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The Effectiveness Of Jean Piaget's Cognitive Theory On The Cognitive Abilities Of Students In Indonesia

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ABSTRACT

Cognitive ability is one of the important learning abilities because it is related to the level of understanding of students in lectures. Theories about cognitive abilities are put forward by many experts. This research takes two aspects, namely social interaction and experience, which Jean Piaget initiated in his theory with the aim of seeing its effectiveness in the cognitive development of students. This research is exploratory quantitative research so in this study hopes to explore and find more in-depth facts. The population taken in this study were students of the Faculty of Economics, Universitas Negeri Semarang who were sampled using the slovin formula of 351. Sampling using stratified random sampling techniques using questionnaires as a tool for data collection and analyzed using SEM. The sample of this study met (1) gender; (2) school origin; (3) activities followed. So that the sample can construct research variables. The result of this study is that social interaction and experience have a significant effect on students' cognitive abilities. The significance of social interaction variables was weak in the study. This is due to the post-pandemic phenomenon where the level of student individualism is very high. So that in learning, students no longer need social interaction too much, but can learn by themselves for the construction of their knowledge.

Keywords: Cognitive Abilities, Jean Piaget, Higher Students, Experience, Social Interaction.

INTRODUCTION

Humans are creatures that experience growth and development, from the prenatal period to the end of their lives. Various aspects include the period of growth as well as human development. Development into a continuous process begins from the moment in the womb. Development is a stage of progressive change that occurs in the life of all organisms in the world including humans. Development can be divided into two aspects, namely physical aspects, and non-physical aspects. The physical aspect can be seen from the development of height, weight, motor system and brain development. While the non-physical aspects are seen from cognitive, socio-emotional and language development (Carey et al., 2015).

The development of the two aspects can differ from one individual to another. Some children show such rapid development in both aspects, but there are also those who experience late development. In other cases, some experience one aspect developing rapidly while the other aspect develops slowly. So that the development of children cannot be confused with one another, depending on factors of age, genetics, food and even the environment (Roache & Lewis, 2011).

The non-physical aspects have many developments and one of which should be known is cognitive development.

The term cognitive which comes from cognition or is knowing which means knowing or in a broad sense, cognition means the acquisition, structuring or use of knowledge. Cognitive development is a comprehensive development because it is related to the ability to think, the ability to remember, the ability to memorize, the ability to solve a problem to the ability to create something. Among all non-physical aspects, cognitive development is so important because it can affect mental and emotional development and language skills (Crowe et al., 2008). Cognitive development can be said to be the basic key to a child's development because a child's attitudes and actions can reflect his cognitive development.

Students will never be separated from learning activities both at school and in the surrounding environment, so cognitive abilities are important for students. Cognitive abilities are an important part of determining student success in participating in lectures or other activities. The importance of cognitive in learning is that it can develop students' knowledge independently and can improve the ability to think. Cognitive abilities are closely related to the ability to think. In this case, cognitivism has a role as a benchmark for the child's development.

The brain, which is the center of cognitive function, is not only a mover of thoughts but also can control human attitudes and behavior. That is why the cognitive abilities of children become a major milestone in a person's life. Cognitive development is something that must be considered because it contains processes of thinking, remembering, and reasoning. The cognitive of a child cannot develop on its own, its development clearly requires the support of several significant parties.

Jean Piaget in his theory suggests that since toddlers' humans already can deal with objects around them. But this ability is still very simple in the form of motor sensor capabilities. To understand their world, children use schemes, assimilation, accommodation as well as equilibration (Adams, 2015). This ability that brings toddlers to dare to explore their environment and make it a basic knowledge and can be transformed into more advanced and complicated abilities.

Piaget states cognitive development in his theory that a child's ability to perform an analysis only begins when they enter the age of 10. As we get older, the child's cognitive development will become more complex as the information obtained becomes varied (Shibley et al., 2003). Piaget's theory of cognitive development is one of the theories that can explain the way children adapt and interpret objects with surrounding events. According to Piaget, cognitive development has four aspects, namely maturity, experience, social interaction, and equilibration.

Research (Adesope et al., 2010), the aspects taken are aspects of experience and maturity that give the result that the child's experience of trying something can make his cognitive abilities develop quickly. This is due to the child's high curiosity, making him analyze the experiences he has experienced himself and can draw his own conclusions. Likewise, the maturity aspect has a high influence on children's cognitive abilities. The maturity of the child is closely related to the development of the physical aspect, namely the nervous system (motor strength). A mature nervous system can also affect a child's emotionality which can affect cognitive abilities.

Research (Magnusson et al., 2019), states the opposite result, that experience does not affect anything on a child's cognitive abilities, Experience is an interaction between the individual and the outside world that can be a source of new

knowledge, but in his research, Magnusson stated that contact with the world is not enough to be able to develop knowledge unless the individual can utilize the experience as knowledge that can improved his cognitive. The aspects of social interaction discussed in this study are included in the language and how the environment can affect the child. Social interaction is proven not to affect the child's cognitive abilities because the child develops on its own here so that external parties cannot affect the child's cognitive abilities.

Other studies say that social interaction has a strong influence on a child's cognitive development. Children's cognitive is not able to develop on its own, children need help and support so that their cognitive is able to develop. This support and help of a person cannot be obtained if the child does not have the ability to interact with his environment. Social interaction can also improve communication as well as skills in a child's language. Where language is one of the benchmarks of high cognitive ability (Carpendale & Lewis, 2004).

This study will take the same two aspects as Magnusson's research, namely the aspect of experience and social interaction as variables. Extensive experience has the possibility for a person to acquire a deep understanding of a problem so that it can enlarge his cognitive abilities. According to Piaget, experience takes place in everyone through a process of knowledge construction. Since childhood, each child already has a cognitive structure called a scheme formed from experience. The more mature the child, the more perfect the scheme will be.

Social interaction is a dynamic relationship, concerning reciprocal relationships between individuals, between groups or between individuals and groups. Social interaction can be implemented in learning to improve critical thinking, gain a variety of perspectives as well as a deeper understanding (Hurst and Nixon, 2013). Social interaction occurs if it has met two conditions, namely social contact, and communication. Social contact generally only occurs if there is a response and reciprocity to the adjustment of behavior towards the actions of the individual towards the other individual. The purpose of this study is to look at Piaget's theory which is represented by aspects of experience and social interaction in its influence on the cognitive abilities of students in Indonesia.

This study aims to see the effectiveness of Jean Piaget's theory in cognitive aspects of student cognitive development. This research is important to carry out because the cognitive level of students is low in the data of the Indonesian Ministry of Education. The employment rate was only 27% in 2021 because the abilities and expertise of students were very low. This research suspects that social interaction and experience have a high influence on the cognitive development of students in the current era and can improve the capabilities and quality of student expertise. The learning experience for students here is more emphasized on the experience outside of college.

RESEARCH METHODS

This research uses an exploratory quantitative approach. This approach has the objective of deepening knowledge and looking for new ideas about certain symptoms. This research was conducted at the Faculty of Economics, Universitas Negeri Semarang. The population of this study is all students of the Faculty of Economics at Universitas Negeri Semarang who are still active, namely the class of 2017 to 2019. The total population is 2,893 students. The sample calculation uses the

slovin formula, so that the number of samples to be taken is obtained as many as 351 students. The number of existing samples will be distributed to all departments in the Faculty of Economics and evenly distributed to all batches.

The sampling technique uses stratified random sampling. This technique provides an opportunity for the entire population to be part of the sample according to its portion. The sample taken, must meet several conditions, namely (1) gender; (2) school origin; (3) regional origin and (4) participation in student activities. The data collection technique uses a questionnaire which is then analyzed using SEM (Structural Equation Model) with the help of an analysis tool, namely warpPLS.

RESULTS

SEM Measurement and Model Analysis

Common Method Bias

Common bias methods are commonly used to count for errors in measurements because questionnaires method may be able to causes bias. The common method bias test is seen from the value of full collinearity VIFs which is the result of full collinearity testing, including vertical and lateral multicollinearity. The criteria for full collinearity of VIFs is < 3.3.

Table 1. Full Collinearity Value VIFs

Variable	Full Collinearity VIFs
Social Interaction (X1)	1.941
Experience (X2)	1.697
Cognitive Abilities (X3)	1.739

Source: data processed in 2022

As shown in the table above, the value of VIFs in all variables in this study has a value of < 3.3. So, this research model does not detect multicollinearity and it is certain that independent variables can affect dependent variable.

Outer Model

Evaluation of the outer model is carried out to construct each indicator of the existing variables to find if any errors have occurred. This evaluation includes assessing convergent validity and composite reliability. The construction of the indicator value can be seen from the value of combined loadings and cross loadings. The outer accepted model indicated by the value of loading factor of each indicator must be > 0.70. However, acceptance of the loading factor value < 0.70 and > 0.40 can still be considered for acceptance by looking at the AVE value. The result of this study still shows some indicators whose value < 0.40 and these indicators should be abolished to avoid bias.

Table 2. Loading Factor P Value, AVE, Composite Reliability

Variables/Items	Loading Factors	P-Values	AVE	Composite Reliability
Social Interaction				
X1. 1	0.881	< 0.001	0.616	0.916
X1. 2	0.709	< 0.001		

X1. 3	0.809	< 0.001		
X1. 4	0.870	< 0.001		
X1. 5	0.824	< 0.001		
X1. 6	0.689	< 0.001		
X1. 7	0.886	< 0.001		
X1.8	0.860	< 0.001		
X1.9	0.695	< 0.001		
X1.10	0.715	< 0.001		
X1.11	0.831	< 0.001		
X1.12	0.873	< 0.001		
X1.13	0.705	< 0.001		
X1.14	0.512	< 0.001		
X1.15	0.596	< 0.001		
Experience				
X2.1	0.725	< 0.001	0.710	0.924
X2.2	0.850	< 0.001		
X2.3	0.671	< 0.001		
X2.4	0.609	< 0.001		
X2.5	0.675	< 0.001		
X2.6	0.654	< 0.001		
X2.7	0.774	< 0.001		
X2.8	0.819	< 0.001		
X2.9	0.693	< 0.001		
X2.10	0.789	< 0.001		
X2.11	0.792	< 0.001		
X2.12	0.701	< 0.001		
Cognitive Abilities				
Y.1	0.773	< 0.001	0.601	0.856
Y.2	0.698	< 0.001		
Y.3	0.648	< 0.001		
Y.4	0.679	< 0.001		
Y.5	0.800	< 0.001		
Y.6	0.813	< 0.001		
Y.7	0.839	< 0.001		
Y.8	0.798	< 0.001		
Y.9	0.787	< 0.001		
Y.10	0.795	< 0.001		
Y.11	0.803	< 0.001		
Y.12	0.596	< 0.001		
Y.13	0.518	< 0.001		

Source: data processed in 2022

The research model is acceptable if it can meet convergent validity and composite reliability. Convergent validity of the model seen from the value of the loading factor of each indicator and the AVE of each variable while the composite reliability is

seen in the composite reliability coefficients when the value > 0.70 then the questionnaire is reliable. The table above shows that the composite reliability coefficients have been qualified so the outer model of this study can be accepted without changes in indicators.

Table 3. Correlations among Latent Variables and errors

	Social Interaction	**Experience**	**Cognitive Abilities**
Social Interaction	0.771	0.605	0.540
Experience	0.605	0.733	0.617
Cognitive Abilities	0.540	0.617	0.740

Source: data processed in 2022

Based on the table above, there is a correlation between all variables in their diagonal values. All variables have a good correlation value with other variables. It can be described that the entire variable meets the criteria of discriminant validity. So, based on the result of convergent validity, composite reliability, and discriminant validity, this research model can be analysed further.

Table 4. Model Fit and Quality Indices

No.	**Model Fit and Quality Indices**	**Fit Criteria**	**Analysis Results**	**Note**
1	APC[1]	p < 0.05	0.359 P < 0.001	Accepted
2	ARS[2]	p < 0.05	0.431 P < 0.001	Accepted
3	AARS[3]	p < 0.05	0.427 P < 0.001	Accepted
4	AVIF[4]	Acceptable if <= 5, ideally <= 3.3	1.674	Ideal
5	AFVIF[5]	Acceptable if <= 5, ideally <= 3.3	1,792	Ideal
6	GoF[6]	Small >= 0.1, medium >= 0.25, large >= 0.36	0.491	Large
7	SPR[7]	Acceptable if >= 0.7, ideally =1	1.000	Ideal

8	RSCR[8]	Acceptable if >= 0.9, ideally = 1	1.000	Ideal
9	SSR[9]	Acceptable if >= 0.7	1,000	Accepted
10	NLBCDR[10]	Acceptable if >= 0.7	1.000	Accepted

Based on the preliminary research data above, this research model has met the construction requirements to be continued as a research model. Constructs in the SEM model must be accepted by all to ensure that the model and variables do not encounter errors for hypothesis testing.

1.1. Hypothesis Test

Model testing will be seen from the results and values of the model that come out on the SEM analysis that has been carried out. The purpose of testing this model is to see the direction, relationship, and magnitude of the coefficients between variables.

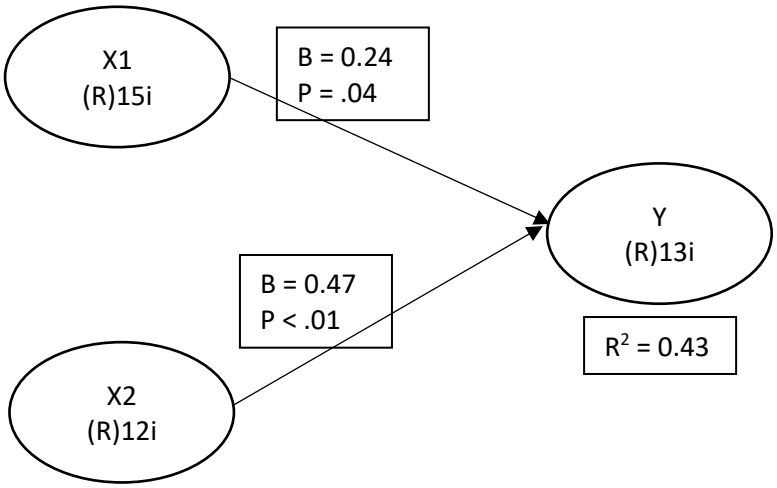

Figure 1. Research Model

The above directions and relationships of the research model can be outlined in the table:

Table 5. Research Model Results

No	Path	Coefficient	P Value
1.	Social interaction has a significant effect on students' cognitive abilities	0,244	0.004
2.	Experience has a significant effect on students' cognitive abilities	0,473	< 0.001

Source: data processed in 2022

DISCUSSION

The Effect of Social Interaction on Students' Cognitive Abilities

The results of this study revealed that social interaction has a positive relationship with students' cognitive abilities. What this means is that there is a positive relationship between social interaction and students' cognitive abilities. The degree of influence of social interaction variables in this study is very strongly indicated by a significance value of 0.004 with a coefficient value of 0.244. The level of such significance is relatively weak. The results of this study support the theory of Jean Piaget who states that another factor that influences the cognitive development of students is social interaction. Where social interaction is a place where the exchange of ideas or opinions occurs so that it can influence cognitive development.

Human beings are destined to need the help of other human beings. Man is synonymous with his inability to live alone. Therefore, humans need social interaction to continue to survive. But in fact, not all humans have good social interactions. Social interaction is the relationship of the individual with others in which each individual can influence and there is a reciprocal relationship (Ybarra et al., 2008). In learning, social interaction is very important because cognitive development can be obtained through social interaction with the environment, both school, family, and community environments.

Students must have good social interaction skills both with their peers, the campus environment and in the family. Social interaction has a fairly important role for students because this ability can make it easier for students to adjust to their environment. The learning experienced by students will obviously be different from the learning experienced by high school children. Students have quite complex learning because they not only study in the classroom but also outside the classroom. Social interaction is important to help students gain appropriate knowledge.

The results of this study are supported by research (Herschbach, 2012) which states that social interaction has a significant effect on students' cognitive abilities. Cognitive abilities themselves include many things in a child's life because cognitive abilities are core skills needed to be able to perform all kinds of tasks. Cognitive ability is a way of thinking that involves a lot of information to be processed in the brain. This information can be obtained incorrectly by interacting with other people.

Not only can social interaction help a person to maintain closeness to each other, but this activity can prevent a sense of loneliness. Loneliness is proven to trigger a decline in a person's cognitive function (Farrelly & Austin, 2007). Talking to peers can provide the information needed by the brain to continuously hone a person's cognitive abilities. That is why, children who have good social interaction abilities generally have good thinking skills as well.

This research also saw that students who are also active in various activities in higher education, have a better level of thinking and problem-solving ability than students who do not participate in activities in college. This is because students who are active in participating in activities interact more with other people. The large number of interactions carried out, makes them absorb a lot of information from what they listen to. The amount of information obtained makes the brain process various kinds of sources

that can provide good thinking skills, so that they have high enough cognitive abilities.

Indicators in social interaction include four things, namely imitation, suggestion, identification, and sympathy. Imitation is the act of imitating the attitudes and behaviors of other individuals. Suggestion is the giving of influence or views from one individual to another where the affected individual will receive the influence either consciously or unconsciously. Identification is a deeper process than the imitation process. Identification is defined as the tendency in the individual to be the same as the rest of the individual. A person's personality can be formed from this process of identification. Sympathy is the process by which an individual is attracted to another individual. Feelings play an important role in a person's sympathy. Sympathy itself is the desire to understand the other person and want to cooperate with him.

These four indicators play an important role in the level of significance of social interaction on students' cognitive abilities. However, there is an indicator that is stated to be weak in this study, namely identification. Identification is indeed synonymous with the formation of an individual's personality judging from his environment. Student intelligence and students' thinking ability, one of the external factors, can be formed because of interaction with their environment. However, the personality of students does not affect students' thinking abilities and intelligence. Identification indicators may be abolished, if abolished it will not change the level of significance of social interactions on students' cognitive abilities.

While the indicator with the highest level of influence is sympathy. Students with high sympathy, encourage their desire to communicate and cooperate with other students. Some students of the faculty of economics participate in various kinds of activities on campus and some who do not. Students who are active in campus activities, have a high sense of sympathy where they can want to cooperate with other students. In fact, students who are active in campus activities and have a high sense of sympathy, have a pretty good brain and emotional intelligence compared to those who are inactive. Cognitive abilities not only include material intelligence but include the overall intelligence that exists in humans including emotional. Emotional intelligence is closely related to the way the student interacts with his social world (Wegerif et al., 1999)(Kutnick & Kington, 2005).

Even so, this study resulted in a weak level of social interaction significance to students' cognitive abilities. If traced to the life that occurs, the current phenomenon of interaction does not only occur in the real world, but also in the virtual world. Meanwhile, interactions in cyberspace bring more negative than positive results (Alloway et al., 2013). This weak level of significance is due to relationships that cannot be felt by the person. Moreover, students experience a pandemic period where they can only interact with others through virtual face-to-face. Social interactions that are effective and can support students' cognitive development are direct interactions and direct discussions. In addition, due to the occurrence of social restrictions that cause education to be shifted to an online system, students are accustomed to not actually interacting socially. Students tend to have a high level of individualism. At one-point, social interaction did not have any influence on the cognitive development of students. This is because students are used to doing anything on their own so they will be better able to learn on their own than having to exchange ideas with others.

The Effect of Experience on Students' Cognitive Abilities

The results of this study revealed that experience has a positive relationship with students' cognitive abilities. This means that experience has a positive relationship with students' cognitive abilities. The degree of influence of the experience variable in this study is strongly indicated by a significance value of < 0.001 with a coefficient value of 0.473. The results of this study support jean Piaget's theory which states that a person's cognitive development starts from childhood formed based on the experiences they have gained. The experiences that occur from the time they are children are a scheme for them to get to know the surrounding environment.

Piaget developed the dominant cognitive theory during this time. In his theory, Piaget discusses how children learn which is a view of constructivism. In the view of constructivism, the knowledge gained by students grows and develops through experience. Students' knowledge can develop well and deepen and be stronger if they face new experiences in their lives. The human brain has a knowledge structure shaped like a box where each box contains different information. The same experience in students can be interpreted differently by each individual (Boudreau et al., 2001). Every new experience they encounter, will relate to the structure of knowledge in the brain. This knowledge structure will be processed into new knowledge based on experience or into a modification to accommodate and adjust to new experiences.

Man learns from his experience to form constructs in his brain from an early age. The incident will imprint in a person's memory to the point of giving rise to new knowledge that can be inferred. It will continue even if someone has been a teenager. Learning for in higher education has a different concept from learning for high school children. Where learning in higher education is more liberating for its students to explore the science out there. This learning hopes that students can learn from the real world, not only from theory. So they are able to deduce what they see and construct into a knowledge (Freund & Kasten, 2012).

Other studies also say the formation of a child's intelligence can be seen from the experiences he has gone through. The more experienced children have, the faster their brain will form a thought construct which will be processed into new knowledge. So the child with a lot of experience in his life, has high cognitive abilities because he is always learning something new (Wainwright et al., 2008).

Constructivism assumes that knowledge no matter how it is defined, is formed in the human brain and the thinking subject has no other style than to constrict what is known based on his own experience. All the human mind is based on what is his experience and it can be explained that the knowledge of a person arising from experience is usually subjective (Le Pine et al., 2000). It can be assumed that the knowledge or abilities possessed based on experience are still subjective in nature because they are only based on one's views. This knowledge has not been proven to be valid, but it is enough to shape a person's intelligence in order to improve the cognitive abilities of students (Le Pine et al., 2000).

Students of the Faculty of Economics are mostly students who actively participate in campus activities. As activists, they also have many activities outside the classroom. Activities outside the classroom generally make students have new experiences. Another study argues that many students have the same new experiences, especially if they are in the same community. But unfortunately, not all

students turn that experience into knowledge. Not all human brain constructs make experiences as their learning material. Some students make the experience only Part of their life that must be lived, not to be learned. Therefore, learning by using experience as a reference, does not work in some students even though only a small part, because not all students can make experience a new knowledge (Deyoung et al., 2014).

The above statement contradicts Jean Piaget's theory which states the motor system and intelligence of the child's brain are shaped by the experiences they live and are shaped into a new knowledge in their brain. In this study, the construct of experience was not transformed into knowledge influenced by gender and school origin. Women are better at constructing an experience into new knowledge because women are more conscientious and more independent in doing a job than men. Students who come from vocational high schools are also easier to use experience as new knowledge for them than students who come from high school or Islamic school equivalent to high school.

Students who graduate from vocational high schools are already familiar with the practice at their school. Generally, vocational high school children do experience knowledge with experience because they practice more in learning activities than theory. The large number of practical activities they undergo, makes them ordinary with the construct of new knowledge from experience. Compared to college students who come from high school, they find it more difficult to construct experience into new knowledge. Because they have become accustomed to learning in theory and have not experienced field practice on their own. So that they do not have time to seek their own experience outside of the classroom.

CONCLUSION

The social interaction and experience of Jean Piaget's theory have an influence on the cognitive abilities of students. This proves that the effectiveness of Jean Piaget's theory is still feasible to apply to develop the cognitive level of students. However, this study saw that social interactions had a weak degree of significance. At one point, it was feared that social interaction would no longer have any influence on the cognitive development of students. The phenomenon that occurs due to the pandemic, students have a high level of individualism. So that students' thinking abilities are no longer honed due to discussions with others, but they are better able to learn by themselves and hone them themselves.

Experience has a strong degree of significance to students' cognitive abilities. Moreover, students who used to come from vocational schools, have a higher cognitive level. Students will find it easier to understand and learn when they practice directly and have experience of existing learning theories. The experience gained by students will be constructed into knowledge. Constructing knowledge from experience has proven to be easier to improve students' cognitive learning.

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