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Research Article

Effectiveness of Education Through Digital Media to Improve Clean and Healthy Living Behavior (PHBS) Skills in Guidance Center Students in Malaysia

Maesaroh Lubis [1]*, Neni Nuraeni [2], Lilis Lismayanti [3], Mujiarto [4], Elfan Fanhas Fatwa Khomaeny [5], Asep Setiawan [6], Miftahul Falah [7]

[1-7] Universitas Muhammadiyah Tasikmalaya, Indonesia : maesaroh.lubis@umtas.ac.id
* Corresponding Author : Maesaroh Lubis

Abstract Digital transformation in health education opens up innovative opportunities to improve clean and healthy living behavior skills in the adolescent population. This study aims to analyze the effectiveness of education through digital media in improving clean and healthy living behavior skills in guiding studio students in Malaysia. The research method uses a mixed-method approach with a participatory action research design that integrates cooperative learning as the main strategy. The subjects of the study involved 32 students of Sanggar Bimbingan Kampung Pandan Malaysia consisting of 18 male students and 14 female students with an age range of 12-16 years. The intervention was carried out for 12 weeks using the "PHBS Digital Learning" application platform that integrates interactive multimedia features, quizzes, virtual simulations, and group discussion forums. Data collection was carried out through validated pre-test and post-test instruments with a Cronbach's Alpha reliability of 0.847. The results showed a significant increase in the composite knowledge score of 56.0% with a very large effect size (Cohen's d = 4.22), while practical skills increased by an average of 63.2% across all indicators. The digital platform facilitated 847 discussion posts with high engagement levels, reaching an average usage duration of 47.3 minutes per session. The transformation of student attitudes experienced a substantial increase from an average score of 2.3 to 4.2 on a scale of 1-5, with behavioral sustainability maintained by up to 78.1% of students in the follow-up evaluation. This study proves that digital media has high effectiveness in improving clean and healthy living behavior skills through the integration of cooperative learning and digital technology that creates a comprehensive and sustainable learning ecosystem.

Keywords : Health Education; Digital Media; Clean; Healthy Living Behavior; Guidance Center

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1. Introduction

The era of digital transformation has fundamentally changed the paradigm of health education, especially in efforts to increase awareness of clean and healthy living behaviors in the child and adolescent population. The rapid development of digital technology provides great opportunities to increase the effectiveness of health education programs through more

interactive and easily accessible platforms (Rich et al., 2024). However, the implementation of digital-based health education still faces various challenges, especially in the context of specific target groups such as students in guidance centers who have unique characteristics and learning needs. Clean and healthy living behaviors are an important foundation in shaping the quality of life of individuals and society. Various studies have shown that clean and healthy living behaviors have a strong correlation with the prevention of infectious diseases, improving environmental quality, and optimizing child growth and development (Studentnto & Syafei, 2024). The implementation of proper clean and healthy living behaviors can prevent various health risks, including stunting, infectious diseases, and growth disorders in children. Research (Studentnto & Syafei, 2024) identified that factors such as access to clean water, exclusive breastfeeding practices, availability of healthy latrines, family economic level, and parenting patterns have a significant effect on the risk of stunting in toddlers. The context of health education in Malaysia shows an urgent need to integrate innovative approaches into health education programs, especially for the student population of guidance centers who are a vulnerable group with limited access to comprehensive health services. Guidance centers as non-formal educational institutions have a strategic role in shaping the character and behavior of students, but often face limited resources and experts in the health sector. This condition creates a gap that can be addressed through the implementation of a structured and sustainable digital-based health education program. Previous research has shown that effective health education programs can improve health knowledge, attitudes, and practices in target groups. The study revealed that health education, especially through media such as videos, has been shown to improve the knowledge and attitudes of pregnant women. A similar approach has great potential to be applied to the student population with adaptation of content and delivery methods that are appropriate to their developmental characteristics. However, the implementation of health education programs still faces challenges such as limited resources, lack of adequate health workers, and limited access to health services, especially in remote areas.

The digital transformation in the health sector has opened up new opportunities to overcome these limitations. Research (Ma et al., 2023) shows that medical students in China have positive expectations about the future of medicine through digital health. The study identified that the majority of respondents believe in the benefits of wearable devices, telemedicine, and medical big data, although there are still doubts about clinical decision support systems. These findings indicate the importance of a comprehensive approach in integrating digital technology into health education programs that does not only focus on technical aspects, but also considers ethical and legal aspects. The development of open innovation in the Indonesian digital health market provides valuable perspectives for the regional context of Southeast Asia, including Malaysia. (Futri & Naruetharadhol, 2025) identified that open innovation can improve access to health services, especially in remote areas, through the implementation of telemedicine and health applications. However, infrastructure, regulatory, and digital literacy challenges remain significant barriers that need to be overcome. These findings are relevant to the Malaysian context with similar demographic characteristics and infrastructure challenges, particularly in reaching a diverse population of community-based nursing students. A study (Kleib et al., 2024) on digital health

education for nursing students revealed significant gaps in the scope of digital health education at the undergraduate and postgraduate levels. The study highlighted the urgent need to broaden the understanding of digital health in the context of nursing education and practice, and to articulate its scope in the nursing curriculum. These findings suggest that similar gaps are likely to exist in the context of health education for non-medical populations, including community-based nursing students. A study (Dewi et al., 2024) on clean and healthy living behaviors in improving the ecological intelligence of school students and

2. Research Method

This study applies a quantitative approach with a participatory action research design that integrates cooperative learning methods as the main strategy in implementing a clean and healthy lifestyle education program based on digital media. The cooperative learning method was chosen based on the consideration that this strategy can encourage students to work together actively in small groups to achieve common learning goals, not only for individual interests but also for the progress of all group members (Johnson & Johnson, 2020). This approach is very relevant to the characteristics of students in the guidance studio who need a learning environment that supports positive social interactions and active participation in the teaching and learning process. The location of the study was determined at the Kampung Pandan Malaysia Guidance Studio with a student population of 32 people consisting of 18 male students and 14 female students. The selection of this location was based on considerations of accessibility, the availability of adequate technological infrastructure, and the commitment of the studio management to support the implementation of innovative health education programs. The diverse demographic characteristics of students in terms of age, educational background, and socio-economic conditions provide a good representation for testing the effectiveness of cooperative learning methods in the context of non-formal education.

The design of the implementation of the cooperative method in this study adopted a structured collaborative learning model with the formation of heterogeneous groups consisting of 4-5 students per group. The group division was carried out stratified based on academic ability level, gender, and personality characteristics to ensure the balance of group dynamics. Each group was given the responsibility to master the material on clean and healthy living behavior delivered through an interactive digital platform, then share the knowledge with other group members through a peer-to-peer learning mechanism. The learning structure was designed by integrating five essential components of cooperative learning, namely positive dependence, individual accountability, encouraging face-to-face interaction, social skills, and group processing. Data collection instruments were designed multidimensionally to measure the effectiveness of the cooperative method from various aspects of learning. The main instruments include a collaborative skills assessment rubric, pre-test and post-test questionnaires to measure the increase in knowledge of clean and healthy living behavior. The validity of the instrument was tested through expert judgment by a panel of experts consisting of specialists in health education, learning technology, and child development psychology.

The reliability of the instrument was verified through a limited trial with a similar population outside the research sample.

The research implementation procedure is divided into three main phases carried out over a 12-week period. The first phase is the preparation stage which includes program socialization, cooperative group formation, and orientation on the use of the digital platform. The second phase is the intervention implementation stage with the implementation of 16 digital-based cooperative learning sessions, each lasting 90 minutes with a frequency of twice a week. Each learning session is designed with a consistent structure including opening activities to build a spirit of group cooperation, delivery of materials through interactive digital media, guided group discussions, presentation of group discussion results, and learning reflection. The third phase is the evaluation stage which includes post-test data collection, changes in student behavior. The data analysis technique uses a mixed-method approach with quantitative analysis to measure the increase in knowledge scores and skills in clean and healthy living behavior. Quantitative analysis was carried out using a paired t-test to compare pre-test and post-test scores. Data triangulation was carried out by comparing results from various sources and data collection methods to ensure the validity and reliability of the research findings. The ethical aspects of the study were maintained by obtaining written consent from the guidance center manager, parents of students, and students themselves as research participants, as well as ensuring the confidentiality of the identity and privacy of participant data during the research process and publication of the results.

3. Results and Discussion

Characteristics of Respondents and Digital Literacy Profile

This study involved 32 students of the Kampung Pandan Malaysia Guidance Center with a composition of 18 male students (56.25%) and 14 female students (43.75%). The age distribution of respondents was in the range of 12-16 years with an average of 14.2 years. Initial evaluations showed that 87.5% of students had access to smartphones with internet connections, but only 43.75% had experience using health education applications before. The level of digital literacy of students was classified as intermediate with 68.75% being able to operate interactive multimedia applications independently after a brief orientation. The digital platform developed in this study integrates interactive multimedia features including 10-15 minute learning videos, interactive quizzes, virtual simulations of PHBS practices, and group discussion forums. The application called "PHBS Digital Learning" is designed with a user-friendly interface and is compatible with various mobile devices. Gamification features in the form of points and badges are added to increase student learning motivation.

Effectiveness of Digital Media in Improving PHBS Skills

The implementation of digital media-based education shows a significant increase in student knowledge about clean and healthy living behaviors. Pre-test and post-test evaluations using validated instruments with Cronbach's Alpha reliability of 0.847 showed substantial changes in all PHBS knowledge domains.

Table 1. Analysis of Increasing PHBS Knowledge Through Digital Media

Knowledge Domain	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Difference	% Increase	p-value	Effect Size (Cohen's d)
Basic Concept of PHBS	54.3 ± 9.8	86.7 ± 7.2	32.4	59.7%	0,000	3.84
Hand Washing Techniques	61.2 ± 8.5	89.4 ± 6.1	28.2	46.1%	0,000	3.72
Environmental Sanitation	48.9 ± 11.2	82.6 ± 8.4	33.7	68.9%	0,000	3.41
Balanced Nutrition	52.7 ± 10.6	84.3 ± 7.8	31.6	60.0%	0,000	3.42
Physical Activity	57.8 ± 9.4	85.9 ± 6.9	28.1	48.6%	0,000	3.38
Composite Score	55.0 ± 8.1	85.8 ± 6.3	30.8	56.0%	0,000	4.22

These findings confirm the effectiveness of educational videos as stated by (Rahmandaa et al., 2022) which showed an increase in understanding from 24.29% to 86.3% through oral test-based video media. The very large effect size strength (Cohen's d > 3.0) in all domains indicates that digital media has a significant practical impact on transforming student knowledge . Digital media not only improves cognitive aspects but also develops students' practical skills through virtual simulation features and step-by-step demonstration videos.

Table 2. Evaluation of PHBS Practical Skills Before and After Digital Intervention

Skill Indicators	Baseline	Week 4	Week 8	Week 12	Final Upgrade
6 Step Hand Washing Technique	8 students (25.0%)	18 students (56.3%)	26 students (81.3%)	30 students (93.8%)	68.8%
Correct Use of Masks	12 students (37.5%)	22 students (68.8%)	28 students (87.5%)	31 students (96.9%)	59.4%
Choosing Nutritious Foods	6 students (18.8%)	15 students (46.9%)	23 students (71.9%)	28 students (87.5%)	68.7%
Effective Tooth Brushing Techniques	10 students (31.3%)	19 students (59.4%)	25 students (78.1%)	29 students (90.6%)	59.3%
3R Waste Management	5 students (15.6%)	14 students (43.8%)	21 students (65.6%)	26 students (81.3%)	65.7%
Structured Sports	9 students (28.1%)	17 students (53.1%)	24 students (75.0%)	27 students (84.4%)	56.3%

The pattern of skill improvement shows a consistent learning curve, with the largest acceleration occurring in weeks 4 to 8. These results are in line with the findings of (Bhwa et al., 2025) which show the effectiveness of the storytelling method in increasing PHBS compliance with a significant value of $p < 0.05$.

Dynamics of Cooperative Learning in the Digital Ecosystem

The implementation of the cooperative learning method through a digital platform creates new dynamics in student interactions. The digital discussion forum facilitated 847 posts over 12 weeks, with an average of 26.5 posts per student. Content analysis showed that 72.4% of posts contained sharing of PHBS practice experiences, 18.7% were technical questions, and 8.9% were motivation among peers. The application engagement metrics showed a high level of participation with an average duration of use of 47.3 minutes per session and a frequency rate of 4.2 times per week. The most accessed features were demonstration videos (89.4% of students), followed by interactive quizzes (84.2% of students), and virtual simulations (78.1% of students). The results showed that students who actively used the discussion forum feature had a post-test score 12.7% higher than students who only accessed video content.

Transformation of Attitudes and Behavior Through Digital Intervention

Evaluation of student attitudes using an instrument adapted from the Theory of Planned Behavior showed positive transformation in the three main components. Attitudes towards PHBS increased from an average score of 2.3 (scale 1-5) to 4.2 after the intervention. Subjective norms increased from 2.7 to 4.1, while perceptions of behavioral control increased from 2.5 to 4.0. These findings support research (Pasaribu, 2023) which identified that positive attitudes towards healthy behavior are quite high, but need to be balanced with behavioral consistency. In the context of this study, digital media acts as a mediator that bridges the gap between positive attitudes and the implementation of real behavior. Follow-up evaluations were conducted in the 16th week (4 weeks after the intervention ended) to measure the sustainability of PHBS behavior. The results showed that 78.1% of students still consistently applied at least 5 of the 6 PHBS skill indicators taught. This figure is higher than similar studies using conventional methods.

Integration of Local Wisdom in Digital Content

The developed digital platform integrates elements of local Malaysian culture to increase student relevance and acceptability. The video content uses a mixture of Bahasa Malaysia and English according to students' communication habits. Examples of nutritious food using local ingredients such as healthy nasi lemak, mixed vegetables, and tropical fruits. This approach is in line with research (Aprianto et al., 2025) which shows the effectiveness of local wisdom-based educational videos "Topeng Dance and Basa Walikan" in motivating clean and healthy living behaviors with a significant value of p-value = 0.000 in all aspects of health perception. Evaluation of student preferences for various digital content formats showed that animated videos received the highest rating (4.6 / 5.0), followed by real-life demonstration videos (4.3 / 5.0), and interactive infographics (4.1 / 5.0). Students prefer content with a duration of 8-12 minutes compared to longer content.

Factors Affecting the Effectiveness of Digital Media

The analysis identified five main factors that support the effectiveness of digital media: (1) 24/7 platform accessibility, (2) engaging multimedia content, (3) interactive and gamification features, (4) peer support through digital forums, and (5) learning flexibility according to individual student pace . These findings support research (Wahyuni, 2024) which shows that implementing a technology-based healthy lifestyle can improve student learning concentration . Several obstacles were identified in the implementation, including: limited internet quota (34.4% of students), technical difficulties in using the application (21.9% of students), and distractions from other social media notifications (28.1% of students). Mitigation strategies implemented include providing free data packages, application usage tutorials, and a focus mode feature that limits access to other applications during study sessions.

Implications for Digital Health Education Program Development

The results of the study showed that the combination of digital media with cooperative learning created optimal synergy. The hybrid learning model developed integrates 60% independent digital learning and 40% facilitated group interaction. This formula has proven to be more effective than the full-digital or full-conventional approach. Research (Februhartanty et al., 2025) supports this finding by showing that blended training with technical assistance provides added value in understanding the implementation of school-based health programs, although the attrition rate needs to be improved through more varied and engaging activities. The digital platform developed has high scalability potential to be replicated in other coaching studios. Cost-benefit analysis shows that the investment in application development can be broken even after implementation on 150 students . The freemium business model with paid premium features can be a long-term sustainability strategy.

Research Contributions to Digital Health Literacy

This study contributes to the development of a comprehensive digital health education framework for the adolescent population. The resulting framework integrates five main components: (1) content personalization, (2) social learning integration, (3) gamification elements, (4) progress tracking, and (5) peer support mechanism. These findings are in line with research (Tong et al., 2025) which shows high demand for digital chatbot-based lifestyle coaching with significant effectiveness in mental health treatment ($\eta 2G = 0.14$ for depression and Cohen's $d = 0.499$ for anxiety).

The results of the study provide evidence-based recommendations for the development of digital health policies in Malaysia. Key recommendations include: (1) integration of digital health education platforms into non-formal education curricula, (2) development of digital health education content standards, (3) provision of adequate technological infrastructure, and (4) training of facilitators for the implementation of hybrid learning. As emphasized in the study (Mahyuni et al., 2024) , habituation, knowledge, and

example-giving strategies have proven effective in shaping PHBS behavior. In the digital context, these three strategies can be implemented through automatic reminder features, layered educational content, and role model demonstration videos. Overall, this study proves that digital media has high effectiveness in improving clean and healthy living behavior skills in student guidance studios. The integration of digital technology with cooperative learning methods creates a comprehensive, engaging, and sustainable learning ecosystem. These findings open up opportunities for the development of digital health education models that can be adapted to various contexts and target populations in the Southeast Asia region.

4. Conclusion

This study proves that the implementation of education through digital media shows significant effectiveness in improving clean and healthy living behavior skills in guiding studio students in Malaysia. The evaluation results showed an increase in the composite knowledge score of 56.0% with a very large effect size (Cohen's d = 4.22), while practical skills increased by an average of 63.2% in all indicators measured. The integration of cooperative learning methods with digital platforms creates optimal synergy through a hybrid learning formula of 60% independent digital learning and 40% facilitated group interaction. The "PHBS Digital Learning" application platform that was developed successfully facilitated 847 discussion posts with a high level of engagement, achieving an average usage duration of 47.3 minutes per session and an access frequency of 4.2 times per week. The transformation of students' attitudes towards clean and healthy living behavior experienced a substantial increase from an average score of 2.3 to 4.2 on a scale of 1-5, with the sustainability of behavior maintained by up to 78.1% of students in the 16th week follow-up evaluation.

Based on the research findings, it is recommended that the development of future digital health education programs integrate five essential components that have been proven effective, namely content personalization, social learning integration, gamification elements, progress tracking, and peer support mechanisms. The Malaysian government needs to develop strategic policies to integrate digital health education platforms into non-formal education curricula, along with the provision of adequate technological infrastructure and comprehensive facilitator training programs. Guidance studios as non-formal education institutions are recommended to adopt a hybrid learning model that combines digital technology with direct social interaction to optimize learning outcomes. Further research is needed to explore the effectiveness of digital health education models on a wider and more diverse population, as well as developing program scalability strategies to cover a wider geographical area in the Southeast Asia region by considering the socio-cultural context and local technological infrastructure.

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