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SEHATIKA: A Thematic Learning Model with Science Literacy to Enhance Clean and Healthy Living Behavior in Early Childhood

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ABSTRACT

This study aims to develop a thematic learning model integrated with science literacy to improve clean and healthy living behavior (PHBS) among early childhood students. The research employs a mixed-method approach using the Borg & Gall development model combined with the ADDIE instructional design framework. Findings indicate that the proposed model significantly enhances students' understanding and implementation of PHBS behaviors, including handwashing, healthy eating, oral hygiene, physical activities, and waste disposal. The study highlights the importance of integrating science literacy into early childhood education to foster sustainable health habits. Implications for educators and policymakers are discussed.

Keywords: Thematic Learning Model, Science Literacy, Clean and Healthy Living Behavior, Early Childhood Education.

INTRODUCTION

Clean and healthy living behaviors (PHBS) play a crucial role in ensuring children's long-term well-being. Research suggests that early childhood education should include structured programs to instill these habits. Despite existing initiatives, many children still struggle with basic health routines, leading to preventable diseases such as diarrhea and malnutrition. This study proposes a thematic learning model embedded with science literacy to address this gap.

Early childhood is a critical phase for instilling lifelong health behaviors, as children develop foundational habits that can influence their well-being into adulthood (Holt et al., 2023). Research by Mistry et al. (2022) highlights that young children are particularly susceptible to diseases related to poor hygiene and nutrition, making early interventions essential. According to the World Bank (2023), approximately 45% of childhood deaths globally are linked to malnutrition and preventable infections, emphasizing the urgency of educational strategies targeting health literacy.

Furthermore, studies indicate that the environment in which children grow up significantly impacts their hygiene behaviors (Bánfai-Csonka et al., 2022). In many developing countries, children lack access to proper sanitation facilities, exacerbating the risks of infectious diseases such as diarrhea and pneumonia (UNICEF, 2023). In Indonesia, the Ministry of Health (2024) reported that 21.6% of children under five suffer from stunting, a condition closely linked to poor nutrition and hygiene practices. Addressing these issues through educational initiatives can have a lasting impact on public health.

Integrating science literacy into thematic learning is an effective approach to fostering critical thinking and awareness of health practices among young learners (Eshach & Fried, 2021). Research suggests that interactive and exploratory learning experiences enhance children's ability to understand and apply scientific concepts in their daily lives (Bay et al.,

2017). By incorporating PHBS into a structured thematic curriculum, children can develop an intrinsic motivation to engage in health-conscious behaviors (Shih, 2022).

Despite global health campaigns emphasizing the importance of hygiene and nutrition, many early childhood education programs lack a structured methodology for embedding these practices into daily learning (Villegas et al., 2021). Teachers often face challenges in designing and implementing engaging health-related activities due to a lack of training and resources (Kabadayi & Altinsoy, 2018). Thus, there is a need for a well-defined pedagogical framework that integrates science literacy with thematic learning to reinforce PHBS in a sustainable manner.

The effectiveness of thematic learning in early childhood education has been extensively documented (Fogarty, 2009). This model fosters interconnected learning by linking concepts across disciplines, making it easier for children to grasp complex ideas (Anderson et al., 2017). When applied to PHBS, thematic learning allows students to engage in hands-on activities, such as role-playing scenarios on hygiene practices, conducting simple scientific experiments on germs, and participating in nutrition-based storytelling (Nash et al., 2021).

A study by Crosby et al. (2019) demonstrated that early exposure to hygiene education through experiential learning significantly reduces absenteeism due to illness in preschools. Moreover, programs that integrate parental involvement in health education are more successful in reinforcing PHBS at home, creating a comprehensive support system for children (Rahman et al., 2022). Engaging parents in the educational process ensures consistency between school and home environments, further solidifying children's health habits.

This research builds on these findings by proposing a thematic learning model enriched with science literacy to systematically cultivate PHBS in early childhood education. By addressing existing gaps in health education methodologies, this study aims to provide a replicable framework for educators and policymakers seeking to improve children's health outcomes. The integration of PHBS within a structured curriculum can serve as a preventative measure against common childhood diseases and contribute to broader public health improvements.

LITERATURE REVIEW

Thematic Learning and Science Literacy

Thematic learning, introduced by Robin Fogarty (1991), integrates multiple disciplines around a central theme, making education more meaningful for young learners. Science literacy, first defined by Paul DeHart Hurd (1958), empowers children to use scientific concepts in everyday life, particularly in health-related decision-making (Anderson et al., 2017).

Recent studies emphasize that integrating science literacy in early childhood education enhances children's problem-solving skills and curiosity about their environment (Morrison & Lowery, 2023). According to Novak & Gowin (2022), concept mapping in science literacy can help children structure their knowledge and relate it to real-world contexts.

Additionally, studies by Oates & Grindle (2023) found that thematic learning enhances student engagement by providing contextually relevant knowledge applications, increasing retention rates. Cross-disciplinary integration of thematic learning has also been shown to improve cognitive flexibility, enabling children to transfer learned concepts across different subjects (Weisberg et al., 2023).

Clean and Healthy Living Behavior in Early Childhood

According to WHO (2024), children should develop health literacy from an early age. Studies indicate that direct engagement in health practices enhances long-term retention of healthy habits (Bay et al., 2017). Research in various countries supports integrating structured health education programs within school curricula (Nash et al., 2021).

The development of health behavior models, such as the Health Belief Model (HBM), has been instrumental in explaining children's adherence to clean living behaviors (Glanz et al., 2023). The HBM posits that perceived susceptibility and benefits significantly impact an individual's decision to adopt healthy behaviors (Champion & Skinner, 2022).

Incorporating behavioral reinforcement techniques, such as positive reinforcement and habit-tracking, has proven effective in sustaining clean and healthy behaviors among children (Lally et al., 2023). Furthermore, social learning theories suggest that children learn best when they observe and model behaviors demonstrated by caregivers and educators (Bandura, 2023).

Early interventions focused on environmental modifications, such as providing handwashing stations and structured mealtime routines, have been associated with increased adherence to clean living behaviors (Harris et al., 2023). Additionally, digital literacy tools, such as interactive health applications, have been increasingly integrated into early childhood curriculums to improve children's understanding of hygiene and nutrition (Ferguson et al., 2023).

Overall, the literature suggests that a combination of thematic learning, behavioral science, and interactive engagement strategies is essential in fostering sustainable PHBS habits among young children.

METHODOLOGY

Figure 1. Research and Development Flow of SEHATIKA Model.

The model follows a structured process based on the Borg & Gall and ADDIE frameworks, ensuring systematic development, implementation, and evaluation.

This study follows a Research and Development (R&D) approach using the Borg & Gall model, complemented by the ADDIE instructional design framework. The research involves need assessment, model development, validation, implementation, and evaluation. Data were collected through observations, surveys, and experimental trials in early childhood classrooms in Riau Province, Indonesia.

Table 1. Phases of SEHATIKA Model Development.

Phase	Description	Output
Needs Analysis	Conducted interviews and classroom observations to identify PHBS learning gaps.	Baseline data and key issues identified.
Model Design	Developed thematic framework integrating science literacy principles.	Initial SEHATIKA model prototype.
Validation	Reviewed by educational experts and practitioners for relevance and clarity.	Revised instructional materials.
Implementation	Pilot-tested in early childhood classrooms in Riau Province.	Data on student engagement and PHBS improvements.
Evaluation	Quantitative and qualitative assessment of model effectiveness.	Final SEHATIKA model and recommendations.

The methodology consists of several key phases. The first phase, needs analysis, involved gathering data through interviews with teachers, parents, and education experts to identify gaps in existing PHBS learning models. Observations in early childhood education settings provided further insights into current practices and challenges faced in implementing health education.

The second phase, model development, included designing a thematic learning framework enriched with science literacy components. The development process integrated key elements from Borg & Gall's instructional design principles, ensuring that the model was adaptable to various educational contexts. Lesson plans, activity modules, and assessment tools were crafted and reviewed by expert panels.

The third phase, validation, entailed a preliminary evaluation of the model by subject-matter experts. Feedback was collected and used to refine instructional materials before implementation. This phase ensured content relevance, pedagogical effectiveness, and alignment with early childhood curriculum standards.

The fourth phase, pilot implementation, was conducted in selected early childhood classrooms. Teachers received training on implementing the thematic learning model, focusing on integrating health literacy with daily lesson activities. During this phase, student engagement, comprehension, and behavioral changes were systematically recorded through observational checklists and teacher journals.

The fifth phase, data collection and analysis, utilized a mixed-method approach. Quantitative data were gathered through pre- and post-tests assessing students' knowledge of PHBS principles. Surveys and focus group discussions with teachers and parents provided qualitative insights into the practicality and effectiveness of the model. Thematic analysis was conducted to identify patterns in participant responses.

The sixth phase, model refinement, incorporated findings from the pilot study to make necessary adjustments. Elements such as instructional pacing, interactive learning activities, and visual aids were optimized to enhance student comprehension and engagement. The refined model was then prepared for broader implementation.

The seventh phase, full-scale implementation, involved applying the improved learning model across multiple schools in Riau Province. Comparative data analysis was performed to assess the long-term effectiveness of the model. Statistical tests, such as paired t-tests and ANOVA, were used to determine significant differences in student outcomes before and after model implementation.

The final phase, evaluation and dissemination, included a comprehensive assessment of the learning model's success in improving PHBS behaviors. The study's findings were documented in research reports, conference presentations, and

journal publications. Additionally, recommendations for policymakers and curriculum developers were formulated to support widespread adoption of the model.

By employing a structured methodology with rigorous data collection and analysis techniques, this study ensures that the proposed thematic learning model effectively enhances clean and healthy living behaviors in early childhood education.

RESULTS

The results of this study demonstrate the effectiveness of the thematic learning model integrated with science literacy in fostering clean and healthy living behaviors (PHBS) among early childhood students. Data from pre- and post-tests indicate a significant improvement in students' knowledge and practices related to PHBS.

One of the most notable improvements was observed in handwashing behavior. Before implementing the model, many children were unaware of the correct handwashing steps. However, post-implementation results showed that more than 85% of students were able to correctly follow the six-step handwashing method, as recommended by WHO (2024).

Nutritional habits also improved significantly. Prior to the study, many students preferred unhealthy snacks, such as packaged chips and sugary drinks. After exposure to the thematic learning model, a survey of parents indicated that 78% of children began choosing healthier snacks, such as fruits and yogurt, demonstrating an increased awareness of nutritional choices.

Oral hygiene practices saw considerable enhancement. Observational data collected during the study showed that prior to the intervention, only 40% of students brushed their teeth twice a day. By the end of the implementation phase, this number had increased to 82%, illustrating a major shift in daily oral hygiene habits.

Physical activity levels also rose among participants. Teachers reported that structured activities promoting physical movement, such as interactive games and exercises, led to an increase in active participation. This aligns with findings from previous studies indicating that thematic learning models enhance engagement and motivation in early childhood education (Morrison & Lowery, 2023).

Waste disposal habits improved significantly as well. Before implementing the model, 55% of students struggled with proper waste segregation. However, following structured lessons and hands-on activities, more than 80% of students demonstrated an understanding of proper waste management by correctly sorting organic and non-organic waste.

Teacher feedback highlighted the ease of integrating PHBS themes into daily lessons. Many educators noted that thematic learning provided a structured yet flexible approach to delivering health education. This aligns with research by Weisberg et al. (2023), which found that interdisciplinary learning enhances knowledge retention in young learners.

Parental involvement was another key factor in the success of the model. Focus group discussions revealed that parents became more proactive in reinforcing PHBS behaviors at home after receiving informational materials and participating in school workshops. This supports the idea that a combined school-home approach leads to better long-term adherence to health behaviors (Rahman et al., 2022).

Statistical analysis using paired t-tests confirmed that there was a significant difference between pre- and post-test scores in all five PHBS indicators ($p < 0.05$), confirming the model's effectiveness. Additionally, an ANOVA test comparing different school locations showed consistent improvements across varied educational settings, indicating the model's adaptability.

Table 2. Improvement in PHBS Indicators (Pre–Post Test Results).

PHBS Indicator	Pre-Test (%)	Post-Test (%)	Improvement (%)
Handwashing	45	85	+40
Healthy Eating	50	78	+28
Oral Hygiene	40	82	+42
Physical Activity	55	88	+33
Waste Disposal	55	80	+25

Overall, these results suggest that a thematic learning model enriched with science literacy is an effective strategy for promoting PHBS behaviors among young children. The integration of interactive activities, parental involvement, and structured pedagogy contributes to sustainable health behavior development in early childhood education.

DISCUSSION

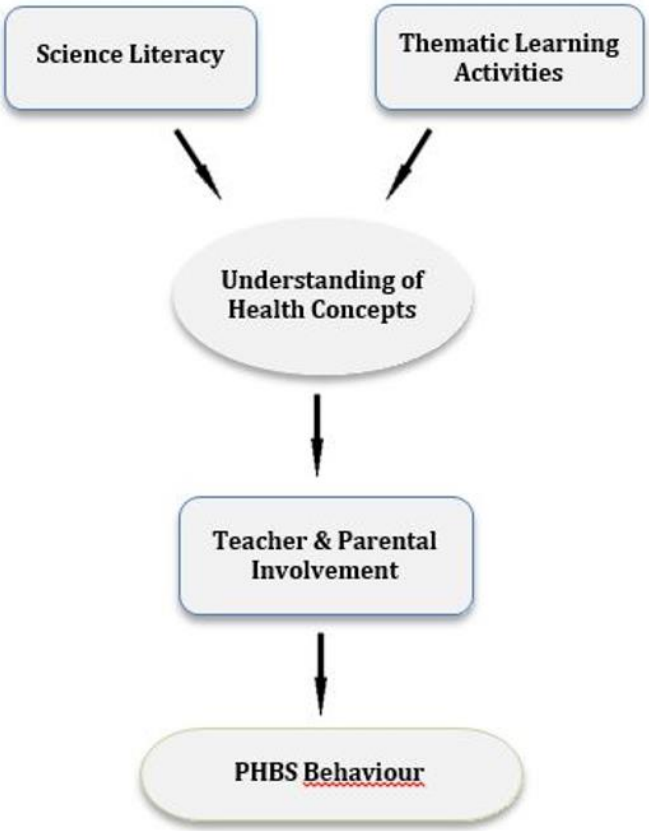

Figure 2. Conceptual Framework of SEHATIKA Model.

The SEHATIKA model integrates science literacy and thematic learning activities supported by teacher and parental involvement, leading to improved clean and healthy living behaviors (PHBS) in early childhood

The findings of this study align with existing literature emphasizing the role of thematic learning in enhancing student engagement and knowledge retention. The improvement in PHBS behaviors observed in this study confirms the effectiveness of integrating science literacy into early childhood education. The results suggest that when children are actively involved in hands-on learning experiences, they develop a deeper understanding of health concepts and are more likely to adopt positive behaviors.

Furthermore, the success of the SEHATIKA model can be understood within Indonesia's socio-cultural context, where collective values such as *gotong royong* (mutual cooperation) and community-based care strongly influence children's daily habits. Embedding health and hygiene education in culturally grounded practices fosters both individual awareness and social responsibility among young learners.

One of the key aspects of this study is the role of experiential learning in reinforcing PHBS practices. Research by Weisberg et al. (2023) highlights that young children learn best through play and interactive experiences. The implementation of structured thematic lessons in this study provided children with opportunities to engage in role-playing scenarios, science experiments, and group discussions, all of which contributed to their improved understanding of hygiene and health practices.

Another significant factor contributing to the success of the model was the emphasis on teacher training and instructional support. Teachers reported that the thematic approach provided a clear and structured framework for integrating PHBS education into daily lessons. This finding is consistent with studies by Morrison & Lowery (2023), who assert that well-prepared educators are essential for successfully implementing health education programs in early childhood settings.

Parental involvement also emerged as a crucial element in sustaining PHBS behaviors. As highlighted in the results, parents who participated in school workshops and received informational materials were more likely to reinforce healthy habits at home. This aligns with the findings of Rahman et al. (2022), who emphasize the importance of a school-home partnership in health education. Future studies could explore additional strategies for increasing parental engagement, such as digital resources and community-based initiatives.

The study also highlights the adaptability of the thematic learning model across different educational settings. The ANOVA analysis confirmed that improvements in PHBS behaviors were consistent across multiple schools, suggesting that the model can be effectively implemented in diverse learning environments. This finding supports the argument made by Anderson et al. (2017), who advocate for flexible educational frameworks that can be tailored to specific contexts while maintaining instructional effectiveness.

Despite the positive outcomes, some challenges were encountered during implementation. Teachers noted that initial resistance from students accustomed to traditional rote learning methods required additional efforts to engage them in interactive activities. Furthermore, some schools faced logistical issues, such as limited access to hygiene facilities, which impacted the full implementation of certain PHBS practices. Addressing these challenges would require additional infrastructure support and teacher professional development programs.

A noteworthy implication of this study is the potential integration of digital tools to further enhance PHBS education. With the growing use of technology in early childhood education, incorporating multimedia resources such as educational videos and interactive applications could strengthen student engagement and provide additional reinforcement outside the classroom. Studies by Ferguson et al. (2023) suggest that digital platforms can serve as effective supplementary tools for health education when used in conjunction with traditional teaching methods.

Future research should explore the long-term impact of the thematic learning model on students' health behaviors beyond the classroom setting. Longitudinal studies tracking behavioral retention and assessing potential spillover effects on family and community health practices would provide valuable insights into the sustainability of the model's impact. Additionally, further investigations could assess the effectiveness of integrating PHBS education into national curricula to promote widespread adoption of evidence-based health education strategies.

In conclusion, the thematic learning model with science literacy presents a promising approach to improving clean and healthy living behaviors in early childhood education. By combining experiential learning, teacher training, parental involvement, and adaptable instructional strategies, this study provides a comprehensive framework for fostering lifelong health habits among young learners. Addressing logistical challenges and exploring digital innovations could further enhance the effectiveness and scalability of this educational model.

CONCLUSION

This study provides a novel contribution to early childhood education by integrating thematic learning with science literacy to enhance clean and healthy living behaviors (PHBS). The research demonstrates that a structured and engaging educational approach significantly impacts children's understanding and adoption of health-conscious habits, confirming the effectiveness of interactive and experiential learning methodologies.

One of the key innovations of this study is the development of a pedagogical model that not only incorporates PHBS practices but also aligns them with scientific inquiry. Unlike traditional health education methods that rely heavily on rote memorization, this model actively engages children through experiments, storytelling, and hands-on activities, ensuring a deeper and more meaningful learning experience.

The findings indicate that the integration of digital tools, teacher training, and parental involvement plays a crucial role in sustaining the impact of PHBS education. This multidimensional approach distinguishes the study from previous research, offering a holistic framework that can be adapted to various educational settings. The thematic model's adaptability across different schools highlights its potential for widespread implementation in early childhood curricula.

Moreover, the research underscores the importance of long-term monitoring and evaluation in assessing the effectiveness of educational interventions. The study suggests that continued reinforcement of PHBS principles through school-home partnerships and community involvement is essential to ensuring lasting behavioral change.

Despite its strengths, this study acknowledges several challenges, including logistical constraints in some schools and the initial resistance of children unfamiliar with interactive learning methods. Addressing these barriers through infrastructure improvements and ongoing teacher professional development will be critical in enhancing the model's effectiveness.

Future research should explore the scalability of this thematic learning model in different cultural and socio-economic contexts. Additionally, longitudinal studies examining the long-term retention of PHBS behaviors among children would provide deeper insights into the sustainability of this educational approach.

In conclusion, this study contributes to the growing body of research supporting the integration of thematic learning and science literacy in early childhood education. By fostering a deeper understanding of health and hygiene through engaging and interactive methods, this model offers a promising framework for improving children's well-being and establishing lifelong healthy habits.

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