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Stages of Cognitive Development and Curriculum Construction (Critical Analysis of Piaget's Theory of Cognitive Development)

M. Faqih[1], Lukmanul Hakim[2] Muhammad Iqbal[3]
University Education Mandalika (Undikma)
muhammadfaqih@undikma.ac.id , lukmanulhakim@undikma.ac.id , muhammadiqbal@undikma.ac.id

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Abstract: This research plan departs from interviews with parents and several educational practitioners regarding problems in implementing the 2013 Curriculum. The results of these interviews show that the competency demands that elementary school students must master today are more complex than in the previous curriculum implementation period. The subject matter taught to elementary school students, especially in the upper grades (grades 4 to grade 6), is material that was previously taught at the junior high school level, perhaps even in some high schools. Referring to Piaget's theory of cognitive development, the construction of the 2013 curriculum is designed in such a way as to engineer children's cognitive development beyond their biological age. If according to Piaget, the last stage of cognitive development is formal operational which is reached after children are 11 years old or more, then in the construction of the 2013 Curriculum it is necessary to assume that children are encouraged to reach this cognitive stage more quickly. This research aims to test whether the stages of cognitive development according to Piaget are still relevant to the current condition of students in Indonesia. The duration of the research is 6 months with a quantitative approach. The unit of analysis is elementary school students in Mataram City whose level of cognitive development will be measured. Research outputs are targeted in research results reports and articles published in accredited national journals Sinta 3 or international journals. The TKT that is expected to be achieved is at level 3, namely confirmation of the relevance of a theory and basis for determining policy, especially in developing educational curricula.

BACKGROUND

Piaget's theory of cognitive development is one of the major theories in developmental psychology. Piaget's conception has greatly influenced policy makers and educational practitioners in building educational curricula and then implementing them, both from pre-school to tertiary levels. In general, this theory explains how *schemata* emerge and are acquired, schemes regarding how a person understands their environment, at certain stages of development. The four stages mentioned by Piaget in his theory are the sensorimotor period (0 – 2 years), preoperational (2 – 7 years), concrete operational (7 – 11 years), and formal operational (11 years to adulthood).

As a theory, Piaget's conception of the stages of cognitive development cannot be separated from criticism. Among the criticisms raised is that Piaget's theory does not offer a complete picture of cognitive development. Another criticism leveled is that often certain stages that a child should ideally reach do not occur. At this age, a child should be able to think logically abstractly, but it is not uncommon to find that this condition is not achieved ideally (Ojose, 2008).

What is no less interesting is that there is a tendency to construct children's cognitive development as faster than Piaget's conception. When children are still at the concrete operational stage, lesson materials are structured and taught in such a way that children can reach the formal operational stage. The construction of the 2013 Curriculum currently used in Indonesia can be assumed to try to build children's cognitive development more quickly compared to Piaget's conception. Currently, the subject matter for elementary school students, especially in the upper grades, requires students to think more abstractly. Materials that in previous systems (KBK, KTSP)

were taught at the junior high school level, are currently being introduced at an earlier level. In Mathematics subjects, for example, if material regarding descriptive statistics is taught at junior high school or perhaps high school level, then now it has been introduced to fifth grade elementary school students.

This phenomenon is interesting for further research, in order to obtain reliable data to support or refute these assumptions. Specifically, this research aims to: (1) test whether Piaget's theory regarding stages of cognitive development is still relevant to the conditions of students in Indonesia, especially at the elementary school level, and (2) the results of testing this theory will later be used as a basis for critically analyzing how the role of the curriculum system in engineering students' cognitive development at the elementary school level. The research will be limited to elementary school students at all levels in Mataram City, West Nusa Tenggara Province. Measurements of children's cognitive development will be carried out in Mathematics subjects with the consideration that this subject has a level that is relevant to Piaget's cognitive theory.

Literature review

Piaget's conception of the stages of cognitive development is one of the main theories discussing cognitive development (Simatwa, 2010). According to Piaget, a person's knowledge begins when he interacts with the world around him. Therefore, the study of thought *can* begin from the moment a child is born. This initial stage was called by Piaget the sensori-motor stage, which starts from the time a child is born until he is 2 years old. Interaction with objects around him is the beginning of the formation of knowledge. This thinking ability continues to develop as the child gets older. The second stage of Piaget's theory of mental development is pre-operational. This stage begins when the child becomes proficient in speaking at the age of 2 years to the age of 7 years (Juwantara, 2019) . At this stage, children still cannot understand concrete logic and cannot manipulate information abstractly *(mentally)* . The third stage starts at the age of 7 to 11 years and is called the concrete operational stage (Anditiasari & Dewi, 2021) . At this stage children can act and think logically, but are limited in what they can manipulate physically. The final stage of children's mental development according to Piaget is the formal operational stage, which begins when children are 11 years old and onwards. In this final stage, children's cognitive mental abilities have developed a lot. To obtain a conception of an object, a person no longer needs direct interaction with the object. He will be able to gain knowledge about new objects by comparing these objects with objects he already knows (Ibda, 2015)

If Piaget's theory emphasizes the active role of children, then Vygotsky gives a more proportional portion to sociocultural factors (Ardiati, 2021) (Suryani et al., 2023) . In the process of forming knowledge, children's mental functions have social connections. With the help of other people at a higher level, children develop their conceptions systematically, logically and rationally. Two relevant Vygotsky concepts presented here are the Zone of Proximal Development concept and the Scaffolding concept. The Zone of Proximal Development is referred to as *the gap* between actual and potential development of children (Verenikina, 2003). This zone emphasizes the importance of children's social interactions in building their conception of knowledge. Scaffolding means changing the level of support, where the guidance provided must be adjusted to the child's ability level (Verenikina, 2008) .

Some research that is relevant to the context of this study includes:

1. Mukhlisah AM, with the research title Jean Piaget's Cognitive Development and Improving Learning for Children with Dyscalculia (2015). This research was conducted at MI Pangeran Dipenogoro. Research findings show that the application of Piaget's theory of cognitive

development to children with dyscalculia is quite successful. Students with dyscalculia can improve their learning outcomes significantly.

2. Suhartini (2015), with the research title Application of *Problem Based Learning* and Piaget's Theory to Improve Quality of Mathematics Learning Class V SD Mangkang Kulon 02 Semarang. In general, through classroom action research (PTK), the findings of this research say that the combination of Problem Based Learning and Piaget's theory can improve the quality of Mathematics learning.
3. Ayu Yulia Heri Rahmawati (2017), researched the role of implementing the 2013 Curriculum in improving the learning achievement of MTs students. Research findings show that there is an increase in the learning achievement of MTs students after the implementation of the 2013 Curriculum.

Method

The research approach used is descriptive quantitative. A quantitative approach is used to obtain an overview of students' cognitive development stages based on the test results given. The test result data was then analyzed using descriptive statistics. Descriptive statistics will not only present certain statistical values, but also cross-tabulate several aspects that may be related. With this cross tabulation, it is hoped that it can provide an overview of the trends in data/variable associations.

The research location is in Mataram City, namely at the elementary school level. The target schools were determined purposively by taking into account the research objectives. Taking into account the budget and research time, the number of schools that will be involved is one private school. The sample was determined randomly, stratified and proportional.

The main data collection instrument is the Mathematics learning outcomes test. Test development is carried out by involving subject teachers who directly teach students, so that the validity of the test content is more guaranteed. Before being used for data collection, the test instrument is first tested for instrument calibration purposes.

Results and Discussion

A. Data collection

Type of research: Quantitative Descriptive. Research location: Hadi Sakti Elementary School, Bertais Village, Sandubaya, Research Time: May 2023. Population: All Hadi Sakti Elementary School students (Grades 1 to 6) Sample: 10 students per class determined randomly. Research instrument: 10 test questions Mathematics multiple choice.

The Multiple Choice Test Grid (combining Piaget's theory & Bloom's Taxonomy) can be tabbed; following:

Table 1. Piaget & Bloom Integration Multiple Choice Test Grid).

Class	Numbers 1 to 5	Numbers 6 to 10
Class 1	Knowledge	Understanding
Grade 2	Understanding	Application
Grade 3	Application	Application
4th grade	Application	Analysis
Grade 5	Analysis	Evaluation
Class 6	Evaluation	Evaluation

The answers of students who have completed the test, their test results show that the average ability of students in answering is 45 to 53. Details can be seen in table 2.

Student	Class 1	Grade 2	Grade 3	4th grade	Grade 5	Class 6
1	50	40	50	50	60	70
2	40	50	60	40	50	40
3	50	60	40	50	80	50
4	50	50	50	60	30	60
5	40	40	40	50	50	80
6	50	50	40	40	40	40
7	50	50	50	50	50	50
8	40	40	40	60	40	50
9	50	40	50	80	40	40
10	60	50	50	40	50	50
Average	48	47	47	52	49	53

B. Data Analysis and Discussion

The data that has been collected is then analyzed using descriptive qualitative data analysis techniques. The results of the analysis can be explained descriptively as follows: (1) Average score obtained: 49.33, (2) Highest average: 53, (3) Lowest average: 47, (4) Standard deviation: 2 .58.

1. Correspondence between Piage's theory (Concrete Operational stage) and student competence

The criteria used to determine the suitability between Piaget's theory and student competence is if the student gets a score of 60. If the score obtained is ≥ 60: there is suitability between Piaget's theory (Concrete Operational stage and student competence). The results are as follows:

Class		Test Score Category		Total
		In accordance	It is not in accordance with	
Class 1	Frequency	1	9	10
	Percentage	10	90	100
Grade 2	Frequency	1	9	10
	Percentage	10	90	100
Grade 3	Frequency	1	9	10
	Percentage	10	90	100
4th grade	Frequency	3	7	10
	Percentage	30	70	100
Grade 5	Frequency	2	8	10
	Percentage	20	80	100
Class 6	Frequency	3	7	10
	Percentage	30	70	100

Total	Frequency	11	49	60
	Percentage	18.3	81.7	100

Overall, from a total of 60 students spread across 6 classes, there were 11 students (18.3%) whose competencies were in accordance with the Formal Operational stage; and there were 49 students (81.7%) whose competencies were not yet in accordance with the Formal Operational stage.

2. **Conformity between Piage's theory (Concrete Operational stage) and the Merdeka curriculum structure for** elementary school level

Based on the percentage of discrepancies between student competencies and the Concrete Operational stage, which reached 81.7%, it can be said that there is still a wide gap between Piaget's theory and the curriculum structure for elementary school level.

At the Concrete Operational stage, according to Piaget, students can understand the concept of conservation, understand the concept of cause and effect, the order of objects based on certain characteristics, the concept of reversibility, and so on. However, based on the tests given, the results show that the average student's abilities have not yet reached the Concrete Operational stage.

Because students' abilities have not yet reached the Concrete Operational stage, the curriculum structure can be said to be not relevant enough to Piaget's theory of cognitive development, especially for the Concrete Operational stage (elementary school students).

Conclusions and recommendations

A. Conclusion

Based on the data presented above, a conclusion can be drawn, including:

1. There is no correspondence between Piaget's theory of cognitive development and the competence of elementary school students in grades 1 to 6. This is based on: a) The average test score for all students is 49.3; b) The percentage of students who obtained a score below 60 was 81.7%.
2. Based on the conclusion in number 1 above, it can be said that the suitability between Piaget's theory of Positive Development and the structure of the Independent Curriculum is still relatively low, which is based on the stage of students' cognitive development is still lower than Piaget's concept of cognitive development and the curriculum structure applied in elementary school.

B. Suggestion

1. This research is not intended for a wide population, it is still limited to the original population of the sample, namely Hadi Sakti Elementary School students. For wider generalization of the results, further research involving samples from a larger population is needed.
2. Student learning outcomes are influenced by many factors. By involving other factors in research, it will be possible to provide more accurate results.

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