



Development of Scientific-Based Thematic Worksheets to Improve Cognitive and Language Abilities of Children Aged 5-6 Years

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ABSTRACT

This study introduces a novel approach by utilizing distinct thematic worksheets with a scientific framework to actively engage 5-6-year-old children in critical thinking through the scientific process. The worksheets appreciate cognitive development, analytical skills, and higher-order thinking. This innovative method encourages active participation and the development of cognitive and analytical abilities in children. The research focuses on the development of scientific-based thematic worksheets to enhance the cognitive and language abilities of 5-6-year-old children in PAUD, specifically at the Soleh Children Education Park (TAPAS) in Taman District, Sidoarjo Regency. The study employed a quantitative approach with a one-group pretest-posttest design, involving 21 children as research participants. The development process followed the Research and Development (R&D) framework, comprising 10 stages. Data collection included the validation of the worksheets by subject matter and media experts to assess their feasibility. The findings highlight the effectiveness of the scientific-based thematic worksheets, as demonstrated by significant improvements in the cognitive and language abilities of the 5-6-year-old students at TAPAS. Overall, this study contributes to early childhood education by introducing an innovative educational resource that enhances critical thinking skills and promotes deeper understanding among young learners.

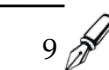


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INTRODUCTION

Education is the main foundation for improving the quality of human resources. Training as a developer of attitudes and behavior of a person or group of people according to self-maturity in teaching and training work. National Education System Law No. 20 of 2003 states that learning is an effort and a strong plan to create an atmosphere in the education system so that students realize their potential in the fields of religion, spiritual strength, self-control, morals, intelligence, leadership and hard work to develop their own and community abilities, nation and state (Ministry of Education and Culture 2003 concerning National Education). To achieve educational goals, there must be a relationship between students and teachers and students with students, involving many components. Learning is a way to get the knowledge, skills, and attitudes needed to carry out work.

By trying to form a learning system and atmosphere in such a way that students can actively grow their strengths, teachers play an important role in shaping the nation's character and developing children's abilities in the framework of Indonesia's educational development. Active learning is a learning strategy where students receive more information and knowledge that is



discussed and studied in the learning process in class (Baharun, 2015). This is in accordance with the General Provisions Chapter I Paragraph 1 Paragraph 1 of Law Number 14 of 2005 (Ministry of Education and Culture, 2005) which states that teachers are competent teachers whose main function is to educate, teach, guide, lead, and direct, and evaluate learning outcomes in early childhood education, formal education, primary and secondary education.

Regulation of the Minister of Education and Culture No. 146 of 2014 concerning the PAUD Curriculum states that the Standard Level of Development for each child (STPPA) differs according to age level. Every area of development in AUD that needs to be instilled is religious and moral values, physical motor skills, language, social feelings and the arts. As stated in the 2014 PAUD National Standard No. 137 Permendikbud, there are several standards. according to the Level of Achievement of Child Development (STPPA) according to the age group. (Permendikbud No. 146 of 2014 in the 2013 PAUD Curriculum).

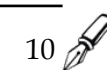
There are still many obstacles in thematic learning. The most obvious problem is the availability of teaching materials, including the quality of books, the distribution process in schools and their use in the learning process. Teaching materials have a significant role in providing numerous benefits to both teachers and students in enhancing the effectiveness of learning." (Kosasi, 2021). The success of teachers in thematic learning depends on their understanding, knowledge, understanding and creativity in mastering learning modules (Trianto, 2015).

Based on the results of observations made by researchers at the Sidoarjo Children's Education Park (TAPAS), it was found that students' abilities were still low in cognitive and language abilities, so they still did not meet the Child Development Achievement Standards (STPPA). Implementation of learning activities using worksheets made by the teacher is less attractive and the images made are not in accordance with the child's character, thereby reducing children's interest in completing assignments and not giving children opportunities to explore, resulting in a lack of motivation in the development of children's cognitive and language abilities. The worksheets used are unstructured and varied, so that children are less enthusiastic in completing the tasks assigned to them, which means that children's cognitive and language development does not develop well for their age.

Therefore, researchers feel the need to provide insight into the importance of using appropriate teaching materials. For this reason, researchers developed scientific-based thematic worksheets to achieve learning objectives according to the Standards for Child Development Achievement Levels (STPPA) for the 5-6 year old PAUD group. This scientific-based thematic worksheet is an implementation of integrative thematic learning according to STPPA accompanied by KI-KD and relevant indicators. By playing and learning to use scientific-based thematic worksheets, children's language and cognitive development can develop properly at least according to STPPA. Because children's abilities, especially cognitive and language, need to be prepared to enter the Elementary School (SD) level. So this paper will discuss the validity, practicality, and effectiveness of developing worksheets based on scientific topics to develop logic and language skills for children aged 5 to 6 years in PAUD.

Scientific-based thematic worksheets have a crucial role in the learning process as they enhance student engagement and encourage independent thinking, as stated by Wulandari (2013). These worksheets enable teachers to guide students in exploring their own ideas and foster the development of process skills, leading to improved student performance and learning outcomes. By utilizing scientific-based thematic worksheets, students actively participate in the learning process and teachers facilitate their thinking based on individual ideas (Wulandari, 2013). Moreover, these worksheets promote the enhancement of process skills, performance, and overall learning outcomes for children.

To assess the effectiveness of using scientific-based thematic worksheets, specifically the "Plant Theme," in enhancing cognitive and language abilities of 5-6-year-old children in PAUD, this study introduces a novel approach. The worksheets employed in this research differ from conventional ones as they are designed thematically and utilize a scientific approach. Despite being worksheets, they encourage critical thinking by involving children in the scientific process,



including observing, questioning, collecting data, making associations, and communicating. This research aims to determine the effectiveness of the scientific-based thematic worksheets in promoting cognitive and language development among young children. The novelty lies in the unique structure and scientific approach of these worksheets, which actively engage children while fostering critical thinking skills. By utilizing this innovative method, children are encouraged to participate in the learning process and develop their cognitive and language abilities effectively.

RESEARCH METHOD

This study examines the Dick and Carey model of instructional development, which is a research model characterized by a procedural and systematic approach. The model suggests that instructional design should be aligned with a sequential set of steps to ensure effective implementation (Dick & Carey, 2015). The instructional material development process, according to Dick and Carey, consists of ten stages. These stages include identifying instructional goals, conducting instructional analysis, analyzing learners and contexts, writing performance objectives, developing assessment instruments, creating instructional strategies, developing and selecting instructional materials, conducting formative evaluation, revising instructional materials, and conducting summative evaluation. Each stage plays a crucial role in the overall development of instructional materials, from understanding the goals and needs of learners to evaluating the effectiveness of the materials in achieving the desired outcomes. By following this systematic approach, instructional designers can create well-designed and impactful instructional materials that effectively facilitate learning.

The research was conducted at Soleh Children Education Park (TAPAS) in Sidoarjo. The data collection technique used in this study was observation and interviews provided in the form of questionnaire filling. The subjects of this study were 21 children aged 5-6 years. The analysis used in this research is as follows.

Validity

The validation assessment score in percentage form is calculated by dividing the total validation component score by the maximum possible score and multiplying it by one hundred percent, adapted from Arikunto (2018).

Then, the generated score (%) is converted into a table format based on the validation assessment criteria presented in the LKPD validation table (Akbar, 2013). The benchmark used to interpret the percentage of expert team validation results can be seen in Table 1.

Table 1. Validation assessment of thematic worksheets

Percentage	Description	Number Category
85 - 100%	Highly Suitable	5
70 - 85%	Suitable	4
50 - 70%	Less Suitable	3
15 - 50%	Not Suitable	2
< 15%	Highly Not Suitable	1

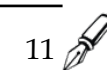
(Akbar, 2013)

Practicality

The data analysis process for teacher questionnaires regarding the practicality of scientific-based thematic worksheets to improve cognitive and language abilities in 5-6-year-old children in PAUD uses a scoring system: (1) strongly disagree, (2) disagree, (3) unsure, (4) agree, (5) strongly agree (Djemari, 2018).

The percentage of teacher questionnaire responses can be calculated using the following equation:

$$P = \frac{f}{N} \times 100\%$$



Formula Explanation:

P = Percentage

F = Frequency

N = Sample Total

Then, the generated score (%) is converted into a table form of criteria presented in the teacher response assessment table 2 as follows:

Table 2. Assessment of LKPD response questionnaire

Percentage	Description	Number Category
81 – 100%	Very Agree	5
61 – 80%	Agree	4
41 – 60%	Less Agree	3
21 – 40%	Disagree	2
< 20%	Very Disagree	1

(Djemari, 2018)

Effectiveness

A significance test is needed to determine the effectiveness of Scientific-based thematic worksheets on the cognitive and language abilities of 5-6-year-old students in Taman Pendidikan Anak Sholeh (TAPAS) by examining the difference between the pretest scores (before the implementation of scientific-based thematic worksheets) and posttest scores (after the implementation of scientific-based thematic worksheets) for each variable, cognitive ability and language ability, using the significance value of paired t-test that is smaller than 0.05 to ensure that there is a significant difference between the pretest and posttest scores (Sahir, 2021).

RESULTS AND DISCUSSION

Results

Validity

Statistical analysis has been performed on the scores obtained from 5-6-year-old students at Taman Pendidikan Anak Sholeh (TAPAS). The analysis reveals that the statements in the first to tenth items of the Scientific-based Thematic Worksheets Development instrument received scores ranging from 3 (Good) to 4 (Very Good). All the items fall within the range of 3.01-4.00, indicating that the development of the Scientific-based Thematic Worksheets using the Dick & Carey method is valid and well-received by the students at Taman Pendidikan Anak Sholeh (TAPAS).

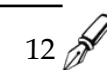
Furthermore, these results are supported by validation from content experts, which includes the assessment of content feasibility and language feasibility. The assessment data for each component of the worksheets were collected using a Likert scale and were analyzed using scoring and categorization. Two expert validators evaluated the validity and practicality of the worksheets, concluding that they are suitable for use.

Dr. Nurul Istiq'faroh, M.Pd., served as the content expert validator and evaluated the content feasibility and language feasibility of the worksheets. In the initial assessment, a score of 84% was obtained for both content feasibility and language feasibility, categorizing it as "Media is suitable for use with improvements." Additionally, the content expert provided specific comments and suggestions, including the need to reanalyze the "Parts of Plants" material, pay attention to the wording of "Fruit Plants" and "Vegetable Plants," and consider aspects such as title writing, punctuation, and readability suitable for the age of the learners.

After implementing the researcher's revisions, a second assessment was conducted by the content expert. The revised worksheets obtained a score of 88%, indicating high validity. This demonstrates that the development of the Scientific-based Thematic Worksheets is suitable for enhancing the cognitive and language abilities of 5-6-year-old children at Taman Pendidikan Anak Sholeh (TAPAS).

Practicality

The assessment consists of two aspects, namely presentation aspect and graphic aspect, conducted by the media expert validator, Mr. Suprayitno, M.Si. The media expert validator did



not provide any notes or revisions, resulting in a total assessment score of 92% in the highly practical and suitable category. Additionally, the practicality assessment was also conducted by teachers through the completion of a response questionnaire. The response questionnaire was completed by Yurizka Nur Rahma, a class teacher/guardian for the 5-6-year-old age group at TAPAS. The questionnaire received a score of 95% with the criteria of strongly agree, indicating that the Scientific-based Thematic Worksheets are highly practical for use.

Effectiveness

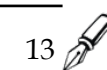
The effectiveness of the development of Scientific-based Thematic Worksheets is evidenced by the improvement in the average scores of 5-6-year-old students at Taman Pendidikan Anak Sholeh (TAPAS). In terms of cognitive abilities, it was found that 13 students (61.90%) scored below the average pretest score of 18.38, while 8 students (38.10%) scored above the average pretest score. This indicates that the cognitive abilities of the students have increased to 91.9% (based on a maximum score of 20) with 8 students, compared to their previous cognitive abilities which only reached 64.05%. Furthermore, in terms of language abilities, it was found that 11 students (52.38%) scored below the average pretest score of 17.71, while 10 students (47.62%) scored above the average pretest score. This indicates that the language abilities of the students have reached 88.5% (based on a maximum score of 20) with 10 students, compared to their previous language abilities which only reached 60.25%.

Discussion

The descriptive statistical analysis is supported by the results of the inferential statistical test, specifically the paired t-test. The significance value of pair 1 (pretest and posttest of cognitive abilities) is 0.000, which is lower than 0.05, indicating a significant difference between the pretest and posttest scores of cognitive abilities. Similarly, the significance value of pair 2 (pretest and posttest of language abilities) is 0.000, which is lower than 0.05, indicating a significant difference between the pretest and posttest scores of language abilities.

This study is supported by research conducted by Elfina & Sylvia (2020), who found that there is a significant difference between the pretest and posttest results of students before and after using Scientific-based Thematic Worksheets (LKPD) in the topic of social integration. The study concludes that the developed LKPD for sociology learning is valid, practical, effective, and influences students' critical thinking abilities towards social integration. The development of LKPD media in sociology learning, especially in the topic of social integration, can provide a fresh perspective for students to enhance their critical thinking skills in understanding social integration. These findings are consistent with the research presented by Muhamad Fathurohman (Fathurohman, 2017), which states that LKPD based on a contextual approach in science education is considered suitable and can improve students' analytical thinking abilities. It also aligns with the study by Fatimah (2017) titled "Development of Student Activity Sheets (LKPD) Based on Inquiry Science Issues to Develop Critical Thinking Skills and Curiosity of Junior High School Students," which indicates that the development of critical thinking skills among students after using LKPD, based on observation sheets, falls into the "moderate" category according to normalized gain scores.

The research findings are supported by Sartika (2022), who discovered that the data obtained from the Critical Thinking Ability Test of 30 students in Grade XII at MA Al-Washliyah Sei Kepayang Tengah revealed that 6 students did not meet the Minimum Completion Criteria (KKM), which is 80. The highest score achieved was 100, while the lowest score was 60. Additionally, the effectiveness test indicated that the average level of critical thinking ability among students prior to using Etnomathematics-based LKPD (Student Activity Sheets) in three-dimensional geometry was 48.6. However, after implementing the Etnomathematics-based LKPD, the average score increased to 61.4, representing an 80% improvement. These findings demonstrate an enhancement in students' critical thinking skills, providing further evidence of the effectiveness of the Etnomathematics-based LKPD in the area of three-dimensional geometry.



The research findings are consistent with the study conducted by Husni et al. (2020), which discovered that this research and development yielded a product in the form of Student-Centered Learning (SCL) based Student Worksheets (LKPD). The development procedure followed the 4D development procedure, but it was limited to three stages: definition, design, and development. The produced teaching materials met the criteria for usability based on the results of validation activities and field trials. These criteria were obtained from expert validation analysis, observation sheets, and student response questionnaires. Therefore, it can be concluded that the Student-Centered Learning (SCL) based Student Worksheets (LKPD) are suitable for use in the learning process, especially for the content of Theme 1, Sub-theme 2: Human and Environment.

This study is also supported by the findings of Ningsih and Wulandari (2022), who found that: (1) Based on the analysis of Android-based Student Worksheets for Sociology Subject on the topic of Deviation, the developed material is suitable for further development. (2) In the development phase, the researchers created a storyboard design for the Student Worksheets, prepared the worksheets in Word format, and developed the assessment instruments for the worksheets. (3) Development: In this phase, the worksheets were created and validated by subject matter experts, media experts, and sociology learning practitioners. (4) Implementation: In this phase, the worksheets were implemented in class X IPS 2 of SMA Negeri 12 Kota Jambi, involving 34 students. The level of suitability for the Android-based worksheets was assessed as follows: (1) The average score from media experts was 3.9, categorized as suitable. (2) The average score from subject matter experts was 3.7, categorized as suitable. (3) The average score from sociology learning practitioners was 4.6, categorized as highly suitable. The Android-based worksheets received positive responses from all students, stating that they found the worksheets engaging, suitable for use in the learning process at school, easy to understand, and encountered no obstacles in their use.

The findings of the author's research (2022) are also supported by the following previous studies, which demonstrate the effectiveness of thematic LKPD development: Munika et al. (2021), Muchlis (2021), Munawaroh (2022), Sagita & Erianjoni (2021), Puspita (2022), Fatmawanti & Istihapsari (2022), Geacelyn et al. (2021), Temiyati & Nuryadi (2022), Nata & Manuaba (2022), Pranata (2021), Hatimah et al. (2022), Nurhayati & Sylvia (2021), Najmi (2021), Sukmawati et al. (2021), Dilla & Sylvia (2021), Utomo (2022), Puri (2022), and Prabandari et al. (2022).

CONCLUSION

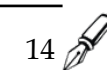
Based on the results and discussion, it can be concluded that the development of Scientific-based Thematic Worksheets (LKPD) for 5-6-year-old students at Taman Pendidikan Anak Sholeh (TAPAS) is valid and well-received. The worksheets are practical and can effectively enhance the cognitive and language abilities of the students. However, it is important to acknowledge the limitations of this study, including the small sample size and the potential lack of generalizability to a larger population. The study also did not consider external factors that may influence students' abilities. Future research should involve a more diverse sample from different early childhood education institutions and explore the impact of additional variables. Furthermore, expanding the investigation to higher age groups and different learning topics would provide a broader understanding of the effectiveness and implementation of Scientific-based Thematic Worksheets (LKPD) in various educational settings.

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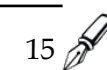
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