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# NUMERICAL LITERACY APPROACH IN MATHEMATICS EDUCATION IN JUNIOR HIGH SCHOOL

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**Abstract**

Mathematics is a basic science, both its applied aspects and its reasoning aspects have an important role in the effort to master science and technology. Seeing the importance of the role of learning mathematics in all fields of science, it is not surprising that the government is very concerned with the development of mathematics at all levels of education in Indonesia. This research is a type of qualitative research, using descriptive method. While the notion of qualitative research can be understood as a research procedure that utilizes data and has the aim of describing and analyzing events, social dynamics, phenomena and attitudes of individual and group perceptions of something, the results of this study explain that, mathematics as one of the most important subjects that must taught to students at every school level, is a benchmark in creating competitive human resources. In learning mathematics itself, various basic abilities are needed, including partial ability, numerical ability, verbal ability, reasoning ability and so on. Numerical ability is one of the intelligence factors that play an important role in learning mathematics. These abilities are special that students have, and are very closely related to numbers and can be observed when students work on math problems such as multiplication, addition, subtraction, division and taking roots. Therefore, the numerical ability of students must be considered and trained continuously, especially when the teaching and learning process is being carried out in the classroom.

**Keywords:** Numerical Literacy; Education; Mathematics Lessons

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## INTRODUCTION

The development of a nation is closely related to a quality education, because basically education has an important role, especially in improving the quality of one's mindset and is a conscious effort made to prepare students through guidance, learning, and training activities for their role in the future. . On the other hand, the level of education of a nation is a reflection of the welfare of the people living there. However, from all aspects contained in the educational process, it is to change one's behavior to be better, orderly, independent, intelligent, responsible, disciplined, skilled and most importantly able to increase piety and faith in God Almighty (Rohantizani et al. , 2022).

Education is a responsibility shared by every school member, including teachers, parents, students, principals and all components directly involved in the learning process. Education in Indonesia itself is carried out openly and regardless of race, ethnicity, religion, social, economic point of view, and is directly protected by the government and sovereign laws, all people have the same opportunity to gain knowledge according to their abilities. they have. In accordance with the mandate of the Constitution No. 20 of

2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students are actively able to develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills. needed by himself, society, nation, and state. Based on this understanding, education must be carried out consciously and the process in learning must be well planned so that everything that is done by teachers and students is a learning to achieve the desired goal, namely developing the potential of students.

Education for a nation that is developing like Indonesia today is an absolute necessity that must be developed in line with the demands of gradual development. If education in Indonesia is managed properly, in an orderly, orderly, effective and efficient manner, it will be able to accelerate the process of civilizing the nation based on the principle of creating general welfare and educating the nation's life equally, in accordance with the national development objectives in paragraph IV, the Preamble of the Constitution. In 1945 where education is a process in order to influence students to be able to adapt to their environment, and will cause changes in themselves to enable them to function significantly, especially in social life. However, the real core of the entire education process is the teaching-learning process between teachers and students with the teacher as the main role holder when in the school environment (Patih et al., 2019).

Mathematics as one of the most important subjects that must be taught to students at every school level, is a benchmark in creating competitive human resources. Mathematics is the parent of science that is built from the development of basic concepts into more complex forms through reasoning and the ability to analyze problems by linking problems to concepts that have been recognized as true, while failure to master basic concepts in every mathematics lesson will affect the mastery of advanced concepts and theories. -the theory. In learning mathematics itself, various basic abilities are needed, including partial ability, numerical ability, verbal ability, reasoning ability and so on.

Mathematics curriculum standards in the current era explicitly emphasize relationships as one of the important processes in learning theory. Every learning material that has been conveyed must make students able to recognize and use it even in contexts outside of mathematics. This includes the relationship to the real world, namely the application outside class hours and getting to know the social environment. Therefore, a teacher is expected to be able to prepare real-world situations in a lesson and the context is linked to making mathematical ideas that make more sense, and can be accepted and understood by students quickly. In addition, this process is also expected to be able to provide opportunities for students to recognize and appreciate the relationship between mathematics and life openly, for that teachers are now encouraged to help students make a more realistic relationship between mathematics and life so as to make mathematics more meaningful (Fu'adiah , 2017).

Mathematics learning can be designed in an activity that involves collaboration through group activities with materials that have been selected in a syllabus. It is intended that students are trained to be able to solve a problem topic from a mathematical material together and full of responsibility. On the other hand, in studying a mathematical concept, prerequisite knowledge is needed which will be the basis for thinking to be further developed on pre-existing concepts, where the prerequisite knowledge includes spatial abilities and numerical abilities.

Numerical ability is one of the intelligence factors that play an important role in learning mathematics. Thus, students' numerical abilities need to be considered in a more comprehensive and strategic mathematics learning process. The intended numerical ability is the ability possessed by students that is special, relates to numbers and can be

observed when students are working on math problems such as multiplication, addition, subtraction, division and taking roots. The numerical abilities include the ability to count in terms of addition, the ability to count in terms of subtraction, the ability to count in terms of multiplication and the ability to count in terms of division. So that numerical ability can influence students in solving math problems (Aisya et al., 2016).

Numerical ability is often used by students, especially in terms of operating numbers, because there is an assumption that mathematics lessons will be easier to learn by people who have very high numerical abilities. In this case, numerical talent concerns the intellectual dimension of students which is a potential ability to perform arithmetic operations manually, for example addition, subtraction, multiplication, division, rapping and root operations operations. At the junior high school level, numerical ability is very important, especially in mathematics, which mostly requires a lot of computational skills. Therefore, numerical abilities in learning mathematics must be developed and possessed by students in the process of learning mathematics seriously.

The development of science, especially mathematics, has a positive impact and plays an important role in the development of education in Indonesia. Education in Indonesia now uses the 2013 curriculum which requires students to be more active during the learning process. Mathematics learning emphasizes the mental activity of students to be able to communicate in writing or orally in understanding mathematical material which is full of various basic ideas, symbols, concepts, abstract material, as well as problems and methods of solving mathematically.

Based on the PISA (Program for International Students Assessment) survey for some students aged 15 years and under. The mathematical literacy ranking of Indonesian students from 2009 to 2015 did not show a significant increase. In 2009 Indonesia was ranked 68th out of 74 countries. In 2012 Indonesia was ranked 64th out of 65 countries with a relatively low level of achievement. While the results of PISA in 2015 showed that Indonesia's ranking experienced a slight increase in the order of 63 out of 72 countries. The results for three surveys show that the ability of students in Indonesia in mathematical literacy in particular is still very low compared to other PISA participating countries (Rikayanti, 2018).

Through the government program, the Ministry of Education and Culture in 2016 discussed the National Literacy Movement (GLN), where this movement is an implementation of the Minister of Education and Culture Regulation Number 23 of 2015 concerning the Growth of Character. The National Literacy Movement (GLN) which has been launched by the government, is implemented through every school throughout Indonesia, with the term School Literacy Movement (GLS). In addition, this program is defined as an effort made to realize a literate learning organization and foster character for school residents through various activities including reading non-learning books for 15 minutes, and one of them is applied to learning Mathematics.

Mathematics lessons are often referred to as the queen of science, so mathematics is the main key to other knowledge learned in school. Mathematics is often interpreted with arithmetic because it is closely related to numbers and numbers and even symbols. So that in the process of learning mathematics, the ability to work on math problems is needed. Mathematics lessons full of formulas and numbers require accuracy in calculations. So to be able to facilitate a person or student in learning mathematics, an ability in mathematics is needed, namely numerical ability. So based on the description and description of the background above, the researcher is interested in further expanding the focus of the problem on the topic of the Numerical Literacy Approach in Mathematics Education in Junior High Schools.

## METHODS

This research is a type of qualitative research, using descriptive method. The definition of qualitative research can be understood as a research procedure that utilizes data and has the aim of describing and analyzing events, social dynamics, phenomena and attitudes of individual and group perceptions of something. Next, the researcher begins activities systematically to collect, process, and conclude data by using certain techniques to find answers to the problems at hand. In addition, this research activity is also carried out by collecting information and data with the help of various existing materials such as reference books, similar previous research results, such as articles, notes, and various journals related to the problem to be solved. The literature study in this study was carried out by examining the concepts and theories used based on the available literature, which included articles published in scientific journals containing theories relevant to research problems. The object of this research is numeracy literacy, thematic learning, and mathematics lesson content, while the subject of this research includes school students, but focuses on the junior secondary level (Aprilia, 2021).

## RESULTS & DISCUSSION

### The Relationship between Mathematics Learning Motivation and Students' Numerical Ability

National education aims to improve the quality of Indonesian people as a whole so that they have competitiveness in facing global challenges. In addition, education is expected to produce graduates who are in accordance with the demands of needs based on the potential of Indonesia's natural resources. So by considering the educational goals, mathematics as one of the most important fields of study that must be taught to various levels of education in Indonesia is expected to be able to increase the reasoning power of students and increase the ability to apply mathematics to face life's challenges in solving various problems both when in the school and social environment (Wahyuni et al., 2017).

The role of mathematics in various fields of life is undeniable, by using symbols and mathematical language, complex problems become simpler and universally understood. Based on this thought, mathematics is considered as a basic science that students must learn from elementary school to university level, even the basic concepts of mathematics, with a simple test, have been developed since children receive Kindergarten benches, with the aim of so that students are equipped with the ability to think critically, objectively, logically, and carefully from an early age. Basically, difficulties in learning mathematics from an early age even up to the college level are considered normal because mathematics is an abstract subject and is very difficult to understand briefly. So based on this assumption mathematics will continue to be a scary thing so that students will be less interested and easily bored in learning mathematics. The difficulties experienced by students in learning mathematics, which tend to be unable to read the questions well, unable to remember the right concepts or principles to be used in solving mathematical problems, plus the inability to understand any problems encountered. In addition, students also do not know the names and shapes of mathematical symbols and are less able to solve a proof.

Learning difficulties in students are what make them less than optimal in achieving learning outcomes and achievements. One way to overcome difficulties in learning mathematics is through education. Because integrated education is an appropriate and supportive means to improve quality human resources. In addition, education is essentially a process to prepare humans to survive in their environment, through

education, humans will also be equipped with conceptual and procedural abilities, and direct thinking skills in applying concepts and procedures that have been received through education (Arti et al. ,2020).

As explained earlier, mathematics is a discipline that must be studied by all levels of education as well as concurrently as the main subject that has the most influence on the core values in school. In Indonesia, the development of mathematics subjects must be in line with the development of the existing world of education, because mathematics is the queen of knowledge. and is the main key of other sciences studied at the educational level. That is why learning mathematics must be introduced to students even from an early age because it will provide greater opportunities for them to understand the way of thinking of mathematical theories. However, most students consider mathematics as the most difficult subject to learn among other subjects.

The government through the Ministry of Education and Culture has implemented changes and revisions to the curriculum by changing the mathematics learning system and the assessment system, but in reality most students' mathematics learning outcomes in schools are still very low. One of the reasons is that the learning model used in the classroom does not provide opportunities for students to develop their potential. In addition, the low mathematics learning outcomes of students are also thought to be due to the low numerical abilities of students which have implications for students' low absorption of mathematics learning materials (Larasaty et al., 2018).

Numerical ability is one of the intelligence factors that play an important role in learning mathematics. These abilities are special that students have, and are very closely related to numbers and can be observed when students work on math problems such as multiplication, addition, subtraction, division and taking roots. Therefore, the numerical ability of students must be considered and trained continuously, especially when the teaching and learning process is being carried out in the classroom. Thus, learning activities will become more lively and meaningful, and students will be much more motivated when the materials are being delivered by a teacher, furthermore students are required to be able to increase their enthusiasm for learning and provide the best achievements for schools. they.

However, numerical ability as an internal factor that can affect students' mathematics learning outcomes also needs to be reconsidered, because between numerical ability and learning outcomes there is a causal relationship that influences each other. Based on this fact, there is a belief in mathematics teachers that mathematics can be mastered only by some students who have special abilities in the field of mathematics. Because in real conditions, having a high level of numerical ability will have a significant impact on student learning outcomes, and vice versa, but there is another assumption which states that students with low numerical abilities can actually achieve very satisfactory scores, and who have high numerical abilities achieve less than ideal learning outcomes. Based on this fact, the study of learning models that are in accordance with the characteristics of students, in this case the ability of students in the numerical field is important to be carried out further (Widodo, 2021).

Based on this, it can be understood that it is important to improve numerical literacy skills in achieving the quality of qualified and highly competitive human resources, and one of them can be applied to mathematics. So, to start the initial step to match the targets that have been set, is to provide numerical training specifically for educators and prospective educators, especially for those who have been in charge of Mathematics Education for a long time. Furthermore, the evaluation results can be used as a measuring tool that is commonly used to determine students' understanding of the numerical learning method that has been delivered. One of the successes of each student in understanding his numerical ability can be seen from his learning achievement that has

been achieved after following a series of learning processes, while the learning achievement itself can be shown through the value given by an educator from the number of fields of study that have been studied by students, for example from previous test results.

Furthermore, giving motivation is very important for students in following every numerical method that will be conveyed by a teacher, while some of the steps include (1) Awareness of the position at the beginning of learning, the process and final results to be achieved (2) Giving information about the strength of the learning effort, which has been done (3) Directing learning activities according to established procedures, and finally (4) Encouraging the spirit of learning at all times. However, motivation is also not constant and tends to change and even motivation in a situation can be lost in students. So, motivation is very important to be given every time to students, because this process is very influential on the teaching and learning process to achieve much better learning goals (Diva et al., 2022).

In the 2013 curriculum which has been compiled by the government through the education and culture office, it instructs students to be more active when the learning process is being carried out, both in the classroom and outside the classroom. Therefore, it takes some intelligence or ability to support learning, especially in mathematics, and one of them can be supported through numerical abilities. Ability here can be interpreted as the ability, skill, strength and intelligence to do something. Meanwhile, the definition of numeric according to the Big Indonesian Dictionary means all things that are in the form of numbers or numbers that are number systems, statistical data or data that require careful processing.

Numerical ability is very important for everyone, this ability can be known through a numerical ability test. This ability sub-test reveals how well a person understands ideas expressed in numbers, and how clearly a person can think and reason with numbers. Thus, the numerical ability test is the ability of students to express the ability of students to reason with numbers, use or manipulate relations with numbers, and describe logically. Numerical ability as an internal factor needs to be considered because learning mathematics involves many arithmetic operations, including addition, multiplication, division, etc. Students who have high numerical abilities tend to be active in learning activities, have problem solving skills, classify and categorize materials, and perform complex mathematical calculations. Students who have low numerical abilities are more passive in learning activities (HASANAH & Sari, 2021).

Numerical ability is a test that is used to reveal how well a person understands ideas expressed in the form of numbers, and how clearly a person can think with numbers. In addition, numerical ability tests are also designed to reveal understanding. number. The numerical ability test or more often referred to as numeric ability can be divided into five categories, namely (1) Arithmetic tests are used to reveal, measure and evaluate a person's intellectual abilities, especially the ability to reason in counting and think logically. Thus he can solve various problems and direct a problem into the appropriate form quickly and precisely. Arithmetic tests are used to measure a person's ability, especially in terms of calculating quickly, precisely and correctly from an array of numbers. This test relates to a person's emotions and mentality. Someone who is less interested in numbers will usually have difficulty working on this problem. This test really requires precision, accuracy and calm in doing it.

Next is the number series test is a test used to measure a person's intelligence ability in solving a problem based on a number of numbers and drawing conclusions quickly and logically. Each question in the number series test section consists of a series of unfinished numbers. Each number series consists of one or more patterns and the task of the participant is to find the missing numbers from the pattern (3) The letter series test

is actually identical to the number series test, but in this test the problem is shown in a number of letters instead of numbers (4) Numerical logic test This is used for one's analytical and critical thinking skills in solving problems related to numbers. And the last one is (5) The Test of Numbers in Stories is a test used to measure a person's intelligence and accuracy in analyzing problems in the form of numbers in a story. Doing this test requires great care and precision. However, in reality, all numerical ability tests in this study were not only used to determine the level of students' numerical abilities, but were used to take research subjects. The subjects taken are students who have high numerical abilities, moderate numerical abilities, and low numerical abilities (Pradipta, 2020).

Mathematics is an important tool for students as they face problems and challenges in personal, work, societal and scientific aspects of their lives. Thus it is important to always involve a variety of mathematical understanding sciences when in the school environment, especially in order to understand important issues and solve meaningful problems. Besides that mathematics also has a vital role to face the challenges of a global world that is full of variety and high risk, but from all these aspects the role of mathematics is focused on being able to help improve the quality of human life in a sustainable manner. For this reason, mathematics education is currently expected to be able to develop students to think creatively, be flexible, solve problems, collaborate and be innovative skills in shaping a much better future, furthermore students can be successful in various work matters and equip them with various abilities to apply knowledge in everyday life.

**The Influence of Collaborative Learning Models By Controlling Students' Numerical Talent**

Education is a very complex series of events, national education, as one of the sectors of national development in its efforts to educate the nation's life, has a very noble vision, namely, the realization of the education system as a strong and authoritative social institution and develop into quality human beings so that they can be proactive. respond to the challenges of an ever-changing era. As for the meaning of quality humans, according to the Constitution Number 20 of 2003 concerning the National Education System, namely educated humans who believe, fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become citizens. democratic and responsible. Therefore, national education must function optimally as the main vehicle in the development of the nation's character (Mahmud & Pratiwi, 2019).

The goals of national education are indeed directed at achieving the interests of students, society and the demands of employment. In addition, the educational process is also focused on increasing mastery of knowledge, abilities, skills, developing attitudes and values in the context of the formation and self-development of students, so that in the future they are able to face various tasks and problems related to themselves, furthermore they are able to become the next generation of the nation that is ready to be competent with the various challenges and opportunities that exist. However, basically education must really be directed to produce quality human beings who are able to compete, in addition to having good morals and noble character.

The development of the era marked by the advancement of internet-based information technology with the name Industrial Revolution 4.0 is one of the challenges for every educator in building and forming knowledgeable human beings, improving the quality of human resources, and achieving national development goals in accordance with the Constitution of the Republic of Indonesia. 1945, namely the intellectual life of the nation. The community is not only required to be able to understand conceptual knowledge, but is able to think critically and creatively in solving various problems, the community must also master the six basic literacys in order to increase competitiveness in

facing the challenges of this globalization era, among which are (1) Literacy literacy (2) Numerical literacy, (3) Scientific Literacy, (4) Digital Literacy, (5) Financial Literacy, and (6) Cultural and Citizenship Literacy. Based on this, mathematics is very relevant if it is associated with the advancement of the world of technology in the current era, this is because mathematics is universal and is used as a science that underlies technological development (Perdana & Suswandari, 2021).

The application of collaborative learning that is integrated through numerical abilities can be an alternative in delivering various materials to students. Collaborative learning will create a learning atmosphere that encourages students to interact, cooperate, share roles, tasks, and responsibilities in completing tasks or problems. To support the creation of this atmosphere, numerical abilities must contain a complete picture of numerical material and emphasize the implementation of methods in mathematical problems, thus requiring students to perform various problem analyzes.

Numerical talent is one of the basic elements for studying the field of mathematics, in this case it concerns the intellectual dimension (cognitive ability) of students which is a potential ability to perform arithmetic operations manually, such as addition, subtraction, multiplication, division, raising and withdrawal operations. root. Numerical talent is closely related to mastery of mathematics, it seems quite reasonable to explore, because it is known that the numerical system is a part of mathematics and provides facilities for the development of mathematics as a whole (Anderha & Maskar, 2021).

The collaborative learning itself is based on three important theories, namely, social constructivism theory, cognitive theory, and motivation theory. Constructivism theory views learning as a social experience that is activated through the zone of proximal development, where the level of potential development will increase when individuals work collaboratively with more capable peers. Then cognitive theory states that the exchange of concepts that occurs between individuals in the group results in the transformation of knowledge in each member in the group and encourages active learning. And finally, the theory of motivation states that the collaborative learning structure creates a conducive situation for learning and encourages each individual to interact and learn together to improve their respective understandings.

As we already know, collaborative learning is learning that encourages students to interact, cooperate, share roles, tasks, and responsibilities in completing tasks or problems while in the school environment. In addition, collaborative learning also has five important elements that are interrelated with each other, including positive dependence, interaction, individual and group accountability, interpersonal skills, and group processes. Therefore, in order for these five elements to be created properly, an appropriate learning activity is needed with the support of adequate teaching materials (Purwati & Erawati, 2021).

The problem that often occurs today in the process of delivering mathematics lessons to students, especially at the junior high school level, is that teachers emphasize more on students memorizing concepts, especially practical formulas that can be used during exams or other exams without looking at some of the main focuses related to learning improvement. This is also shown based on the results of initial observations in schools where as many as 80% of students still have not reached the KKM (Minimum Completeness Criteria) determined by the school. Such a monotonous mathematics learning process does not support students to be active in learning, so that students become bored and lazy in training themselves when answering questions if they are not instructed by the teacher.

Then the teacher only explains the material and then gives examples from the book and sometimes only a few students understand the material that has been explained. This of course will affect the knowledge possessed by students which are only procedural in

nature, namely being able to memorize the examples given by the teacher. As a result, if students are given questions that are different from the examples given by the teacher, they will experience difficulties and encounter obstacles without using the formula directly, for that the teacher must make new innovations in classroom learning, so as to provide opportunities for students to build their knowledge. alone. learning that can involve student participation as a whole, so that student activity in the learning process can increase. In addition, it is also necessary to stimulate students to want to explore more material related to technical drawings from learning sources other than the teacher. One of the known learning methods according to the explanation is the collaborative learning model (Widiastuti & Kurniasih, 2021).

The application of numerical talent in learning mathematics is indeed very beneficial directly to students, because this method involves the intellectual dimension of students which is a potential ability to perform arithmetic operations manually, such as addition, subtraction, multiplication, division, raising and withdrawal operations. root. So numerical ability is the ability to count, the ability to reason with numbers, use or manipulate number relations and describe logically. The term numerical reasoning test is often used interchangeably with a numerical ability test. There is no widely accepted definition of the difference between numerical ability and numerical reasoning and the two terms are often used interchangeably in the teaching methods of mathematics in schools. In addition, there are numerical ability test items designed to reveal understanding of number relations and make it easier for students to handle concepts, questions related to numbers (Fendiyanto, 2021).

Mathematics lessons, which are full of formulas, numbers and require accuracy in calculations, are indeed a challenge for students, so to make this easier, students are trained to be able to master numerical skills, which is an ability that is directly related to the process of learning. count counting, because without a sensitivity to numbers, one is likely to be unable to understand important economic, political, and social issues. In school, numerical ability is very important, this ability can be known through learning mathematics. This ability subtest reveals how well a person understands ideas expressed in numbers, and how clearly a person can think and reason with numbers. Thus, the numerical ability test is the ability of students to express their reasoning skills through calculations, multiplication, division and so on.

## CONCLUSION

Based on the results of the analysis and discussion above, it can be concluded several points as follows, numerical literacy which is applied in mathematics learning for junior high class students can be done by providing stimulus to students, the characteristics found in junior high class students do need to be directed by a teacher. so that the learning situation does not run monotonously. The selected stimulus should be contextual, interesting, and should be contemporary so that it stimulates students' curiosity. In addition, the availability of facilities and infrastructure, the capacity of school residents, and a good curriculum capacity will increase students' interest in learning to be stronger. For this reason, efforts through a numerical literacy program twice a week before learning hours take place, must be studied further. Because in numerical literacy itself there is the ability to use numbers, data, and mathematical symbols, as well as knowledge and skills in making decisions related to real problems both in the school environment and in everyday life. In addition, problem solving skills are in fact not only related to learning mathematics, but even complex level problems can

be found in social life, but if every student has the best solution and is able to master the numerical literacy skills, then everything can go according to what is expected we target.

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