

Enhancing Numerical Intelligence through Higher Order Thinking Skills in Learning Management

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Abstract:

This study aims to analyze the application of Higher Order Thinking Skills in learning management to improve students' numerical intelligence in public elementary schools in Tebo District. This study uses a qualitative approach to the type of case study. The data in this study were obtained from interviews, observation and documentation. Data analysis was carried out using a qualitative approach involving organizing, coding, searching for themes, and developing patterns of findings. The results of the study show that there are three steps in learning management regarding HOTS-based learning management in improving students' numerical intelligence, namely; 1) Planning of learning whose indicators are in the form of analysis components, 2) Implementation of learning whose indicators are in the form of evaluations, and 3) Controlling, whose indicators are in the form of creating components. The results of this study provide practical insights for educators in optimizing the application of HOTS in classroom learning management to improve students' numerical intelligence. This study offers a greater comprehension of how the application of HOTS might be incorporated within learning management. This enhances our knowledge of the value of HOTS in raising students' numerical intelligence, which adds to the body of academic literature.

Keywords: *Higher Order Thinking Skills (HOTS), Learning Management, Numerical Intelligence*

Abstrak:

Penelitian ini bertujuan untuk menganalisis tentang penerapan Higher Order Thinking Skills dalam manajemen pembelajaran dapat meningkatkan kecerdasan numerik siswa pada sekolah dasar negeri di Kabupaten Tebo. Penelitian ini menggunakan pendekatan kualitatif jenis studi kasus. Data dalam penelitian ini diperoleh dari interview, observasi dan dokumentasi. Analisis data dilakukan dengan pendekatan kualitatif yang melibatkan pengorganisasian, pengkodean, pencarian tema, dan pengembangan pola temuan. Hasil penelitian menunjukkan bahwa terdapat tiga langkah dalam manajemen pembelajaran tentang manajemen pembelajaran berbasis HOTS dalam meningkatkan kecerdasan numerik siswa, yaitu; 1) Planning pembelajaran yang indikatornya berupa komponen analisis, 2) Implementation pembelajaran yang indikatornya berupa evaluasi, dan 3) Controlling, yang indikatornya berupa komponen menciptakan. Hasil penelitian ini memberikan wawasan praktis bagi pendidik dalam mengoptimalkan penerapan HOTS dalam manajemen pembelajaran di kelas untuk meningkatkan kecerdasan numerik siswa. Penelitian ini memberikan pemahaman yang lebih dalam tentang bagaimana penerapan HOTS dapat diintegrasikan ke dalam konteks manajemen pembelajaran. Hal ini memberikan kontribusi pada literatur pendidikan dengan memperkaya pemahaman kita tentang pentingnya HOTS dalam meningkatkan kecerdasan numerik siswa.

Kata Kunci: *Higher Order Thinking Skills (HOTS), Manajemen Pembelajaran, Kecerdasan Numerik*

INTRODUCTION

Numerical intelligence, or the ability to understand and use numbers and mathematical operations, is an essential skill in everyday life and various scientific disciplines (Wu et al., 2021; Al-Othman et al., 2022; Fadilah et al., 2022). In the current technological and information development era, solid numerical skills are becoming increasingly important to face challenges in various fields, such as science, technology, business, and finance.

Numerical intelligence is understood as one of the eight human intelligences developed by Howard Gardner, a psychology professor at Harvard University, in his theory of multiple intelligence (Rahmawati et al., 2021). According to Armstrong (Kristiyono & Suendarti, 2019), intelligence in using numbers and logic can be said to be numerical and logical. According to Howard Gardner, this intelligence includes, in the field of science, classifying information and being able to think abstractly to solve problems with logic. Numerical intelligence is the ability of the brain to process various alphabetic numbers. The ability to process these numbers is commonly known as logical-mathematical ability or numerical intelligence (Akbar, 2018). Numerical intelligence is understanding number correlations and solving problems that correlate with number concepts. Through numerical intelligence, it will be easier to understand the concept of numbers and solve mathematical problems (Fadilah et al., 2022). The components of numerical intelligence include mathematical calculations, the ability to think logically, the ability to solve a problem, and the sharp ability to distinguish numerical patterns and their relationships (Nisak & Afifah, 2019).

However, in the context of learning, students often face difficulties in developing their numerical intelligence, especially at SD Negeri (Public Elementary School) 170/VIII Purwoharjo and SD Negeri (Public Elementary School) 095/VIII Tegal Arum. Low, in this case, means that most students at these two institutions need help capturing and digesting lessons at school. This explanation is proven by students having difficulties when faced with an abstract problem, for example, in questions or practice. Students cannot correlate their understanding of number theory with an existing problem. The picture of a child with high numerical intelligence is a picture of an intelligent student, a student who always goes to class with good grades. It is usually true that students with high numerical intelligence find it easier to grasp and digest lessons at school than those with low numerical intelligence (Aziz & Rusmana, 2021).

Traditional teaching methods focusing on understanding concepts and applying algorithms are often insufficient to strengthen students' understanding and numerical abilities. To improve students' numerical intelligence approaches involving Higher Order Thinking Skills (HOTS) have become the focus of attention. Higher Order Thinking Skills (HOTS) refers to higher-order thinking skills, such as analysis, synthesis, evaluation, and application of mathematical concepts in real situations (Singh, 2020; Lu, 2021; Hamzah, 2022). By integrating HOTS into learning management, teachers can help students develop the

analytical, creative, and critical thinking skills needed to solve math problems more effectively.

For this reason, to improve their students' numerical intelligence, the two schools apply HOTS-based learning management. This is because HOTS-based learning is closely related to numerical intelligence in terms of reasoning or logic. Higher Order Thinking Skills (HOTS) or high-order thinking occur when new information is received and is related to previous information or expands on existing information so that it can formulate answers in certain confusing situations (Utaminings, 2020; Sa'dijah, 2021). HOTS, or higher-order thinking skills, are also understood as thinking processes that require students to process existing information and can produce new meanings and implications in specific ways (Jansen, 2022; Valen et al., 2023). This method is very relevant if used to solve the problem of low numerical intelligence in these two primary educational institutions. Brookhart in (Rohim, 2019) states that higher-order thinking skills are classified into three categories: transfer of learning outcomes, critical thinking and problem-solving. In practice, the two institutions do not necessarily implement HOTS learning but are supported by management. HOTS-based learning management in the two institutions is divided into three activities in general, namely planning, implementation, to evaluation; this is because good management determines whether learning is good or bad (Prastawati & Mulyono, 2023), how a teacher uses the correct method, provision of tools sufficient learning, and a conducive classroom atmosphere during the teaching and learning process (Gemnafle & Batlolona, 2021). Learning management is understood as teachers' (managers) ability to utilize existing resources (Usiono et al., 2023) through activities to create and develop collaboration so that learning is created between them to achieve educational goals in the classroom effectively and efficiently.

Meanwhile, research with a similar theme was conducted by Widyanto (2021), who obtained a statement explaining that HOTS-based learning management emphasizes learning management using a student-centred learning approach. It was further explained that in practice, HOTS-based learning management consists of 3 steps, namely, planning, implementing and monitoring. Research with a similar theme was also carried out by (Pongoh, 2023), who stated that practical classroom management skills are needed from the teacher or educator in the management of HOTS-based learning. For the steps that are applied, there are also three stages, namely, learning planning, the implementation process and supervision. Research with a similar theme states that HOTS-based learning management effectively increases students' comfort, not quickly boredom, and enjoyment of learning religious education (Kosasih et al., 2022). Research on various efforts that can be made to improve students' numerical intelligence was carried out by (Pakpahan et al., 2020), who stated that numerical intelligence could be improved through various methods of explaining with the medium of fairy tale books, then (Andriyani et al., 2023). Kuryanto et al. (2023) explained that role-playing models and traditional market games can improve children's numerical intelligence.

Of the several studies, the majority only explain the application of HOTS-based learning management in eliminating boredom, the boredom experienced by

students when learning. Meanwhile, the majority explained implementing various games to improve numerical intelligence. The novelty of this research lies in this effort to combine learning management approaches with the development of numerical intelligence by applying HOTS. This approach allows for a more comprehensive understanding of how effective learning management can improve students' numerical intelligence.

This study aims to identify the most effective strategies and approaches in utilizing HOTS to improve students' numerical intelligence. Thus, this study makes a practical contribution by providing guidelines and recommendations for educators to optimize the use of HOTS in learning management at SD Negeri 170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum.

RESEARCH METHODS

This research uses a qualitative approach with a case study type. The form of HOTS-based learning management as an effort to improve numerical intelligence is the focus chosen in this study. This research was conducted in two locations, namely SD Negeri (Public Elementary School) 170/VIII Purwoharjo and SD Negeri (Public Elementary School) 095/VIII Tegal Arum, which are located in Tebo Regency, Jambi Province. The data presented in the following explanation were obtained through observation and interviews with several informants at the two institutions.

Techniques for gathering data include observation, interviewing, and document analysis. In addition to learning activities utilizing HOTS, observations were done to watch how teachers and students interacted with one another. Interviews with the teacher and concerned students were undertaken to learn more about the use of HOTS and its impact on numerical intelligence. Documents like lesson plans and evaluation reports are also examined to fully comprehend the context and consequences of applying HOTS.

The collected data were analyzed qualitatively. The steps of analysis include organizing data, coding, searching for themes, and developing patterns of findings (Milles & Huberman, 2014). Analysis was carried out systematically to identify the relationship between applying HOTS in learning management and improving students' numerical intelligence. The analysis's findings will be summarized in terms of their significance for developing students' numerical intelligence and using HOTS in learning management. These data will be utilized to learn more about the efficacy and impact of putting HOTS into practice and the variables that affect the outcomes. The results of the research will be discussed and related to pertinent hypotheses. HOTS will be applied in learning management to enhance numerical intelligence, and conclusions based on the analysis and interpretation of data will be developed to address research concerns and provide new information.

RESULTS AND DISCUSSION

Learning management can be understood as a process of planning, implementing and evaluating learning in the process of implementing learning. According to Connors (in Adri et al., 2021), learning management includes planning in learning, implementation in learning, and evaluation in learning. At

the same time, HOTS-based learning management, in this case, is understood as a learning management process that makes HOTS the basis and benchmark. Creating productive, creative and innovative students can be realized through implementing learning using critical thinking skills or HOTS. HOTS can be a skill in combining, manipulating, and transforming existing knowledge and experience to think critically and creatively in making decisions and solving problems in new situations.

For this reason, in order to improve students' numerical intelligence, SD Negeri 170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum implemented HOTS-based learning management. The target that must be achieved from this activity is, as stated, the characteristics of students who have mathematical, logical intelligence. Namely, Cammbel mentions the ability to calculate, measure, and consider the propositions of hypotheses and complete mathematical operations (Nisak & Afifah, 2019). HOTS is part of the cognitive domain in Bloom's taxonomy, which aims to hone mental skills around knowledge. According to Bloom's Taxonomy, compiled by Anderson and Krathwohl, the two components of cognitive processes are higher-order thinking skills (HOTS) and lower-order thinking skills (LOTS). Higher-order thinking skills involve analysis and synthesis (C4), evaluating (C5), and creating or creativity (C6), while low-order thinking skills involve remembering (C1), understanding (C2), and applying (C3).

Three stages are carried out at SD Negeri 170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum in packaging HOTS-based learning management, which is generally similar. However, there are several forms at different evaluation stages. The first stage of planning is to formulate a problem for students; the goal to be achieved in this first stage is the analyzing component. Students are expected to be then able to characterize the problems given by the teacher. In the second stage, as a form of implementation, the teacher asks students to explain decisions regarding their problems by them. The goal to be achieved in this stage is the evaluating component. Students are expected to be able to evaluate the material/problems provided so that then they demand a decision. In the third stage, as a form of evaluation, the teacher analyzes whether the student could apply theoretical understanding or decisions he made in everyday life. The purpose of this stage is the creating component, which means the ability shown by students that they can apply knowledge or combine theory with facts.

This was conveyed by the Deputy Principal of SD Negeri 170/VIII Purwoharjo in his statement, "Learning student-centred may be familiar, from that approach, we then try to make a way in overcoming the low numerical abilities experienced by most of our students. HOTS-based learning management in mathematics learning at SD Negeri 170/VIII Purwoharjo is implemented through 3 stages with three indicators as benchmarks. The first stage is to prepare or explain one or several problems to students, the second stage is to ask students to explain the answers to the problems given, and the third stage is to observe students' abilities in their daily life as a form of evaluation.

From this explanation, it can be understood that there are three stages in the application of learning management at SD Negeri 170/VIII Purwoharjo in improving students' numerical intelligence. The three stages are formulating and

preparing problems as a form of planning, providing opportunities for students to present their answers as a form of implementation, and observing student behaviour as a form of evaluation.

While the indicator used as a reference is conveyed by one of the teachers at SD Negeri 095/VIII Tegal Arum, "From the three stages that are attempted, three indicators are used as benchmarks in each stage. At the planning stage, the indicator is the analysis component, then at the implementation stage, the indicator is evaluation, and at the evaluation stage, the indicator is creating, that is." From this explanation, it can be understood that the three steps applied in HOTS-based learning management at SD Negeri 095/VIII Tegal Arum have at least three indicators: components of analysis, evaluation and creation.

Formulate Problems

The first stage carried out in HOTS-based learning management both at SD Negeri 170/VIII Purwoharjo and at SD Negeri 095/VIII Tegal Arum as an effort to improve students' numeric intelligence is to prepare or formulate some material that is formed with a problem. This activity is categorized as a form of lesson planning.

This was conveyed by the head of SD Negeri 170/VIII Purwoharjo "The first step I observed from the math teachers here was doing or preparing math material, but it had already been made into questions or problems to be solved, either in the form of questions or games or field practice. For example, I have observed word problems, so students are given several forms of word problems which the teacher then asks them to read and understand the instructions and then arrange the answers.

From this explanation, it can be understood that the first step taken by the teacher is to provide a problem; the form can vary from questions to games, in which the point is that students are equally asked to understand the problems they face. Problem-based learning is one of the characteristics of HOTS learning because it requires critical thinking to solve it (Simanjuntak & Sudibjo, 2019).

Mathematics is a science that can develop reasoning and logic (Fauziah & Fitria, 2022). Kumala & Widiawati (2022) divides mathematics into two types of reasoning: inductive and deductive. Inductive reasoning requires observation and experiments to obtain facts that can be used as a basis for arguments (Setiawaty et al., 2019). Meanwhile, deductive reasoning involves analysis, evaluation, generalization, synthesis and problem-solving. Mathematical critical thinking is described as a person's ability to analyze something based on evidence to make judgments and decide what is right and not suitable (Nasution & Mujib, 2022).

The indicators to be achieved in this activity are the analyzing component, where students can then analyze and consider ways to solve the mathematical problems they face. Giving problems can stimulate students' critical thinking skills. This was stated by the mathematics teacher at SD Negeri 095/VIII Tegal Arum "The indicator to be achieved in this first stage is component 4 in Bloom's theory, namely analyzing. The hope is that by being faced with various problems surrounding mathematics material, students can classify the form of the problem and can formulate a solution. For example, previously, it was explained how to

complete the arithmetic operation of division, and then the problems the teacher gave were in the form of story problems. So, here then, the student is expected to be able to correlate and analyze story simultaneously and complete the arithmetic operations in the problem."

From this explanation, it can be understood that the indicator to be achieved in this first step is the analyzing component or the 4th component in Bloom's theory. In this component, students are expected to be able to analyze, calculate and formulate hypotheses on the problems they face. When students can have these competencies, indirectly, the students' numerical intelligence has increased. In line with the characteristics of students who have mathematical, logical intelligence, according to Cammbel, namely the ability to calculate, measure, and consider the propositions of hypotheses and complete mathematical operations (Nisak & Afifah, 2019).

Asking Students to Describe Decisions

The second stage is the implementation of learning carried out in HOTS-based learning management both at SD Negeri 170/VIII Purwoharjo and at SD Negeri 095/VIII Tegal Arum to improve students' numerical intelligence. This implementation phase is filled with activities asking students both at SD Negeri 170/VIII Purwoharjo and at SD Negeri 095/VIII Tegal Arum to present the results of their analysis and answers to the problems previously given.

This was conveyed by the deputy principal of SD Negeri 095/VIII Tegal Arum "Based on my observations, the math teacher here for the next stage after giving the problem is asking students to provide answers to the often sweeten see is that each student has the same opportunity to express their answer. Not just expressing answers, the teacher usually also asks the reasons behind these answers.

From this explanation, the second stage is the implementation of learning, in which some activities provide opportunities for students to present their results or answers regarding the problems given by the teacher. In learning mathematics, problem-solving abilities are one of the focuses able students must possess students (Agustina et al., 2023). Mathematical problem-solving ability is a person's ability to solve non-routine mathematical problems presented in the form of textual and contextual math questions (Hignasari & Diputra, 2021), which can measure students' ability to solve problems with indicators of being able to understand problems, plan solutions, perform calculations and check return the calculation results (Agusta & Sa'dijah, 2021). The indicator to be achieved in this second stage is the evaluation component.

This is as conveyed by the mathematics teacher at SD Negeri 170/VIII Purwoharjo "In this second stage, the indicator to be achieved is the evaluation component, where the success of this evaluation component can be seen from the student's ability to assess, debate, defend, decide on answers to the problems faced. Presenting the answers to the existing problems will show what the components of the evaluation of the students in the class will look like.

From this explanation, the indicator to be achieved in this second stage is the evaluation component. The ability to evaluate, namely assessing, debating,

defending, deciding, choosing, supporting, assessing, criticizing, and weighing (Listiani & Rachmawati, 2022). Because, in essence, mathematics is an excellent abstract, structured idea structured, and their relationships are regulated according to logical rules based on a deductive mindset (Hikmawati et al., 2023). Learning math is meaningless if you memorize it. Mathematics will have meaning if it is understood. Suggests that students should not learn mathematics only by receiving and memorizing it but must learn meaningfully. When a student can solve a mathematical problem, then indirectly, the student has numerical intelligence. Numerical intelligence will increase if it continues to be sharpened.

This was conveyed by a student at SD Negeri 170/VIII Purwoharjo "In the beginning, solving math problems was quite tricky, and I did not even like it. Then, the teacher always brings material accompanied by a question or game that requires completion.

Likewise, with the researcher's observation notes, it was found that "students slowly began to understand how to solve problems in their learning, some were sufficient with just one theory, for example, only games that required additional arithmetic operations material, some had to collaborate, for example, additional arithmetic operations were associated with division arithmetic operations are also presented in the form of word problems.

From this explanation, it can be understood that the ability to calculate and solve mathematical problems also requires habit, so that the information possessed will also increase. As this information increases, so do students' strategies for solving them. According to Aziz & Rusmana (2021), numerical intelligence will occur when a person can associate new information with information already stored in his memory and link it and rearrange and develop this information to achieve a goal or find a solution to a situation. which is hard to solve.

Analyzing Capability

The third stage is learning evaluation which is carried out in HOTS-based learning management at the two institutions to improve students' numerical intelligence. Learning was evaluated at SD Negeri 170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum by observing and then analyzing students' abilities to apply their knowledge in everyday life. This was conveyed by the teacher at SD Negeri 170/VIII Purwoharjo, who said, "At the learning evaluation stage, in practice, we analyze the learning outcomes that have been passed by paying attention to the ability of students to practice numerical or mathematical knowledge in their daily lives."

From this explanation, it can be understood that the form of learning evaluation carried out by teachers at SD Negeri 170/VIII Purwoharjo by observing and analyzing students' abilities after the learning process can put their understanding of mathematical theory into practice or not. With this analysis, it can then be understood what parts and things need to be developed or what things need to be replaced. The indicator in this evaluation stage that is expected is creating, which means the ability shown by students is that they can apply knowledge or combine theory with facts (Sari et al., 2023).

This was stated by the mathematics teacher at SD Negeri 095/VIII Tegal Arum "The indicator to be achieved in this evaluation stage is the creating component. Creating is the 6th component or called C7 in Bloom's theory. A student can be said to have numerical intelligence when he can think critically, in this case, in learning mathematics; for example, he can reason, develop his knowledge then apply it in everyday life. The easiest example is the ability of students to count their pocket money or calculate their total snacks. Not just understanding the amount, a student who can think critically will be able to manage his allowance well."

From this explanation, it can be understood that the indicator of the evaluation stage is the creating component. In this case, students must be able to create a concept or analyze, predict, and build new knowledge based on previously acquired knowledge. Creating means designing, assembling, constructing, guessing, developing, formulating, composing, and investigating (Pramarth et al., 2023).

Mathematics emphasizes reasoning activities rather than emphasizing the results of experiments or observations. Mathematics is formed because of human thoughts related to ideas, processes, and reasoning (Ruci et al., 2023). Mathematics is formed from human experience in the world empirically. Then the experience is processed in the world of ratios, processed by analysis with the reasoning in the cognitive structure so that until mathematical concepts are formed so that others easily understand the mathematical concepts formed and can be manipulated precisely, mathematical language or notation is used Mathematics with global value (Romanti & Rohita, 2020). Mathematical concepts are obtained due to thought processes. Therefore, logic is the basis for forming mathematics (Ruwaida, 2019). When a student has been able to design, assemble, build, suspect, develop, formulate, compose, and investigate problems in mathematical theory, then automatically, the student can calculate, measure, and consider the propositions of the hypothesis and complete the mathematical operations that are characteristic of numerical intelligence.

CONCLUSION

From the presentation of the data, it can be understood that HOTS-based learning management at SD Negeri 170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum in improving students' numeric intelligence is through three stages. The first stage is learning planning, which is filled with preparing problem-based mathematics learning materials, making the C4 or analyzing component the indicator. The second stage, the implementation of learning, is filled with activities to provide opportunities for students to express their decisions in answering the problems they face, which then makes the C5 or evaluating component the indicator. The third stage is called learning evaluation. It is filled with observations of students' ability to apply mathematical theory to everyday life and make the C6 or creating component as an indicator. The implication of this research is as a reference for educational institutions in improving or building their students' numerical intelligence. This research is limited to implementing HOTS-based learning management in improving students' numerical intelligence at SD Negeri

170/VIII Purwoharjo and SD Negeri 095/VIII Tegal Arum. For this reason, further research is needed regarding the inhibiting factors and the supporters of the implementation of HOTS-based learning management.

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