

# Analysis of Cognitive Process Dimensions by Problem-Based Learning on Globalization Theme

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## Abstract

Globalization brings changes to the behavior of human life. One of the benefits of globalization is that students are easy to get learning material. Students are easy to complete learning material for factual, conceptual, and procedural knowledge. The negative impact of globalization can cause changes in negative behavior of students. Problem-Based Learning is an innovative learning model. The purpose of the study was to analyze Problem-Based Learning as its impact on cognitive processes dimensions. The research design is qualitative descriptive. The study was conducted on students of Madrasah Ibtidaiyah public school/ elementary schools with the theme of Globalization by applying Problem-Based Learning. The study involved as many as Madrasah Ibtidaiyah students. Dimensions of cognitive processes that are measured are the dimensions of knowledge (C1), the dimensions of understanding (C2), the dimensions of application (C3), the dimensions of analysis (C4), the dimensions of evaluation (C5), and the dimensions of creating (C6). Data analysis was performed by using method with statistical analysis t-test to see differences in trends of each dimension of the cognitive process under study and qualitative descriptive analysis through interviews and image analysis. The results showed that there were differences in each dimension of cognitive processes and there was a significant increase from the dimensions of low cognitive processes to medium and high cognitive processes in the application of Problem-Based Learning.

Keywords Cognitive Process, Problem-Based Learning, Globalization, Elementary school

## 1. Introduction

Globalization is the interdependence of countries in the world on the economy, culture and people caused by trade in goods and services, technology and investment, including information technology and people. Countries in the world in the context of globalization then build partnership in the economic field. The other hand globalization also has an impact on the emergence of economic crises arising in various nations and countries.

Globalization emerged as a result of changes in the global economy and increased trade between nations and between countries. Globalization brings the impact of foreign investment into a country thus opening up the global economy. The other side of globalization is the increasing economic cooperation relations between nations and countries in the world. Globalization also led to the liberalization of trade rules and procedures from one country to another. Globalization also causes the productive sector to develop rapidly in various countries in the world. Globalization has an impact on countries in the world, especially in the world of trade because it is set in the World Trade Organization (WTO) [1].

The world of education plays an important role in the global era. Higher education has an important role in globalization because it is involved in the preparation of educated workers. Higher education is an integral part in direct aspects of people's lives. On the other hand it is important to know the cognitive dimensions of students so that as teachers have the right strategy in classroom learning. We often hear the term Bloom's Taxonomy and we use it in compiling learning indicators when developing lesson plans. Verbs used in Bloom's Taxonomy describe the dimensions of cognitive processes that occur in learning. Bloom's taxonomy was first published by Benjamin S. Bloom et al., which in its development underwent a revision in 2001 by Anderson and Krathwohl.

The old Bloom's taxonomy, the sequence of cognitive processes takes the form of nouns in the order from lowest to highest as follows: knowledge, comprehension, application, analysis, synthesis and evaluation. The

revised Bloom's new taxonomy changes nouns into verbs in a somewhat different order at the end as follows: remembering, understanding, applying, analyzing, evaluating and creating. Dimensions of cognitive processes include Dimensions of cognitive processes that are measured are the dimensions of knowledge (C1), the dimensions of understanding (C2), the dimensions of application (C3), the dimensions of analysis (C4), the dimensions of evaluation (C5), and the dimensions of creating (C6). The right learning strategy will get optimal learning outcomes so that learning objectives are achieved. Some innovative learning models can empower dimensions of students' cognitive processes, one of which is Problem-Based Learning.

Problem-Based Learning is instructional that challenges students to learn a lot to realize good cooperation in groups to find solutions to real problems. The capacity of self efficacy to promote students better performance in mathematics by Problem-Based Solving efficacy [6]. This problem is used so that students curiosity and analytical skills and initiatives on subject matter can be provoked and encouraged. The learning model Problem-Based Learning as a learning model that prepares students to think critically and analytically, as well as find and use appropriate learning resources to deal with an existing problem. Problem-Based Learning has an important difference with discovery learning. Therefore, learning discovery is based on questions based on student discipline and inquiry. The students with Problem-Based Learning demonstrated significantly higher scores than the conventional instruction in the overall mathematical values [4]. Students get meaningful and interesting learning by STEAM Project-Based Learning [1].

The principle of the Problem-Based Learning model of learning is related to real life problems, students have the opportunity to choose and carry out any investigation both inside and outside of school as far as needed in solving problems. Implementation of the revised 2013 curriculum emphasizes learning processes that require higher-order thinking skills (HOTS / High Order Thinking Skill), and the Problem-Based Learning Model is one of the most reliable models. The Problem-Based Learning model is one of the effective approaches to teaching high-level thought processes (HOTS). This learning model will greatly help students to process information that has already become in their minds and compile their own knowledge about the social world and its surroundings. There is a significant difference between teaching experience and school level in teaching teachers with reflective thinking skills, self-evaluation and feedback given by teachers to students [8].

By applying the Problem-Based Learning model, students are trained to arrange their own knowledge, develop skills and abilities in solving problems they face. In addition, by providing authentic problems, students can shape the meaning of learning material through the learning process and store it in their memory so that at any time it can be reused. Problem-Based Learning that emphasizes learning strategies using real world problems as a context for students to learn about critical thinking and problem solving skills, as well as to obtain essential knowledge and concepts from subject matter. The purpose of this study was to analyze the dimensions of students' cognitive processes by learning Problem-Based Learning on the concept of globalization students.

## **2. Materials and Methods**

### **2.1 Research Design**

The research design is to use a type of research development by applying a 4-D Models development research model which consists of define, design, developed, and disseminate.

### **2.2 Population**

The small scale test and the field scale test were carried out at MI Negeri 5 Jember which was located in Silo, Jember regency, east Java, Indonesia. The small group test research involved 12 students while the large group test involved 23 students.

### **2.3 Instrument**

Research instruments in the form of instruments of cognitive process dimensions, learning Problem-Based Learning model instruments, learning tools, feasibility of learning, and student responses are first tested for validation before being used. Validation is carried out by validators including expert validators, user and practitioner validators. Validation results are said to be valid if the average validation results are in the good category and all elements in the minimal category are good.

### **2.4 Data Analysis**

Data cognitive process dimensions which include indicators of remembering, understanding, applying, analyzing, evaluating, and creating through pre-test and post-test. In limited trials and field trials data also were collected about student responses and also the implementation of learning. Analyze data with quantitative descriptive and quantitative descriptive. Validity analysis by following the following criteria (Table 1).

**Table 1.** Instrument Validity Level

Level of validity	Criteria	Information
80.26 – 100	Very Valid	No revision, product is ready to use
62.6 – 80.25	Valid	Small scale revision needed to use
43.76 – 6.50	Invalid	Major revision, products can be used with major revisions
25.00- 43.75	Not valid	It cannot be used

The effectiveness of the cognitive process dimension results is done using the Normalized gain (N Gain) formula. Data obtained by analyzing the students' pretest and posttest scores. The gain index is calculated using the gain index formula

$N\text{ Gain} = \frac{\text{score post test} - \text{score pre test}}{\text{score maximal ideal} - \text{score pre test}}$

Criteria N Gain score (Table 2.)

**Table 2.** N Gain criteria

Score	Criteria
$G < 0,30$	Low
$0,30 \leq g < 0,70$	Medium
$G \geq 0,70$	High

### 3. Finding

The results showed that the implementation of Problem-Based Learning can be carried out properly in the order of learning. The Problem-Based Learning model is a learning based on problems that require students to gain important knowledge, which makes them proficient in solving problems, and has their own learning strategies and ability to participate in study groups. The learning process in the Problem-Based Learning model uses a more systematic approach to solving a problem and facing challenges that are likely to confront in everyday life. In this way, later students are expected to be ready and trained to deal with problems in daily life in their environment.

#### 3.1 Instrument Validation

The instrument validation which included the syntax of the learning model, learning material, learning content, and instruments of cognitive process dimensions. The Validation instrument cognitive process dimensions for category learning syntax, learning material, and learning content consists of compliance with instructions, assessment aspect, performance aspect, development learning models, and presentation aspect. Validation instrument cognitive process dimension consists of clear works instructions, clear instruction of assessment, the accuracy of the component contents, the accuracy of language, and the accuracy of terms

The results of the instrument validation which included the syntax of the learning model, learning tools, learning materials, and instruments of cognitive process dimensions are presented in Table 3.

**Table 3** Results of instrument validation

No	Parameter	Indicator	Validity (%)	Category
1	Learnng Syntax	Compliance with instructions	94,10	Very good
		Assessment aspect	77,30	Valid

		Performance aspect	94,10	Very good
		Development learning models	77,50	Valid
		Presentation aspect	76,70	Valid
		Average	83,94	Very good
2	Learning Material	Compliance with instructions	93,30	Very good
		Assessment aspect	77,20	Valid
		Development learning models	82,60	Very good
		Presentation aspect	81,50	Very good
		Worksheet aspect	77,30	Valid
		Average	82,38	Very good
3	Learning content	Compliance with instructions	93,80	Very good
		Definition, concept and theory	84,60	Very good
		It is not cause misconceptions	92,40	Very good
		Presentation of learning concept	81,50	Very good
		Image and graphic	81,50	Very good
		Average	86,76	Very good
4	Cognitive process dimension	Clear works instructions	97,90	Very good
		Clear instruction of assessment	88,80	Very good
		The accuracy of the component contents	85,20	Very good
		The accuracy of language	77,80	Valid
		The accuracy of terms	87,50	Very good
		Average	87,44	Very good
	Average		85,13	Very good

Based on Table 3, it can be seen that result of validation is carried out by validators including expert validators, user and practitioner validators shows that the average result of instrument validation on the learning syntax, learning material, learning content and cognitive process dimensions is 85.13 with the very good category. The highest average instrument validation was the dimensions of cognitive processes at 87.44 in the very good category. The lowest instrument validation was Learning Material with an average value of 82.38 in the very good category.

The results of the instrument validation for the learning syntax parameter obtained an average result of 83.94 in the very good category. The highest indicator validation results in learning syntax are in the Compliance with instructions and Performance aspect indicators with a value of 94.10 in the very good category. The validation results for the lowest indicators are on the Presentation aspect indicator with a value of 76.70 in the valid category. The results of the validation of the learning material parameter instrument obtained an average result of 82.38 in the very good category. The validation results for the highest learning material indicators were on the Compliance with instructions indicator with a value of 93.30 in the very good category, while the lowest was on the Assessment aspect indicator with a score of 77.20 in the valid category.

The results of the validation of the learning content instrument obtained an average result of 86.78 in the very good category. The results of the validation for the highest learning content indicator were on the Compliance with instructions indicator with a value of 93.80 in the very good category, while the lowest was on the Compliance with instructions and Image and graphic indicators with a value of 81.50 in the very good category.

The results of the validation of the cognitive process dimension instrument were obtained with an average value of 87.44 in the very good category. The highest validation result was on the Clear works instructions indicator with a value of 97.90 in the very good category, while the lowest was on the indicator The accuracy of language with a value of 77.80 in the valid category.

### 3.2 Cognitive Process Dimension

Cognitive Process Dimension is measured by N Gain. The results of the N Gain Cognitive Process Dimension are shown in Table 4.

**Table 4.** Results of N Gain cognitive process dimension analysis (N = 23 students)

No	Aspect	Test	Rerata	Normalized Gain	Category
1.	Remembering	Pre test	61,30	0,44	Medium
		Post test	78,50		
2.	Understanding	Pre test	62,70	0,51	Medium
		Post test	81,60		
3	Applying	Pre test	57,80	0,44	Medium
		Post test	76,40		
4.	Analyzing	Pre test	53,20	0,50	Medium
		Post test	76,80		
5	Evaluating	Pre test	53,70	0,49	Medium
		Post test	76,40		
6	Creating	Pre test	52,70	0,50	Medium
		Post test	76,40		
Average N Gain				0,48	Medium

Based on Table 4 it can be seen that the dimensions of cognitive processes for all levels have the category N Gain in the medium category with an average N Gain value of 0.48. The understanding dimension has the highest N gain which is 0.51. While the dimensions of cognitive processes with the lowest N Gain are for remembering and applying dimensions both have N Gain of 0.44. Thus the effectiveness of the implementation of learning Problem-Based Learning on the concept of globalization in the medium category for all aspects of cognitive process dimensions both remembering, understanding, applying, analyzing, evaluating, and creating.

The effectiveness of Problem-Based Learning on the concept of Globalization on the dimensions of cognitive processes is also supported by students response data to Problem-Based Learning in the Globalization concept.

### 3.3 Student Responses

The results of student responses to the implementation of Problem-Based Learning are listed Table 5.

**Table 5.** Student responses to the implementation of Problem-Based Learning (N = 23)

Indicator	Average (%)	Category
Easy to learn	88,70	Very good
Easy to understand the learning material	87,50	Very good
Enjoyable learning	89,30	Very good
Practicing accuracy	85,70	Very good
Average	87,80	Very good

Student response data as shown in Table 5 that all student responses to all indicators in the category are very good. Fun learning indicators get the highest score of 89.30 with a very good category. Indicators of student responses to practice accuracy get the lowest score of 85.70 in the excellent category. The average results of student responses to the learning Problem-Based Learning on the theme of globalization amounted to 87.80 with excellent categories.

## 4. Discussion

The results of the research and the results of data analysis show that the validity of the Problem-Based Learning learning tools that are implemented in the learning of the concept of globalization and the dimensions of cognitive poses are valid and very valid. Overall average validity of learning tools and cognitive process dimension instruments is (85.13) with a very valid category this shows that learning devices and cognitive process dimension instruments are good to use.

The theme of Globalization is an interesting theme for students, especially with Problem-Based Learning. This is consistent with the results of research on student responses to the implementation of Problem-Based Learning on the theme of Globalization (87.8%) with a very good category. This is because the theme of Globalization is a contextual and comprehensive theme that makes it easy for students to solve the problems given.

Globalization is influenced by three main actors, namely; 1) Globalists, those who believe that globalization

is a reality that contains a real consequence of how people and institutions around the world work. 2) Traditionalists, those who do not believe that globalization is happening and consider it a myth or something that is exaggerated. 3) The Transformalists, namely those who are in the midst of globalists and traditionalists. They believe that globalization is taking place, but consider the influence of globalization to be exaggerated by globalists [2].

The process of globalization occurs due to several factors [5]. Referring to the understanding of globalization above, as for several factors causing globalization, namely 1) The development of information and transportation technology, information technology and transportation play a major role in the process of globalization in the world. The more advanced technology makes trading activities between countries easier. 3) International economic cooperation, economic cooperation between countries in the world is also a contributing factor to globalization. The ease in making international trade agreements results in the process of globalization happening continuously. 4) Ease of shipping goods and services, people between countries can send goods and services to one another. The ease of delivery of this product makes many foreign products enter the country and are adapted by the public. 5) Conflict between countries decreases, increasing awareness of the world community of the importance of international relations results in reduced conflict between countries. When there is international relations between countries, globalization occurs. Globalization has an impact on a country's economy. Economic growth of a country depends on the level of development of each country [3].

The effectiveness of the implementation of Problem-Based Learning on the dimensions of cognitive process average score is 0.48 in the medium category and for all indicators of the cognitive process dimension in the medium category. Problem-based learning is believed to be effective in increasing the dimensions of students' cognitive processes on learning with the theme of Globalization. Problem-based learning organizes teaching around questions and problems that are both socially important and personally meaningful to students. This is also because Problem-Based Learning has advantages compared to other learning models. Problem-Based Learning helps in understanding student learning needs because Problem-Based Learning is student-centered learning. Problem-Based Learning is learning that is motivated by future learning [10].

Some of the advantages obtained when applying the model of Problem-Based Learning are as follows: 1) Problem solving is very effective used to understand the contents of the lesson, 2) Problem solving will break down and challenge students' abilities and provide satisfaction to find new knowledge for students, 3) Solving problems make student learning activities increase, 4) Problem solving can help students know how to transfer their knowledge to understand problems in real life, 5) Problem solving can help students to develop new knowledge and be responsible for the learning they are doing and 6) Students become more sensitive to problems that occur in the surrounding environment. Problem-Based Learning model can stimulate students critical thinking skills [7].

The dimensions of cognitive processes in students are important to know. The dimensions of cognitive processes describe students' thought processes. Dimensions of cognitive processes describe the level of thinking ability of students. There are 3 (three) levels of thinking in students, namely the level of thinking at a low level (the dimension of remembering and understanding), the level of moderate level thinking (application), and the level of high level thinking (analysis, evaluating, creating). Therefore learning that empowers thinking skills is very necessary. Student worksheet with Problem-Based Learning designed to improve students critical thinking skills [9].

There are differences in social competencies of different sexes. This causes a correlation between social competence and school performance. This finding has a practical impact on teachers' learning in schools to develop social competence in learning [11].

## 5. Conclusions

Globalization is a comprehensive and contextual concept. Problem-Based Learning can improve the dimensions of the thought process including remembering understanding, applying, analyzing, evaluating, and creating in the medium category

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