

The Effect of Utilizing Laboratory Teaching Method on the Performance of Grade-10 Students of MSU-Sulu Laboratory High School

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Abstract: To investigate the effectiveness of the laboratory approach of teaching science of grade-10 students of MSU-Sulu Laboratory High School using quasi experimental design and explores further to determine the level of performance and significant difference in pretest and posttest to enhance valuable assessment. Descriptive statistics determines the procedure and strategies of laboratory method to reveal the following conclusion that the teacher in MSU-Sulu Laboratory High School used laboratory method associated with appropriate procedures and strategies that can give very high impact on the performance of the students. Step-by-step demonstration of procedures, make interpretation, explain objectives, jot down observations, motivation of teacher and observed student work are some of the strategies of laboratory teaching method gives outstanding performance and very high impact. Significant difference is observed in pretest and posttest scores that indicates performance of the students grouped according to gender.

Keywords: effectiveness of laboratory approach, quasi-experiment, level of performance, strategies of laboratory method, outstanding performance, very high impact.

1. Introduction

The Advent of the K-12 curriculum has put science teacher into extremely shaky ambiguous situation whether to adjust to the constructivism approach or continue to adopt the old tradition of chalkboard to paper notes teaching process. Many teachers who have major field of specialization in Physics, Chemistry, Integrated Science, and Biology could hardly reconcile their method into the new spiral teaching scheme. The teachers graduated with major in Integrated Science and Biology could hardly teach Physics and Chemistry. This Phenomenon has driven the teachers into dilemma to select appropriate teaching method that can develop cognitive performance of the students. Eventually, the teachers major in Biology and Integrated Science admittedly learned a little mastery integrating the concept of the mathematical equation such as Algebra, Integral and Differential Calculus, Geometry, and Trigonometry in teaching which are essential tools in teaching Physics and Chemistry.

These are some of the problems encountered by the science teachers in MSU-Sulu Laboratory High School. Hence, this researcher has developed the interest to discover and master the Laboratory Teaching Method which are basic in all sciences.

The ultimate aim is to improve the performance of the grade-10 students in MSU-Sulu Laboratory High School. Laboratory method exposed the students to constructivism approach which was the pedagogical standard of the K-12 curriculum. Constructivism approach specially involved students to inquiry approach according to Bell, et. Al, (2007) the inquiry is research-based scientific teaching through experimentation by learners, rather than only traditional class lectures. The content frame work is built on the core concepts upon which science is founded.

Osborne et.al, (2003) opined that the issue of how science is taught to individuals, especially to students, has been more important than it used to be before since the ideas about the nature of scientific knowledge radically changed owing to the work of epistemologists. Therefore, the focus on the nature of science and scientific inquiry in science education reforms of many countries in the world is rapidly increasing.

Knowledge structure is regarded as an important component of understanding in a subject domain, especially in science. The concept is tool, based upon the cognitive psychological theory of constructing meaning, developed by Novak and Gowin (1984) as a convenient and concise representation of the learner's conceptual or propositional framework of a domain-specific knowledge. Concept mapping technique can be used to follow the restructuring and the evolution of the cognitive structure by comparing successive concept maps produced by students at different stage of the teaching learning process of a given topic (Mintzes, et. Al., 1997). Therefore, in the development process of a new science method course about scientific inquiry, we thought that it would be reasonable to use the concept mapping technique for monitoring the changes in students' cognition and also as an assessment device.

Inquiry based learning is curriculum design and a teaching or learning strategy which simultaneously develop high order thinking, disciplinary knowledge bases and practical skill by placing students in the active role of practitioners (or problem-solvers) confronted with a situation (an ill-structure problem) which reflect the real world. The basic characteristic of this learning are that it is context-based using 'real-life' situation focuses on thinking skills, require integration of inter-disciplinary knowledge, is self-directed and develops lifelong

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learning skills and can be applied in small groups. Students are driven by posed real-life problem and become interested in its solution. To solve the problem, they should learn how to: actively integrate knowledge; accumulate and connect skills; and work cooperatively, as the teacher's role is one of support, not direction, it is obvious that this is a student-centered teaching approach (Guohui, 2004).

The concept of laboratory teaching method as a major course of action in this study is the right approach leading to develop the academic cognitive performance in level appropriate to grade-10 students in the rural setting specifically in MSU-Sulu Laboratory High School. Hence, this researcher pattern out the concept in the following related literature.

2. Literature Review

Harty and Al-faleh (1983) conducted a study about the effect of lecture presentation method and the small group's experiments on the Saudi secondary school students' achievement in chemistry and their attitudes to science. The study involved a sample of seventy-four secondary students in Riyadh, the capital of Saudi Arabia. They were divided into control group, taught by lecture-presentation method, and an experimental group, taught by small group experiments. The study showed that there were statistically significant differences between the achievements of both groups; the experimental group score higher than the control group.

Aql (1988) also proposes that the school laboratory has a significant role in accomplishing the cognitional, emotional and psychomotor objectives. To carry out laboratory experiments, the teachers must have the readiness and positive attitude toward laboratory work, and should be able to guide the students and advise them so that they can carry the work successfully.

El-Safy (1988) conducted a study involving (140) students of third intermediate grade, divided equally into control and experimental groups. The study investigated the effect of presentation method versus the experimental method on the students' achievement in chemistry. As the experimental group scored higher than the control group, the study indicated that there were statistically significant difference between the achievements of both groups.

Kok and Brain (1993) in their study compared knowledge cognition and the learning outcomes of the preparatory stage students, who studied science through laboratory investigations, and the students who were taught by the traditional teaching method in the capital city of Singapore. The study showed that there were significant difference in the mean scores of the students who studied science through experiments and those who studied through traditional method. The student taught by using the laboratory experimental method scored higher than the students taught by the traditional method.

Hussein (2001) also invested the effect of laboratory experiments on the send grade secondary students' achievement in chemistry in Abyan Governorate in Yemen. The sample of study consisted of 126 students divided into an experimental groups and a control group. The study showed the experimental group students scored higher than the control group students,

due to the positive effect of laboratory experiments on the student's achievement.

Salameh, (2002) pointed out that planning for the practical lesson is important because it stimulates the students interest. He also emphasized that the teacher should discuss with students the lesson instructions. He should move around in the laboratory monitor the students work and answer their questions.

3. Theoretical and Conceptual Framework

Swiss psychologist Jean Piaget (1960; cited by Aql, 1988), claimed that children construct new knowledge by applying their current knowledge structure to new experience and modifying them accordingly. His perspective, called constructivism, emphasized the active role children play in their own mental growth as inquisitive thinkers. American psychologist Urie Bronfenbrenner (1980, cited by Aql, (1988)) sought to describe child development in terms of ecological and cultural forces. In this model environmental influences on the child extend well beyond the family and peer group, and include school and other community agencies, social institution such as the media, political and economic condition, and national customs.

Laboratory teaching method is a student centered teaching strategy based on learning by doing principles. The students discover the knowledge and perform specific skill to develop critical thinking in solving problem. This method can influence the cognitive ability of the students which can be registered in the long term memory. Laboratory teaching method and its procedures and strategies can affect the cognitive performance in Science in the classroom. Hence, this study treated the laboratory teaching method as the independent variables and the cognitive performance as the dependent variables.

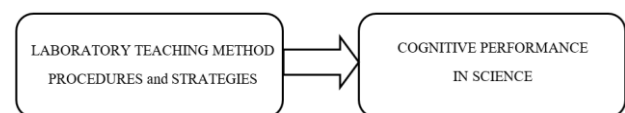


Fig. 1. Conceptual model

4. Methodology

Quasi experimental design involved laboratory teaching method using pretest-posttest. It involved comparisons of the two groups of data (experimental group) treated with laboratory teaching method and the other (control group) treated with usual traditional teaching method in the first and second quarter of the semester at Mindanao State University-Sulu Laboratory High School, Capitol Site, Barangay Bangkal, Patikul, Sulu, 100 grade-10 students were utilized by convenient sampling design.

5. Results

The teacher used laboratory method in terms of procedures and strategies ($\mu=4.28$) that can give high impact on the cognitive performance of the students. Giving instruction ($\mu=4.40$), make final conclusion ($\mu=4.38$), step-by-step demonstration of procedures ($\mu=4.35$), make interpretation

($\mu=4.33$), explain objectives ($\mu=4.33$), jot down observations ($\mu=4.20$), motivation of teacher ($\mu=4.16$) and observed student work (4.04) are some of the strategies of laboratory teaching method that can give high impact on the performance of the grade-10 students in Science. The level of performance of the grade-10 students using laboratory method is satisfactory ($\mu=28.75$) in the pretest score and outstanding ($\mu=33.14$) in the posttest score. The hypothesis is rejected when the performance in the pretest ($t= 5.932$, $p=.000$) and posttest ($t=8.122$, $p=.000$) of the students are grouped according to section and gender. Significant difference ($p=.000 < \alpha=.01$) exists between the scores in pretest and posttest of the grade-10 students in science when grouped according to sections and gender. Conclusion reveals that the teacher in MSU-Sulu Laboratory High School used laboratory method guided by appropriate procedures and strategies that can give impact on the performance of the students, giving instruction, make final conclusion, step-by-step demonstration of procedures, make interpretation, explain objectives, jot down observation, motivation of teacher and observed student work are some of the strategies of laboratory teaching method which can give high impact on the performance of the grade-10 students in science. The level of performance of the grade-10 students using laboratory method is satisfactory in the pretest score and outstanding in the posttest score.

6. Conclusion

There is significant difference of the score in pretest and posttest when the data are grouped according to section and gender. The scores of the students are significantly high in the posttest when compared with the pretest scores which indicates that laboratory method is appropriate method of teaching science.

7. Recommendation

Laboratory teaching approach following specific procedures can increase the achievements of the students in Science. The DepEd, University, College and other higher Institutions should sponsors trainings, seminars, workshops and conferences to

motivate teachers to use laboratory teaching approach in teaching sciences. These institutions should monitor and activate the performance of teachers while using the laboratory teaching approach.

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