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**E-COMIC MEDIA ON CLEAN AND HEALTHY LIVING BEHAVIOR  
TOWARDS PROPER HANDWASHING ABILITY AMONG EARLY  
CHILDHOOD LEARNERS**

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**Abstrak**

Anak-anak di Indonesia, terutama yang berada di lingkungan pendidikan, masih rentan terhadap berbagai penyakit menular, termasuk diare dan infeksi saluran pernapasan yang disebabkan oleh bakteri dan virus. Penelitian ini bertujuan untuk mengkaji pengaruh penggunaan media e-komik terhadap peningkatan keterampilan mencuci tangan yang baik dan benar pada anak usia dini sebagai bagian dari pendidikan perilaku hidup bersih dan sehat (PHBS). Penelitian menggunakan pendekatan kuantitatif dengan desain pre-eksperimen jenis one-group pretest-posttest. Subjek penelitian terdiri dari 20 anak kelompok B usia 5–6 tahun. Intervensi dilakukan melalui pembelajaran dengan media e-komik bertema PHBS yang dirancang untuk mengajarkan prosedur mencuci tangan sesuai standar kesehatan. Data dikumpulkan melalui lembar kerja anak (LKA), lembar observasi, dan angket guru. Hasil uji t menunjukkan adanya perbedaan yang signifikan antara skor pretest dan posttest ( $t = -12,114$ ;  $p < 0,05$ ), dengan rata-rata skor meningkat dari 11,50 menjadi 28,00. Meskipun korelasi antara kedua skor tergolong lemah dan tidak signifikan ( $r = 0,206$ ;  $p = 0,383$ ), peningkatan skor secara keseluruhan mengindikasikan efektivitas intervensi. Data observasi menunjukkan peningkatan antusiasme dan keterampilan mencuci tangan anak, sedangkan respons guru terhadap media mencapai 98% dalam kategori sangat efektif. Hasil ini menyimpulkan bahwa media e-komik tidak hanya meningkatkan pemahaman kognitif, tetapi juga mendukung perubahan perilaku anak. Oleh karena itu, media e-komik direkomendasikan sebagai alat pembelajaran yang menarik dan edukatif dalam pendidikan PHBS di usia dini.

**Kata kunci:** E-Komik; Perilaku Hidup Bersih dan Sehat; Mencuci Tangan; Anak Usia Dini

**Abstract**

Children in Indonesia, especially those in educational settings, are still vulnerable to various infectious diseases, including diarrhea and respiratory tract infections caused by bacteria and viruses. This study aims to examine the effect of using e-comic media on improving good and correct handwashing skills in early childhood as part of clean and healthy living behavior (PHBS) education. The study used a quantitative approach with a one-group pretest-posttest pre-experimental design. The research subjects were 20 children in group B, aged 5–6 years. The intervention was carried out through learning with e-comic media, with a PHBS theme designed to teach handwashing procedures in accordance with health standards. Data were collected through children's worksheets (LKA), observation sheets, and teacher questionnaires. The t-test results showed a significant difference between the pretest and posttest scores ( $t = -12.114$ ;  $p < 0.05$ ), with the average score increasing from 11.50 to 28.00. Although the correlation between the two scores was weak and insignificant ( $r = 0.206$ ;  $p = 0.383$ ), the overall improvement in scores indicated the intervention's effectiveness. Observational data showed an increase in children's enthusiasm and handwashing skills, while teachers' responses to the media reached 98%, indicating very effective implementation. These results indicate that e-comic

media not only improve cognitive understanding but also support behavioral changes in children. Therefore, e-comic media is recommended as an engaging and educational learning tool in PHBS education at an early age.

**Keywords:** Digital Comic; Clean and Healthy Living Behavior; Handwashing; Early Childhood Class

## INTRODUCTION

Child health is a crucial aspect of developing high-quality human resources. Healthy children possess the potential to grow and develop optimally—physically, mentally, and socially. In this regard, early childhood education (ECE) plays a crucial role, as it is during this stage that the foundation for healthy living habits begins to form (Aulina & Astutik, 2018; Natalia & Anggraeni, 2022). Through early education, children can be taught the importance of maintaining hygiene, consuming nutritious food, engaging in regular physical activity, and caring for their mental and emotional well-being. Habits instilled from an early age have a significant influence on their lifestyle and overall health quality in adulthood (Alifia & Hendriana, 2021). Therefore, ensuring every child's right to adequate health services must be a shared priority among families, educational institutions, and the government. Such efforts not only guarantee children's optimal growth and development but also serve as a long-term investment in creating a healthy, intelligent, and productive generation for the nation (Atikah et al., 2023; Aulina & Astutik, 2019).

However, in reality, children in Indonesia especially those in educational settings remain vulnerable to various infectious diseases, including diarrhea and respiratory tract infections caused by bacteria and viruses. The World Health Organization (WHO) WHO explains that, diarrhea remains one of the leading causes of child mortality globally, with an estimated 6 million child deaths reported in 2015 alone, largely due to poor hygiene and limited access to clean water (Atikah et al., 2023; Febrianti et al., 2022). In the Indonesian context, this global issue is mirrored by national data from the Basic Health Research (Riskesdas) conducted in 2010, which reported a diarrhea prevalence rate of 42.2% across the general population, with a particularly high incidence of 9.0% among school-aged children, highlighting the vulnerability of this age group to waterborne and hygiene-related diseases. These statistics underline not only the urgency of improving sanitation and hygiene infrastructure but also the critical importance of educational interventions aimed at instilling clean and healthy living behaviors (PHBS) from an early age. Specifically, in early childhood settings where children are in the most formative years of their physical, cognitive, and behavioral development it becomes imperative that schools serve not only as centers of academic learning but also as environments that actively promote health awareness and personal hygiene practices (Ramlah & Yuniarti, 2024; Taib et al., 2022). Consequently, educational institutions at the early childhood level must be empowered with effective teaching tools and strategies that emphasize disease prevention and equip children with the knowledge and habits necessary to protect their health in the short and long term.

One key component of PHBS is proper handwashing habits (Hasibuan et al., 2023; Pebriani et al., 2022). Handwashing with soap can significantly reduce the risk of disease and infection, particularly in high-activity environments such as kindergartens. Observations at TK Islam Bina Empat Lima Tanray indicated that the school has implemented routine handwashing practices as part of its PHBS efforts. Children regularly wash their hands before entering the classroom, after playing, and before eating (Muyassaroh et al., 2022; Wardhani et al., 2020). This practice is reinforced by a school policy requiring students to queue at the sink after playtime and participate in periodic group handwashing sessions held each semester. However, observations also showed that 21 children washed their hands only as a formality, without following the steps recommended by WHO. Although some children practiced a few of the correct steps, others skipped or improperly performed several stages. According to WHO guidelines, proper handwashing involves wetting the hands with clean running water, applying soap, rubbing palms, cleaning the backs of hands and between the fingers, scrubbing the thumbs, cleaning fingertips and nails against the palms, rinsing with clean water, and drying

with a tissue or clean towel (Lian et al., 2022; Safitri & Harun, 2020). These steps are designed to ensure that hands are thoroughly cleaned of bacteria and viruses that cause illness.

This finding emphasizes the need for further efforts to ensure that handwashing is not only a regular activity but also performed correctly to achieve maximum effectiveness in disease prevention. In addressing the challenges of health education at the kindergarten level, the use of digital educational media, such as e-comics, has emerged as a promising solution. E-comics deliver information in an interactive and engaging format, making it easier for young children to comprehend (Laksma & Suniasih, 2021; Udayani et al., 2021). E-comics have several advantages over conventional teaching methods such as lectures or static posters. They combine visual elements, text, and interactivity in a way that captures the attention of early childhood learners (Hapidin et al., 2022; Ismiyanti et al., 2024). Research has shown that e-comics can improve children's learning motivation and comprehension because the material is presented through engaging stories that are easy to remember. Moreover, this media allows children to review the content independently, which is essential in forming sustainable learning habits. In contrast, conventional methods often fall short in maintaining children's attention, particularly when the subject matter is technical or abstract (Afriana & Prastowo, 2022; Prihandini & Siswati, 2022).

Previous studies have found that e-comics are effective in increasing children's understanding of clean and healthy living behaviors (Ramlaah & Yuniarti, 2024; Syahnaz et al., 2020). Digital comic media has been found to possess high validity and effectively enhance students' engagement and conceptual understanding through visually appealing and interactive presentations in thematic learning, as evidenced by the study conducted (Atikah et al., 2023; Rohmanurmeta & Dewi, 2019). Other research has also demonstrated that the use of e-comics in teaching the human digestive system significantly improves learning outcomes and makes the learning process more enjoyable (Setyawan & Kusuma, 2024; Yudha & Sepriani, 2024). Furthermore, comic media has been proven to play a crucial role in increasing students' learning motivation and concentration by creating an active and meaningful learning atmosphere, as concluded in the study (Hapidin et al., 2022; Suryaningsih et al., 2023).

Although numerous studies have confirmed the effectiveness of e-comics in learning, there remains a limited number of studies specifically examining the use of this medium in teaching handwashing to early childhood learners. Therefore, this study aims to investigate the effect of using PHBS-themed e-comic media on children's handwashing skills at TK Islam Bina Empat Lima Tanray. Although the school has already implemented regular handwashing routines, the use of e-comic media is expected to improve children's understanding of the correct handwashing procedures in accordance with health standards, while also making the habit more appealing. It is hoped that this research will make a significant contribution to raising health awareness among young children and serve as a reference for developing innovative learning methods in early childhood education. With this approach, it is possible to foster a healthier generation that is more aware of the importance of personal hygiene.

## METHOD

This study employed a quantitative approach with a one-group pretest-posttest design, in which the same group of participants was assessed before and after the intervention using e-comic media. This design was selected to determine the extent to which e-comic media influences the improvement of proper handwashing skills in early childhood. The research subjects were 20 children aged 5–6 years from Group B of TK Islam Bina Empat Lima Tanray, Pontianak, during the 2023/2024 academic year. The sample was selected purposively based on age uniformity and readiness to participate in digital media-based learning. Data were collected through three instruments: children's worksheets (*Lembar Kerja Anak / LKA*) used during pretest and posttest to measure handwashing skills, observation sheets to document behavioral changes during the learning process, and teacher questionnaires to assess their perceptions of the effectiveness of the e-comic media as a learning tool. The data were analyzed using quantitative descriptive statistics. The LKA pretest and posttest scores were analyzed to determine score differences before and after the intervention, using paired sample

t-tests to assess the statistical significance of the change. In addition, percentage attainment of each performance indicator was calculated for individual students. Observation data were analyzed to identify practical behavioral changes in handwashing practices. Teacher questionnaire responses were analyzed using mean scores on a Likert scale to evaluate the effectiveness and practicality of the e-comic media in the learning process.

## RESULT AND DISCUSSION

### Result

This study was conducted to examine the extent to which the use of e-comic media can enhance proper handwashing skills in early childhood. The research employed a pre-experimental design with a one-group pretest-posttest approach, allowing the researcher to compare students' handwashing abilities before and after the intervention. The primary instrument used to assess handwashing skills was the Children's Worksheet (Lembar Kerja Anak / LKA), which was developed based on handwashing skill indicators outlined by the World Health Organization (WHO). Each worksheet consisted of six items representing the systematic steps of proper handwashing. Each item had a maximum score of five points, resulting in a total maximum score of 30 points per child. A total of 20 children from Group B at TK Islam Bina Empat Lima Tanray participated in this study. Pretest scores were collected prior to the learning process, while posttest scores were obtained after the participants received instruction using the e-comic media. The pretest and posttest data were analyzed using both descriptive and inferential statistical methods.

Descriptive analysis results show that the mean pretest score was 11.50 with a standard deviation of 6.091, while the mean posttest score increased to 28.00 with a standard deviation of 2.513. This increase indicates a significant improvement in children's handwashing skills following the e-comic-based learning intervention. The difference in standard deviation also suggests that the posttest scores were more homogeneous compared to the pretest scores, indicating a more uniform level of understanding among the children after the treatment. To provide a clearer visual comparison of each participant's score, a bar chart illustrating the differences between pretest and posttest scores of all research subjects is presented in Figure 1.

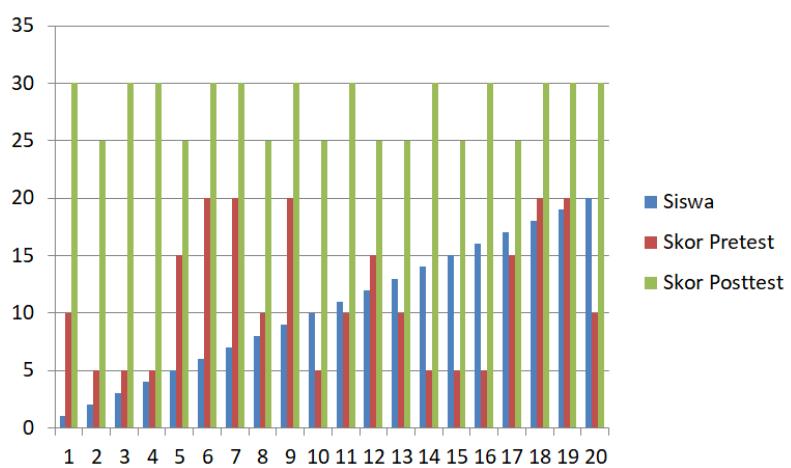


Figure 1. Comparison of Pretest and Posttest Scores in Children's Handwashing Skills

As shown in Figure 1, all students experienced an improvement in their scores after participating in the learning sessions using e-comic media. In fact, the majority of students achieved the maximum score in the posttest, indicating a significant increase in their understanding of proper handwashing procedures. Following the descriptive analysis, the researcher conducted an inferential analysis using a paired samples t-test to determine whether the difference between pretest and posttest scores was statistically significant. The results of the paired t-test showed a t-value of -12.114 with degrees of freedom (df) = 19 and a significance level (p-value) of 0.000. Since the p-value is less than the critical value of 0.05

( $p < 0.05$ ), it can be concluded that there is a statistically significant difference between children's handwashing abilities before and after the intervention using e-comic media.

These findings reinforce the conclusion that learning with e-comic media contributes positively to enhancing young children's understanding of proper handwashing steps. The average score difference of 16.5 points between the pretest and posttest further emphasizes the effectiveness of this media in fostering clean and healthy behavior. The results of the t-test analysis are detailed in Table 2.

Table 2. Results of the Paired Samples t-test on Handwashing Skills

Mean	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
Pair 1							
before treatment	-16.500	6.091	1.362	-19.351	-13.649	-12.114	19
- after treatment							0.000

As additional information, a Pearson correlation test was conducted to examine the relationship between pretest and posttest scores. The correlation coefficient was  $r = 0.206$  with a significance value of  $p = 0.383$ . These results indicate a very weak and statistically insignificant relationship between scores before and after the intervention. This suggests that although overall scores improved, the pattern of improvement varied among individual participants.

In addition to the quantitative data, the researcher conducted direct observations of children's behavior during the learning sessions. Based on these observations, it was found that the children demonstrated high levels of enthusiasm and active participation when engaging with the e-comic media. They appeared more focused, interested, and motivated throughout the handwashing activity. The children were able to recall and practice each step of the handwashing procedure according to the WHO standard, including wetting the hands, rubbing palms and the backs of hands, cleaning between fingers, thumbs, fingertips and nails, rinsing, and drying the hands properly. These activities were also visually documented during the observation process. In addition to observing the children, teachers' perceptions of the e-comic media were also assessed using a questionnaire. The questionnaire consisted of ten items reflecting three aspects: effectiveness, clarity, and attractiveness of the e-comic in learning activities. The results showed that nine items received a response of "strongly agree", and one item received "agree." The total score obtained was 49 out of 50, equivalent to 98%, indicating that the teacher rated the e-comic media as an excellent, effective, and appropriate learning tool for early childhood education. A systematic summary of the teacher's evaluation is presented in Table 2.

Table 2. Summary of Teacher's Evaluation of E-Comic Media

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree
1	-	-	-	4
2	-	-	-	5
3	-	-	-	5
4	-	-	-	5
5	-	-	-	5
6	-	-	-	5
7	-	-	-	5
8	-	-	-	5
9	-	-	-	5
10	-	-	-	5
<b>Total Score</b>				<b>49</b>
<b>Percentage</b>				<b>98</b>

Further observation revealed that the children exhibited noticeable changes in their awareness and handwashing practices. They began showing initiative to wash their hands independently, without being told, and became more attentive to following the correct sequence of handwashing steps. These behavioral changes reinforce the quantitative findings, suggesting that the use of e-comic media not only enhances cognitive understanding, but also contributes to sustained, real-life behavioral change. A visual illustration of children practicing handwashing habits after the e-comic-based learning. Overall, the results of this study demonstrate that the use of e-comic media has a positive impact on improving proper handwashing skills in early childhood. This impact is evident not only in statistically measurable learning outcomes, but also in the affective and psychomotor domains, as reflected through children's engagement and the teacher's evaluations. Therefore, e-comic media can be recommended as an interactive, enjoyable, and educational alternative for teaching clean and healthy living behaviors in early childhood settings.

## Discussion

Based on the analysis results, it was found that of e-comic-based instruction, there was a significant improvement in the children's handwashing skills. All participants showed marked improvement in their evaluation results, with most falling into the "good" to "very good" categories. Observational data confirmed that children began applying the correct handwashing techniques using soap and successfully followed all six handwashing steps according to health standards. In addition, assessments through Children's Worksheets (Lembar Kerja Anak / LKA), direct observation, and teacher questionnaires demonstrated a positive overall impact of the e-comic intervention. The average LKA score reached 94.5%, while the teachers rated the e-comic media with an overwhelmingly positive 98% approval rating. Teachers considered the media highly effective for conveying PHBS content and noted that it successfully increased children's participation and enthusiasm in learning activities. The e-comic media did not only enhance children's cognitive understanding, but also contributed to positive behavioral change through an enjoyable and age-appropriate approach.

Comics are one of the most popular media among children and are widely favored even by upper elementary students (Jannah & Reinita, 2023; Supartayasa & Wibawa, 2022). The use of comics in learning activities has been shown to make the educational process more engaging and participatory, which in turn increases students' interest and motivation to learn (Putra & Milenia, 2021; Sari & Harahap, 2021). Through narrative storytelling, e-comics make it easier for children to absorb information, relate to characters, and emulate positive behaviors demonstrated in the storyline. Delivering material through comics creates a more enjoyable learning experience, encouraging children to engage actively in the learning process (Sigit et al., 2024; Udayani et al., 2021). In fact, comics remain a preferred medium from elementary school students to university-level learners (Hobri, Murtikusuma & Hermawan, 2019; Pinta & Yanti, 2024).

The narrative and visual structure of e-comics makes them an effective medium for internalizing values related to clean living habits. Children are emotionally and cognitively engaged, enabling them to experience active and meaningful learning (Ismiyanti et al., 2024; Salim et al., 2022). Characters within the stories act as behavioral role models, strengthening comprehension and facilitating natural habit formation through imitation (Kumalasari et al., 2024; Putra & Milenia, 2021). Thus, the e-comic medium proves to be an innovative, engaging, and practical learning tool that successfully fosters clean and healthy living behaviors from an early age particularly in supporting handwashing skills as an essential component of PHBS practices in kindergarten environments.

These findings are consistent with previous studies showing that the use of e-comics can enhance students' understanding and application of Clean and Healthy Living Behaviors (PHBS) (Hendawati et al., 2024; Ramlah & Yuniarti, 2024). The use of PHBS-based e-comics has been proven to increase children's awareness of the importance of maintaining personal and environmental hygiene (Suryaningsih et al., 2023; Udayani et al., 2021). Other studies also revealed that digital comic media possess a high level of validity and are effective in

improving student engagement and conceptual understanding through visually appealing and interactive displays (Afriana & Prastowo, 2022; Pinta & Yanti, 2024). This medium enables children to learn in an enjoyable way while strengthening their ability to understand basic health concepts such as handwashing, dental hygiene, and consuming nutritious food.

The implications of this study are expected to serve as a foundation for educators and policymakers in integrating PHBS-based e-comic media into early childhood learning activities. By utilizing engaging and interactive media, children are expected not only to understand the concept of clean and healthy living but also to apply it consistently in their daily lives. Furthermore, the findings of this study may encourage schools and government institutions to develop digital health education programs aligned with the Healthy Living Community Movement (GERMAS), thereby fostering a generation that is highly aware of the importance of cleanliness, health, and personal responsibility from an early age

## CONCLUSION

Based on the results of this study, it can be concluded that the use of e-comic media themed around Clean and Healthy Living Behavior (CHLB) has a significant impact on improving proper handwashing skills among early childhood learners. The increase in scores from pretest to posttest demonstrates that this media effectively enhances children's understanding of handwashing steps according to WHO standards. Beyond cognitive improvement, the e-comic media also positively influenced affective and psychomotor domains, as evidenced by the children's enthusiasm during learning and observable changes in their handwashing behavior. The highly positive evaluation from teachers further supports the finding that e-comic media is an appropriate and effective learning tool for early childhood education settings. In line with these findings, it is recommended that early childhood educators utilize e-comic media as an alternative method for delivering health education, particularly in teaching clean and healthy living behaviors. This media has been proven to enhance learning interest, strengthen conceptual understanding, and foster healthy habits from an early age.

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