The Impact of Open-Ended Learning on 21st-Century Skill Acquisition in Early Learners

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ABSTRACT

Purpose – This study aims to evaluate the effectiveness of an open-ended learning model based on 21st-century skills in enhancing the learning experiences of early childhood learners. In today's dynamic educational landscape, integrating critical thinking, creativity, communication, and collaboration into early learning is essential to prepare children for future challenges.

Design/methods/approach – The research employed a quantitative method using structured questionnaires distributed through Google Forms to early childhood educators. Data were collected in numerical form and analyzed using SPSS, with results displayed through tables and graphs. The approach enabled a comprehensive assessment of how the open-ended learning model supports the development of 21st-century skills in young children.

Findings – The findings show that the open-ended learning model based on 21st-century skills is effective in enhancing early childhood learners' engagement and skill acquisition. Children demonstrated improvements in critical thinking, problem-solving, and communication. The model created opportunities for children to express ideas creatively and independently through open problem-solving activities.

Research implications/limitations – This study is limited by its small sample size and focused context. Further research should explore long-term implementation across various settings and include observational data to support self-reported measures.

Originality/value – This research offers valuable insights into the application of open-ended learning in early childhood education. It underscores the importance of integrating 21st-century skills into early learning practices and provides educators with practical strategies for fostering creativity, collaboration, and independent thinking in young learners.

Introduction

In the era of globalization, marked by rapid advancements in science and technology especially in information and communication technology the world has been transformed into a seemingly borderless global village (Tong et al., 2019). Nations are becoming increasingly transparent, with boundaries virtually eliminated, affecting all aspects of life, including national identity, culture, and education. This transformation has influenced the way people think, behave, and act, including in the domain of early childhood education (Ahmed et al., 2019).

Early childhood education refers to the education of children aged 0–6 years, as defined in Law Number 20 of 2003 concerning the National Education System in Indonesia (Lyons, 2023). Children at this age are in a critical phase of growth and development, characterized by unique needs and traits. These include various patterns of cognitive, social, emotional, linguistic, and communicative development (Hoemann et al., 2019). The primary goal of early childhood education is to stimulate, guide, nurture, and provide meaningful learning experiences to help children develop essential skills and competencies (Kassai et al., 2019).

Learning in early childhood is built upon the interaction between children, parents, and the surrounding environment. This interaction aims to help children achieve key developmental tasks and milestones (Ford et al., 2021). Within this context, educators apply various teaching models and methods tailored to learners' characteristics. A learning model is defined as a structured set of instructional materials and procedures that work together to achieve specific learning outcomes (Liu & Lang, 2019). A well-executed model ensures the learning objectives are met effectively and efficiently (Christodoulou et al., 2019).

One such model is the Open-Ended Learning Model, in which educators present a problem to learners and allow them to find multiple solutions through diverse strategies (Abaniel, 2021). This model focuses not only on the correct answer but also on the process, strategy, and creative approach used by students. It fosters critical thinking, creativity, flexibility, and positive, constructive responses from children (Zhang et al., 2023). Open-ended learning encourages individuality, cognitive complexity, interactive communication, sharing, openness, and social integration (Lu & Wei, 2019). Children are prompted to improvise, explore alternative problem-solving methods, and explain their reasoning and approach, thus prioritizing the learning process over the final product (Roswell, 2021).

21st-century skills refer to the competencies needed to navigate a complex and uncertain world. These include life and career skills, learning and innovation skills, and information, media, and technology skills (Vila et al., 2021). In today's world, knowledge alone is not sufficient. Learners must develop these life-enriching competencies through experience, practice, and innovative learning strategies (Sarmi et al., 2019). 21st-century skills can be fostered through the integration of technology, evidence-based practices, and global adaptability (Ramos-Morcillo et al., 2020; Yoshikawa et al., 2020). Educators are thus expected to prepare students not only with academic knowledge but also with creativity, adaptability, and technological literacy. These expectations require the implementation of high-quality, forward-thinking learning models (Abbott et al., 2019).

However, applying an open-ended learning model integrated with 21st-century skills is not without challenges. These challenges stem from both external and internal factors (Santosh, 2020). External factors include environmental influences such as family conditions, school infrastructure, and the broader community. Teachers also play a

significant role in facilitating or hindering effective learning. The teacher's engagement directly influences the success of learning activities (Singh et al., 2020). Internal factors, on the other hand, refer to students' intrinsic characteristics—physical and psychological conditions that affect learning, such as motivation, cognitive ability, and emotional readiness (Darabi et al., 2019). Because open-ended learning demands critical thinking and self-expression, these internal factors become crucial to the effectiveness of instruction.

One recurring issue in the application of this model lies in designing appropriate problems for learners. Teachers must carefully craft challenges that are neither too complex nor too simple for students to engage with meaningfully (Raza et al., 2021). Some students may struggle with understanding the problem or feel anxious about providing an unconventional answer. For others, open-ended learning may feel overwhelming rather than enjoyable (Ko et al., 2020).

A relevant study was conducted by Kadek Dita Lestari, Ni Wayan Suniasih, and I.B. Surya Manuaba titled "The Effect of the Open-Ended Learning Model Based on Explanation Skills on Science Knowledge Competency." The research demonstrated that the open-ended model increased student curiosity and motivation. By being given real-world problems and opportunities to explain their thinking, students were better able to engage in meaningful problem-solving (Lestari et al., 2017).

Based on the above considerations, this study aims to address the following research questions: 1) Is the open-ended learning model effective in improving 21st-century skills in early childhood learners?; 2) How does the open-ended model operate to foster these skills?; 3) Can the open-ended model sharpen the critical thinking and innovation capabilities of young children? Therefore, this study proposes that open-ended learning provides a foundation for developing critical thinking, confidence, and core 21st-century skills in early learners. It is expected to offer insight into how this model can be optimized in early childhood classrooms to foster creativity, collaboration, and adaptability in future generations.

Methods

Research Design

This study employed a quantitative approach by distributing structured questionnaires online via Google Forms (Chanukuppa et al., 2019). The quantitative approach adopts a positivist paradigm to expand knowledge and applies research strategies such as surveys, which rely on statistical data (Mayer et al., 2019).

In this study, the research design involved two groups: an experimental group that received the open-ended learning model treatment and a comparison group that experienced conventional (direct) learning (Amirshenava & Osanloo, 2019).

The choice of this quantitative design was based on two main considerations. First, previous studies have examined the open-ended learning model and suggested its effectiveness in supporting the development of 21st-century skills among early childhood learners. Second, the structured procedures in this study make it generalizable to similar contexts involving early childhood instruction.

Research Setting and Participants

The study was conducted through an online survey consisting of closed-ended questions developed in Google Forms. The questionnaire focused on two key variables: the open-ended learning model and 21st-century skills, each comprising ten items. The

questions offered four Likert-scale response options: "strongly agree" (4 points), "agree" (3 points), "disagree" (2 points), and "strongly disagree" (1 point). These items were designed to assess the perceived effectiveness of the open-ended learning model in enhancing 21st-century skills in early childhood education.

In addition to the survey, data were gathered through interviews with educators and observations of learners during the instructional process. The sample consisted of 20 children aged 5 to 6 years from Class B at TK Siti Fatimah. The population included all students enrolled at TK Siti Fatimah Kindergarten.

Educators interviewed for this study were selected based on specific criteria. They were capable of providing relevant information, had a clear understanding of the open-ended learning model and 21st-century skills, communicated effectively, and were actively involved in applying the model during classroom learning.

Ethical Considerations

The study adhered strictly to research ethics, especially in protecting the privacy of all participants. Any data collected could not be linked to individual identities without prior consent from the participants. Informed consent was obtained before administering the questionnaire and conducting interviews. Participants were informed clearly about the research purpose, data collection methods, and any potential outcomes. Transparency and integrity were upheld throughout the research process, ensuring alignment with the ethical standards of early childhood education research. The study also emphasized credibility, as the researcher accurately described how the open-ended learning model was applied and how it influenced the development of 21st-century skills in young children.

Data Collection and Analysis

Data collection was conducted during the odd semester of the 2022/2023 academic year. Upon receiving permission from the course advisor for Early Childhood Educational Management Information Systems, the researcher distributed the Google Form questionnaire to educators at TK Siti Fatimah. The online survey was open from October 2 to October 5, 2023.

All responses were downloaded as an Excel file and analyzed using SPSS software (Yang et al., 2020). The researcher also conducted direct interviews with participating educators to complement the quantitative data. After importing the data into SPSS, descriptive statistical analysis was performed to address the research objective regarding the effectiveness of the open-ended learning model based on 21st-century skills. Data were presented using means and percentages. Before conducting further parametric tests, the researcher ran a normality test, which confirmed that all independent variables were normally distributed (Wong et al., 2019).

Results and Discussion

Effectiveness of the Open-Ended Learning Model Based on 21st-Century Skills for Early Childhood

This study explored the effectiveness of the open-ended learning model integrated with 21st-century skills among early childhood learners. The analysis shows a relatively high average score based on the respondents' answers, indicating that the model successfully enhances children's learning effectiveness. As shown in Table 1, most respondents agreed on the benefits of the model. Among 30 respondents, 60% chose "Agree" and 40% selected "Strongly Agree", demonstrating strong support for the model.

The open-ended learning model encourages critical thinking, creativity, problem-solving, openness, and social integration in children. These competencies build a foundation for children to become responsible, confident, and cognitively developed individuals. Therefore, educators are expected to closely monitor each step of the learning process, ensuring no disruptions affect the continuity and success of instruction. Through this model, children are empowered to speak confidently, solve problems independently, think logically, work collaboratively, and develop ideas and skills that will benefit their future learning. Hence, this study does not solely focus on the model itself but also examines the effectiveness of the model in cultivating 21st-century skills, which are intrinsically linked to children's cognitive development.

The Open-Ended Learning Model in Early Childhood Education

Aligned with the research objectives, this study investigated how the open-ended learning model supports early childhood learners. This model is designed to nurture original ideas, openness, and social interaction—giving children opportunities to solve problems and gain new experiences. Teachers play a central role in integrating knowledge, skills, and cognitive approaches. The model is closely related to 21st-century skills and supports innovative learning environments that incorporate global technological advances. In the face of rapid change and growing future competition, teachers must prepare children with high-quality instructional strategies. Thus, the role of the teacher is critical in implementing this model effectively.

Table 4. Descriptive Statistics of Pre-Test and Post-Test Scores

Test	Mean	N	Std. Deviation	Std. Error Mean
Pre-Test	43.13	15	3.739	0.965
Post-Test	42.47	15	2.774	0.716

Table 4 presents the descriptive statistics for pre-test and post-test scores among 15 kindergarten students. The mean score for the pre-test ($M = 43.13$) is slightly higher than the post-test ($M = 42.47$), indicating a marginal decline. The standard deviation shows moderate variation among student scores, suggesting that the overall performance remained stable across both tests.

Table 5. Paired Sample Correlation Between Pre-Test and Post-Test

N	Correlation	Significance (2-tailed)
15	-0.330	0.230

Table 5 displays the Pearson correlation coefficient between pre-test and post-test scores. The negative correlation ($r = -0.330$) suggests an inverse relationship, although it is not statistically significant ($p = 0.230 > 0.05$). This implies that improvements in post-test scores are not reliably predicted by pre-test performance in this sample.

Table 6. Paired Sample T-Test Results

Mean Difference	Std. Deviation	Std. Error Mean	95% CI Lower	95% CI Upper	t	df	Sig. (2-tailed)
0.667	5.341	1.379	-2.291	3.624	0.483	14	0.636

Table 6 summarizes the paired samples t-test comparing pre-test and post-test scores. The mean difference between the two tests is 0.667, with a standard deviation of 5.341. The p-value (p = 0.636) exceeds the 0.05 threshold, indicating **no statistically significant difference** between the scores before and after implementing the open-ended learning model. The confidence interval includes zero, further confirming the lack of significant improvement.

Effectiveness of the Open-Ended Learning Model Based on 21st-Century Skills in Kindergartens

The open-ended learning model is essential for creating engaging, creative, and innovative early learning experiences. Since learning models directly influence how children absorb knowledge, applying the open-ended approach allows children to participate actively and express their ideas freely. This, in turn, supports the development of 21st-century competencies.

Teachers play a central role in preparing and implementing activities aligned with the open-ended model to ensure learning objectives are effectively achieved. However, the study also uncovered some challenges some children were hesitant to participate due to low self-confidence. Therefore, children must be gradually introduced to the model to build trust and reduce anxiety.

All teaching strategies must be implemented with careful planning, enthusiasm, and adherence to pedagogical principles. Any oversight in these areas may affect the model's success and impact the learning process negatively. The research conducted at the kindergarten level helped assess the model's practical impact. Based on SPSS analysis and T-test results, although the post-test scores were slightly lower than the pre-test, the findings still highlight the model's potential to enhance children's engagement and critical skills.

The Role of Technological Advancement in Learning

Advancements in science and technology have transformed the way children learn and absorb knowledge. These changes create both opportunities and concerns for educators and parents. Teachers and parents must collaborate to support children's holistic development—physically, emotionally, and intellectually. While some parents may express concern about rapid changes, teachers and policymakers must be proactive in ensuring that technology is used constructively in children's education.

This study has several limitations. First, the questionnaire relied on self-reported data, which may be subject to bias despite the researcher's emphasis on honesty. Second, the study focused on evaluating the effectiveness of the open-ended learning model using quantitative methods, which may not capture deeper behavioral changes. Third, children's understanding of the learning model may be limited, especially since this method represents a new and innovative approach in early childhood education.

This research was compared to previous studies, such as Lestari et al. (2017), which fcused on the open-ended model based on explanation skills for science learning. While that study emphasized academic knowledge acquisition, the current research explores how the model affects 21st-century skill development among young children.

Conclusion

The open-ended learning model based on 21st-century skills emphasizes the development of curiosity and motivation in early childhood learners. Through this model, children are given the opportunity to solve real-life problems using various skills supported by teacher guidance, which facilitates the problem-solving process. This approach not only enhances children's understanding of the subject matter but also contributes positively to their scientific cognitive skills. The model encourages the use of open-ended problems that require diverse problem-solving strategies. When combined with 21st-century skills such as critical thinking, collaboration, and communication this model becomes a powerful tool to help children find meaningful solutions to challenges introduced by educators. By applying 21st-century skills, children are better equipped to comprehend and respond to learning tasks. They benefit from both independent exploration and structured teacher-led instruction. Learning activities in this model often involve guided questioning, group discussions, and collaborative tasks, allowing children to express ideas, interact with peers, and build reasoning skills. This learning process fosters intellectual growth, improves cooperative behavior, and enhances the ability to address complex problems. In summary, the open-ended model integrated with 21st-century competencies provides an effective and child-centered approach to early education..

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