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The effect of thematic learning by using a scientific approach to increase the multiple intelligence of students

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Abstract

This study aims to increase the multiple intelligence of students of elementary school teacher education STKIP NU Indramayu by using thematic learning with a scientific approach and to find out the obstacles experienced by students in increasing multiple intelligence. The method used is a mix method with sequential explanatory strategy, a strategy is applied by collecting and analyzing quantitative data in the first stage, in this study data collection and analysis of multiple intelligence enhancements, followed by qualitative data collection and analysis in the second stage, obstacles students in developing multiple intelligences built based on quantitative initial results. The subjects were students of PGSD STKIP NU Indramayu who attended the basic science concepts course. The instruments used in the form of tests and interviews. The results showed an increase in multiple intelligence students after scientific approached thematic learning seen from the results of the N-gain test analysis increased by 0.41 in the medium category. Obstacles in increasing multiple intelligence students are 3, students have difficulty in analyzing existing data from the results of the study, students have difficulty in working on calculation problems, and students have difficulty in predicting a problem.

Keywords: thematic learning, scientific approach, multiple intelligence, basic concepts of science

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Introduction

The education in the 21st century is a flow of change where teachers and students will play an important role in learning activities. The role of the teacher is not only as a transfer of knowledge or the only source of learning that can do anything it's called teacher center but the teacher can be a mediator and active facilitator to develop their acting potential. Knowledge, skills, and teacher experience are integrated into creating effective and professional learning conditions to make them more varied, meaningful and enjoyable.

Nowadays the 2013 Curriculum is a reference for education in Indonesia. 2013 Curriculum is oriented towards improving and balancing between attitudes, skills, and knowledge. These equal to the mandate of Law No. 20 of 2003 as stated in the explanation of 35 clauses, graduate competency is a qualification of ability that includes attitudes, knowledge, and skills in accordance with national standards (Chong & Cheah, 2009; Ikhwan, 2018; Majid, 2014, p. 28).

Therefore, the duty and the role of the teacher in realizing an advanced education that can compete internationally as well as being able to adapt to curriculum change requires intelligence and skill, so that the teacher is ready to face the challenges of life that continues to grow.

PGSD students will become teachers at the elementary school, it means they must be able to master various kinds of knowledge and skills in order to educate students. At the elementary school, the educators as a teacher, motivator, and mentor for students. Teachers must have expertise in all matters, it is necessary for PGSD students as prospective educators to develop multiple intelligences to equip themselves in planning learning and solving problems in the future. As expressed by Gardner in Armstrong (2009) intelligence is more related to the capacity or ability to solve problems and create products

and works in a rich context and naturalistic conditions.

In fact, there are many problems are found by research of the Center for Educational Assessment of the Research and Development Agency (2015), 27% of parents in Indonesia carry out activities that stimulate numerical abilities and student reading such as fairytale reading, alphabet singing and so on, it means there is a little awareness from parents in education. In this case, the role of the teacher is needed in order to awaken parents to educate their children at home and this only be done if the teacher is able and aware to change the mindset of parents. Meanwhile, the proportion of teachers in Indonesia who feels difficulties in following curriculum changes from KTSP to the 2013 curriculum is still high, amounting to 12.8%.

According to Putri & Jumadi (2017, p. 210), one of the obstacles experienced by teachers in following curriculum changes from KTSP to 2013 curriculum is the implementation of learning, especially in applying the models specified in the 2013 curriculum. In one semester, the teacher is only a few times using these learning models and adjusting to the learning material. And the reality is only a few teachers applied learning models determined in the 2013 curriculum, the learning model applied was problem based learning. Based on observations, the obstacles faced by teachers when applying the problem-based learning (PBL) model in the classroom are in organizing or PBL scenarios themselves. Students still need more guidance from the teacher, especially in formulating problems and solving them. Based on the results of the two studies, it means that teachers in Indonesia are still having difficulties in following curriculum changes that occur. Though curriculum changes aim to provide better education.

The results of the data clearly will have an impact on the progress of student achievement, which can be seen in the 2015 TIMSS (Trend International Mathematics Science) results according to the 2015 International Association for the Evaluation of Educational Achievement (IEA) that Indonesia is still ranked 45 out of 48 countries in the field of science and ranked 45 out of 50 countries in the field of Mathematics.

According to Syah (2010, p. 223) teachers as educators or instructors are the determinants of the success of any educational endeavor. That is why every curriculum renewal effort, the procurement of educational equipment up to the criteria of human resources produced by education efforts always leads to the teacher. This shows how important the position of teachers is in education.

Based on these problems it is clear that the development of multiple intelligence in PGSD students is so important as an effort to improve educational problems so that education in Indonesia can achieve its goals.

One way to develop multiple intelligence is by applying thematic learning with a scientific approach which is also in accordance with the 2013 curriculum because thematic learning has topics are close to everyday life will be able to give meaning to students. Linking the field of science with other sciences packed in one theme can stimulate students' knowledge and skills to enable students to develop multiple intelligences. The formulation in this study is (1) how to increase the fourth semester multiple intelligence of students in the Indramayu STKIP NU PGSD Study Program after conducting thematically scientific approaches?; (2) What are the student barriers to developing multiple intelligence?

Method

The method in this study uses a mixed method. Mixed methods research according to Creswell & Creswell (2017) is a research approach that combines or associates qualitative and quantitative forms. The strategy used is a sequential explanatory strategy.

The procedure in this study is, the first stage will be conducted collecting and analyzing quantitative data on increasing the multiple intelligence of PGSD students in the basic science concept subjects in elementary school using the pretest and posttest questions. Then, the results of quantitative data used as materials to collect and analyze qualitative data. Its used to analyzes student barriers in developing multiple intelligence based on intelligence categories such as Linguistics, Logical-mathematical, Spatial, Kinesthetic-body, and Naturalists using interview techniques.

This research was conducted at STKIP NU Indramayu for PGSD Study Program students in the fourth semester of the 2017/2018 who taught basic concepts in science in elementary schools. Data collection techniques used test, observation, and interview. The instrument used is a multiple intelligence test sheet that has been tested for validity and reliability. The test questions were 14 questions with the results of validity 12 valid questions and 2 invalid questions with n = 27 and r_{table} 0.381. The results of reliability testing of the

test questions obtained $\alpha = 0.839$ means that reliability in testing multiple categories of high intelligence. While the difficulty index results obtained as many as 8 questions in the medium category, at numbers 1, 2, 3, 4, 6, 10, 11, 13, and 6 difficult categorical questions, at numbers 5, 7, 8, 9, 12 and 14. Results distinguishing power is as many as 12 questions with the medium category while the 2 questions are in a bad category.

Based on the results of the analysis of the validity, reliability, differentiation and difficulty levels, it can be concluded that 12 questions can be used and 2 questions are revised, with certain considerations, in this study only 12 questions were used and 2 questions were discarded or not used because invalid.

The observation sheet instruments from a total of 76 items with N = 27 and r_{table} 0.381, then the number of valid statements in the multiple intelligence questionnaire trials was as much as 70 items. While those that are invalid are as many as 6 items. So that the total number of statements that will be used in the multiple intelligence research questionnaire is 70 statements. The reliability analysis of the questionnaire trial questionnaire using the Cronbach Alpha formula, in providing an interpretation of the value of obtained, the value of α obtained were correlated with rtable. If α is more than r_{table}, the test is said to be reliable. Reliability coefficient data results are $\alpha = 0.957$ or $r_{11} = 0.957$ with $r_{table} = 0.381$ and n = 27. It can be concluded that the multiple Intelligence questionnaire has very high reliability, it means that multiple intelligence questionnaires can be used to identify multiple intelligence STKIP NU Indramayu PGSD students.

This quantitative research analysis uses the N-gain test to determine the increase in student multiple intelligence before and after thematic learning using the scientific approach. According to Hake (1998), this test is used to determine the achievement criteria for tests before (pretest) and after (posttest) treatment (Miri, David, & Uri, 2007, p. 358).

Qualitative data analysis in this study to describe student barriers in increasing multiple intelligence. The qualitative data analysis activities are carried out interactively and take place continuously until complete. The steps in the data analysis model of Miles and Huberman according to Sugiyono (2010, p. 337) are data reduction, data presentation, and conclusions or verification.

Results and Discussion

Increased Multiple Intelligence

The results of the improvement test were based on the results of the pretest and posttest of fourth semester student multiple intelligence in the Indramayu STKIP NU PGSD Study Program can be seen in Table 1.

Table 1. Recapitulation of Student N-Gain Multiple Intelligence Test Results

	Pretest	*Posttest*	<g>	category
Total	1652	2324		
Average	50,06	70,42	0,41	Medium
Minimum	36	51		
Maximum	65	80		

Multiple intelligence based on the results of the overall N-Gain test students experienced an increase seen in table 1 obtained average pretest results of 50.06 increased to 70.42 from the posttest results, with N-gain of 0.41 has a good category. The use of learning indicators that refer to four multiple intelligences such as kinesthetic, spatial, mathematical and naturalistic logic in thematic learning have a scientific approach involving students in learning activities that require high-level thinking skills, because in Multiple intelligence there are many intelligence indicators including conclusions based on experimental results, making hypotheses, predicting, calculating, analyzing, relating, identifying, explaining and describing a phenomenon.

According to Wahyono, Isaac, & Rusman (2017, p. 227) in their research showed that the implementation of learning uses a scientific approach to carry out excavation, planting, enhancement, and development of knowledge through research, from this activity will form analytical thinking patterns, and bring facts of the phenomenon that occurs. While scientific learning is built from learning materials based on facts or phenomena that can be explained by certain logic or reasoning so that they can encourage and inspire students to think critically, analytically and precisely in identifying, understanding, and solving problems, and are able to apply and encourage and inspire students to be able to think hypothetically in seeing differences, similarities, and relationships between elements and being able to understand, apply, and develop rational and objective mindsets in responding to subject matter.

Thematic learning that links between one concept to another allows students to think integrated in seeing a phenomenon, students can

see an event not only from one point of view but from another perspective, thematic learning can also train students to be able to solve a problem based on knowledge integrated, so that the knowledge gained will be broader and more comprehensive. Based on the explanation, it proves that thematically oriented scientific learning can encourage students to think higher so that students are able to develop their intelligence.

According to Wahyudi, Ngadiman & Sulardi (2014, p. 1), the advantages of thematic learning are students linking each other, connecting with each other between parts of the subject. Besides thematic learning also encourages student motivation.

Learning that uses the scientific approach also provides a positive impact on changes in student attitudes because the scientific approach at the stage of processing students is conditioned on collaborative learning. In this activity, students must be more active while the teacher is more directive or a learning manager. Collaborative learning allows students to interact with empathy, mutual respect, and accept their own shortcomings or strengths. Thus a sense of security will grow so that it allows students to deal with various changes and demands for learning together (Majid, 2014, p. 230).

Learning that uses the multiple intelligence approach as an approach in classroom learning has a positive influence on student self-development. Because learning includes all aspects of intelligence needed by students and carried out in a way that can develop every intelligence.

According to Amitha & Vijayalaxmi (2017, p. 327) in their research, they suggest that the multiple intelligence approach is more useful than the traditional approach learning. The multiple intelligence approach impacts on better academic achievement to improve student behavior and efficient classroom management.

The research conducted by Sulaiman, Hassan, & Yi (2011, p. 430) also revealed the advantages in implementing multiple intelligence approaches, through the implementation of multiple intelligence (MI) approaches in class-room learning, teachers will indirectly decentralize classes, encourage students to take a proactive role in learning and change the function and role of the teacher from the director to the facilitator.

The result of N-gain test is also seen from the increase in each indicator that refers to multiple intelligence before and after scientific thematic learning is approached using the values of the pretest and posttest which are indicators of multiple intelligence. The results of the analysis of each indicator of multiple intelligence problems can be seen in Table 2.

Table 2. Results of Analysis of Tests for Student Multiple Intelligence

No.	Intelligence	Rata-Rata	Rata-Rata		N-Gain	Kategori
			Post Test	*Pre Test*		
1.	Linguistik	4,33	3,43	4,19	0,85	Tinggi
2.	Spasial	5	3,22	4,67	0,82	Tinggi
3.	Logis Matematis	8,57	3,02	4,70	0,28	Rendah
4.	Naturalis	4	2,99	3,64	0,64	Sedang

Based on Table 2 from the analysis of multiple intelligence tests of PGSD Study Program students with the number of questions as many as 12 test questions with indicators that refer to multiple intelligence consisting of 3 linguistic intelligence questions with N-gain of 0.85 high category, 3 questions of spatial intelligence with N-gain of 0.82 in high category, 7 questions of mathematical logical intelligence with N-gain of 0.28 has a low category, and 3 questions of naturalist intelligence with N-gain of 0.64 in the medium category.

The results of the test can be seen in each indicator of four multiple intelligences based on Table 2. It shows the highest increase in intelligence test results is the linguistic and spatial intelligence test with N-gain 0.85 and 0.82 with the high category, while the lowest is the test of mathematical logical intelligence with N-gain of 0.28 in the low category.

The question of linguistic and spatial intelligence tests viewed based on the analysis of Bloom, most of the questions types are the cognitive domains C1 and C2. It consists of remembering and understanding. In the realm of remembering, students are asked to mention or explain again the knowledge that has been gained from learning. While in the realm of understanding, students are asked to interpret knowledge that has been obtained before. So the questions on the linguistic and spatial intelligence tests are relatively easy. In addition, when viewed from the profile of the STKIP NU Indramayu PGSD study program the dominant intelligence possessed by students is spatial intelligence and linguistic intelligence, which are 8 and 7 students. This affects the results of increasing student multiple intelligence.

The low level of mathematical logical improvement viewed from the type of questions, most of them are included the cognitive domains

C3 and C4. It was the ability to apply and analyze. Applying is the ability to do something and apply concepts in certain situations, meaning that students must be able to apply a concept in certain situations. Whereas in the matter of analyzing the problem, students are asked to have the ability to separate concepts into several components and connect with each other to gain an understanding of the concept as a whole. It can be concluded that the test questions of increasing logical intelligence are mathematically included in the types of difficult questions.

Student Obstacles in Increasing Multiple Intelligence

Student barriers in increasing multiple intelligence were conducted in 2 ways, the first was done quantitatively by using multiple intelligence tests in which the data were in the form of multiple intelligence test analysis and the second was by qualitative methods from the interviews of 33 students. Student obstacles in increasing multiple intelligence can be seen more clearly in Figure 1.

Based on the results of test and interview analysis, the student barriers to increasing multiple intelligence are categorized into 3 categories as follows. (1) 15 students had difficulty in analyzing existing data from the results of the research, in question number 6 with N-gain of 0.45 in the medium category; (2) 20 students had difficulty in working out the calculation questions, seen from the results of the test answers to question number 8a with N-gain of 0.17 with the low category, the question number 9a with N-gain of 0.22 in the low category and the problem number 9b with N-gain 0.23 in the low category; (3) 18 students had difficulty in predicting a problem, seen from the results of the answer to question number 7 with N-gain of 0.33 in the medium category.

The most findings in the study of the obstacles experienced by students in increasing multiple intelligence are the indicators of logical-mathematical intelligence, 20 students have difficulty in solving problems with the form of calculations, seen in the answer to the problem students have difficulty in planning the solution. Students have not been able to collect data or information by linking the requirements specified for analysis, such as converting units known to those that should be used in calculations. Students also have difficulty in determining which formula is used to solve the problem.

15 students also experienced difficulties in analyzing existing data from the results of the study. In analyzing requires the ability to visualize, articulate, conceptualize or solve complex and uncomplicated problems by making reasonable decisions considering the information available. Analyzing skills cannot develop significantly only with a short amount of time and classroom learning. Analyzing can develop by doing exercises regularly in a short time. The difficulty of developing analytic skills revealed in the research of Jönsson & Lennung (2011, p. 14) shows that the analytic skills of prospective teachers do not develop substantially during teacher education.

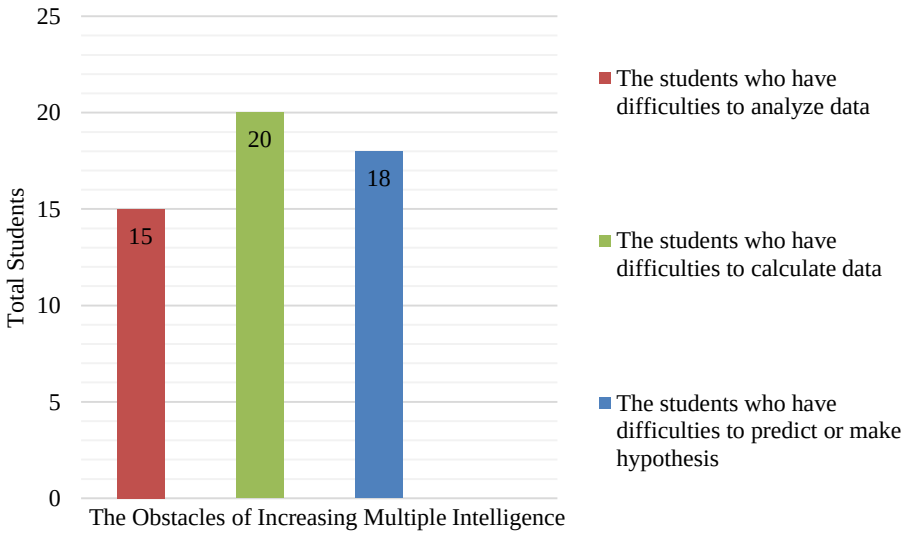

Figure 1. Student Obstacles in Increasing Multiple Intelligence

As many as 18 students had difficulty in making predictions, the difficulty in improving their predictive ability was also shown in the research conducted by Juhji (2016, p. 66) regarding science process skills which showed that the smallest percentage increase was in predicting skills from the percentage pretest average value in cycle 1 it was 59.38% to 65.63% in cycle 2. This means that the increase that occurred from cycle 1 to cycle 2 was only 6.24%.

According to Dewi, Nugroho & Sulhadi (2015, p. 143) in the skill predicts prior knowledge or students' initial knowledge about the material related to the problem. Previous knowledge can be obtained from the results of learning experiences or from an event experienced by students. In predicting it also requires skills to connect the patterns associated or connecting between one phenomenon with another phenomenon so that it seems clear the solution to a problem.

Based on the results of interviews conducted on 33 students found that most PGSD students were graduates of Social Sciences and Language majors, only 5 students came from science graduates, so students were not accustomed to carrying out activities related to the development of mathematical logical intelligence such as conducting experiments, making predictions, testing hypotheses, observing and solving problems related to numbers, the background results in less trained students working on questions related to logical-mathematical intelligence.

According to Danin (2011 p. 128), there are 3 factors that can influence the development of multiple intelligences such as biological factors including hereditary or genetic factors and injury or brain injury before, during and after the event. Cultural or historical background factors include the time and place of students being born and raised, as well as the nature and conditions of historical or cultural development in other places. Then the historical factors of personal life, including experiences with parents, friends, and teachers both those that evoke and those that hinder the development of intelligence.

Life history factors related to experiences with teachers are educational experiences. The magnitude of the role of educators in helping students develop multiple intelligence can be seen from the way educators do learning in the classroom, such as the use of media, methods and appropriate learning models are one effort that can be done in developing multiple intelligence. Therefore, the background of student education is one of the determining factors that can influence multiple intelligence.

Conclusion

The conclusion of this study is based on the thematic learning scientific approach can increase student multiple intelligence seen from the results of the N-gain test analysis has increased by 0.41 with the medium category. The obstacles in increasing student multiple intelligence there are 3, namely 15 students having difficulty in analyzing existing data from the results of the study, 20 students have difficulty in working out the calculation questions, and 18 students have difficulty predicting a problem.

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