CONNECTING CONCEPTS LEARNING TO INCREASE STUDENTS' LOGICAL THINKING ABILITY ON GEOGRAPHY SUBJECT

Ahmad Yani and Nurmala Dewi
Indonesia University of Education, Jl. Dr. Setiabudhi No.229 Bandung
ahyani_07@yahoo.co.id

ABSTRACT

According to cognitive theory and constructivism, students' knowledge is not transferred from others, but constructed by the students' own awareness. Knowledge is collection of concepts that have meaning and connecting with one another. Cross (1999) states that the essential of learning is teacher's effort to help their students build "connections" between or among concepts. Cross suggests four categories of connections in each learning, neurological connection, cognitive connection, social connection, and experiential connection. This research was intended to describe the researcher's experience in applying four Connecting Concept Learning strategies: (1) Drawing concepts, (2) Developing concept structures, (3) Developing concepts, (4) Connection between concepts. The results of this study showed that Connection Concept Learning can be used as an alternative to learn geography, especially when teachers have desire to increase learning ability of the students in the class that less motivation to learn and tend to be passive.

Keywords: connecting concepts, geography, high school, learning, logical thinking

INTRODUCTION

In the theory of cognitivism and constructivism, logical thinking is the process of processing information into new knowledge. The new knowledge comes from two sources, from the information as a result of one's interaction with the environment in the form of facts, concepts, procedures, and other notions obtained from the environment either consciously or unconsciously, and the connection between concepts that have been previously owned. Long-termed concepts in the memory of the brain (in the long run) are connected to other old concepts. Such connections occur suddenly or are planned "to happen". The end result of connection between concepts are new knowledge.

The concerted events of concepts can be illustrated as follows. A lecturer asked new students (in a first lecture) to explain the relationship between the concept of "age" and the concept of "oil." Almost all new students are silent and unable to answer. Furthermore, the lecturer asked the students to group the categories of human age, they smoothly replied that the human age can consist of the age of children (infants), adolescents, and adults. On the next occasion, lecturer also asked students to name various types of oil. Students can only name a few of them such as telon oil (oil made from herbal for baby), aromatheraphy oil, and cajuput oil. In Indonesia, telon oil is a medicine to reduce stomach bloating for babies, aromatheraphy oil is for adultscents, and cajuput oil is medicine oil for adults. After the two concepts are paralleled, the student realizes that between age and oil have a relationship. The emergence of a new awareness is the result of a connection between concepts that have long settled between the age and concept of oil. The new knowledge seems to appear without "presenting" a new concept and its presence is only taken from the available memory.

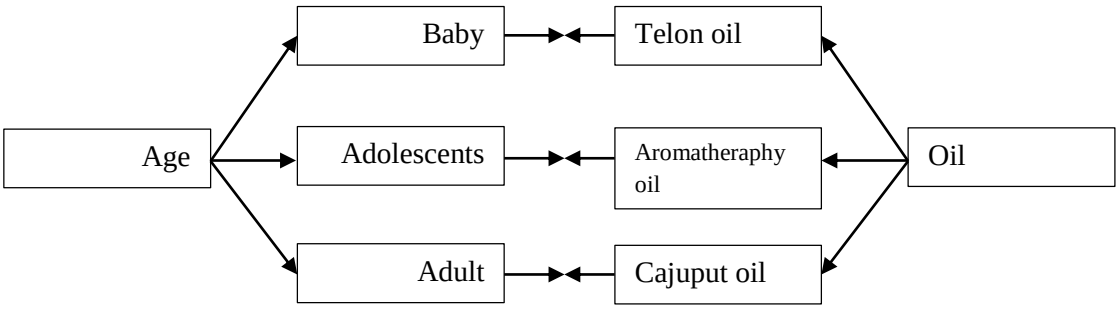

Figure 1. Connection of Two Concepts to New Knowledge

From the illustration above it can be taken to mean that "new knowledge" can be born from human effort to connect existing concepts. Students can be trained to cross-connect concepts from what they have long known. For example linking the concept of forest destruction with urbanization; the massive concept of cheap cell phone use with land crises; the concept of robot technology with the threat of termination of employment in factories, and others. Thus, learning can be interpreted as a teacher effort to facilitate and guide students to connect between concepts. If in children's memory is not yet available a certain concept, teachers can add new concepts through the delivery of information to them. New concepts received by students from their teachers will also be connected with the old concept that has been known before. Such is the essence of Connecting Concepts Learning theory.

The next question that arises is how the Connecting Concepts Learning strategy is applied in the classroom. This study reports several of the Connecting Concepts Learning strategies applied by researchers in the classroom on geography subjects at Senior High Schools in Indonesia.

LITERATURE REVIEW

1.1 The Making Connection

Cross (1999) said that learning is essentially a teacher's effort to help learners make "connections". Cross entitled his article "Learning is About Making Connections" published by the League for Innovation in the Community College Educational Testing Service. He divides four categories of connections in each learning: neurological connection, cognitive connection, social connection, and experiential connection.

Neurological connection is neurons connection that take place in the human neocortical brain. As is known, the human brain consists of three parts, the stem (reptilian brain), limbic system (mammalian brain), and neocortex. The reptilian brain is responsible for sensory motor functions. Around the reptilian brain there is a limbic system that has the function of storing feelings, experiences, memories, and human learning abilities. The limbic system also controls the biorhythms of life such as sleep patterns, hunger, thirst, heart rate, sexual arousal, temperature and body chemistry, metabolism, and immune system. While the neocortex is where the process of intellectual thinking, decision-making, language, and the creation of nonverbal symbols. The neo-cortex consists of 12 - 15 million nerve cells called neurons. These cells can interact with other cells through vibrations along their branches, called dendrites. Interactions between neurons determine the ability of people to learn (DePoter and Hernacki, 1999, p.34). The assumption is that the more active the neocortical brain interacts, the more intelligence a person will be. Neurons that are exploited or connected intensively, will be strengthened, while the untapped will be replaced by another connection and or vanish (Santrock, 2007: 43).

The notion of cognitive connection is similar to the neurological connections theory. Cognitive connection have the assumption that in the human mind has a cognitive scheme known as the schemata. Piaget and Cook (1952) define that schema is "a cohesive, repeatable action sequence possessing component actions that are tightly interconnected and governed by a core meaning". In other words, the schemata is a structure of abstract knowledge that is stored hierarchically in the brain (Pratiwi, 2001). Human cognitive schemes continue to evolve along with the level of development and intensity of interaction with the environment. Technically, the development of cognitive schemes is built on a conceptual connection between concepts involving assimilation, accommodation, and equilibrium.

Assimilation is the process of accepting new concepts into existing cognitive structures, while accommodation is the process of forming new schemata and or modifying existing cognitive structures so that new concepts increase the scheme's building and cognitive structure.

Social connection is the formation of new knowledge that is rooted in truth based on social "truth" that prevails in certain places. Social connections are a critique towards constructivism that often leads to misperceptions and leads to new misconceptions because in theory no one controls. Vygotsky (Santrock, 2007) proposed a theory of social constructivism which says that knowledge is not individually constructed but collectively in the social environment of learners. New knowledge involving social processes provides opportunities for learners to evaluate and improve their understanding in their social environment. In this way the content of knowledge formed by learners will be influenced by the culture in which learners engage in social interaction.

Experiential connection is learning that seeks to leverage experience to reinforce learning, otherwise learning outcomes are expected to improve performance, and competence. Learning that connects experience as a source of learning has long been known, such as the idea of "experiental learning" from John Dewey that encourages learners to practice solving problems that occur in the environment. David Kolb says that "learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p.38). Experiential learning model has four learning stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation.

The foundation of Connection Concepts Learning combines the four types of connections above that are concerned with neurological connection, cognitive connection, social connection, and experience connection. Traditionally, however, its reference remains to the process of assimilation, accommodation, and equlibration, first proposed by Piaget. Some scholars call this the theory of Cognitive equilibrium. Beauchamp (without years) published in the Encyclopedia Britannica explains that "Cognitive equilibrium is a state of balance among individuals, mental schemata or frameworks, and their environment. Such balance occurs when their expectations based on prior knowledge fit with new knowledge. Furthermore Beauchamp also explained that "equilibration as an ongoing process that refines and transforms mental structures, constituting the basis of cognitive development. More equilibration tends to occur as an individual is transitioning from one major developmental stage to the next ".

Connection Concepts Learning is also based on inquiry, and of course many use cognitive theory. The pattern of learning always begins by shaking the schemata of learners, so there is an unbalanced state (disequilibrium). Teachers usually ask questions and learners will be motivated to answer them. This strategy to generate motivation and curiosity of learners. The assumption is that everyone will feel uncomfortable if there is a problem that has not been solved. At this stage, learners will try to find answers. Once the questions are answered, learners will feel satisfied, comfortable, or balanced (equilibrium phase). After feeling comfortable, the teacher returns again raising new problems, then re-happening disequilibrium in the learners. They will try to find answers to make equilibrium happen to them.

METHODS

This research employed descriptive method to describe about experience of researcher practicing learning strategies of Connection Concepts Learning. Learning practice time was from 2010 - 2016 with locations in number of senior high schools, 1) SMA Negeri 8 Bandung, 2) SMA Negeri 1 Ciparay, 3) SMA Negeri 1 Palimanan, 4) SMA Negeri 1 Waled, 5) SMAN 6 Bandung, and 7) SMA Labschool Universitas Pendidikan Indonesia. The technique used was classroom observation so that the research data will be processed qualitatively.

FINDINGS AND DISCUSSIONS

The object of this research is the learning model. The study focused on learning strategies derived from the Connection Concept Learning model. The term Connection Concept Learning (Yani, 2010) is a proposed researcher submitted to the dissertation report in 2010. Further refined through a number of research and the latest is the year 2017 with the title of Implementation Connecting Concepts Learning

to Improve Understanding Concept Geography Subject. Based on the results of a long study, researchers formulated four strategies of Connection Concept Learning which are considered feasible to use in the classroom.

a. Drawing Close The Concepts

Drawing the concept closer is to Closes two concepts that are related but do not necessarily have a general meaning. For example the concept of a bottle, it can be juxtaposed with water, oil, shelves, breakable, or other concepts close to the bottle. Other example is the concept of parking space juxtaposed with the concept of campus, hospital, or super market. The benefit is to stimulate that every concept has an opportunity to be juxtaposed with other concepts in meaningful relationships. The learning strategies are:

1) The teacher provides a number of concepts written on A4 size paper according to the material to be delivered. On the trial occasion, the researcher provides concepts about area planning and layout so that the concept provided is about location; names of geographical phenomena such as rivers, mountains, roads, rivers; and the names of buildings such as hospitals, markets, and others.
2) Students are divided into four groups evenly.
3) Each member of the group carries two to three concepts while standing face to face with each other, thus forming a longitude. The goal is for each student to see the concept brought by his friend. Teacher stands in the middle of the students.
4) In the first round, group one is asked to juxtapose the concept they carry with the concept brought by another group. For example, one of the group members who carried the concept of "river" pointed to the concept of "boat" in group two, pointing to the concept of "floating market" in group three, and the concept of "water" carried by group four. Thus collected four concepts are river - boat - floating market - water. If they are able to collect four concepts at once, then get a maximum score. It may be that a group only gets two or three concepts that can be brought closer.
5) At the end of the lesson, the teacher announces the game scores gained by each group.

This game is very appropriate to use in the initial meeting before explaining about the actual material. Its function is to generate interest in learning.

b. Constructing The Concepts Structure

Constructing the concepts structure means to pair the concepts adjacent to a more rational order. The structure of the concept in question can show the correlational relationship as well as cause and effect. For example the concept of "tree", it can be divided into stems, roots, leaves, and so on. Learning strategies are:

1) The teacher provides paper size 5 cm x 15 cm for fifty pieces or more.
2) The teacher creates a list of concepts designed in such a way that they can be arranged into tree charts or flow charts.
3) Students are asked to write one concept on each piece of paper.
4) Each learner obtains three or five pieces of paper already filled with the concept.
5) The teacher writes the main concept theme on the board. In turns students create a concept chart structure that begins from the main concept. Each concept is related to other concepts.
6) After all the concepts are embedded on the board (usually there are some unplugged concepts due to placement mistakes), one student explains about the arrangement of the concept.

c. Developing Concepts

Developing concepts is conceptualizing activities in the form of concept maps or mindmap. The learning step is very simple that students are asked to read the lesson material from the available teaching materials (according to the learning material). After that, students are asked to prepare the mindmap. Concepts can be added and developed from other sources beyond the required teaching materials for example from the internet and books from the library. Concept development can be done in groups and individuals. Here is an example of the work of students of class XII IPS 3 SMA Labschool Universitas Pendidikan Indonesia.

Figure 2. Mindmap made by students of class XII IPS 3 SMA Labschool

d. Connection Between or Among Concepts
Connection between or among concepts is an individual activity that connects two or more concepts that have meaning. Learning activities are assisted by students' work sheet (LDKP in Indonesian). Students are asked to fill the connecting concepts worksheet consisting of four three columns, or more that contains concepts while the last column is a conclusion filled by learners. The following is a form of Connecting Concepts column that connects three concepts at once.

No	Concept A	Concept B	Concept C	Connecting Concept
1	Atmospheric Pressure	Wind	Rice	.....
2				
...				

Figure 3. Connecting Concepts test column

The four strategies of Connection Concept Learning learning above are factually proven to increase students' learning participation. For example, from a study of the effectiveness of Connection Concept Learning, especially the concept development strategy (mindmap use) done in 2010 in four research sites as follows.

***CONNECTION CONCEPT LEARNING* CONTROL AND EXPERIMENT CLASS T-TEST CALCULATION TABLE**

No	Schools' Name	N	Mean Gain *)		t-hit	dk	prob.	t-tab
			Control	Eksp.				
1	SMAN 1 Ciparay	33	2.79	3.61	4.3854	32	0.01	2.739
2	SMAN 1 Palimanan	31	0.68	3.48	1.7241	30	0.10	1.697
3	SMAN 1 Waled	30	2.50	3.93	1.7460	29	0.10	1.699
4	SMAN 8 Bandung	32	0.91	3.50	1.7398	31	0.10	1.697
5	Total	126	1.67	3.63	3.8087	125	0.01	2.616

*) pretest and posttest result (Research Data: Yani, 2009)

In SMAN Ciparay for 1% error, t-count (4.3854) is biger than t-table (2,739). In SMAN Palimanan for a 10% error, t-count (1.7241) is biger than t-table (1.697). In SMAN Waled for a 10% error, t-count (1.7460) is biger than t-table (1.3699). In SMAN 8 Bandung for a 10% error rate, t-count (1.7398) is biger than t-table (1.697). When the data were combined from all control classes and experimental class it is still consistent that for 1% error obtained t-count 3.8087 and t-table 2,616. This means that H0 is rejected and proven that onnection concepts learning effectively improves students' logical thinking ability.

The latest research results in 2017 at SMA Labschool Universitas Pendidikan Indonesia is also effective. The study uses a conceptual connection strategy. The study only compared the pretest and posttest results after the students worked on the LKPD (worksheet) of connections between concepts. The results are quite significant, the average score of pretest results of 8.11 points and the average postest score of 14.32 points, so that the gain reaches 6.21 points. Thus it can be concluded that exercise by filling the worksheet of connecting concept has effect on learning outcomes of the students (Yani and Dewi, 2017).

CONCLUSION

The results showed that connection concepts Learning strategy is very effective in improving students' logical thinking ability. The learning process of connection concept learning seems not to give the opportunity to the students to "sit calmly" listening to the teacher's lecture in front of the class. The students are actually required to participate actively in learning. In addition, it also proved to improve the logical thinking ability through several trials. With the results of this study, connection concept learning can be used as an alternative in the learning of geography, especially when teachers have the desire to increase the learning ability of the students that are less motivated to learn and tend to be passive.

REFERENCES

Beauchamp, A.S. (2017). *Cognitive equilibrium*. online https://www.britannica.com/topic/cognitive-equilibrium.

Cross, K.P. (1999) *Learning is About Making Connections*. League for Innovation in the Community College Educational Testing Service. 26522 La Alameda, Suite 370 Mission Viejo, California 92691 (949) 367-2884.

DePoter, B., Hernacki, M. 1999. Quantum Learning Membiasakan Belajar Nyaman dan Menyenangkan. Bandung. Penerbit Kaifa.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Piaget, J., & Cook, M. T. (1952). *The origins of intelligence in children*. New York, NY: International University Press.

Pratiwi, Y. (2001) Jurnal Pendidikan dan Pembelajaran. “Pengembangan Kompetensi Teks dalam Pembelajaran Prosa Fiksi”. Malang: IKIP Malang.

Santrock, J, (2002) *Life-Span Development (Perkembangan Masa Hidup)*, Alih bahasa oleh Ahmad Chusairi, Jakarta: Penerbit Erlangga.

Suparno,P. (2006). *Perkembangan Kognitif Jean Piaget*, Yogyakarta: Kanisius, Cet I, 2006, hal.11.

Yani, A dan Dewi. N. 2017. *Connecting Concepts Test: An Alternative Instrument Form To Improve Students' Logical Thinking Ability In Conceptual Understanding (Case Study on Geography Subject)*. Proceding Geography Seminar (IGEOS 2017).

Yani, A. (2010) Pengembangan Model Meaningful Learning Untuk Meningkatkan Daya Nalar Siswa Melalui Aplikasi Mind Map Pada Mata Pelajaran Geografi Di Sma. Disertasi. Sekolah Pascasarjana Universitas Pendidikan Indonesia.