

IMPLEMENTATION OF 3N (NITENI, NIROKKE, NAMBAHI) IN STIMULATING CRITICAL THINKING ABILITY

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Abstract

Education as a learning process is not enough to simply pursue the problem of intelligence. Various potential students or other learning subjects must also get proportional attention in order to develop optimally. In fact, the learning process in Indonesia is generally only directed at cognitive abilities. Students are required to memorize information without being required to understand the information obtained. The application of teaching and learning processes in the classrooms does not encourage the achievement of critical thinking skills (Sanjaya, 2009: 1). Though critical thinking skills are one of the basic capital or intellectual capital that is very important for everyone and is a fundamental part of human maturity. Therefore the development of critical thinking skills becomes very important for students at every level of education. Through the principle of 3N (*niteni, Nirokke, nambahi*) by Ki Hajar Dewantara expected to emerge as one of the solutions in an effort to stimulate students' critical thinking skills.

Keywords: critical thinking, *niteni, nirokke, nambahi*

Introduction

The challenge of education in the future is to create an educational process that is not only aimed at preparing students for their lives in the present but must be able to prepare them to enter life in the future, the characteristics of which are increasingly difficult to predict. Education is an effort to prepare the future of students, education must be able to provide students with a number of abilities needed to develop and adapt to real life. The education process must be able to provide basic capital to form a competitive and superior competitive advantage for the workforce. The fact that happened in Indonesia based on statistical data is that the unemployment rate of educated workers is increasing, one of the reasons is the low quality of human resources (Limongan, 2001: 1). With the condition of the newly fledged world, education must make students more competent and more empowered so that they are able to quickly accelerate the development of technology that develops along with economic growth.

Education as a learning process is not enough to simply pursue the problem of intelligence. Various potential students or other learning subjects must also get proportional attention in order to develop optimally. In fact, the learning process in Indonesia is generally only directed at cognitive abilities. Students are required to memorize information without being required to understand the information obtained. The application of teaching and learning processes in the classrooms does not encourage the achievement of critical thinking skills (Sanjaya, 2009: 1). Though critical thinking skills are one of

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Two factors causing the development of critical thinking skills so far are curricula that are generally designed with broad material targets so that teachers are more focused on material completion and lack of teacher understanding of learning models that can improve critical thinking skills (Duldt-Bathey, 1997: 92). This has an impact on the application of the teaching and learning process in the class which is less encouraging in achieving critical thinking skills, consequently, when students graduate from school, they are theoretically intelligent but they are less able to solve problems in their lives. Especially in facing the era of globalization, free trade and regional autonomy which has urged the world of education. Critical thinking ability is a very necessary thing to face increasingly fierce and increasing competition. With the condition of low critical thinking skills will result in students being less able to compensate for the development of the contemporary world where knowledge develops rapidly (Moseley et al., 2005).

Critical thinking is a process of intellectual discipline from active and skilled conceptualization, applying, analyzing, synthesizing, and or evaluating information collected or generated, observation, experience, reflection, reasoning, or communication, as a guide to beliefs and actions (Scriven & Paul, 2007: 1). Furthermore (Scriven & Paul, 2007: 1) mentions critical thinking is a mental habit that requires students to think about their thinking and about improving processes, requiring students to use high-level thinking skills, not just memorizing or accepting what they read or being told without thinking critically about it. Critical thinking skills are important because they allow students to deal effectively with social, scientific and practical problems (Shakirova, 2007: 42). Simply put, students who are able to think critically are capable of solving problems effectively. Just having knowledge or information is not enough. To be effective at work (and in their personal lives), students must be able to solve problems to make effective decisions, they must be able to think critically.

According to Appelbaum (2004: 1), the development of critical thinking in mathematics in the classroom can be done by doing activities such as comparing, contradicting, inducing, generalizing, sorting, analyzing, proving, linking, analyzing, evaluating, and making patterns, coupled continuous. While Fink (2003: 1) mentions 5 steps of learning to turn students toward critical thinking in accordance with Bloom's taxonomy, namely: (1) Determining learning goals; (2) Teaching through questions; (3) Practice before assessing; (4) Review, improvement and improvement; and (5) Providing feedback and assessment of learning.

Critical thinking is a directed and clear process used in mental activities such as solving problems, making decisions, persuading, analyzing assumptions, and conducting scientific research (Halpern in Johnson, 2011: 183). If everyone is able to think critically, the problems they face will certainly be simpler so that they are able to solve problems effectively (Shakirova, 2007: 42). Therefore, humans are given the mind and mind to always think about

how to make their lives better, and be able to undergo a problem no matter how hard it is given to them. In this study students' critical thinking abilities are measured through students' ability to solve a problem in mathematics learning.

Critical thinking is needed by everyone to address problems in the reality of life that cannot be avoided. Through critical thinking, a person can regulate, adjust, change or improve his mind, so that he can solve problems to make effective decisions (Shakirova, 2007: 42). Thus, critical thinking skills need to be developed in mathematics learning to prepare students to become strong problem solvers, mature decision-makers and people who have never stopped learning. To achieve these goals a concept of learning is needed which leads to the planting and development of students' critical thinking skills. In fact, there are not many results of research on the concept of learning, especially on mathematics subjects that lead to the planting and development of students' critical thinking skills that are used as a reference for learning by teachers.

Therefore, researchers want to apply the principle of 3N (Niteni, Nirokke, Nambahi) by Ki Hajar Dewantara as one of the efforts in the process of learning mathematics in particular to stimulate students' critical thinking skills.

DISCUSSION

The Nature of Learning Mathematics

According to the definition of learning and the definition of mathematics, mathematics learning is a process or system that supports student activities in the mathematics learning process that is planned, implemented, monitored and evaluated by the teacher to achieve the expected goals effectively and efficiently.

The definition of mathematics learning is the process of providing learning experiences to students through a series of planned activities so that learners obtain competencies about the mathematics material being studied (Gatoto, 2007: 26). According to Suyitno (2004: 2) mathematics learning is a process or activity of the teacher in teaching mathematics to students in which the teacher contains efforts to create a climate and service to the abilities, potentials, interests, talents, and needs of students about diverse mathematics so that interactions occur optimally between teachers and students and between students and students in learning mathematics.

Harta (2006: 4) argues that mathematics learning is a process aimed at fostering students' abilities in understanding mathematical concepts, using reasoning, solving problems, communicating ideas, and having respect for mathematics. According to Cobb (Suherman, 2003: 71) learning mathematics as a learning process that involves students actively constructing mathematical knowledge. Definition according to Soejadi (2000: 6), mathematics learning is an educational activity that uses mathematics as a vehicle to achieve the set goals.

Based on a number of opinions it can be defined as mathematics learning is a learning process planned by the teacher that involves students actively constructing concepts and mathematical structures in which the teacher's effort is to create climate and service (facilitating) the abilities,

potentials, interests, talents, and needs of students to obtain competencies about the mathematics material learned.

Critical Thinking Ability in Mathematics

Thinking occurs in every human mental activity that functions to formulate or resolve problems, make decisions and look for reasons. There are two main signs of critical thinking (Hassoubah, 2007). The first is that critical thinking is thinking that guides towards thinking deduction and correct decision making and are supported by correct evidence. Second is that critical thinking is reflective thinking that shows a complete awareness of the steps of thinking that lead to deductions and decision-making.

Bloom's Taxonomy (1956) which has been revised by Anderson & Krathwohl (2001: 66-88) regarding the level of thought, humans have six levels of thinking as follows: (i) remembering (ii) understanding; (iii) apply; (iv) analyze; (v) evaluate; and (vi) creating. Remember (remembering) is the ability to regain relevant knowledge from long-term memory. Understand (understanding) is the ability to formulate the meaning of a learning message and be able to communicate it in oral, written and graphical forms. Apply (apply) is the ability to use procedures to solve problems. Analyze (analyzing) includes the ability to break down a unit into parts and determine how these parts are connected to one another or that part to the whole. Evaluate (rate) is defined as the ability to conduct judgment based on certain criteria and standards. Create is defined as generalizing new ideas, products or new ways of seeing an event.

Based on Bloom's taxonomy described earlier, according to Alvino (1990), there is a level of thinking that is included in the category of critical thinking, namely the process of analyzing and creating. Thinking skills are mental processes that occur when thinking. Muijs and Reynolds (2008) mention that there are four main types of programs related to critical thinking skills, namely; problem-solving skills approach or called heuristic approach that is by parsing the problem to make it easier to do. metacognitive or self-reflection about the mind, open-ended, namely developing high-level thinking skills, and formal thinking is to help students undergo the transition between developmental stages more easily. Thus, critical thinking skills are part of high-level thinking which is a heuristic thinking process that will be formed and developed through solving problems or challenges that involve formal thinking.

Critical thinking skills are nothing but problem-solving abilities that produce reliable knowledge. Moore and Parker (1994) illustrate that critical thinking is more complex than ordinary thinking because critical thinking is based on standards of objectivity and consistency. Further said, critical thinking can be developed early and does not depend on the level of one's intellectual intelligence. Critical thinking is an exercise to process information proficiently, accurately, and in a strict manner, so as to achieve results that are reliable, logical and responsible.

Ennis (1996: 364) explains critical thinking is a process that aims so that we can make decisions that make sense so that what we think is best about a

truth we can do right. Based on this statement, critical thinking is a form of tendency; looking for a clear statement of a question, looking for reasons, using a source that has credibility, paying attention to situations and conditions as a whole, trying to remain relevant to the main idea, remembering genuine and fundamental interests, looking for alternatives, behaving and thinking openly, looking for reasons logical, and sensitive to other sciences. Thus, critical thinking can be interpreted as a process and also the ability to understand concepts, apply, synthesize, solve problems, prove and evaluate information obtained. Not all information obtained is always true or relevant information, because it requires assessment through various criteria such as clarity, accuracy, accuracy, reliability, and other evidence that supports argumentation in conclusions.

A person's critical thinking ability is not innate from birth, and cannot develop by itself, but only with learning and training (Muijs & Reynolds, 2008). Critical thinking can easily be obtained if someone has motivation or tendency and abilities that are considered as the characteristics and characteristics of critical thinkers. In addition, critical thinking can also be influenced by emotional factors so that seeing a decision is viewed skeptically.

The importance of critical thinking skills in making decisions is also based on the opinion of Ennis (1996) which states that critical thinking is a thought process that aims to make rational decisions directed to decide whether to do something. Based on this opinion, it can be revealed that critical thinking is focused on understanding something that is full of awareness and leads to a goal. The purpose of critical thinking is to consider and evaluate information which ultimately allows us to make decisions. Students who have the ability to think critically do not just believe what is explained by the teacher. Students try to consider their reasoning and find other information to get the truth.

Potts and Bonnie (1994) state that there are three specific strategies for learning critical thinking skills, namely building categories, determining problems, and creating a supportive environment (physical and intellectual). Whereas, Swart and Perkin (Hassoubah, 2004) state that critical thinking means finding and gathering information that can be trusted to be used as evidence that can support an assessment. Thus critical thinking consists mainly of evaluating arguments or information and making decisions that can help develop trust and take action and prove.

Krulik and Rudnick (1999) suggest that what includes critical thinking in mathematics is the ability to think which includes the element of testing, questioning, connecting, evaluating all aspects in a situation or a mathematical problem. For example, when someone is facing a problem. He will try to understand and try to find or detect the things that are necessary for the purpose of the solution. Likewise, from a data or information, he will be able to make conclusions that are right and true while seeing the existence of contradictions or the presence or absence of consistency or irregularities in that information.

Critical thinking skills related to mathematics learning in the classroom are divided into two, namely general indicators and indicators related to content (Ennis, 1996: 349).

1. General indicators
 - a. Abilities
 - 1) Prioritizing a specific issue
 - 2) Focus on the main problem in mind
 - 3) Questions are immediately clarified
 - 4) Give questions to be better understood
 - 5) Consider models or opinions.
 - 6) Linking previous knowledge with new ones
 - 7) Using appropriate statements and symbols
 - 8) Provide information in a systematic way, and in a logical order
 - b. Dispositions
 - 1) Emphasize on identifying goals and planning what should be done before starting to answer
 - 2) Emphasize on identifying the information given before starting to answer
 - 3) Looking for information needed
 - 4) Test the settlement obtained
 - 5) Students are encouraged to show information through use, graphics, maps, and others.
2. Indicators were related to content.
 - a. Concepts
 - 1) Identify the characteristics of the concept
 - 2) Comparing concepts with other concepts
 - 3) Identify examples of concepts with justification
 - 4) Identify concepts followed by giving reasons
 - b. Generalizations
 - 1) Finding concepts
 - 2) Finding conditions for applying concepts
 - 3) Find formulas that are different from generalizations (special situations)
 - 4) Showing supporting evidence for generalization
 - c. Algorithms and skills
 - 1) Explain the basic concepts of skills
 - 2) Comparing student performance with exemplary performance
 - d. Problem Solving
 - 1) Find a common form for the completion target.
 - 2) Find information provided from a context.
 - 3) Find information linkages and deviations.
 - 4) Choose and justify a strategy for solving problems.
 - 5) Find and conclude the goals that lead to goals.
 - 6) Propose alternative methods to solve problems.
 - 7) Find similarities and differences between the problems given with other problems.

Furthermore, critical thinking indicators are grouped into five major activities as follows:

1. Provide elementary clarification

- Contains focusing questions, analyzing questions and asking questions, and answering questions about an explanation or statement;
- 2. Building basic skills (basic support)
 - Consists of considering whether the source can be trusted or not and consider an observation report;
- 3. Concluding (interference)
 - Consists of deducing activities or considering the results of deduction, inducing or considering the results of induction, and making and determining the value of consideration;
- 4. Provide advanced clarification
 - Consists of identifying terms and definitions of consideration and dimensions, and identifying assumptions;
- 5. Regulate strategy and tactics (strategy and tactics)
 - Consisting of determining actions and interacting with others.

Based on critical thinking indicators that have been grouped into the top five activities and the six critical thinking elements that Ennis put forward in the form of FRISCO, can be visualized the relationship between the two as follows:

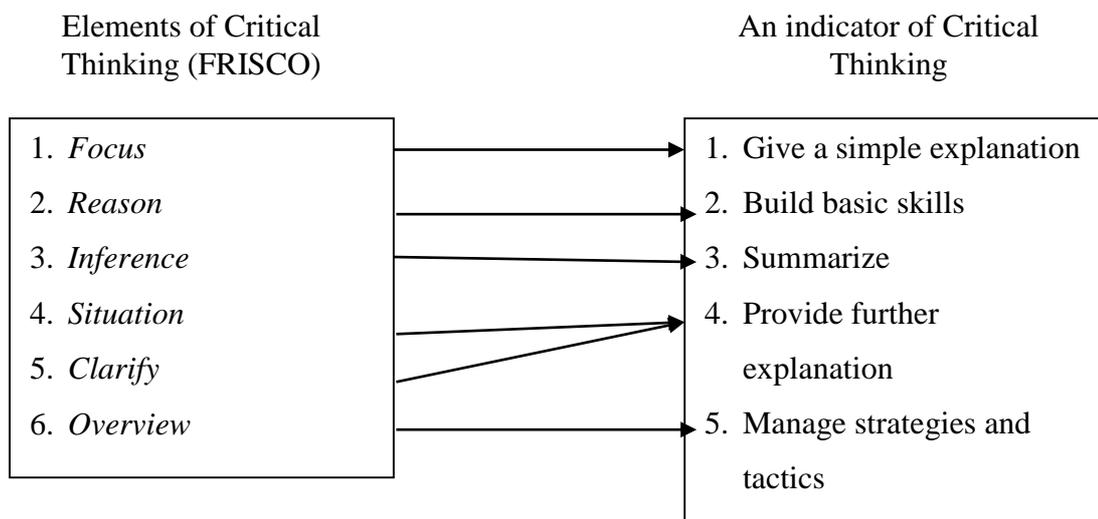


Figure 1. Relationship Between Critical Thinking Elements (FRISCO) and Indicators of Critical Thinking

Principle 3N (Niteni, Nirokke, Nambahi)

In Indonesia, Ki Hadjar Dewantara's thoughts on education have become a distinct image for the history of Indonesian education. He is an embryo of the Indonesian classical education model that was once considered suitable and ideal for developing and actualizing the potentials of Indonesia's young generation (cognitive, affective, psychomotor, social, and spiritual). Education is a field that he sees as the right foundation for humanitarian development in Indonesia.

Ki Hadjar Dewantara argued that education is a process of acculturation natural nature of each individual with the skills to preserve life, which is focused on the achievement of independence so as to obtain the

safety, security, comfort, and happiness of both inner and outer. In his view, the purpose of education is to promote the nation as a whole without distinction of religion, ethnicity, tribe, culture, customs, habits, economic status, social status, and based on the values of human freedom.

According to Ki Hadjar Dewantara, the western education system was deemed not suitable to be applied in Indonesia, because the fundamentals were *regering, tucht, orde* (orders, punishments, and order) which meant force. This model of education in practice is a rape of the inner life of children. This is clearly dangerous for the development of the character of children because such education does not develop the character of children, but destroys it. Children do not become independent individuals, have no initiative, and are not creative. So, the western education system in the presence of Ki Hadjar Dewantara is passive human beings whose superficial awareness is to create independently. Therefore, Ki Hadjar Dewantara applied the 3N learning concept (Niteni, Nirokke, Nambahi).

Niteni comes from the basic word "titen" which refers to the ability to carefully recognize and capture the meaning (traits, characteristics, procedures, truths) of an object. Niteni means the process of finding and discovering meaning (traits, characteristics, procedures, truths) of an object which is observed through sensory means. Thus, niteni is a cognitive process/mind which according to Ki Hadjar Dewantara he calls *copyright*. Copyright is the power of thought, which is tasked with finding the truth of something by observing and comparing something compared so that it can know the differences and similarities. Nirokke can be translated as imitating and add meaning to develop (to innovate / to add value). The discussion of these two concepts is put together considering that nirokke and adding are at the same level, namely the application of niteni processing. According to Ki Hadjar Dewantara included in the realm of "will or will" which always arises beside or as if as a result of thoughts and feelings. The difference between the two lies in the level and the creative process. Nirokke or imitating according to Ki Hadjar Dewantara is the nature of childhood (Suroso, 2011).

In relation to the process of imitation, especially children have the desire to always imitate everything that attracts their attention. Most of the abilities, skills, and behavior of children are a process of imitation, especially parents, for example speaking, behaving, playing, and so on. This imitation is very useful because it has the nature of educating oneself by way of orientation and experience, even though it is imaginary or fantasy. Adding or adding/developing is a further process from Nirokke. In this process, there is a creative and innovative process to give new colors to the imitated model. This process of adding is expected to occur in students. In this case, Ki Hadjar Dewantara stated that we do not imitate, but a process. If we just copy "copyeren", remember that people who imitate it are usually people who have nothing on their own. If people have, on the other hand, they improve, add, reduce, change, and process something that is copied (Suroso, 2011).

The principle of 3N (Niteni, Nirokke, Nambahi) in Mathematics Learning

Mathematics is considered an important science because mathematics is an introduction to other sciences. Mathematics is abstract, so many students assume that mathematics is a difficult lesson. The principle of 3N (Niteni, Nirokke, Nambahi) can be applied in mathematics learning. In mathematics learning, the 3N principle of Ki Hadjar Dewantara can be used as a learning model. However, the application of the 3N principle must be gradual, namely Niteni, Nirokke, then Nambahi. Each stage does not overtake each other, because Nambahi is the final process that will produce intact knowledge and skills.

The use of the 3N concept of Ki Hadjar Dewantara in mathematics learning is as follows:

Niteni	Nirokke	Nambahi
Students listen to the teacher's explanation of the material explained.		
Students are asked to find the basic concepts of the material presented by the teacher.		
Students identify the use of appropriate concepts on the problems given that have been observed.		
	Students arrange to problem-solve with previously identified concepts observed with the guidance of the teacher	
		Students write problem-solving using concepts that have been identified and then modified so that they are easily understood when studying again
		Students and teachers conclude the problems that have been resolved in accordance with the material delivered properly and correctly

With the steps mentioned above, learning using the 3N concept can train students' abilities through their five senses. The hope is from the niteni process, students can seek clarity from mathematical objects through observant observations and depth. Whereas from the nirokke process, students

can imitate exactly the object that has been observed. Then in the process of adding, students can try to be creative in solving a mathematical problem with the knowledge that has been obtained from the niteni process and nirokke.

Linkage Critical Thinking Ability and Principle 3N (niteni, Nirokke, nambahi)

In learning mathematics with the 3N principle, the teacher gives problems according to the material being taught. Then students are told to understand the problem, so it is advisable to make a strategy that will be used to solve the problem (Niteni). Students are guided to know when and why to apply the strategy to solve problems. At this stage, students are expected to be able to apply predictive skills, planning skills, and monitoring skills. By doing this activity the critical thinking skills of students are formed.

The next step, individual students are told to solve the problem in their own way (Nirokke). It is expected that students can consciously apply their mathematical knowledge, students know how to apply a particular strategy and when to apply it in solving problems. Thus students are expected to apply their knowledge such as procedural, conceptual, conditional, and correlational knowledge.

Furthermore, the teacher gives the opportunity for students to hold discussions with their friends, then the teacher directs students to draw conclusions from the results of the discussion to find a concept (Nambahi). So that a formula, principle or mathematical procedure is used to solve the problem. By carrying out these steps, the critical ability of students to increase can be due to the indicators of critical thinking skills, namely:

An indicator of Critical Thinking	Niteni	Nirokke	Nambahi
Give a simple explanation	√		
Build basic skills	√		
Summarize			√
Provide further explanation	√		
Manage strategies and tactics		√	

CONCLUSION

Learning mathematics in schools should use the principles of learning that are appropriate to the needs of children and can meet the objectives of learning mathematics at school. So that the classic problem for children can be overcome, which in turn mathematics lessons favored by students. One of the principles related to the world of children and the possibility of developing a teacher is the principle of 3N. Through the 3N principle, students are given the opportunity to experience the process and discover mathematical concepts. This is done by providing opportunities for students to explore their abilities through the activities of 3N (Niteni, Nirokke, Nambahi), followed by the grammatical procedure for solving students discovering the concepts themselves. By paying attention to the advantages of the 3N principle, it does not rule out the possibility that learning mathematics with this approach can

improve students' critical thinking skills, which in turn increases students' mathematical abilities.

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