development of educational materials.

**3. Development and Validation of Digital Educational Media**

The team developed an educational e-book and web-based platform as supporting media for the training. The e-book covered adolescent mental and reproductive health topics, including emotional regulation, self-esteem, healthy relationships, bullying prevention, puberty, menstrual health, body safety, and prevention of gender-based violence. The platform provided supplementary educational materials, a non-diagnostic mental health self-screening tool, and self-help guidance, including mindfulness, pranayama, journaling, grounding, and self-hypnosis.

The digital media were designed to reinforce the training rather than function as standalone interventions, and all materials were validated by experts before implementation.

**4. Training and Peer Cadre Development**

Participants underwent four structured training sessions using lectures, group discussions, demonstrations, role-playing, and hands-on exercises. The training covered cadre roles and responsibilities, leadership, effective communication, active listening, teamwork, peer education, and basic health promotion.

Training served as the primary capacity-building component, providing the knowledge, practical skills, and confidence required to function as peer cadres. The e-book and web-based platform were used as supplementary resources to review and reinforce the training materials.

**5. Mentoring and Digital Technology Implementation**

Following the training, participants received guidance on using the e-book and web-based platform to access educational materials and self-help resources. Two mentoring sessions were subsequently conducted to reinforce leadership, communication and peer education skills, address implementation challenges, and support the application of competencies acquired during training.

Teachers and guidance and counseling staff were also involved to support the implementation of peer cadre activities and program sustainability. Thus, mentoring functioned as a reinforcement and application component, while the e-book and web-based platform served as supporting learning resources.

**6. Post-test Phase**

A post-test was administered immediately after the mentoring sessions using the same questionnaire. Participants completed the questionnaire in approximately 15 minutes using the same scoring procedure. The total score was calculated based on the number of correct responses, with higher scores indicating a higher level of knowledge related to becoming and functioning as a peer cadre.

**Data Analysis**

We analyzed participant characteristics and pre-test and post-test scores descriptively. Differences between pre-test and post-test scores were analyzed using the Wilcoxon signed-rank test, with statistical significance set at  $p < 0.05$ . Because the program represented a multicomponent intervention, changes in scores were interpreted as reflecting the integrated implementation of the program rather than the effect of any single component. Training provided the foundation for knowledge and competencies; mentoring reinforced their application; the e-book provided reference materials for continued review; and the web-based platform provided supplementary educational and self-help resources. Thus, the observed pre-test to post-test changes reflected the combined contribution of all program components.

## RESULTS

**Table 1.** Characteristics of respondents based on Age, Number of siblings, Birth order, pretest and posttest scores

| Variable              |                | F (%)     | Min-Max | Mean±Std    |
|-----------------------|----------------|-----------|---------|-------------|
| Age                   | 12             | 1 (6.7%)  | 12-15   | 13.93±0.799 |
|                       | 13             | 2 (13.3%) |         |             |
|                       | 14             | 9 (60%)   |         |             |
|                       | 15             | 3 (20%)   |         |             |
| Number of Siblings    | 1              | 7 (46.7%) | 1-3     | 1.67±0.724  |
|                       | 2              | 6 (40%)   |         |             |
|                       | 3              | 2 (13.3%) |         |             |
| Order of the Brothers | 2              | 8 (53.3%) | 2-3     | 2.47±0.516  |
|                       | 3              | 7 (46.7%) |         |             |
| Pretest               | Low (0-55)     | 1 (6.7%)  | 4-12    | 8.2±2.178   |
|                       | Medium (56-75) | 11 (73%)  |         |             |
|                       | High (76-100)  | 3 (20%)   |         |             |
| Posttest              | Low (0-55)     | 0         | 13-15   | 14.73±0.594 |
|                       | Medium (56-75) | 0         |         |             |
|                       | High (76-100)  | 15 (100%) |         |             |

Table 1 presents the demographic characteristics of the participants and the pre-test and post-test results. A total of 15 adolescent girls participated in this community service program. Most participants were 14 years old (60.0%), followed by those aged 15 years (20.0%), 12 years (6.7%), and 13 years (13.3%), with a mean age of  $13.93 \pm 0.80$  years (range: 12–15 years). Regarding family characteristics, nearly half of the participants had one sibling (46.7%), followed by two siblings (40.0%) and three siblings (13.3%), with an average of  $1.67 \pm 0.72$  siblings. Most participants were the second child (53.3%), while the remaining 46.7% were the third child, with a mean birth order of  $2.47 \pm 0.52$ .

The pre-test results showed that the majority of participants had a moderate level of knowledge regarding the orientation and leadership of adolescent girls' peer cadres (73.3%). In comparison, 20.0% demonstrated good knowledge and 6.7% had poor knowledge. The mean pre-test score was  $8.20 \pm 2.18$  (range: 4–12). Following the intervention, all participants (100%) achieved a good level of knowledge, with post-test scores ranging from 13 to 15 and a mean score of  $14.73 \pm 0.59$ . These findings indicate a substantial improvement in participants' knowledge and understanding of peer cadre orientation and leadership after completing the training program.

**Tabel 2.** Comparison between pretest dan posttest Orientation and Leadership Questionnaire for Adolescent Girls' Peer Cadres

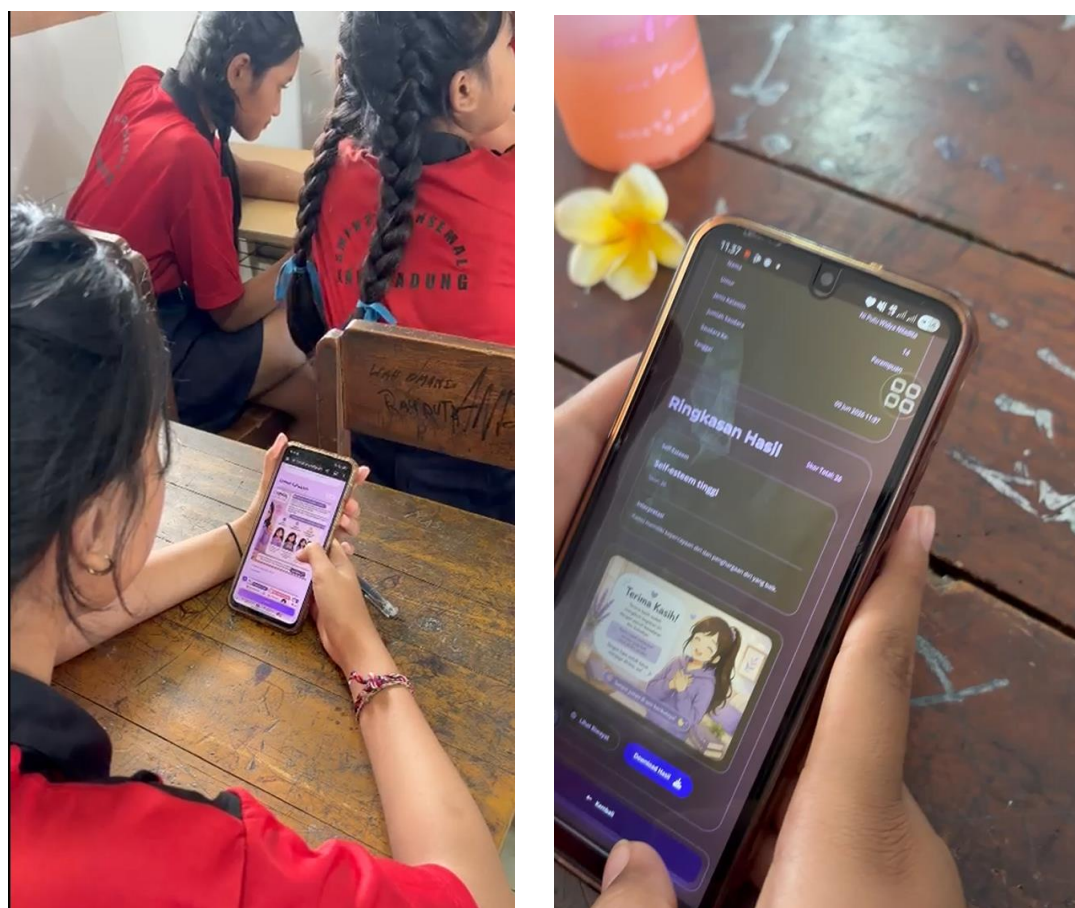
|          | Min-Max | Mean±Std    | z      | p-value |
|----------|---------|-------------|--------|---------|
| Pretest  | 4-12    | 8.2±2.178   | -3.417 | 0.001   |
| Posttest | 13-15   | 14.73±0.594 |        |         |

Table 2 presents the comparison of participants' knowledge scores related to becoming and functioning as adolescent girls' peer cadres before and after the program. The mean pre-test score was  $8.20 \pm 2.18$  (range: 4–12), and the mean post-test score was  $14.73 \pm 0.59$  (range: 13–15). The Wilcoxon signed-rank test revealed a statistically significant difference between the pre-test and post-test scores ( $Z = -3.417$ ,  $p = 0.001$ ). These findings demonstrate an increase

in participants' knowledge following the program and indicate that the targeted program indicator for improving peer cadre knowledge was achieved.



**Figure 1.** Providing training for mental health and reproductive health cadres.



**Figure 2.** Mentoring and digital technology implementation

## DISCUSSION

The participants in this community service program were predominantly 14 years old (60.0%), with a mean age of  $13.93 \pm 0.80$  years, indicating that most were in early adolescence. This developmental stage is characterized by rapid physical, cognitive, emotional, and social changes that influence identity formation, decision-making, and interpersonal relationships. During early adolescence, peer influence becomes increasingly important, making this period particularly suitable for developing leadership competencies and empowering adolescents as peer educators (Carapeto et al., 2025; Main et al., 2025). The World Health Organization (WHO) emphasizes that adolescence is a critical period for establishing lifelong health behaviors and strengthening health literacy through school-based interventions. Therefore, implementing peer cadre development programs at this stage is expected to enhance adolescents' knowledge, leadership skills, and active participation in promoting healthy behaviors within the school environment (Chen et al., 2024; WHO, 2021).

Most participants had one or two siblings and were predominantly the second-born child. Although family characteristics were not the primary focus of this program, supportive family relationships may contribute to adolescents' communication skills, cooperation, and social responsibility. These interpersonal competencies are important for developing leadership and effective peer interaction. Adolescents who experience positive family support generally demonstrate better psychosocial adjustment and greater readiness to participate in collaborative learning and peer-led activities, which may facilitate the success of school-based empowerment programs (Gunawan & Muttaqin, 2022; Lestari et al., 2026).

The baseline assessment showed that most participants had a moderate level of knowledge (73.3%) regarding knowledge related to becoming and functioning as adolescent girls' peer cadres, while only 20.0% demonstrated good knowledge before the intervention. This finding indicates that participants had an initial level of knowledge regarding peer cadre roles and responsibilities, but there was still room to strengthen their understanding of these aspects. The absence of previous structured cadre training at the school may have contributed to the need for further strengthening of participants' knowledge. School-based health promotion programs provide an important opportunity to strengthen adolescents' knowledge and preparation for peer cadre roles through active participation and peer engagement (Widnall et al., 2024).

The findings of this community service program demonstrate that peer cadre training significantly improved participants' knowledge regarding the orientation and leadership of adolescent girls' peer cadres. The mean knowledge score increased from  $8.20 \pm 2.18$  before the intervention to  $14.73 \pm 0.59$  after the intervention, and the Wilcoxon signed-rank test confirmed that this improvement was statistically significant ( $Z = -3.417$ ;  $p = 0.001$ ). These findings indicate that the training program successfully enhanced participants' understanding of the roles, responsibilities, and leadership competencies required to function as peer cadres within the school environment.

The significant improvement in knowledge observed following the program may reflect the integrated implementation of its multiple components. The combination of lectures, group discussions, demonstrations, role-playing, mentoring, and practical exercises provided participants with structured opportunities to engage in the learning process. The educational e-book and web-based platform were used as supporting resources to reinforce the training materials and facilitate continued access to educational content and self-help resources. Active participation in learning activities may have supported participants' understanding and retention of the knowledge provided during the program. A recent realist-informed systematic

review reported that peer education is most effective when participants are actively involved, receive structured mentoring, and are provided with opportunities to practice leadership roles in authentic settings (Strobl et al., 2020; Tamilselvi et al., 2025)

Another important factor contributing to the positive outcomes is the integration of digital educational media. The use of an educational e-book and a web-based platform enabled participants to access learning materials repeatedly after face-to-face sessions, supporting independent and continuous learning. Digital educational interventions have become increasingly important in adolescent health promotion because they provide flexible, accessible, and engaging learning experiences. Recent systematic reviews have demonstrated that digital mental health interventions improve adolescents' mental health literacy, engagement, and psychological well-being, particularly when digital resources are combined with direct guidance from educators or facilitators (Fernández-Batanero et al., 2025; Yeo et al., 2024)

The present findings are also consistent with previous studies highlighting the effectiveness of peer education in school-based health promotion. Adolescents generally communicate more openly with peers of similar age, making peer cadres an effective strategy for delivering health information and providing psychosocial support. Well-trained peer leaders not only improve their own knowledge and leadership competencies but also help create a supportive school environment that promotes healthy behaviors among their peers. Although the effectiveness of peer-led interventions varies depending on program characteristics, recent systematic reviews consistently conclude that peer education enhances health literacy, communication skills, self-confidence, and leadership among adolescents (Chen et al., 2024).

From the researchers' perspective, the success of this program is reflected not only in the significant increase in participants' knowledge scores but also in the establishment of adolescent girls' peer cadres equipped with the competencies required to promote mental health and reproductive health within the school community. The integration of structured training, continuous mentoring, and digital educational resources provides a sustainable model for strengthening school-based health promotion. This approach enables schools to develop internal peer support systems while promoting adolescents' leadership capacity, health literacy, and active participation in creating a healthy and supportive school environment (Szucs et al., 2024).

Despite these encouraging findings, several limitations should be acknowledged. The intervention involved a relatively small number of participants from a single junior high school, limiting the generalizability of the findings. Furthermore, the evaluation focused primarily on short-term knowledge improvement immediately after the intervention and did not assess long-term behavioral changes or the sustainability of leadership competencies. Future community service programs should involve larger samples from multiple schools and include longitudinal follow-up to evaluate the long-term effectiveness of peer cadre empowerment in promoting adolescent mental health and reproductive health.

## CONCLUSION

This community service program was associated with an increase in adolescent girls' knowledge related to becoming and functioning as peer cadres, as indicated by the significant difference between pre-test and post-test scores. Through structured training, mentoring, and supporting digital educational resources, the program achieved its targeted indicator of improving peer cadre knowledge. The program also established adolescent girls' peer cadres who were prepared to undertake peer cadre roles within the school setting. However, the sustainability of the cadre program and the continued implementation of peer-led health

promotion activities require ongoing monitoring and support from the school. Schools are encouraged to integrate peer cadre activities into routine health promotion programs, while future programs should involve larger samples, multiple schools, and longer-term follow-up to assess the sustainability of the program and the continued implementation of peer cadre activities.

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