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Multifaceted Presentation Oriented-Instruction (MPOI): Effects on Students' Concept Learning, Achievement, and Attitude towards Chemistry

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Abstract. Considering multiple intelligences (MI) in the teaching-learning process may provide relevant opportunities for the students. The study investigated the effects of Multifaceted Presentation Oriented-Instruction (MPOI), an MI based teaching strategy on the students' concept learning, achievement, and attitude towards Chemistry. Experimental method was employed and both quantitative and qualitative data were gathered. These were analyzed using t-test and Pearson product-moment correlation. Students from third year sections of MSU-Integrated Laboratory School, Marawi City served as the respondents of the study. Different dominant intelligences were observed among the respondents such as visual (28%), verbal (24%), interpersonal (24%), musical (16%) and logical (8%). Pretest mean scores on the concept learning, achievement, and the attitude of the control and experimental groups were statistically not significant at α=.05; thus, indicating that the two groups were comparable. Whereas, the mean gain scores on the concept learning and achievement as well as attitude rating scores of both groups were statistically significant at α=.05. Moreover, it was found out that there was a significant positive relationship between the students' attitude and their achievement towards Chemistry. Finally, the students perceived MPOI as effort-requiring activity but challenging. Students under MPOI performed better in concept learning and achievement test. Further, they acquired good attitude towards Chemistry.

Keywords: multiple intelligences, individual differences, teaching strategy

Introduction

When children are given the opportunity to use their stronger intelligences and when they have fun doing so, they become much more engaged in the learning process. Thus, we all learn from one another… -Meyer

One of the most challenging tasks continually confronting Science educators and teachers is how to accommodate and stimulate the students' interests and their imaginations in the teaching pedagogy so that motivation is augmented. As it goes, learners' motivation is a stepping stone to stimulate the other domains of students' capabilities. Although academic achievement is anchored according to one's intellectual ability and readiness to learn, the personal attitudinal factors can be a good influence.

Witty (1961) stated that there is a direct relationship between the subjects the students like best and those wherein they receive higher grades. This claim is supported by Padura (1984) who asserted that negative attitudes and mismatched learning styles of the students towards the subject have led to poor performance of secondary school students. Besides, Chemistry, one of the Science subjects taught in secondary schools is perceived as inherently difficult which makes it uninteresting to students (Hambre, 1995). Others believe that Chemistry is facetious and unreasonable as presented by Sildreman (1986) at the 9th Northeast Regional Meeting of the American Chemical Society. Consequently, students' good performance in Chemistry may not be expected. This can be manifested by the lower results in performance as claimed by different researchers during their assessments.

The researcher, herself, has the apprehension that many scientific concepts are abstract, invisible in the real world, and difficult to grasp. Qualitative reasoning about these concepts poses a serious challenge in Science education in addition to sustain if not enhance the immediate science-is-fun impact on the students' interest. As Fr. J. Galdon (1995) puts it, "learning begins in wonder, or it does not begin at all". Along this line of thought, the researcher's six-year teaching experience entails that anchoring the teaching approach to constructivist theory and multiple intelligences theory may build the learning process not only realistic and experiential but also alleviate the chemophobic attitude of students through enjoyable learning environment. In the course of her teaching stint, she observed that exposing her students to this type of instruction had given them an extensive opportunity to use their multiple intelligences. Subsequently, the students showed a positive attitude towards the subject. Moreover, their grades seemed to increase compared to the previous grading using the traditional type of instruction. This teaching-learning process tried out, however was not documented. Owing to this experience, the researcher coined the teaching strategy, Multifaceted Presentation Oriented-Instruction (MPOI).

This study aimed to investigate the effects of MPOI on the students' concept learning, achievement, and attitude towards Chemistry. Specifically, it intended to answer the following questions:

1. What is the Multiple Intelligences profile of the respondents exposed to Multifaceted Presentation Oriented-Instruction (MPOI)?
2. Is there a significant difference between the concept learning pretest mean scores of the students in the experimental and control groups?

3. Is there a significant difference between the concept learning mean gain scores of the students in the experimental and control groups?
4. Is there a significant difference between the achievement pretest mean scores of the students in the experimental and the control groups?
5. Is there a significant difference between the achievement mean gain scores of the students in the experimental and the control groups?
6. Is there a significant difference between the experimental and the control groups in terms of attitude of the students towards Chemistry before and after the intervention?
7. Is there a significant relationship between the attitude towards Chemistry and the achievement of the students?
8. What are the perceptions of the students in the experimental group on the use of Multifaceted Presentation Oriented-Instruction (MPOI) in the Class?
9. What are the implications of the results of the study on Science education?

Research Methodology

The study employed experimental research design specifically Matching-Only Pretest-Posttest Control Group Design. Further, both qualitative and quantitative research methods were used. The quantitative part of the study focused on determining the students' pretest-posttest mean gain scores in the teacher-made achievement test and concept learning test on selected topics on Nuclear Chemistry and Organic Chemistry, and the attitude rating scores of the students and the relationship between the independent and dependent variables. The students' logs and interview responses to the questions asked on the problems encountered during the intervention and their reactions on the instruction together with the researcher's observation and teachers' journal constituted the qualitative aspect. Data were then analyzed using t-test, Pearson product-moment correlation, and triangulation method. All questionnaires were either developed and pilot tested by the researcher or adapted from experts.

Third year sections B and C of Mindanao State University-Integrated Laboratory School-High School Department for the School Year 2009-2010 were chosen as the respondents of this study. Since these were two intact classes, the students were matched based on their general average in Chemistry from first to third grading period and their Intelligence Quotient (IQ) results. With this, fifty (50) of the students were taken to constitute the study samples. Through tossing a coin, one class was assigned to control group and the other to experimental group.

Results and Discussion

a. Multiple Intelligences of Students in Experimental Group

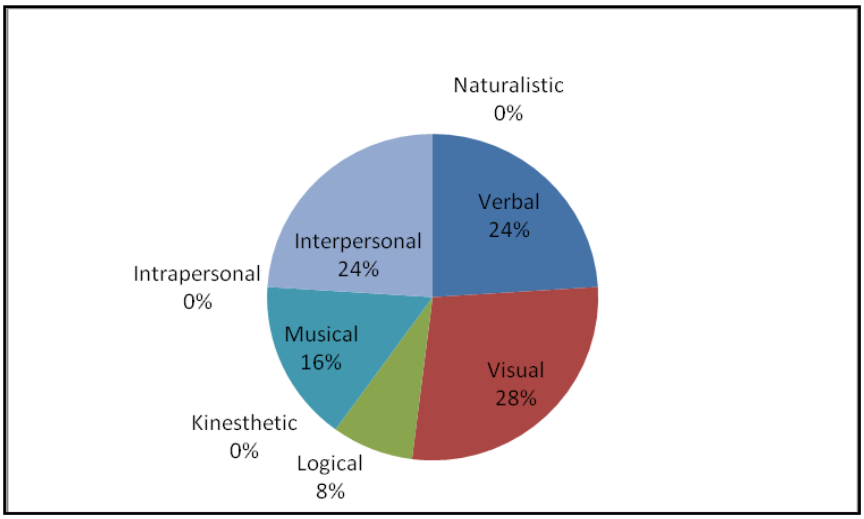

Figure 1 Multiple Intelligences of Respondents in the Experimental Group

The five facets of intelligences as categorized by Gardner namely visual, verbal, interpersonal, musical and logical have been manifested by the students in the experimental group. As shown, most of the respondents acquired the visual intelligence. Probably, they may find the delivery of instruction effective with the use of visual aids such as concrete objects, pictures, etc. used by the teacher during instruction. Students on the other hand may have used it in their outputs as expression of their learning. This is in conformation with the old adage that learning mostly takes part through "seeing". Moreover, experience tells us that the first sense that is used in knowing things is the sense of sight. On the other hand, the second most possessed intelligence among the respondents was verbal. Doubtlessly, even in time of the eminence of traditional teaching, learning could be manifested through vocal mode. Teachers usually mark their students good if they are good in verbal discourse. Though, the students can grasp and convey ideas orally, the long term learning in this manner cannot be assured in as much as retention may not be at high when inspite of expertise in verbals, no accompanied internalization of those is being made.

Parallel to verbal intelligence, interpersonal facet was also observed among the respondents. This may imply that the students may learn cooperatively. As the students could work by groups while doing the task, they might tend to learn from each other. Since students were observed to socialize more, learning through collaborative work may have been timely used.

Musical and logical intelligences were also identified in the group. However, the percentage was minimal particularly in the logical intelligence. It may be inferred that the chalk-talk approach of teaching which is commonly used may not have developed the use of logical ability among the majority of the respondents. It may have catered only to few students, while others may have been left behind. In terms of musical ability, some students possessed this

intelligence, may it be inherent or acquired. In fact, outside school, some students have been observed to have passion for music especially nowadays that music rocks the streets and almost in all houses. Perhaps, the integration of music in the teaching approach may boost learning.

Nonetheless, kinesthetic, intrapersonal and naturalistic intellligences were not observed in the group of the students. This is not to say that they did not have these abilities completely, but these may have been dominated by other types of intelligences as revealed by the MI test results. It can be inferred that the intelligences aforementioned may be the strengths of the students. Accordingly, the teacher may strike and even to the point of developing those intelligences to deliver the instruction effectively.

b. Students' Concept Learning

Table 1 shows that the pre-test mean scores p-value (.724) is greater than 0.05 level of significance. Hence, the null hypothesis stating there is no significant difference between the concept learning of the two groups prior to the intervention is accepted. This may imply that the two groups were comparable and that the matching method was done properly.

On the other hand, the p-value (.000) for the post-test mean gain scores is less than 0.05 level of significance. Thus, the null hypothesis stating that there is no significant difference between the concept learning of the two groups after the intervention is rejected. Accordingly, this may indicate that the students under MPOI performed better in concept learning than those in the traditional type of teaching.

Table 1
t-test on Concept Learning

	Test-statistics	**p-value**	**Decision**
Pre-test mean scores	.355	*.724	Not significant
Post-test mean gain scores	7.585/	**.000	Significant

*not significant at α= 0.05, **significant at α= 0.05

c. **Students' Achievement**

Table 2
t-test on Achievement

	Test-statistics	**p-value**	**Decision**
Pre-test mean scores	.101	*.920	Not significant
Post-test mean gain scores	4.302	**.000	Significant

*not significant at α= 0.05, **significant at α= 0.05

Table 2 expresses that the p-value (.920) for the pre-test mean scores is greater than 0.05 level of significance. Thus, the null hypothesis stating that there is no significant difference between the achievements of the two groups prior to the

intervention is accepted. This may suggest that the two groups were comparable. On the other hand, the p-value (.000) for the post-test mean gain scores is less than 0.05 level of significance. Hence, the null hypothesis stating there is no significant difference between the achievements of the two groups is rejected. This may entail that students under MPOI had better achievement than students in the control group.

d. Students' Attitude Towards Chemistry

As revealed in Table 3, the p-value (.432) for the rating scores before the intervention is greater than 0.05 level of significance. Meaning, the null hypothesis stating that there is no significant difference between the attitudes of the two groups prior to the intervention is accepted. It denotes that the two groups were comparable in terms of attitude before the intervention. Whereas, the p-value (.000) for the rating scores after the intervention is less than 0.05 level of significance. Thus, the null hypothesis stating that there is no significant difference between the attitudes of the two groups after the intervention is rejected. It can be inferred that students under MPOI had acquired better attitude than those from the control group.

Table 3
t-test on Attitude Rating Scores

	Test-statistics	**p-value**	**Decision**
Rating Scores before intervention	-.792	*.432	Not significant
Rating Scores after intervention	9.536	**.000	Significant

*not significant at α= 0.05, **significant at α= 0.05

e. Relationship between Students' Achievement and Attitude

Table 4 indicates the relationship between the students' achievement and attitude. As shown in the table, the p-value (.000) is less than 0.05 level of significance; meaning, the null hypothesis stating that there is no significant relationship between the students' achievement and attitude is rejected. One may surmise that the students' intrinsic levels of motivation through natural talents may have been enhanced by MPOI. As a result, the students were able to construct self-motivating educational experiences that helped promote the concept of flow in the classroom. One may say with confidence that they acquired positive attitude towards the subject.

Table 4
Correlation between Students' Achievement and Attitude

		Achievement	Attitude
Achievement	Pearson correlation	1	.557
	Sig. (2-tailed)		.000
	N	50	50
Attitude	Pearson correlation	.557	1
	Sig. (2-tailed)	*.000	
	N	50	50

*significant at α = 0.05

f. **Perceptions of the Students on the Use of Multifaceted Presentation Oriented Instruction in the Class**

The students in the experimental group perceived that the use of Multifaceted Presentation Oriented-Instruction (MPOI) is an innovative teaching approach where they were able to use their multiple intelligences such as verbal, visual, interpersonal, etc. From this, they considered learning as a challenge for the variety of activities. Further, they gained confidence and positive attitude not only towards the subject matter but also towards their peers/classmates. Subsequently, they have learned to learn.

g. Implications of the Study to Science Education

To go over the main points, MPOI may give the students more diverse learning experiences. Accordingly, the more vigorous their learning environment is, the more ways for them to learn the lessons; thus, better learning output might be anticipated to achieve. Incorporating their different intelligences in the class instruction may turn them into alert, engaged, and active learners. Accordingly, if one finds a student encountering a difficulty grasping an idea, one may tap his intelligence for better concept learning outcomes. Further, MPOI may improve the students' achievement. The strategy provides them to employ their respective intelligences and empower them to translate a difficult learning condition into an opportunity to maneuver from ones strength. Similarly, letting the students to use their multiple intelligences may enable them to gain confidence, interest, and good attitude towards the subject matter. As they get hold of the positive attitude in the class, they tend to exert effort for better learning production.

Likewise, the teachers may find an approach to observe the individual differences of the students by tapping their multiple intelligences. Through this, they may able to help the students to enhance both their cognitive and noncognitive skills. And through the process, the teachers may tend to develop their own noncognitive intelligences while planning for the learning tasks to be presented in the class. In addition, science educators may use MI and gradually shift in their teaching styles, from giving so much emphasis on cognitive

development (with little consideration for the affective development of learners) to recognizing the equal importance of cognitive, affective and psychomotor development of the learners. Having this in mind assures the total education of the learners.

Conclusions

Students exposed in the Multifaceted Presentation Oriented-Instruction (MPOI) performed better in terms of concept learning and achievement than that of students under the direct/traditional teaching. Furthermore, they acquired good attitude towards Chemistry and they learned to learn.

Recommendations

In line with the findings of the study, the following were recommended:

1. The Department of Education (DepEd) in cooperation with the Department of Science and Technology (DOST) is recommended to integrate the multiple intelligences of the students in the curriculum content of the different programs they are implementing in Teachers Training. In due course, modules may be developed and used in the class instruction.
2. The superintendents and supervisors of school divisions are suggested to initiate seminars and workshops for the teachers to integrate multiple intelligences in the teaching strategies and promote learner-centered education.
3. It is recommended that teachers create more opportunities for students to reach and develop their multiple intelligences. That is, they take cognizance of the MI that students possess and incorporate the different MI of the students in their instructional strategies (multiple intelligence based-instructions). Since the pedagogy assimilating this requires time and effort, it is suggested that teachers to be insightful, determined and have a well time-table management.
4. A similar study is recommended for the future researchers using other activities incorporating multiple intelligences and that greater number of variables be considered. Path analysis may be performed other than those used in the data analysis of this study in order to determine the effects of MI on broader perspective.
5. A follow-up study to focus on the critical thinking skills of the students using Multifaceted Instruction Oriented-Instruction.
6. A more extensive study is suggested to be done to compare the results of this study to other fields of Natural Sciences such as Biology and Physics classes.

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Ms. Norolayn K. Said is a faculty member of Mindanao State University-Institute of Science Education (MSU-ISED) since 2004. She is currently pursuing PhD in Science Education major in Chemistry at MSU-Iligan Institute of Technology under DOST scholarship. She finished her MST-General Science degree in MSU-ISED last 2010. Further, she completed BS-BSE Biology (five-year double course under CHED-CITE scholarship) at MSU-Main Campus in 2004 and awarded College Athlete of the Year, College Service, and Magna Cum Laude. She humbly owed those recognitions to her high school alma mater, MSU-Science Training Center-Science High School (presently known as MSU-ISED-SHS), which she believes provided her the determination and hardworking attitude. Ms. Said has been involved in the trainings for teachers conducted by MSU-ISED funded by DOST as well as in the college entrance test review sessions for fourth year high school students organized by some academic groups in Lanao del Sur. Moreover, she actively served as coach of the MSU-ISED-SHS students in the different quiz shows both local and national levels specifically in the Philippine National Chemistry Olympiad (PNCO).