The Effect of Multiple Intelligence-Based Learning Towards Students' Concept Mastery and Interest in Matter

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ABSTRACT This research was focused on investigating the effect of multiple intelligence -based learning as a learning approach towards students' concept mastery and interest in learning matter. The one-group pretest-posttest design was used in this research towards a sample which was according to the suitable situation of the research sample, n = 13 students of the 7th grade in a private school in Bandar Seri Begawan. The students' concept mastery was measured using achievement test and given at the pretest and posttest, meanwhile the students' interest level was measured using a Likert Scale for interest. Based on the analysis of the data, the result shows that the normalized gain was 0.61, which was considered as a medium improvement. in other words, students' concept mastery in matter increased after being taught using multiple intelligence-based learning. The Likert scale of interest shows that most students have a high interest in learning matter after being taught by multiple intelligence-based learning. Therefore, it is concluded that multiple intelligence – based learning helped in improving students' concept mastery and gain students' interest in learning matter.

Keywords Concept Mastery, Interest, Matter, Multiple Intelligence Based Learning

1. INTRODUCTION

Every child is unique in their own way, this uniqueness depends on their intelligences which is defined as a basic aptitude for learning, or it is the ability to gain and apply knowledge or skills. Gardner (1983) emphasizes that each individual has different kinds of intelligences including logical-mathematical, verbal-linguistic, musical-rythmic, bodily-kinesthetic, intrapersonal, interpersonal-social and naturalist intelligence, which individuals used in order to understand concepts, solve problems and create products (Hanafin, 2014). In facing these facts, multiple intelligence-based learning plays an important role as an educational approach which considers mostly to the uniqueness in every individual as learners. In which an educator provides several learning activities based on the students' present intelligences. According to previous studies, Armstrong (1994) states that the Multiple Intelligence Theory to be applied in classrooms was concerned with teaching to, for and through intelligences (Tek and Peng 2006).

Aikenhead (2006) stated that nowadays children's interest in learning science is declining; therefore students become disconnected with their world and lost their interest in learning science. As students grow, their interest in science is decreased. Even there are students with a strong interest in learning science, but it is found that their interest is declining because there are school subjects which are more interesting. Therefore, the new challenge for science teachers is to increase students' learning interest, because students would not be able to learn science effectively without being interested (Osborne, Simon and Collins, 2003). Interest is an essential predictor for secondary course options and therefore become an assumption for further research on science not only as a career choice but also an advice for young generations' decision making in this technologically controlled era (Maltese and Tai, 2011). According to the above explanation, it is shown that students' interest plays an important role in order for students to have an effective learning in science. The lack of interest might bring another problem such as low learning motivation and also achievement which can even cause a bigger problem in the educational world nowadays.

In chemistry, matter is one of the very basic chapter and most of chemisty topics are related to matter. From the definition itself, matter is anything which occupies space

and has mass. Most matter are extremely small and unseen by a human naked eye, therefore it makes chemistry as one of the difficult subject for students. Chemistry curricula integrates many abstact concepts, which became the central for chemistry and other sciences (Taber, 2002). Meanwhile these intangible concepts are essential in order for students to understand further chemistry or other sciences concepts, students understood little about the particulate nature of matter or about chemical phenomena in their everyday lives. However, the difficulty of a topic, as perceived by students, will be a major factor in their ability and willingness to learn it (Sirhan, 2007). In this study, the concepts of matter which includes states of matter, diffusion and elements, compounds and mixtures became the topic which was taught using multiple intelligence-based learning. Based on the above explanation, it is understood that interest has a huge impact on students achievement in students who has different intelligences inside them. Therefore, this research was aimed to investigate the effect of multiple intelligence-based learning towards students' concept mastery and interest in matter.

2. METHOD

The research method applied in this research was the weak experimental method or usually known as pre-experimental research. It is a type of research design which involves a within-group or within-individual procedure in which a single group or single individuals are studied (Creswell, 2008). The research design which was used in this research was one-group pretest and posttest design where only one group of sample were treated using multiple intelligence-based learning in between the pretest and post-test.

This research was conducted in a private school in Bandar Seri Begawan, Brunei Darussalam which implements a combination of Brunei SPN 21 Curriculum and Cambridge International Curriculum. The population of this research was 13 students of Grade 7 students in the school described above. During the implementation of multiple-intelligence-based learning, students were grouped according to their strongest intelligence based on

the result of a preliminary research. Then students were provided with multiple-intelligence based learning activities which were selected and planned making it the most suitable with the classroom condition and sub topics.

In this research, the concept of Matter is limited according to Brunei SPN 21 Curriculum which includes the following subtopics: Matter around us, states of matter, diffusion and elements, compounds and mixtures. Matter in this research is defined as anything which occupies space and has mass. There are three states of matter which are solid, liquid and gas, and each of them has its own characteristics and properties. Matter also moves, and their movement is called as diffusion. Diffusion can happen in solid, liquid and gas. Finally, matter is then further classified into elements, compounds and mixtures. An element is made up of only substance which cannot be broken down into simpler substances, compound is made up of two elements which cannot be broken down or separated by physical means and mixture is also made up of two or more elements which can be separated by physical means.

There were three instruments used in this research. The observation sheet is an instrument for the observers to make sure whether the activities implemented are in line as planned which consists of the planned activities with their time allocations. In this research the observation sheet was judged by experts which are our lecturers. The achievement test is the instrument which was used to measure the students' concept mastery before and after the treatment was given, it consists of 25 multiple choice questions which were also tested for its validity, reliability and homogeneity. The third instrument is an interest Likert scale adopted from Glynn and Koballa (2006) which consists of statements of interest and enjoying the lesson and their response towards the lesson after being taught using multiple intelligence-based learning. In the Likert scale of interest, students interest are measured from 1-10 which means that the higher the number, the higher interest the student is. The score of interest is then summed up and converted into percentage. 0%-20% categorized as student has no interest or very low interest, 21% - 40% is

Table 1 Multiple intelligence-based activities

No	Concept	Intelligence/ Activity			
		Visual-Spatial	**Logical-Mathematical**	**Interpersonal**	**Verbal- Linguistic**
1.	a. Matter around us b. States of matter : Solid, liquid and gas	Mind mapping	Learning scientific models	Group work	Listening to teacher's instructions and explanation
2.	The movement of matter particles	Looking at teacher's demonstration Card Game	Simple experiments on diffusion in liquid	Group Discussion.	Watching a video.
3.	The classification of matter	Cross-word puzzle game.	Predicting and classifying.	Sharing.	Presentation.

Table 2 Statistical data of achievement test

Component	Pretest	Posttest
N	13	13
Average Score	48.31	80.00
Standard Deviation	14.56	9.24
Highest Score	76	96
Lowest Score	24	68
G = 31.69		
$<g>$ = 0.61		
Category = Medium		
Shapiro-Wilk Normality Test		
Signification (sig.α =0.05)	0.962	0.385
Conclusion	Normally Distributed	Normally Distributed
Homogeneity Test		
Signification (sig.α =0.05)	0.147	
Conclusion	Homogenous	
Paired T-Test		
Signification (sig.α =0.05)	(Asymp sig (*2-tailes*) <0.05, H_1 = Rejected) 0.000	
Conclusion	H_0 rejected, H_1 accepted, there is significant difference	

categorized as low interest, 41% - 60% is categorized as medium interest, 61% - 80% is categorized as high interest and 81% - 100% is considered as very high interest. In this study, the interest score of each student was calculated and categorized.

3. RESULT AND DISCUSSION

The pretest and post-test were conducted to determine whether there is any increase or decrease of students' concept mastery after the treatment, then the interest scale was also distributed to see whether the students' learning interest in matter increase or decrease after the treatment. The result of the students' achievement test and interest scale were analyzed and further explain in the following:

3.1 Multiple Intelligence-Based Learning

During the implementation of this research, students were taught using multiple intelligence based activities which were considered unusual to them. The activities were planned according to the four intelligences which include logical-mathematical intelligence, verbal-linguistic intelligence, visual-spatial intelligence and interpersonal intelligence adopted from Gardner's Multiple Intelligence Activities and has been approved by expert includes the lecturers and the science teacher. The implementation of multiple intelligence-based learning was conducted for three meetings where in each meeting students were facilitated with multiple intelligence-based activities in learning matter. In this study, the topic which was taught

to the students using multiple intelligence-based learning was the concepts of matter which includes matter around us, the three states of matter, diffusion and elements, compounds and mixtures. For visual-spatial intelligence, students were provided with activities of mind mapping, demonstration, card game and crossword puzzle. For logical-mathematical intelligence, students are provided with scientific models, doing experiment on diffusion and predicting and classifying elements, compounds and mixtures. Interpersonal intelligence was triggered using group work, discussion and sharing session. Finally, verbal linguistic intelligence was triggered through listening, watching video and presentation. The recapitulation of the multiple intelligence-based activities which were implemented during this study is summarized in Table 1.

3.2 Students' Concept Mastery

Before the questions for the achievement test was conducted, the validity and reliability of the question items have been tested. The result shows that most of the questions are valid with range very low to very high validity; meanwhile the reliability value was 0.86 which is categorized as very high reliability level. After the pretest and posttest results were analyzed, it was calculated that the average score of the pretest is 48.31 and the average score of the post-test is 80.00, therefore resulted a normalized gain value $<g>$ is 0.61, categorized as medium. So it is said that there is a medium increase in students' concept master after learning using multiple intelligence-based learning. Based on the statistical result which will be shown in the Table 2, it shows that the normality test of this data was done using the Shapiro-Wilk which results the sig value is more than 0.05 for both pre-test and post-test which means that the data is considered as normal. The sig value of the homogeneity test is 0.147 which means that the data is homogeneous. Finally, in order to conclude whether the hypotheses of this research is rejected or accepted, a paired T-Test was done which results to have the value of 0.000, therefore we can say that H0 is rejected and H1 is accepted. In other words, the hypotheses that multiple intelligence

Table 3 Recapitulation of Students' Interest Level

No	Code	Interest Score (%)	Interest Level
1	Student 1	94	Very High
2	Student 2	80	Very High
3	Student 3	72	High
4	Student 4	74	High
5	Student 5	76	High
6	Student 6	86	Very High
7	Student 7	82	Very High
8	Student 8	92	Very High
9	Student 9	84	Very High
10	Student 10	50	Medium
11	Student 11	46	Medium
12	Student 12	68	High
13	Student 13	78	High

based learning has a significant effect towards students' concept mastery and interest in learning matter. According to the above statements, it can be said that multiple intelligence – based learning has a significant effect towards students' concept mastery in learning matter.

3.3 Students' Interest Level

From the students' interest Likert scale as reported in Table 3, it was found that 46% of students were categorized as having very high interest, 38% are having a high interest and the remaining 16% are found to be categorized as having a medium interest in learning matter after learning using multiple intelligence-based learning. In other words, multiple intelligence-based learning has brought interest to students in learning matter.

4. C ONCLUSION

Since it was found that students' concept mastery have increased after learning using multiple intelligence based learning and students' were found to have medium to very high interest in learning matter, it can be concluded that multiple intelligence-based learning has a significant effect to both students' concept mastery and interest in learning matter.

The implementation of multiple intelligence-based learning was done systematically as planned referring to the lesson plans which have been approved by the experts.

Students' concept mastery increased after being taught using multiple-intelligence based learning, referring to the result of their pretest and posttest scores in matter concepts.

Multiple intelligence-based learning draws students' interest in learning matter proven by the result of the Likert scale of interest which shows that most students have a high interest in learning matter after being taught using multiple intelligence-based learning.

REFERENCES

Aikenhead, G. (2006). Towards Decolonizing the Pan-Canadian Science Framework. *Canadian Journal of Science, Mathematics and Technology Education*, Vol 6, pp 387-399.

Armstrong, T. (1994). *Multiple Intelligences in The Classroom*. Alexandria: VA:ASCD.

Cresswell, J. W. (2012). *Educational Research: Planning, Conducting and Evaluationg Quantitative and Qualitative Research*. Boston: Edward Brothers.

Gardner, H. (1993). *Frames of mind: The Theory of Multiple Iintelligences*. London: Fontana Press.

Glynn, S. M., & Koballa, T. J. (2006). *Motivation to Learn College Science: A Handbook of College Science Teaching*. Arlington VA: National Science Teachers Press.

Hanafin, J. (2014). Multiple Intelligence Theory, Action, Research and Teacher Proffesional Development: The Irish MI Project. *Australian Journal of Teacher Education*, Vol 39 (4), pp 126-139.

Maltese, A. V., & Tai, R. H. (2011). *Pipeline Persistence: Examining the Association of Educational Experiences with Earned Degrees in STEM among US Students*. Bloomington: Willey periodicals Inc.

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: a review of the literature and its implications. *International Journal od Science Education*, Vol 25, pp 1049-1079.

Sirhan, G. (2007). Learning Difficulties in Chemistry: an overview. *Journal of Turkish science Education*.

Taber, K. (2002). *Chemical Misconception- Prevention, Diagnosis and Cure*. London: Royal Scociety of Chemistry.

Tek, O. E., & Peng, Y. K. (2006). The Theory of Multiple Intelligence and its Application in Science Classroom. *Seameo Recsam*, pp 1-6.