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Constructivism-Based Teaching and Learning in Indonesian Education

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Abstract

In recent years, constructivism has emerged as the dominant paradigm in education and has made a major intellectual impact on pedagogical development in Indonesia, rooted in Piaget's cognitive development, and in Vygotsky's sociocultural theory. Applying constructivism in the classroom is basically rooted from Vygotsky's psychological theory in which knowledge is not transferred from teachers to students but is constructed in the students' minds. In this case, the focus of knowledge does not come from teacher to students but from how the students can construct by their own selves. Constructivism has also had a positive impact on the development of science in general in Indonesia. The application of global micro-technology and linguistic research to literacy and the development of constructivist learning narratives has been developed as a substantial approach to teaching in Indonesia. Constructivism is the foundation of teachers because this method represents a shift from behaviorism-based education to cognitive theory-based education. In addition, in recent years, language pedagogy has integrated a variety of instructional approaches that underline the centrality and diversity of learners and their active involvement in authentic and meaningful pursuits as individuals and in the community of learners. This study aimed to reveal the roles of constructivism-based teaching and learning in Indonesian education. In this research, Dewey's theory of constructivism is the main theory used, in which Dewey states that constructivism can build individual and social knowledge. This study applies a case study approach to ensure the validity of the results of the research conducted as proposed by Kothari (2004). The results showed that constructivism is a promising method and has a positive impact on the progress of education in Indonesia because it can improve students' abilities. This method also builds students' knowledge to be creative, and is designed according to their needs.

Keywords: constructivism, teaching and learning, Indonesian education, Vygotsky's psychological theory

1. Introduction

Constructivism theory is defined as generative learning. It is the act of creating meaning from what is learned. In constructivism, each learner constructs knowledge individually and socially, and it is actually not a new idea. What has been through in our lives so far is

the accumulation and formation of experience after experience. This causes a person to have knowledge and become more dynamic. Constructivism emphasizes that our knowledge is our own construction (Merriam & Caffarella, 1999). Glasersfeld asserts that knowledge is not an imitation of reality. Knowledge is not a picture of the existing world of reality. Knowledge is always the result of a cognitive construction of reality through one's activities. One forms the schema, categories, concepts and structure of knowledge needed for knowledge (Merriam & Caffarella, 1999). So, knowledge is not about the world apart from observers but it is a human creation constructed from experience or the world as far as it is experienced. Piaget said that the process of formation continued when reorganizing because of a new understanding (Kroll & LaBoskey, 1996).

In the construction process, according to Glasersfeld in Suhendi and Purwarno (2018), several abilities are needed in the process like the ability to recall and express experiences, the ability to compare, make decisions (justification) regarding similarities and differences; and the ability to prefer one experience over another. The ability to recall and express experiences is very important because knowledge is formed based on interactions with these experiences (Suhendi and Purwarno, 2018). The ability to compare is very important to be able to draw on the more general nature of special experiences and see the similarities and differences to be able to make a classification and build knowledge. The ability to prefer one experience over another because sometimes someone prefers certain experiences over others, then comes the matter of the value of the experiences we form.

Constructionism influences much science and mathematics education in many American, European and Australian countries (Dahar, R. W. 1989). Broadly speaking, the principles of constructivism taken are knowledge is built by students themselves, both individually and socially, knowledge cannot be transferred from teacher to student, except only by the activeness of students themselves to reason, active students constructing continuously, so that there is always a change in the concept towards a more detailed, complete, and in accordance with scientific concept, the teacher simply helps provide facilities and situations so that the construction process of students runs smoothly. In addition, constructivist learning considers that students continually check new information that is contrary to the old rules and revise those rules if they are no longer appropriate. Thus, to encourage students to be actively involved in learning activities, then the atmosphere of the learning environment must be democratic; learning activities take place interactively and are student-centered; and educators encourage students to learn independently and be responsible for their learning activities (Danarjati, Murtiadi, & Ekawati, 2014). In line with this idea, Kaufman (2004) states that in recent years, language

pedagogy has integrated a rich palette of instructional approaches that underscore the centrality and diversity of learners and their active engagement in authentic and meaningful pursuits as individuals and within communities of learners (Kaufman, 2004).

Seeing the practice of education in Indonesia, the concept of constructivism has not yet been realized, even though the concept has been intended, for example as stated in the Education Unit Level Curriculum (KTSP) which clearly gives freedom to the education unit including the teacher in it to form student competencies according to the needs and student interest. According to Trianto (2007), one of the main problems in learning, in formal education (schools) today, is the low absorption of students.

The above situation can be seen from the average student learning outcomes that are of concern. This achievement is certainly the result of learning conditions that are still conventional in nature and do not shape the realm of the dimensions of the students themselves, namely how the actual learning is (learning to learn). In a more substantial sense, that the learning process to the present still gives the dominance of the teacher and does not provide access for students to develop independently through their discovery and thought processes. Another fact about education in Indonesia according to the World Bank Report (2014) explains that student learning achievement in Indonesia continues to get low achievement in international standardized tests of student achievement, even after taking into account socioeconomic conditions. In 2003, Indonesia took 33rd place out of 45 countries in the Third International Mathematics Science Study (TIMSS). In 2006, the Program for International Student Assessment (PISA), which assesses how well-prepared students are 15 years old in facing life, Indonesia ranked 50 out of 57 countries in the fields of science, reading and mathematics.

This illustrates the lack of portraits of learning in educational practice in Indonesia that must be addressed, to reach a generation of Indonesians who are more accomplished, and have quality in the true sense.

2. Literature Review

Constructivism assumes that knowledge is the result of human construction. Humans construct their knowledge through their interactions with their objects, phenomena, experiences, and environment (Hopkis, J. R. 2011). A knowledge is considered true if the knowledge can be useful to deal with and solve problems or phenomena accordingly. For constructivism, knowledge cannot be transferred from one person to another, but is interpreted individually by each person.

Each person must construct their own knowledge. Knowledge is not something that has become ready, but rather a process that develops continuously. Constructivism influences the field of education through learning and learning theory, from a constructivism perspective, learning is seen as:

a human process to achieve various kinds of competencies, skills, attitudes. Learning starts from infancy, an infant master simple skill, such as holding a bottle and getting to know the people around him. When stepping on children and adolescents, a number of attitudes, values, social interaction skills are achieved as competencies. As an adult, individuals are expected to be proficient with certain work tasks and other functional skills, such as driving a car, being self-employed, and collaborating with other people (Baharuddin and Esa Nur wahyuni, 2007)

It can be said that learning is viewed as a regulatory process of struggling with the conflict between existing personal models of the world and discrepant new insight, constructing new representation and models of reality as a human meaning making venture with culturally develop tool and symbols, and further negotiating such meaning through cooperative social activity, discourse and debate" (Hopkis, J. R. 2011).

Thus, constructivist learning can be formulated as the compilation of knowledge from concrete experiences, through collaborative activities, reflection and interpretation. Such activities allow students to have a different understanding of knowledge depending on their experiences and perspectives used in interpreting them. Learning is an activity of setting the environment so that the learning process occurs, namely the interaction of students with their environment.

There are five constructivist learning elements (Oxford, R. L. 2003), namely: a) activating new knowledge (activating knowledge); b) acquiring new knowledge (acquiring knowledge) by learning as a whole first, then paying attention to the details; c) understanding knowledge, i.e. by means of constructing a temporary concept (hypothesis), sharing with others in order to get a response (validation) and on the basis of that response, the concept is revised and developed; d) practice the knowledge and experience (applying knowledge); and e) reflecting on the knowledge development strategy.

More value from constructivist learning (Oxford, R. L., 2003) is its strength in building freedom, realness and positive attitudes and perceptions of learning as learning capital. Because learning requires freedom, without freedom students will not be able to learn in the best way. Because constructivist learning is not teacher centered or student centered (Glasersfeld, 1995). Instead, constructivists position teacher-student equality

in the learning process so as to enable the elaboration process of the principles and concepts learned to build meaningful new knowledge. Therefore, teaching must "turn on" a dead topic so as to create understanding, mastery, and love for the material being taught and grow in a commitment to study it deeper.

Psychological figures who started the approach to constructivism are Piaget and Vygostky. The difference between the two, Piaget emphasized and discussed the constructivism of the learning process from the personal side and Vygostky developed it by emphasizing and discussing the constructivism of the learning process on the social side. Two views of Individual Cognitive Constructivist and Sociocultural Constructivist dominate the concept of constructivism.

2.1. Individual Cognitive Constructivist

This theory was put forward by Jean Piaget (1977). This theory focuses on the internal construction of individuals towards knowledge (Khodijah, 2016). Knowledge does not originate from the social environment, but social interaction is important as a stimulus for internal cognitive conflict in individuals (Khodijah, 2016). Cognitive constructivists emphasize learning activities that are determined by students and are oriented towards self-discovery.

Piaget was the first psychologist to develop the philosophy of constructivism in the learning process. He explained how one's knowledge processes in the theory of intellectual development. And he also explained that the theory of knowledge is basically a theory of adaptation of the mind into a reality, just as an organism adapts to its environment. To understand Piaget's theory, here are some standard terms used to describe a person's process of reaching understanding, which is then known as cognitive development, namely: 1) schemata, 2) assimilation, 3) accommodation, and 4) equilibration.

Schema (cognitive structure) is the process or way of organizing and responding to various experiences (Slavin, R. E.1997). In other words, the scheme is a systematic pattern of actions, behaviors, thoughts, and problem solving strategies that provide a framework of thought in dealing with various challenges and types of situations. Schema is also understood as a mental and cognitive structure through which a person intellectually adapts and coordinates the surrounding environment (Suparno, P. 2001). The schemata will adapt and change during the student's mental development. Schemata are not tangible objects that can be seen, but a series of processes in people's conscious systems, so they have no physical form and cannot be seen. Schemata are the results

of conclusions or mental formations, the construction of hypotheses, such as intellect, creativity, ability, and instinct.

Assimilation occurs when a child incorporates new knowledge into existing knowledge, i.e. the child assimilates the environment into a scheme (Desmita, 2010). In another sense assimilation is a cognitive process by which a person integrates perceptions, concepts, or new experiences into a scheme or pattern that is already in his mind. Everyone always continuously develops this process.

Accommodation occurs when children adjust to new information, ie children adjust their schemes to their environment (Desmita, 2010). The new experience that is owned may not be compatible with the scheme that has been owned. In these circumstances the individual will make accommodation, namely: 1) forming a new scheme that can match the new stimulus or 2) modifying the existing scheme so that it matches the stimulus.

The process of assimilation and accommodation is necessary for one's cognitive development. In the development of one's intellect, a balance is needed between assimilation and accommodation. This process is called equilibrium, which is mechanical self-regulation to balance the process of assimilation and accommodation. Equilibration is a process from disequilibrium to equilibrium (Suparno, P. 2001). The process continues in people through assimilation and accommodation. Equilibration allows one to unite external experiences with internal structures (schemata). If an imbalance occurs, then someone is encouraged to seek balance by assimilation or accommodation.

The constructivist paradigm by Piaget (Slavin, R. E.1997) underlies the emergence of cognitive strategies, called meta cognition theory. Meta cognition is a skill possessed by students in organizing and controlling their thought processes, according to meta cognition includes four types of skills, namely: First, Problem Solving Skills (Problem Solving), namely individual skills in using their thought processes to solve problems through gathering facts, analyzing information, compiling various alternative solutions, and choosing the most effective problem solving. Second, Decision Making Skills (Decision making), namely individual skills in using the thought process to choose the best decision from several choices available through information gathering, comparison of the merits and disadvantages of each alternative, information analysis, and the best decision making based on reason rational reasons. Third, Critical Thinking Skills (Critical thinking), namely individual skills in using their thought processes to analyze arguments and provide interpretations based on correct and rational perceptions, analysis of assumptions and biases of arguments, and logical interpretations. Fourth, Creative Thinking Skills, namely individual skills in using their thought processes to produce new,

constructive ideas based on rational concepts and principles as well as perceptions, and individual intuition.

The skills above are interrelated with one another, sometimes at the same time someone uses his cognitive strategy to solve problems, so he uses skills to solve problems, make decisions, think critically, and think creatively at the same time.

2.2. Sociocultural Constructivist

This theory was put forward by Lev Vygotsky (Bruning et al, 1995). This theory holds that knowledge exists in a social context, therefore emphasizing the importance of language in learning that arises in social situations that are activity oriented (Eggen & Kauchak, 1997; Khodijah, 2016). According to Vygotsky, children can only learn by engaging directly in meaningful activities with smarter people. By interacting with others, students improve their understanding and knowledge and help shape understanding about others.

Important concepts of Vygotsky's sociogenesis theory of cognitive development in accordance with the sociocultural revolution in learning and learning theory are genetic law theory of development (genetic law of development) and the zone of proximal development (zone of proximal development), and mediation.

Genetic Law of Development (Genetic Law of Development). According to Vygotsky, every ability of a person will grow and develop through two levels, namely the social level where social people form their social environment (can be categorized as inter psychology or inter-mental), and the psychological level in the person concerned (can be categorized as intra psychological or intra-mental). The view of this theory places the internal or social environment as a primary and constitutive factor towards the formation of knowledge and one's cognitive development.

Zone of Proximal Development (Zone of Proximal Development). Vygotsky put forward his concept of a zone of proximal development (zone of proximal development). According to him, a person's development can be divided into two levels, namely the level of actual development and the level of potential development. The actual level of development can be seen from a person's establishment in completing tasks and solving various problems independently. This is called intra mental ability. Whereas the level of potential development appears from one's ability to complete tasks and solve problems when mentored by adults or when collaborating with peers who are more competent. This is called inter mental ability. The distance between the level of actual development and the level of potential development is called the zone of proximal development,

which is defined as immature functions or abilities that are still in the maturation process. To interpret the concept of the zone of proximal development scaffolding interpretation is used, which views the proximal development zone as a scaffold, a kind of buffer zone or stepping stone to achieve a higher level of development. In this case, there are several types of scaffolding that can be applied (Khodijah, 2016), namely: 1) Modeling, for example: an art teacher shows how to draw with two points of perspective before asking students to try drawing themselves, 2) Think aloud, for example: a physics teacher verbalizes his thoughts as he solves the problem of motility on the board, 3) Questions, for example: physics teacher "leads" students through several problems and asks them to ask at important points of time, 4) Adaptation of learning materials, for example: elementary physics teacher lowering and raising while teaching shooting techniques, and 5) Prompt and cue (encouragement and cues), for example: preschoolers are taught to tie shoelaces to chill saying "rabbits go into a hole and jump into it".

According to Byrnes (Khodijah, 2016), Vygotsky's theory has major educational implications, namely: 1) The teacher must act as a scaffold that provides sufficient guidance to help students achieve progress; 2) Learning must always try to "accelerate" the student's current mastery level; 3) To internalize skills in children, learning must develop in four phases. In the first phase, the teacher must model and give verbal comments about what they are doing and why. In the second phase, students must try to imitate what the teacher is doing. In the third phase, the teacher must progressively reduce his intervention once the student has mastered the skill. Fourth, the teacher and students repeatedly take roles in turns; 4) Children need to be repeatedly confronted with scientific concepts so that their spontaneous concepts become more accurate and general.

Some key concepts that need to be noted from Vygotsky are that development and learning are interdependent or interrelated, development and learning are context dependent or cannot be separated from social contexts, and as a fundamental form of learning is participation in social activities (social action). The framework of the development of constructivism pedagogy especially in educational practice is reflected in the two theories above, Piaget believes that the process of schema, assimilation, accommodation and equilibration affects one's cognitive development and Piaget states that one's potential can develop and succeed is due to the construct itself. Whereas Vygotsky states that students develop more systematic, logical, and rational concepts that are the result of dialogue with skilled teachers, so in Vygotsky's theory, others and languages play a key role in a student's cognitive development (Zhou, M. 2011. Learning

Styles and Teaching Styles in College English Teaching: International Education Studies, 4(1): 73-77). These two theories become complementary, and the development of constructivism pedagogy will occur after this process is carried out in the teaching and learning process, which will later be discovered many problems and challenges that become the potential development of constructivism education (pedagogy).

3. Research Method

This study applies a case study approach to ensure the validity of the results of the research conducted as proposed by Kothari (2004). Kothari claims that case study design is a way of organizing data and seeing the object to be studied as a whole. A case study performs a detailed examination of a subject or group of phenomena. The data collection method was tested for validity and reliability, a condition which according to Kothari must exist in descriptive research.

4. Discussion

According to Langeveld, pedagogy or the science of educating is a science that not only examines the object to find out how the condition or the nature of the object is to know how the condition or nature of the object, but also learns how to act (Hasbullah, 1999). The object of education is educational processes or situations. Meanwhile, Educational education or pedagogy is an educational theory, contemplation on education (Hasbullah, 1999). In the broadest sense pedagogy is the science that studies questions that arise in educational practice.

Constructivism according to Philips (1995) is a very broad and complex philosophical theory in gaining knowledge. This view is considered to have greatly influenced learning during the last two decades of the 20th century, and this approach can still be used to this day (Harris & Graham, 1994; Linschinsky, 2015). The constructivist approach directs students to have new experiences facing challenges, through challenges students can understand their anxiety and have new information from these new experiences (Powell & Kalina, 2009).

As explained earlier, this constructivism approach influences science and the educational process (pedagogy) as a learning theory. In constructivism, learning is a change of attitude through the context in which students learn, believe and attitudes. Students must be given the opportunity to develop priority knowledge, find the desired solution,

and test ideas and hypotheses. Here are the basic ideas of constructivism learning theory (Jia, 2010): 1) Knowledge, is an explanation and assumption but not the final answer to all questions. This is in stark contrast, because it is thrown away along with humane processes and new assumptions will emerge. Besides that, knowledge cannot conclude world regulations precisely; 2) Learning, is the process that individuals construct their cognitive structures. "Construction" is an initiative, aware, and self-esteem. Knowledge is the interaction between subject and object. The learning process is a construction of knowledge. Learning is a construction of initiative and generation of meaning. This process will be complete through interaction from past learning and new knowledge; 3) Students enter the classroom with a wealth of their past experiences. They hold their opinions in daily life and even universal issues. Although they do not know the issues and have no experience, they get some explanations and assumptions that underlie previous experiences. Therefore, teachers must understand students' prior knowledge and experiences as points for developing their new knowledge, and introduce students to produce new knowledge derived from past knowledge; 4) Teacher, the teacher's role must be changed, from the initiator and the indoctrinator to the helper and directs the students to understand constructively with full initiative.

Savery and Duffy (Goldman, 2006) explain eight constructivist principles, namely: 1) Linking all learning activities in the development of independence to all problems or tasks; 2) Support students in the development of independence for all problems and assignments; 3) Designing authentic assignments; 4) Design the task and learning environment to reflect the complexity of the environment that students must be able to use at the end of their learning period; 5) Give students confidence in the process of developing solutions; 6) Designing learning environments to support and challenge students' ways of thinking; 7) Encourage the emergence of ideas and against other views and contexts; and 8) Providing opportunities and supporting reflection on what has been learned and the learning process.

Other constructivism principles are: 1) knowledge is actively developed by students, 2) the pressure in the learning process lies with the students, 3) teaching is helping students learn, 4) the pressure in the learning process is more on the process rather than on the final outcome, 5) the curriculum emphasizes student participation, and 6) the teacher is a facilitator (Suparno, P. 2001). These principles are widely used to plan appropriate teaching and learning processes, curriculum updates, planning teacher preparation programs, and to evaluate teaching and learning practices that are already underway.

Based on the analysis of constructivism in the pedagogical point of view above, there are situations and conditions that require further review of its implications in educational praxis, especially in Indonesia. The study in question departs from a PISA (Program for International Student Assessment) survey result which shows that the average literacy score of Indonesian students' literacy, mathematics and science achievement is significantly below the international average. For literacy reading, Indonesia in 2000 ranked 39th out of 41 countries, 2003 ranked 39th out of 40 countries, and 2006 ranked 48th out of 56 countries. With the same number of participant countries as in literacy reading, for the average mathematics literacy achievement score, Indonesia's position is not much different. Indonesian students in 2000 ranked 39th, in 2003 ranked 38th, and in 2006 ranked 50th. Likewise for the average scientific literacy achievement score, Indonesia's position is still far below the international average. Indonesian students in 2000 ranked 38th, in 2003 ranked 38th, and in 2006 ranked 50th.

The PISA report above indirectly shows the background of the causes of the low ability of students in literacy, reading, mathematics and science achievement. There are many possible causes for this low ability, one of which is the pattern of learning and learning which is still a "transfer of knowledge" from teachers to students, the pattern includes traditional patterns. The concept of learning explained in the curriculum in Indonesia is not the same as its realization, as in a curriculum that is developed based on competence is needed as an instrument to direct students to become: (1) qualified human beings who are capable and proactive in responding to the challenges of an ever changing era; and (2) educated people who have faith and are devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent; and (3) democratic and responsible citizens. The development and implementation of a competency-based curriculum is one of the national education development strategies as mandated in Law Number 20 Year 2003 concerning the National Education System.

It can be seen that the curriculum described above is in line with the concept of constructivism which explains that constructivist teachers help students through problem solving and inquiry-based learning activities by testing students' ideas, drawing conclusions and accommodating and conveying their knowledge in a collaborative learning environment (Khalid & Azeem, 2012). Constructivism transforms students from passive ones into active participants in the learning process. If always guided by the teacher, students actively construct their knowledge more than just gaining mechanical knowledge from the teacher or textbook. Very good basic concepts in the curriculum in Indonesia that have not been accompanied by educational practices that fit the concept.

The importance of reforming education in Indonesia through research begins with examining the needs of students in Indonesia, and it will be better if the specific needs of each region are raised, so that appropriate learning can be used according to the characteristics of each region. Pedagogic constructivism that is very flexible and constructs the concept of understanding, development and completion allows it to be the basis of the research theory.

5. Conclusion

Education with a constructivism approach enables students to reach their full potential, because students gain hands-on experience in learning, so that cognitive development can be built by directly involving students to build their own knowledge and understanding from their experiences. In general, the concept of constructivism is divided into two, namely individual cognitive constructivist and sociocultural constructivist, these two aspects are both studying individual learning processes that are based on the process of individual cognitive formation itself and also cognitive formation that is influenced by the social environment. Both become synergies when applied in the learning process, which is to help students build cognitive potential through self-potential and experience, and a healthy, supportive environment. Constructivism education not only helps improve students' cognitive development, but also increases their independence in the development process.

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