

THE DEVELOPMENT OF HOTS-BASED ENCYCLOPEDIA SAKU BOOK TO ENHANCE SCIENCE LITERACY CULTURE IN THEMATIC LEARNING

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ABSTRACT

Abstract: The culture of scientific literacy is being urgency in the 21st-century education challenges. 21st-century learning is inseparable from the textbooks used by students. This type of learning tool affects the interest of students in learning participation. The development of the HOTS-based encyclopedia SAKU book in this study is one of the researcher's efforts to enhance the culture of scientific literacy following the demands of 21st-century education. SAKU is an acronym for "Siswa Aktif Kreatif Unggul" or Superior Creative Active Learners. The stages in its implementation are cyclic, they are (1) Thematic lesson plans; (2) encyclopedia SAKU book with 15 minutes reading culture; (3) early learning activities; (4) core activities/scientific literacy; and (5) HOTS-based final activities. Data collection techniques using observation, interviews, and tests. Based on the results of the calculation of the effect size data, it shows that the HOTS-based encyclopedia SAKU book in the class I thematic learning had a large positive impact on enhancement the science literacy culture of students with the effect size criteria classified as large. The innovative work of developing the HOTS-based encyclopedia SAKU book had been disseminated through a teacher forum that the principal had identified as the result of innovative work by classroom teachers in supporting thematic learning, especially grade I thematic learning and is oriented towards building a reading culture, especially a culture of scientific literacy.

INTRODUCTION

The success in learning activities is determined by several factors, including how a teacher implements learning innovations that make students more conducive in learning activities (Soewalni Soekirno, 2019). Heinrichs revealed that preparing students as 21st-century learners is a major reform in education (Handini & Mustofa, 2022). The reform itself is that can develop innovative systems that will equip all students with the skills necessary to succeed in the 21st century (Heinrichs, 2016). In line with Heinrichs, Komara revealed that several things need to be considered in the development of 21st-century learning, namely the main task of teachers as learning planners, higher-order thinking skills, implementation of variations in learning approaches/models and technology integration (Komara, 2018). So, the learning innovations created by the teacher should meet several criteria to attract the attention of students (Cabreros, 2023). Good learning innovation should fulfil innovative, applicable, and

educational aspects. Innovative aspects are synonymous with novelty, are contemporary and respond to the demands of a new paradigm of education, especially the demands of 21st-century learning (Chaiyama, 2018). Applicative aspects mean that they are easy to implement in various classroom conditions. The educational aspect emphasizes more on being a learner, providing facilities for students in learning activities so that learning outcomes are achieved in each basic competency (Twiningsih, Gunarhadi, & Musadad, 2024).

Learning of Curriculum 2013 requires every educator has to play an active role in developing a culture of literacy, strengthening character education and developing 21st-century learning (Tania & Fadiawati, 2015). Literacy culture is a government movement in developing reading interest in educational settings both in informal, formal and non-formal education environments (Shanmugam & Balakrishnan, 2019). Strengthening character education is an educational strategy in building Pancasila society that refers to 5 aspects, namely nationalism, integrity, independence, cooperation and religion. The development of 21st-century learning refers to aspects of communication, aspects of collaboration, aspects of critical thinking, aspects of problem-solving, aspects of creativity and aspects of innovation (Nurwidodo, 2020).

The success of a lesson is determined by the learning tool. Learning resources as a learning tool play an important role in the learning process (Twiningsih, 2022). According to Supriyadi, learning resources can be interpreted as anything or power that can be used by teachers and students, either separately or in the form of a combination of the interests of learning process activities to increase effectiveness, efficiency, ease and fun for the continuity of learning (Twiningsih, Sajidan, & Riyadi, 2019). Books as a source of learning will have a more positive impact on student learning outcomes if they are presented more attractively. The attractiveness of a learning resource is determined by the syntax applied in the learning resource (Chan & Luk, 2022). By the demands of 21st-century learning, a good learning resource must be oriented to the aspects of communication, collaboration, critical thinking and problem-solving, and creativity and innovation (Kızılaslan, 2019).

HOTS (Higher Order Thinking Skills) is an innovative learning strategy that is suitable for 21st-century learning because in HOTS several aspects are the demands of 21st-century learning. Higher-order thinking skills (HOTS) are abilities that support students to think critically, creatively, analytical, and able to solve a problem (Intan, Kuntarto, & Alirmansyah, 2020, p. 6). All of them are activated when someone has an unfamiliar, uncertain and questionable problem. The implementation of HOTS in learning begins with the analysis / C4, evaluation / C5, and creating / C6 stages. Students who are accustomed to problem-based learning that involve higher-order thinking skills (analyze, evaluate, and create) tend to be able to solve problems well in their daily lives. This is because the activities of studying a problem are carried out by students often enough so that they can solve problems with the background knowledge they have (Utaminingsih, 2020, p. 91).

HOTS as a learning strategy can be implemented along with learning resources. Books as a learning resource will be more attractive to students "reading interest if they are presented full of information so that in the end it can have a positive impact on students" higher-order thinking skills (Afriana, Permanasari, & Fitriani, 2016). Good high-order thinking skills can enhance students' reading interest, this has a positive impact also on students' literacy skills. Meanwhile, the curriculum model needs to pay attention to the three dimensions of the curriculum which include content, processes, and products, all of which are interrelated (Vidgor, 2017, p. 4). This is inseparable from the aspects that are considered by teachers in implementing HOTS-based learning (Taubah, 2019, p. 198). Besides, teachers also need to get used to continuing to innovate in creating meaningful learning (Chusni, Saputro, & Rahardjo, 2020). Hasnidar and Elihami found that teachers who are not used to innovating in learning are one of the factors causing the low active participation of students (Hasnidar & Elihami, 2020). According to Lawe, teaching patterns that explain more, give assignments and ask students to make summaries affect the way students think (Lawe, 2018, p. 28). Therefore teachers are required to have all competencies that directly determine the success of students

in learning such as mastery of the material, learning methods and learning media (Sulfemi, 2019, p. 13).

The reality shows that the books used by students for literacy activities are almost in the form of thick books in general (Abaniel, 2021). This makes students less enthusiastic about reading books because learning resources are less attractive (Pamungkas & Widiastuti, 2020). As a result, the content they read is not fully absorbed by them which also determines their literacy (Wullur & Werang, 2020). Moreover, O'Neal, Gibson, and Cotten found that many teachers still focus on memorizing and passive learning, whereas active learning, such as critical thinking skills, problem-solving, collaborating, expressing creativity, demonstrating leadership and responsibility are needed in the 21st century (O'Neal, Gibson, & Cotten, 2017, p.2). Based on the situations, the researcher is encouraged to carry out learning innovations entitled "Development of Hots-Based Encyclopedia SAKU Books to Enhance Science Literacy Culture in Thematic Learning". SAKU is an acronym for Superior Creative Active Learners.

The reality in the field shows that the books used by students for literacy activities are almost in the form of thick books in general (Wijayanti & Basyar, 2016). This makes students less enthusiastic about reading books because learning resources are less attractive. As a result, the content they read is not fully absorbed in the brain which also determines their literacy. What's more, O'Neal, Gibson, and Cotten found that many teachers still focus on memorizing and passive learning, whereas active learning, such as critical thinking skills, problem-solving, collaborating, expressing creativity, demonstrating leadership and responsibility are needed in the 21st century (O'Neal, Gibson, & Cotten, 2017, p.2). Based on this, researchers are encouraged to carry out learning innovations entitled "Development of Hots-Based Encyclopedia SAKU Books to Improve Science Literacy Culture in Thematic Learning". SAKU is an acronym for "*Siswa Aktif Kreatif Unggul*" or Superior Creative Active Learners.

By empowering the HOTS-based encyclopedia SAKU book in class I thematic learning, besides aiming to improve student learning outcomes, on the other hand, it is also to enhance the science literacy culture of students (Nurwidodo, 2020). The development of learning innovation by empowering the HOTS-based encyclopedia SAKU book, which is the result of teacher creativity, is expected to further encourage students' learning motivation because it is presented in a simple pocketbook which presents the substance of science material that is adjusted to the basic competencies that are the learning objectives in each theme (Im, Jiar, & Talib, 2019). As stated by Cahyaningsih, the purpose of learning is to provide experience to students so that they gain knowledge, skills and values that control attitudes and behaviour in everyday life (Cahyaningsih, 2018, p. 5).

The development of the HOTS-based encyclopedia SAKU book (higher-order thinking skills) was prepared by the teacher to facilitate students to more easily recognize and learn scientific knowledge, both scientific knowledge contained in thematic book guides and the development of scientific literacy (Ichsan et al., 2019). This encyclopedia SAKU book was compiled by the teacher herself which had been adjusted to the thematic learning objectives so that the substance of the HOTS-based encyclopedia SAKU book (higher-order thinking skills) was inspired by the student book which became the student's guide (Al-harthy, 2019). The HOTS-based encyclopedia SAKU (higher-order thinking skills) book is the result of the teacher's design so that the implementation does not require major operations. The encyclopedia SAKU book is provided by the teacher for students as a learning resource and can be used in the school as well as in the family environment. Because the encyclopedia SAKU book is designed not to improve learning outcomes but is also oriented towards improving a reading culture, especially in a culture of scientific literacy (Eren, 2021).

METHOD

This study was conducted at SDN Laweyan No.54, Surakarta, Indonesia. The research subjects used were class I students consisting of 66 children. The number of students was divided into two groups, they were the experimental group and the Exclusive group.

This study was the result of research and development, namely the development of an encyclopedia SAKU HOTS-based book to improve the culture of scientific literacy in thematic learning. This writing report design used 10 general steps. The development stage referred to Borg and Gall which consisted of two main objectives, they were developing the product and testing the effectiveness of the product (Borg & Gall, 2003, p. 772).

The product of this development was in the form of an encyclopedia SAKU HOTS-based book in class I thematic learning which was the design of the class teacher, so that students did not need to buy it, it was enough to be given by the class teacher. The design of this learning innovation work went through the following stages: (1) The teacher determined the themes and basic competencies to be developed, (2) the teacher adjusted the substance of the encyclopedia SAKU book with the substance of the thematic material, and (3) the teacher drafted an encyclopedia-based SAKU HOTS book.

Meanwhile, the implementation of using the SAKU encyclopedia science book based on HOTS (higher-order thinking skills) in improving the culture of scientific literacy in thematic learning was carried out by the teacher by linking the substance of the science encyclopedia SAKU book with thematic learning in class. The stages of the HOTS-based encyclopedia SAKU book implementation (higher-order thinking skills) in thematic learning activities are as follows:

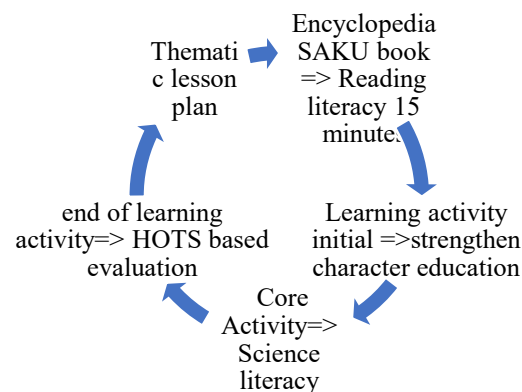


Figure 1. The stages of the HOTS-based encyclopedia SAKU book implementation

RESULT AND DISCUSSION

Result

The innovative work of developing the HOTS-based encyclopedia SAKU book had been disseminated through a teacher forum that the principal had known as the result of innovative work by classroom teachers in supporting thematic learning, particularly thematic learning for grade I, and was oriented towards building a reading culture in enhancing a culture of scientific literacy. The description of the results of the analysis of the pretest and posttest scores of students' literacy culture is following Table 1.

Based on Table 1, shows that the results of the acquisition of an average increase in the science literacy culture of students after the learning process activities, the experimental class obtained a higher average than the exclusive class. These results identify that teaching scaffolding, development in improving the science literacy culture of students has been achieved as expected so that students achieve Minimal Completeness Criteria.

Table 1. Analysis of students' pretest and posttest literacy culture scores

Category	Experiment		Exclusive	
	Pre	Post	Pre	Post
Mean	76.83	83.98	67.96	70.63
Score max	90.50	93.33	87.33	90.00
Lowest score	65.50	70.50	50.67	53.33
Std. deviation	6.85	5.65	9.41	9.41
Average Gain		0,30		0,09

The results of the acquisition of pretest and posttest scores are calculated to determine the effectiveness of increasing the literacy culture of students by using the gain formula, the normalized score is interpreted using the gain level criteria (Hake, 1999). The results of the gain average score for the experimental test class and the exclusive class are shown in Table 2.

Table 2. N-Gain results for the experimental class and exclusive class scores

Class	Mean score	Criteria
Experimental	0,30	Low
Exclusive	0,09	Low

Based on Table 2, shows that the results of the max. The score increase in the average N-gain score occurred in the experimental class 0.30 compared to the 0.09 exclusive class with low criteria. The implementation of the HOTS-based encyclopedia SAKU book in a class I thematic learning can contribute effectively to improving the science literacy culture of students.

The N-gain value data for the enhancement of students' scientific literacy culture were analyzed using prerequisite tests (normality and homogeneity) so that further tests could be carried out to test the effectiveness of the HOTS-based encyclopedia SAKU book in class I thematic learning to enhance students' scientific literacy culture. The results of the analysis of the N-gain normality and homogeneity test for the science literacy culture of students are presented in Table 3 and 4.

Table 3. The results of the N-gain normality test for student literacy culture

Value data	Class	Kolmogorov-Smirnov		
		Statistic	df	P
<i>N-gain</i>	Experimental	0,098	32	0,200>0,05
	Exclusive	0,194	32	0,030>0,05

Table 4. The results of the N-gain normality test for students' literacy culture

Value data	Leven's test			
	F	df1	df2	P
<i>N-gain</i>	40,042	1	62	0000>0,05

Based on Tables 3 and 4 shows that the n-gain data for the experimental class and the exclusive class obtained normal and homogeneous distribution of data, so it is followed by a parametric test, namely the t-test. The results of the t-test analysis of the N-gain value increasing the literacy culture of students can be observed in Table 5

Table 5. T-test results of N-gain in students' literacy culture improvement

	Mean	Std. Error Mean	t-test for Equality of Means 95% Confidence interval of the difference		t	df	P
			Low-er	Up-per			
Equal variances assumed	0,287 5	0,2819	1,5241	0,26509	7,406	62	0,000

Based on Table 5, the t-test value obtained sig of 0.000 ($p < 0.05$), which means there is a significant difference in the value of the two literacy culture data of students between the experimental class and the exclusive class. The N-gain data of the experimental class was higher than the exclusive class. It can be assumed that the implementation of HOTS-based encyclopedia SAKU book learning in thematic learning is more effective in enhancing the science literacy culture of students.

To determine the impact of the effect of learning using the HOTS-based encyclopedia SAKU book in class I thematic learning to enhance students' scientific literacy culture, the calculation of the effect size formula was analyzed using the Rstart Effect size Calculator (Sullivan & Feinn, 2012). The results of the effect size calculation are presented in Table 6. Table 6 The results of the effect size calculation:

Table 6. The results of the effect size calculation

Class	Cohen's	Hedges's	<i>Effect size</i>		Criteria
			Glass's Δ_2	r^2	
Experimental Exclusive	1,852	1,830	5,803	0,051	large

Based on the results of the calculation of the effect size data, it is concluded that the HOTS-based encyclopedia SAKU book in class I thematic learning has a large positive impact on enhancing the science literacy culture of students with the effect size criteria classified as large. The HOTS-based encyclopedia SAKU book on thematic learning contributed with a coefficient of determination (r^2) of 0.051 or 5.1% in the enhancement of the science literacy culture of students. Other external factors also influenced 94.9% in the use of HOTS-based encyclopedia SAKU books in thematic learning.

The results of the practical implementation of learning innovations in the development of the encyclopedia SAKU book on thematic learning show that the development of the SAKU encyclopedia of science books has a positive impact on enhancing learning motivation and learning outcomes of students. By the development of the encyclopedia SAKU book, it enhances the reading culture of students so that it has a positive impact on the development of a literacy culture, especially in a culture of scientific literacy. The ability of students in higher-order thinking or HOTS (higher-order thinking skills) increases thereby making it easier for teachers to prepare assessment evaluations as an instrument to measure success in learning activities.

Discussion

The diagram below explains that the culture of scientific literacy is the centre of the development of learning activities by empowering the SAKU encyclopedia of science that is integrated into learning.

According to Anyanwu and Grange, teacher characteristics affect the literacy climate in schools (Anyanwu & Grange, 2017). Barnes and Oliveira argue that disciplines in literacy (disciplinary literacy) also suggest that learners may need different skills to actively participate and become literate in different content areas. They also refer to disciplinary literacy as

emphasizing the knowledge and abilities possessed by those who create, communicate, and use knowledge in scientific disciplines. For example, reading a science text may require skills that are different from those required for reading fictional narratives. Students need to obtain media or reading sources to have literacy in various fields of study (Barnes & Oliveira, 2017, p.463)

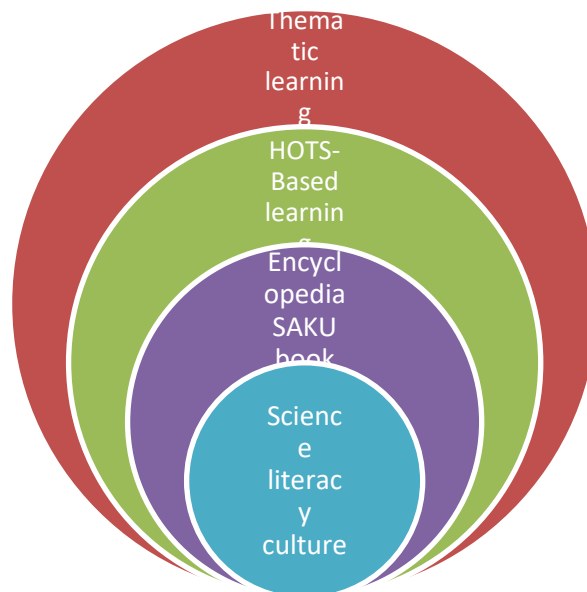


Figure 2. Meeting concept

In this study, scientific literacy culture activities were developed through the development of a science encyclopedia SAKU book that led to HOTS (Higher Order Thinking Skills) -based learning. Scientific literacy culture activities were developed by increasing literacy skills in subjects using the SAKU encyclopedia of science books and reading strategies in all subjects with the following stages: habituation, development, and learning. This habituation stage could be done by reading 15 minutes before the lesson began. The development stage could be carried out by providing a variety of reading experiences, activities like reading and writing, and reading enrichment books for fiction and non-fiction. The learning stage could be carried out by carrying out integrated literacy activities by adjusting themes and subjects. This is in line with Hidayah's opinion that a habit becomes a basic literacy practice that holds the key to successful literacy improvement (Hidayah, 2017, p. 49).

Critical and creative thinking skills and analysis through the SAKU encyclopedia book of science is one of the outputs expected from the activities of building a culture of scientific literacy, with a culture of scientific literacy, which is expected to enhance critical thinking skills, creative and analytical students to form the character of students who are skilled in solving problems and analyze all forms of information that have been obtained from what they have read or learned. The habit of reading culture enhanced the curiosity of students so that it raised problems that must be solved so that it required students to have high-level thinking skills as well, and in the end, the important role of HOTS (Higher Order Thinking Skills) was needed. Taubah reinforces this by stating that learning that applies HOTS must be characterized by transfer of knowledge, critical and creative thinking, and problem-solving that includes facts, concepts, procedures, and metacognitive in the learning process (Taubah, 2019, p. 199).

Good learning must be imbued with HOTS (Higher Order Thinking Skills) -based learning, thereby shaping the character of students who are skilled in critical thinking and the end has a positive impact on literacy or reading culture activities. HOTS-based learning (Higher Order Thinking Skills) requires students to be active in learning so that the teacher acts as a facilitator

means that the teacher bridges students when students find difficulties in solving the problems they find. In this regard, Erikson and Erickson also revealed three learning outcomes problems, they are (1) the use of learning outcomes that depend on an interpretive framework, (2) the problem of educational objectives that cannot be expressed through learning outcomes, and (3) the risk that learning outcomes can be set an upper limit on the ambition of students (Erikson & Erikson, 2018). It has been highlighted in Widiastuti and Sumantri's research that the principal is recommended to be able to provide policies that can encourage teachers to consider the comfort of students in the learning process. Besides, teachers also need to improve their creativity so that they can create meaningful learning (Widiastuti & Sumantri, 2020, pp. 312–313). This is also in line with Freitas, Cicuto, and Pazinato who stated that the activation of learning is influenced by several factors and is not the full responsibility of the students. It must also involve the academic environment (teachers, colleagues, and technicians) and their systems of function, as well as family and friends (Freitas, Cicuto, & Pazinato, 2020, p. 360).

Learning by integrating the culture of scientific literacy through the HOTS-based encyclopedia SAKU book (higher-order thinking skills) can be implemented in the learning stages. The effectiveness of a culture of scientific literacy through a reading culture can be implemented at the core learning activity stage. In the core activities of learning in the classroom, a teacher can integrate a reading culture by linking themes or lessons to the learning material when it is taking place. The culture of scientific literacy which is integrated with the core learning activities must refer to solving problems related to the subject matter so that there is a link between the development of a culture of scientific literacy with the core competencies and basic competencies that will be achieved by the teacher. Nurdin reinforces that the implementation of a culture of scientific literacy is something that is expected and is a very important part of increasing knowledge competence in linking general knowledge. Besides, science can be a provision and strength in facing global challenges in the 21st century which have complex levels of problems such as global warming, economic crises, energy crises, environmental pollution, and problems that occur among various groups (Nurdin, 2019, p. 56). The culture of reading activities 15 minutes before learning begins, Tantri and Dewantara's research has found that literacy activities include organizing school libraries and mini-libraries in the classroom; creating a text-rich environment; create a reading corner; and carry out effective literacy Saturdays to increase students' reading interest (Tantri & Dewantara, 2017)

Integration and synchronization between learning activities in the classroom and building a culture of scientific literacy through the science encyclopedia SAKU book will have a positive impact on Strengthening Character Education (PPK) of students who can solve problems that are HOTS (higher-order thinking skills) so that they can provide an increase in learning outcomes that in the end, students can obtain learning outcomes according to the Minimum Completion Criteria assessment which becomes the standard for competency achievement. However, the learning process and outcomes are influenced by two factors, they are internal and external. Therefore it is necessary to evaluate so that changes can be identified in students and determine the extent of change in students (Hikmah, 2020, p. 31). Besides, a positive learning attitude contributes to fostering a higher activity intensity. Therefore, the learning media used determines the learning attitudes of students (Hajrah, 2018, p. 101).

CONCLUSION

The HOTS-based encyclopedia SAKU book (higher-order thinking skills) on thematic learning to enhance the science literacy culture in grade I students is one of the teacher learning innovations that are structured as learning resources that ultimately provide effectiveness and optimization in good learning outcomes. Based on this, it can be seen that an interesting learning resource will have a positive impact on several aspects of learning activities, both aspects of the activeness of participants in the learning process, as well as aspects of learning outcomes as indicators of success in every lesson. However, the success

of learning objectives is largely determined by teacher factors in carrying out the learning process. Palupi, et al also stated that the implementation of the model applied by teachers in the classroom is a major factor in determining the success of educational goals. With the existence of learning innovations that are carried out continuously and programmed, it is hoped that the quality of teachers and student learning outcomes will increase according to the demands of 21st-century learning. Besides, learning innovations from teacher creativity will provide practical benefits both materially and costly so that they are easier to apply to every learning process. This is reinforced by Chalkiadaki that the discussion of 21st-century skills and competencies in basic education that is developing in the context of this literature review is considered very important based on the recognition of changing conditions in personal, social and professional life.

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