The Influence Of Implementation Brain-Friendly Learning Through The Whole Brain Teaching To Students' Response and Creative Character In Learning Mathematics

Winarso, Widodo and Karimah, Siti Asri

IAIN Syekh Nurjati Cirebon, Indonesia, IAIN Syekh Nurjati Cirebon, Indonesia

6 May 2017

THE INFLUENCE OF IMPLEMENTATION BRAIN-FRIENDLY LEARNING THROUGH THE WHOLE BRAIN TEACHING TO STUDENTS' RESPONSE AND CREATIVE CHARACTER IN LEARNING MATHEMATICS

Widodo Winarso, Siti Asri Karimah

Department of Mathematics Education, Faculty of Education and Teaching
IAIN Syekh Nurjati Cirebon, Indonesia

e-mail: widodoiain@gmail.com

ABSTRACT: This study aims to determine whether the application of brain-friendly learning through whole brain teaching gives a positive effect on the creative character of students, to know the response of the students against the application of brain-friendly learning through whole brain teaching, and to find out if the student response against the application of brain-friendly learning through whole brain teaching correlates positively with the creative character of students in learning mathematics. The research method used that is quantitative. The instruments used, namely the now student response related application of brain-friendly learning through whole brain teaching, and sheets of observation about the creativity of students in learning mathematics after implementing this method. The correlation analysis with the results of the study showed that the value of the larger significance of the alpha values (5%) which means accepting and rejecting H0 Ha which means student response against the application of brain-friendly learning through whole brain teaching not correlated positively with the creative character of students in learning mathematics. The average student response score against this method is found on very good i.e. amounted to 85%. As for the observations of the creative character of the students, after this method is applied, the average score of 68% is found quite creative.

Keywords: Brain-friendly learning, Whole Brain Teaching, Response, Creative Character

National education serves to develop the ability and character development and civilization is aimed at developing students' potentials to become a man of faith and devoted to God Almighty, noble, healthy, knowledgeable, skilled, creative, independent, and became aware of democratic state and responsible. In essence teaching does not just deliver learning material, but interpreted also as a process of formation of character, which means that schools are not only responsible for making the students become just smart, but also must take responsibility to empower themselves in order to have moral values that can be applied in everyday life as capital to build creativity and innovation. Therefore, the effort to develop the creativity of learners should be a part that should not be separated from each of the learning objectives, in addition, to equipping students with creativity, means have been giving them a tool that will certainly be required for the provision of live and thrive not only in the present but a useful tool to support their life in the future.

So the most important definition of creativity that the intent is not to say a new discovery that has never existed or were not known before, but creativity in question is a new product for themselves which do not have to be something new for others. Be aware that cognition with emotion even though they are in a different brain area, but they have a strong bond of mutual influence, it can be proved at the sight of the emotional side of the learners,

emotional situations will trigger students to be active and passive.

Creativity is closely associated with the cognitive development of the individual as creativity is a manifestation of the work of the brain. To support creative behavior in mathematics, not only the knowledge students need to be trained, but the attitude aspect must be given treatment that can help students to bring personal creative. Learning math is friendly; it is a renewal in the study of mathematics, namely the implementation of brain-friendly learning through the whole brain teaching.

Creative characters need to be owned by learners. The character is fundamental to foster creative ideas, new concepts, and divergent thinking, so prolific in academic (Arends, 2009; Papalia & Bertarelli, 2008; Nolan, 2004; in Meintjes & Groser, 2010). McWilliam & Dawson (2008) argued that the creative code includes the ability to solve the problem to find a solution, implement and foster new ideas.

Through these characters, is expected to have the ability to think creatively. Creative thinking serves to foster original ideas, raise the curiosity, increase flexibility, and improve the ability to identify relationships between concepts or ideas that can design a learning program (Lombard, and Grosser, 2008; in Meintjes, H. & Groser, M., 2010). Anderson, Krathwohl & Bloom (2001) argues that creative thinking is a synthesis of elements or reorganize elements into a new pattern, a new structure, new or functional coherence which is a combination of generalization, planning, and productivity. Craft, A. (2010) states that creative thinking consists of two levels, namely: (1) a high level of creative thinking, and (2) low-level creative thinking. High level of creative thinking with regard to something new and unusual that can be transformed into a variety of things significantly.

While Nolan (2004) found that creative is divided into two, namely: (1) creative behavior (behavioral characteristics, such as attitudes and dispositions that support the process of creative thinking) and (2) creative action (physical action in any work). According to Shi's (Meintjes, H. & Groser, M., 2010) creative behavior is the result of mutual interaction between the creative thinking, creative actions, and creative habits. Creative behavior is influenced by (1) contextual factors (education, social environment, family environment, economic conditions and physical); and (2) individual factors (personality, intelligence, knowledge, and experience). Creativity is part of the psychology and may be described from three perspectives, namely: humanistic, existential, and psychology. According to Goleman, Kaufman & Ray (1992) creativity include certain correctness, usefulness, valuable, meaningful, flexible, and open to new possibilities. Creativity is the foundation for developing scientific thinking (Innamorato, 1998), and is required by every teacher educators, particularly in mathematics (Meintjes, & Groser, 2010; Magno, 2011).

Results of research conducted Magnesen (1983) that the human brain more quickly capture the information derived from the modalities of visual motion, which reads only a contribution of 20%, to hear 30%, seeing 40%, say 50%, at 60%, but see, say and do provide a contribution of 90%. Therefore, the need for a reform in the learning activities, where the presence of this update, expected to make the learning process that is readily accepted by every learner, activities that make the learner at the center of the learning process, as well as the creation of atmosphere of the class enjoyable and capable develop interest in creativity.

The results of preliminary observations and interviews on one of the State Junior High School in Indonesian shows the learning process of mathematics in the classroom at least have started oriented to the learning process that invites students to participate actively and creatively, it's just that the methods used are revenues less evenly distributed in terms of treatment given that not all students can receive and be actively involved in it because of the way or method used comes from the instruction that was adopted from a minor penalty, which is the beginning of the learning of all students instructed to stand and teachers will provide questions/problems, and for students who are able to answer the exact question, the students are allowed to sit back, different learning styles of every student is also one of the causes inhibition of the learning process is slow.

To support it, an educator must make a learning process that is able to optimize the function of the entire brain learners, and learn based on the natural workings of the brain, because in essence the human brain is divided into three main parts, namely: the neocortex, limbic system, and reptiles.

While the whole brain teaching will facilitate the work of the brain caused by the learning is not fragmented. Educator's class setting with the right, which is able to foster a sense of safety, comfort, and a sense of enthusiasm in accepting the material/lesson, learning that such a brain-friendly learning or often referred to as brain-friendly.

Learning-friendly brains through whole brain teaching selected researchers as an alternative solution to address the statements that have been described above, the learning brain-friendly through the whole brain teaching is teaching instructional by optimizing the overall function of the brain where educators with the ability to use methods of creative and expected to develop the innovative creativity of their students and make the learning activities that can form the intelligence that refers to the brain development of students as a whole and develop a sense of safety, comfort, affection, acceptance, enthusiasm in receiving the material and can improve students' attention and concentration.

In this method there is a movement which is a movement of symbolic meaning, which has a positive meaning and beneficial to help students understand what is learned, through this teaching in addition to optimizing the performance of the brain, also increase the active participation of students during the learning process, as well as increase the student's motivation and the ability of learners to communicate and enhance creativity.

Based on the mapping of the above problems, the focus of this research is on improving the response and character of students in the application of brain-friendly learning through the whole brain teaching. The research questions are as follows:

1. Does the application of brain-friendly learning through the whole brain teaching a positive effect on the creative character of students in the learning of mathematics?
2. How is the response of students to the application of brain-friendly learning through the whole brain teaching in the learning of mathematics?
3. Is the students' response to the application of brain-friendly learning through the whole brain teaching positively correlated with the creative character of students in the learning of mathematics?

METHOD

This research was conducted at Junior High School 4 Palimanan, Cirebon, West Java-Indonesia, with a time of execution of the research is estimated to be approximately six months starting from January to April 2016. The research used quantitative approach. This study used one group posttest-only design (Fraenkel, Wallen, & Hyun, 1993).

In the collection of data, this research uses techniques of active participatory observation (Spradley, 2016). In addition, this study used Likert Scale question form (Brown, 2000). The instruments aimed at obtaining data about the responses of learners against the application of brain-friendly learning through whole brain teaching in the learning process.

The analysis technique used in this research is quantitative analysis (Miles & Huberman, 1994). We used t-test to answer the formulation problem in measuring creative character data of students in mathematics (Mielke, 1984). Descriptive analysis was used to explain the distribution of data from questionnaires concerning the application of brain-friendly learning through whole brain teaching. To correlate the application of brain-friendly learning through the whole brain teaching with creative character of students in the learning of mathematics, we used product moment correlation (Mendenhall, Sincich & Boudreau, 1996)

RESULTS AND DISCUSSION

Learning-friendly brains through whole brain teaching is a learning method that is instructional, combined with the methods of cooperative learning, and aims to optimize the workings of the brain (the right brain and left brain) as well as function during the learning

process (Biffle, 2013; Bergen, & Coscia, 2001; Johnson & Johnson, 1994).

Brain-friendly learning through the whole brain teaching main characteristic of these is composed of three parts. The third part consists of visual learning, verbal, and kinesthetic (gesture) which educators with the ability use creative methods and expected to develop the innovative creativity of learners. In addition, teachers can create learning activities that can form the intelligence and refers to the brain development of students as a whole, creates a sense of safety, comfort, compassion, and acceptance during the learning process, a sense of enthusiasm in accepting the material/subject and can improve attention and concentration of students during learning activities take place (Tri, Dafik, & Susanto, 2013).

Learning-friendly brains through whole brain teaching has seven elements, namely "class-yes", "teach-ok", "switch-ok", "mirror-ok", "five classroom rules", "scoreboard ","hands and eyes" (Kagan, 2014; Willis, 2008; Sousa, 2009). As for knowing how big the students' response to the application of brain-friendly learning through the whole brain teaching, the authors used questionnaires which totaled 25 statement items relating to the method.

A questionnaire distributed consisting of 16 indicators with reference to the concept Biffle and Kagan, as describe:

1. Students feel relaxed and happy on the condition alpha zone through instruction "Class-Yes" in mathematics, i.e. by instruction "Class-Yes" These students are able to bring a sense of relaxed and happy before the learning begins.
2. Students are always ready to accept the learning of mathematics in the conditions of an alpha zone through the five elements of classroom rules, mean that through the five elements of classroom rules, students should be able to always be ready to follow the mathematics learning activities.
3. The teacher always know the initial conditions of students in the learning of mathematics through the instruction "Class-Yes", i.e. by instruction "Class-Yes" teachers also can determine the condition of students and classes in general, so that teachers understand and know what steps should be done with the condition students and classes at that time.
4. Students always get a funny story at the beginning of the learning mathematics through new discoveries teachers, i.e. by a new discovery well during the teacher outside the classroom as well as in the classroom.
5. Students are always motivated in learning mathematics through scoreboard element, i.e. by elements of this scoreboard, the students will always feel motivated to continue to become better and better in following the activities of mathematics learning, by continuing to increase their knowledge and be able to play an active role during the learning takes place.
6. Students always felt confident in mathematics learning through instruction "Teach-Okay" and "Switch-Okay", mean that through directives and Switch Teach-okay-okay, students can train and foster self-confidence in following the teaching of mathematics, students trained to become a tutor/speaker and a good listener.
7. Students can reflect himself with emotions on learning of mathematics through the five elements of classroom rules, mean that five classroom rules through the element's students are able to reflect on what is happening.
8. Students get a lag time to set the rhythm of concentration in mathematics learning through instruction "Hands and Eyes" and the five elements of classroom rules, mean that students always get the lag time to rest and be trained to be able to set the rhythm of concentration.
9. Students can balance the workings of the brain in learning mathematics through music and instruction "mirror", mean that the provision of learning interspersed with music and Brain Gym, students will be able to balance the brain.
10. Students with learning styles (visual) can understand the material easily through the study of mathematics instruction "Mirror", i.e. by the instruction "Mirror" is the student's learning style is more prominent on the visual side.

11. The student's learning style (auditory) can understand the material easily through the study of mathematics instruction "Teach-Okay" and "Switch-Okay", i.e. by instruction "Teach-Okay" and "Switch-Okay", the students can catch and understand mathematics learning materials easily simply through exposure teacher, discussions, and peer tutors.
12. Students with learning styles (kinesthetic) can understand the material easily through the study of mathematics instruction "Mirror", i.e. by the instruction "Mirror", the student's learning style is more prevalent in the kinesthetic, they can catch and understand mathematics learning materials with easily through some materials that the teachers presented in several gestures/movements adapted to the material being studied.
13. Students with complex learning styles (auditory, kinesthetic, visual) can understand the mathematics learning materials easily through the five elements of classroom instruction rules, which means that students with its diversity through the five elements of classroom rules is expected to easily adjust to what was going on around him.
14. Students can maximize the brain by doing Brain Gym through instruction "Mirror", that is to say through the Brain Gym activities and with the instructions mirror each student is able to maximize his brain.
15. Students can strengthen your memory via the instruction "Teach-Okay" and "Switch-Okay", meaning that through directives and switches teach-okay-okay which is an activity describes learning materials; in turn, is expected to help students in strengthening students' memory the material they are studying.
16. Students can release stress during the learning of mathematics through the Brain Gym.

Based on calculations questionnaire regarding respond students to the application of the learning brain-friendly through the whole brain teaching, obtained an average percentage that is in a strong category (good), which means that during the learning process students can receive and play an active role in implementing any syntax of that learning.

Figure 1 shows that the highest percentage found in the indicator number 5 is always motivated students in the learning of mathematics through the element scoreboard with the percentage of 5.9%. The conditions in line with the view that the use of learning evaluation through the scoreboard can identify students' learning activities (Veronesi, 2000). Besides, it is also supported by the view that a more active learning model effect on student motivation (Schunk, Meece &Pintrich, 2012; Atkinson, 1964). While the percentage was lowest for the indicator number 13 indicators that student's learning style can understand the complex mathematics learning materials easily through the instruction "Mirror". This is consistent with the concept of learning styles of students in mathematics (Chinn, 2001). the tendency for students to learn the condition of imitation (Byrne & Russon, 1998; Kash & Parkes, 2010).

It can be interpreted that the brain-friendly learning methods through the whole brain teaching in mathematics have managed to build student motivation during the learning process. The condition looks to enthusiastic students in vying synthesize scoreboard points to fill, such as scrambling to do exercises, homework has been given. Many students in the class of research, no matter what a student really has a complex learning style as expected because on average they only have one more dominant learning style.

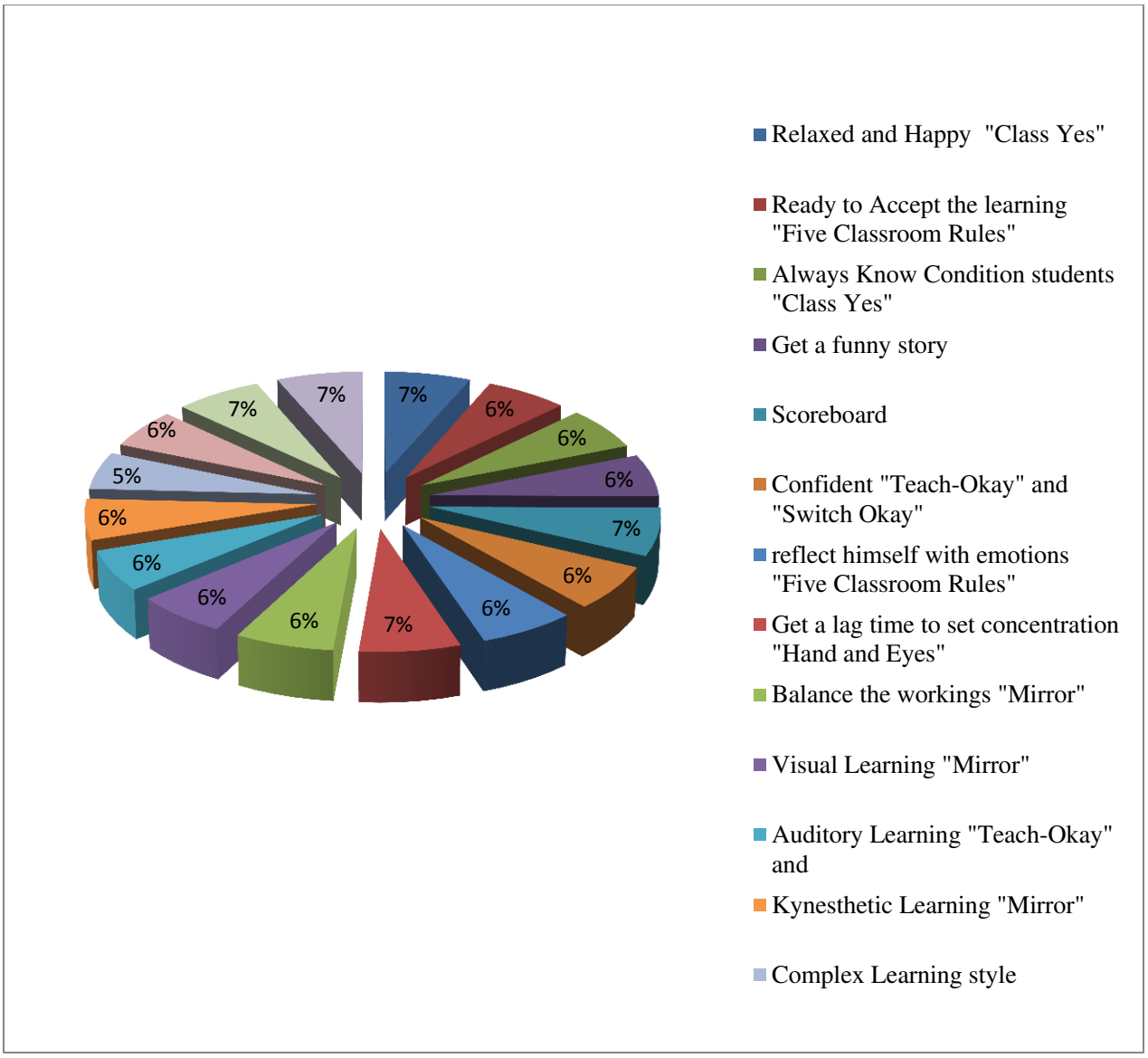

Figure 1. Proportion Indicators of Student Response

Creative Students

Creative students in the learning of mathematics is a collection of values inherent in human nature that underlies the thinking, attitudes, and behavior displayed by human beings are and have the ability to create new combinations based on what already exists in a person with all something which has students from both the formal education, informal, family and community circles.

Studies show that the forms of creativity depend upon individual interests and abilities, opportunities to do what they want to do, and activities that give the greatest satisfaction (Eisenstadt, 1978; Goertzel, Goertzel, & Goertzel, 1978; Simonton, 1999).

Some young adults find a creative outlet in hobbies while others choose vocations in which they can express their creativity. We observed that creativity is encouraged by a receptive as contrasted to a critical attitude toward novel ideas and that creative solutions are likely to occur during the period of relaxed, dispersed attention that during periods of active concentration on a problem.

Guilford (1975) arrived at creativity constructs that are components of creative work. A contemporary view of creativity as intelligence is explained by Sternberg (2006) in theory of successful intelligence. In this theory, creative intelligence comes out when individuals are faced with problems and they assess how well they can cope with relative novelty. This theory explains creativity when individuals experience problems and how they come up with solutions considering each problem is a new task. What consistently sets individuals who successfully engage in the creative process apart from those who are less successful is their dedication, commitment, steadfastness, vigor, and intensify their motivation for creative work.

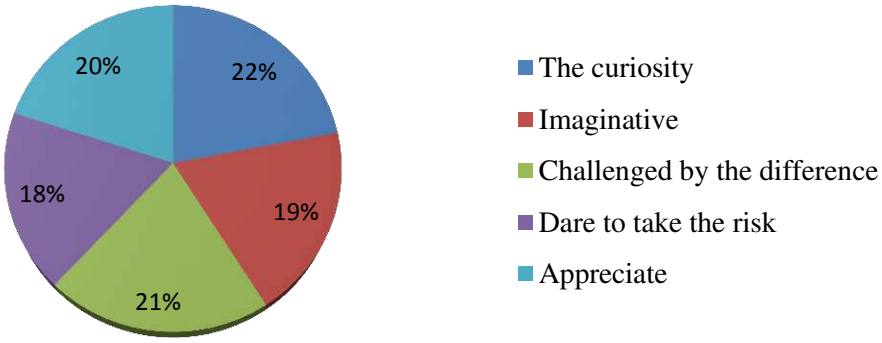

Figure 2. Proportion Indicator Creative Character of Students

We observed that the creative character of the students after the implementation of brain-friendly learning through the whole brain teaching. Creative character of students in the learning of mathematics categorized quite creative. In addition, the results of observations also show that the highest in the dimension percentage curiosity of students towards learning mathematics with a percentage of 22% and the lowest for the dimension presented attitudes of students in taking risks in mathematics that is equal to 18%. It can be interpreted that the actual students are able to bring a sense of enthusiasm and interest in learning mathematics. But most of them still do not dare to take the risk, as is the case when they gave an answer that is not necessarily true, there is still fear of failure or criticism from others, is still in doubt because of vagueness or less unstructured.

Figure 2 shows that the highest percentage contained in the dimensions of curiosity, it is in line with previous research has been done by Stiyowati (2014), where the research results mention that the use of methods *of whole brain teaching* has significant effect on student learning activities because students who had been passive and just watching it during the learning process in the classroom as active so the learning activities increased. Albab (2012) found the same result using the same method in teaching physics in junior high school.

The Effect of The Application of Brain-Friendly Learning Through The Whole Brain Teaching

Brain-friendly learning methods through the whole brain teaching were able to change the state of some students to become a little more active in mathematics class. The application of brain-friendly learning through the whole brain teaching had a positive effect on the creative character of students in the learning of mathematics (Table 1).

Table 1. Observations Recapitulation Character Creative Students On Mathematics Learning

Scale Value	Frequency	Category
≥ 92	0	Very Creative
$82 - 92$	6	Creative
$54 - 82$	24	Quite Creative
$40 - 54$	6	Less Creative
≤ 40	0	Not Creative

The students' response to the application of brain-friendly learning through the whole brain teaching was not positively correlated with the creative character of students in the learning of mathematics. It can be seen from the significant value of 0.081 (Table 2). Because the value was higher than 0.05, H_0 is accepted. Therefore, we conclude that there is a positive relationship between students' response to the application of brain-friendly learning through the whole brain teaching with creative character of students in the learning of mathematics. The method is more relevant when applied to support the emotional development of students, as noted by Cherry (2012).

Table 2. Correlations

		Brain-Friendly Learning Through The Whole Brain Teaching	Creative
Brain-Friendly Learning Through The Whole Brain Teaching	Pearson Correlation	1	.295
	Sig. (2-tailed)		.081
	N	36	36
creative	Pearson Correlation	.295	1
	Sig. (2-tailed)	.081	
	N	36	36

CONCLUSION

The application of brain-friendly learning through the whole brain teaching has a positive effect on the creative character of students in the learning of mathematics. This method also has a very positive response. The method is more relevant when applied to support the emotional development of students and correlates positively to the creative character of students in the learning of mathematics.

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