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Learning Model Combined with Mind Maps and Cooperative Strategies for Junior High School Student

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Abstract: The problem is the teachers in the school feel very busy and do not have enough time to design a creative learning. Based on these facts, the researcher considers it important to develop a creative learning model in expectation that learners will have creativity competence as a provision in managing life. This study is a quasi-experimental with pretest-posttest control group design. The samples are junior high school students in Makassar. The data are analyzed with descriptive statistics such as mean and inferential statistics in form of Analysis of Covariance (ANCOVA). As a result of the study, the use of Synectics learning model combined with mind maps and cooperative strategies have a significant impact on the ability of creative thinking, creative attitude and mastery of the subject matter to students.

Key words: Synectic learning model combined, creative thinking, creative attitude, Makassar, thinking, creative

INTRODUCTION

Today we live in a knowledge era that has changed the way we live, communicate, think and achieve prosperity. In relation to education and learning in our schools, this era should be a challenge in managing a more productive learning. According to (Gibson, 2011). The era was an era of intellectual capital. Therefore, the purpose of education and teaching must lead to the fulfillment of a student's intellectual skills that can later be assimilated with the era. According to Ciputra (2007) education and learning in this country should teach about science of life in the form of creativity. Because, people have to be creative or they have creative thinking during their life. To realize this idea, then to consider what is proposed by Raths and Rothstein (1986) that the important task in teaching is to help students to think, all subject teachers should attempt or intend to develop the creative abilities of students so that they move toward "self-actualization" as well as better mental health (Amien, 1987) and creative learning should be applied in our schools.

The importance of creative thinking in learning activities, Splitter (Liliasari, 2001) explained that creative thinking can prepare students to think in different disciplines, towards the fulfillment of their intellectual needs and develop as potential individuals. Further research explained that the learning process, students should be more engaged as thinkers rather than knowledge collector. Meanwhile, in the practice of our education and learning, the development of students creative thinking is less applied as learning goals. Schools are being seen as places for the encouragement of creativity because they can do this in a "more efficient" manner and can develop it "not merely in elites but in masses of students" (Csikzentmihalyi, 2006; Walberg, 1988).

Meanwhile, the formation of abilities requiring longer time period as well as mission of cross-subjects such as ability to think, collaboration capabilities and ability to solve problems and assumption on learning experience as a system of logical and creative mind set is still quite far behind in its management (Subiyanto, 1990; Joni, 1993). As evidence of the case, the graduates of our schools are still too passive, waiting and tend to look for job rather than creating jobs

Based on the phenomenon and learning outcomes as stated above, one of solutions to overcome this problem is to develop and implement creative learning. Creative learning is a learning which aims to enhance creative behavior, pull out creative potential of students such as creative thinking and lead to various invention to the things previously unknown; not recognized or not understood. According to Irtadji (1995) creative learning is a learning to develop student's creativity.

The creative learning is characterized by their creative relationship between teachers and students and uses learning models to develop their creative ability.

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Children's ability to form positive relationships is important to their social development and academic success. That creative relationship of teachers and students in creative learning is realized by the teacher in forms of appreciating questions and ideas of student's, trying to understand what students think, encouraging to think more deeply and more open with evocative question. One of the models is Synectics model combined with mind maps and cooperative.

The problem is the teachers in the school "feel" very busy and do not have enough time to design a creative learning. They prefer to use design or learning scenarios that have been developed and ready to apply (Irtajid, 1995). Based on these facts, the researchers considers it important to develop a creative learning model in expectation that learners will have creativity competence as a provision in managing life.

MATERIALS AND METHODS

This study is a quasi-experimental with pretest posttest control group design (Gall *et al*., 2003). The samples are junior high school students in Makassar City drawn randomly from medium grade schools. Learning syntax is conducted by teachers as research partners, who previously have been coached through a work shop. Dependent variables measured are ability of creative thinking, creative attitude and mastery of biology materials. Instruments used include: a test on ability to think creatively developed by the author in accordance with teaching materials by indicators such as fluency, flexibility, originality and elaboration in expressing ideas made in 5 unit tests creative attitude scale questionnaire to measure the creative attitude. Multiple choice questions and essays to determine the mastery of biological materials. The data are analyzed with descriptive statistics such as mean and inferential statistics in form of Analysis of Covariance (ANCOVA).

RESULTS AND DISCUSSION

Creativity is no longer a luxury for th efew, necesity for everybody (Gredler, 1991; Fryer, 2003). Based on the analysis, it can be concluded in the findings of the research that creative thinking ability, creative attitude and mastery of biological material are result of learning model implementation as follows.

Creative thinking: The analysis shows that the value of F-class treatment is 234.662 with a probability of 0.000<0.05 which means that the influence of learning model on the ability to think creatively is significant. The F-value of students with different initial abilities is 3.383 by probability of 0.071>0.05 (5% significance) which means there is no difference in the creative thinking ability of students with different initial abilities the F-value of interaction between the learning model used with the prior knowledge of students is 0.845 with a probability of 0.362>0.05 (5% significance) which means that there is no effect of interaction between the learning model and the prior knowledge of students on the ability to think creatively (Shaheen, 2010). Categories of creative thinking ability on students after being taught with Synectics learning model combined with mind maps and STAD cooperative increased from low category into medium category at students with lower initial ability. On the students with high initial capacity, their creative thinking skill is increased from the medium category into the high category. In other words, both students with high or low initial capacity have increased ability to think creatively if being taught with Synectics learning model combined with mind maps and cooperative STAD.

Creative attitude: The result of data analysis shows that: the F-value of class is 88.319 with a probability of 0.000<0.05 (5% significance) which means that the effect of learning model used to gain creative attitude is significant. The F-value of students with different initial abilities is 1.192 with a probability of 0.280>0.05 (5% significance) which means there is no difference in creative attitude between students of different initial capabilities the F-value of interaction between the learning model used and the prior knowledge of students is 0.771 with a probability of 0.384>0.05 (5% significance) which means that there is no effect of interaction between the learning model and the prior knowledge of students to creative attitude, creative attitude categories of students after being taught with Synectics learning model combined with mind maps and STAD cooperative increased from low category into moderate category at students with lower initial ability. While the students with high initial capability, creative thinking skills is increased from the moderate category into the high category. In other words, there is an increase of creative attitude both in the students with low or high initial capacity, if being taught with Synectics learning model combined with mind maps and cooperative STAD.

Mastery of biological materials: The result shows that: the F-value of -class treatment is 44.034 with a probability of 0.000<0.05 (5% significance), it means the difference in the mastery of biological material due to the learning model used is significant the F-value of students with different initial abilities is 7.448 with a probability of

0.009<0.05 (5% significance) which means there are differences in the mastery of biological materials among students with different initial capabilities the F-value of interaction between the learning model used and the prior knowledge of students is 7.724 with a probability of 0.007<0.05 (5% significance), this means that there is an effect of interaction between the learning model used and the initial ability of students to the mastery of biological materials, categories of mastery in biology material after being taught with Synectics learning model combined with mind maps and STAD cooperative has increased from low category into moderate category for students with lower initial ability. While, the students with high initial capacity, their creative thinking skills tend to increase from the moderate category into the high category. In other words, Synectics learning models combined with mind maps and cooperative STAD can increase the mastery of biological materials among students with different original capabilities.

With the intention of "combining" the research findings and its practical benefits then a discussion is held as follows. Synectics model learning combined with mind maps and cooperative can develop creative thinking skills, creative attitude and student's mastery of biology as the findings in this study is very possible. Therefore, the Synectics model is a learning model that allows the realization of creative learning objectives. The basic assumption is then explained by Gordon (Joice and Weil, 1980) in three basic assumptions underlining Synectics, namely: a creative process can be described in concrete, this description can be used to develop teaching methods which later develop student's creativity individually or in a group, creative discovery in the field of art and science are similar and obtained through the same intellectual basis and an individual creative process is similar to the creative process in group.

Joyce and Weil (1980) explain that the Synectics model is a model of creativity development to resolve problems by coaching individuals to work together to overcome problems that could improve productivity. More specifically (Hydo *et al*., 2007) explains that Synectics learning model is an activity prepared and used by students as a way to think creatively. If so, then the Synectics can be understood as a set of creativity (creative thinking) to declare a problem and its solution.

Synectics model study focuses on activities of analogy in learning which leads to the acquisition of new and more complex understanding of the concept (Joice and Weil, 1980). Analogy as the workings of Synectics in learning can be defined as an activity to make parables thing (new concept) to something else (a concept that was already understood) based on similarities between the two, to gain an understanding of more complex concept.

By analogy then, there is a conscious creative process a conceptual distance is formed between students and objects and allows for creative thinking (Joice and Weil, 1980). By the formation of the conceptual distance, it will emotionally give you freedom of mental structure and can be directed into new ways of thinking (Biggs and Tang, 2007). In line with this (Amien, 1987) explains that the analogy activities may help to release "mental structural bonding", that is strongly inherent in looking at an object so that it supports the emergence of creative ideas.

According to Ramasami (2002). Synectics model is very helpful in finding and explaining the concepts learned. At the time student doing Synectics, the learning process becomes more active as a result of the student's efforts in seeking appropriate analogy for understanding the topic. De Bono suggested that in analogy activity, students do not only learn more concepts but they also use it as a kind of creative thinking that so-called "lateral thinking". In line with this Coom explains that an analogy thinking can develop creative appreciation of students and foster their creativity.

Elaboration theory is supported by two field studies of cognitive psychology, namely: the theory of cognitive structure is defined as the organizational structure in the memory/scheme of someone that integrates the separated elements into a conceptual unit. Process of memory (memory). The memory process is the mechanism of encoding, storage and disclosure of what has been stored in memory (Degeng and Sudana, 1997). Thus it can be concluded that the elaboration is a process of re structuring the cognitive because the influx of new information into memory (Spencer *et al*., 2013).

According to Gunter, Synectics procedure is initially used for developing creativity of group in industrial organizations. Individuals are trained to be able to cooperate with each other to overcome problems and develop production. In the perspective of learning explains that Synectics has played an important role in providing scientific explanation, deep understanding, discovery and creativity. Further research explained that the use of analogy in learning should be careful because any mistakes could be detrimental to students. Moreover, in this study the kind of analogy used are direct analogy, personal analogy and analogy of contention. This means that the Synectics as learning models requires habituation and training in its use both by students and teachers.

Teaching students with Synectics models is not easy because it needs proper infrastructure to facilitate the analogy activities as Synectics work. After a critical analysis on some of learning infrastructure that allows for combined with Synectics models, the author chose mind maps. It turned out that the findings of this study, associated with the use of mind maps as an infrastructure that can facilitate the activities of the Synectics learner has shown positive results.

How then mind maps can positively affect the development of the creative thinking, creative attitude and increasing mastery of biology subject can be stated as follows. Utilization of mind maps as a learning infrastructure, to facilitate the analogy activities is very possible. Therefore, through the mind maps students can map the entire knowledge through the establishment of branches related to the topic studied (Wilson *et al*., 2016). In this research mind maps are developed in three levels of association, namely: the association Level 1 (shape, size and color), the association Level 2 (in everyday life) and the association Level 3 (other biological processes).

According to Buzan (2004), mind maps is a thinking tool that encourages the brain to develop associations between ideas and a visual manifestation of the brain's way of thinking. Based on these explanations, it can be argued that mind maps can facilitate the activity of analogies in Synectics. Therefore, both have relatively similar mechanism in form of performing associations of ideas (Brinkmann, 2003).

Mind maps as a road map of learning, can develop the potential thought creatively (Pollitt, 2003). Through a mind map, people are able to focus on what is the essential problem through an association and the development of imagination, investigating every possible opportunity that opens in solving the problem, provide unlimited intellectual freedom, allowing for an assessment of the priority ideas, provide understanding of the concept in the whole because it can create a stronger impression that so easy to memorize (Buzan, 2004; Bachman, 2005; Dryden and Vos, 1999). If so, then the mind maps are also expected to develop creative attitude and acquisition of better learning outcomes. Expectations as mentioned, according to the study's findings are appropriate.

Analogy activities based on cognitive restructuring due to the influx of new information to gain a better understanding will go more smoothly with mind maps. Mind maps are actually the mapping of information stored in the mind, how it works is based on how the brain organizes and stores information (Bachman, 2005). The process is as important as the events preceding the elaboration of a person's cognition. In the theory of information processing described, that psychological events are information transformations from input to output. Information is originally accepted by the receptor and into sensing registor and further a part of the whole information is transferred to the memory, then the generator's response is converted into patterns of behavior that guide the effectors to produce a series of actions (Gredler, 1991; Buzan, 2004) the information processing is actualized in the form of mind maps, in form of associations of creative ideas triggerring the brain's potential to be maximized. Hence the importances of mind maps are used as a tool in making analogies in learning activities.

Role of mind maps in facilitating Synectics are clear. However, the job of making mind maps and analogy activity as expected Synectics work seems to be performed in groups by students. The learning is not considered complete if there still members of the group who have not mastered the subject matter.

The strength of Synectics model, mind maps infrastructure and cooperative strategies in small groups in terms of developing creative thinking abilities, mastery of the material and creative attitude are possible because all the three have a similar way of working, by using association of ideas to solve problems. In Synectics, association of ideas occurs when students make analogies or comparisons of what they have seen, felt and known to the subject matter studied. Whereas the association of ideas on mind maps infrastructure occurs when students make the branches of main topics and make more unlimited branches from each. In other words, from simple nature of a topics student will obtain from various possibilities for problem-solving and complex information or knowledge. Similarly, in cooperative strategies, associations of idea occurred when students conduct a group discussions in which disagreement and exchange of ideas occurs, this is one of effective teaching strategy (Hydo *et al.,* 2007; Cooke and Moyle, 2002).

Mechanism of Synectics, mind maps and cooperative strategies above is in accordance with constructivism learning paradigm. According to Piaget's constructivist learning is a learning that enables exchange of ideas to develop reasoning, to give students freedom to form their own opinions (expressed, maintain and feel responsible for it) and freedom of thought. Constructivist learning emphasizes each student individually to be able to find, construct and transfer complex information if they intend to make such information for their own. From the description, it is understood that the constructivist learning puts students as active learner's so-called student-centered instruction. In a student-centered

instruction, the teacher's role is as a facilitator to help students in finding facts, concepts or principles for themselves (Muhammad, 1995).

Based on explanation above, it seems that the strengths of Synectics models in developing student's creativity will be better if combined with mind maps and cooperative strategies. This is supported by the findings of this study. In addition to this model, the teacher as a facilitator also developed into a creative facilitator. According to the Synectics framework, creativity is not a talent that is inherited but a skill that is learned (Georgiou, 1994; Gomez, 2007). It is possibble to build creativity on to student.

CONCLUSION

As a conclusion of the study, the use of Synectics learning model combined with mind maps and cooperative strategies have a significant impact on the ability of creative thinking, creative attitude and mastery of the subject matter to students.

SUGGESTIONS

Some suggestions based on the results or findings of this research, are: If the learning objective is to improve the creative thinking ability, creative attitude and mastery of biological materials, thus application of these learning models for learners is advisable. As far as possible, science teachers, especially biology teacher consider the initial capability of students in the selection of learning model, so that the learning objectives can be achieved optimally. In order this model to be more efficient, it is suggested for biology teachers to vary this model with other forms of learning such as problem-based learning.

Based on the experience during the study, the researcher suggests that in applying this model, the material should be self-designed so that the material is accompanied by analogical explanations. In order that students can easily to create variations of analogies to develop imagination and understanding of the concepts being studied. It will also save the very limited time of learning.

REFERENCES

Amien, M., 1987. [Teaching Natural Science (IPA) using the Discovery and Inquiry Methods]. Publisher Depdikbud, Jakarta, Indonesia, (In Indonesia).

Bachman, E., 2005. [Methods of Critical and Innovative Thinking]. Prestasi Pustaka Publisher, Jakarta, Indonesia, (In Indonesia).

Biggs, J. and C. Tang, 2007. Teaching for Quality Learning at University. 3rd Edn., Society for Research into Higher Education and Open University Press, Buckingham.

Brinkmann, A., 2003. Graphical knowledge display-mind mapping and concept mapping as efficient tools in mathematics education. Math. Educ. Rev., 16: 35-48.

Buzan, T., 2004. [Mind Maps at Work: Cara Excellent being Featured at the Workplace]. Gramedia, Jakarta, Indonesia, (In Indonesia).

Ciputra, M., 2007. [Teach Life Science]. Jawa Pos Publisher, Surabaya, Indonesia, (In Indonesia).

Cooke, M. and K. Moyle, 2002. Students evaluation of problem-based learning. Nurs. Educ. Today, 22: 330-339.

Csikzentmihalyi, M., 2006. Foreword: Developing Creativity. In: Developinf Creativity in Higher Education: An Imaginative Curriculum, Jackson, N., M. Oliver, M. Shaw and J. Wisdom (Eds.). Routledge, London, England, pp: XVIII-XX.

Degeng, I.N.S. and N. Sudana, 1997. Learning Strategy Organizing Content with Elaboration Model. State University of Malang, Malang, Indonesia,.

Dryden, G.D. and J. Vos, 1999. The Learning Revolution: Cetakan VII. Terjemahan oleh Word ++ Translation Service. Kaifa Publishing, Bandung, Indonesia,.

Fryer, M., 2003. Creativity across the curriculum: A review and analysis of programmes designed to develop creativity. Quezon City Academy, Manila, Philippines.

Gall, M.D., J.P. Gall and D.W.R. Borg, 2003. Model of Teaching. 7th Edn., Pearson Education Inc., Boston, Massachusetts,.

Georgiou, S.N., 1994. Synectics: A problem-solving tool for educational leaders. Intl. J. Educ. Manage., 8: 5-10.

Gibson, R., 2011. Rethinking the future: Rethinking Business, Principles, Competition, Control and Complexity, Leadership, Markets and the World. Nicholas Brealey Publishing, London, Boston, Pages: 269.

Gomez, J.G., 2007. What do we know about creativity?. J. Effective Teach., 7: 31-43.

Gredler, M.E.B., 1991. Learning and Learning. Rajawali, Jakarta, Indonesia,.

Hydo, S.K., D.L. Marcyjanik, C.R. Zorn and N.M. Hooper, 2007. Art as a scaffolding teaching strategy in baccalaureate nursing education. Intl. J. Nurs. Educ. Scholarship, Vol. 4,

Irtadji, M., 1995. [Creative Teaching in the Department of Educational Psychology and Guidance (MIS)]. Publisher Lembaga Penelitian, Malang, Indonesia, (In Indonesia).

Joice, B. and M. Weil, 1980. Model of Teaching. 2nd Edn., Printice-Hal, London, England,.

Joni, R.T., 1993. [Improving the Quality of Education through Active and Meaningful Learning: Consortium of Education Sciences]. Publisher Depdikbud Dikti, Jakarta, Indonesia, (In Indonesia).

Liliasari, M., 2001. [Model IPA learning to improve teachers high-level thinking skills as a new trend in the globalization era (In Indonesia)]. J. Math. Sci. Teach., 2: 54-66.

Muhammad. N., 1995. [Development of PBM model IPA oriented PKP to increase students' reason power in order to facing IPTEK society on second long term development]. University of Surabaya, Surabaya, Indonesia. (In Indonesia)

Pollitt, D., 2003. Mind mapping your way to a better career. Career Dev. Intl., 8: 253-256.

Ramasami, P., 2002. Students as solid, liquids and gases. J. Chem. Educ., 2: 141-147.

Raths, W.J. and Rothstein, 1986. Teaching for Thinking. Columbia University, New York, USA.

Shaheen, R., 2010. Creativity and education. Creative Educ., 1: 166-169.

Spencer, J.R., K.M. Anderson and K.K. Ellis, 2013. Radiant thinking and the use of the mind map in nurse practitioner education. J. Nurs. Educ., 52: 291-293.

Subiyanto, 1990. [Teaching and Learning Strategy of Natural Science]. State University of Malang, Malang, Indonesia, (In Indonesia).

Walberg, H.J., 1988. 14 Creativity and Talent as Learning. In: The Nature of Creativity: Contemporary Psychological Perspectives, Sternberg, R. (Ed.). Cambridge University Press, Cambridge, England, ISBN:978-0-521-338929, pp: 340-361.

Wilson, K., S.E. Copeland and D.N. Guthrie, 2016. A preliminary study on the use of mind mapping as a visual-learning strategy in general education science classes for arabic speakers in the united arab emirates. J. Scholarship Teach. Learn., 16: 31-52.