



Effect of Chemistry laboratory usage during and after academic session on students Metacognitive Self-Consciousness at Secondary Level

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Abstract: Metacognition self-consciousness refers to the monitoring of our thoughts towards using chemistry labs at school level. The purpose of this study to enhance consciousness of student about use of chemistry laboratories. However it was perceived that prospective teachers and students exhibit low metacognitive self-consciousness about it. Data was collected by sixteen (16) students enrolled in Government girls high school Phalia. Data was analyzed by SPSS. Pragmatists advocated that learning by doing is long lasting. However it was examined that practical science work has been neglected at school level. Practical work for consolidate learning was suggested.

Keywords: Metacognition, Self-Consciousness, Chemistry Laboratories

1. Introduction

Metacognition refers to knowledge about our own learning or about how to learn. Research in the natural sciences depends on a variety of actions. For this purpose, the classroom's function in an educational laboratory is essential. (Aderibigbe&Aladejana, 2007) The experimental method works well for teaching science. For example, Piaget (1996) advocates for children to naturally and voluntarily interact with their environment in order to find their own knowledge. Dolcet-Sanjuan and associates, 1997

The developed world, where new discoveries are being made, especially in the area of science education, is a major source of scientific understanding in the twenty-first century. According to Hogstain-Naaman (2007), in order to comply with new criteria, teaching and learning techniques are being closely analysed and revised. (Council, 2000). Science instructors have planned laboratory accomplishments with the objective of `stimulating learner learning in affecting as well as cognitive domains such as scientific consideration, motivation, awareness, skills for doing scientific practicals, inquiry-based learning, and accepting the nature of science (Hofstein et al., 2005; Mamlok-Naaman et al., 2005) (Darke& Freedman, 1997) (Henderson et al., 2000). When science education laboratory experiments are finished, students can assess what they have not yet discovered and confirm that they have learnt from various sources. Experiments in scientific classes motivate students to learn more and make them tenacious in their pursuit of science knowledge. Cayci (2007)

Prior research on ninth-grade chemistry topics revealed that while students can comprehend the course unit on physical and chemical changes (Ayas&Demirbas, 1997), they struggle to explain chemical changes in relation to chemical bonds and comprehend events at the micro level (MirzalarKabapinar&Adik, 2005).

It's common to blame a lack of laboratory experience for this deficiency (Yang & Heh, 2007). A common explanation for this limitation is a deficiency in laboratory experience (Yang & Heh, 2007). Studies have shown that, despite the fact that laboratory work is an essential component of understanding chemistry courses, it cannot

be effectively incorporated into conventional chemistry courses due to a number of issues, including safety concerns, a lack of confidence, and the excessive time and effort needed to conduct accurate experiments (Elton, 1983; Bryant & Edmunt, 1987; Hofstein & Lunetta, 2004; Durmus & Bayraktar, 2010).

The study of people's awareness of cognition in general and their own cognitive and memory processes in particular, as well as how they apply this knowledge to control how they process information and behave, is known as metacognition. The word "metamemory," first used by Flavell in 1971, refers primarily to the observation and management of one's memory and learning.

It focuses on the knowledge that kids have about how memories work, especially on an individual's own memory strengths and weaknesses. Learning and memory methods have also received a lot of attention in developmental study (Bjorklund & Douglas, 1997; Brown, 1987; Pressley, Borkowski, & Schneider, 1987). Furthermore, a great deal of the topics covered in the theory of mind field (Perner & Lang, 1999) relate to metacognitive processes. These concerns may be especially crucial for comprehending children's cognitive development.

Metacognitive self-consciousness is the awareness and ability to monitor one's own thoughts. They are aware of their own knowledge, opinions, and convictions. It involves actively monitoring and taking into account one's cognitive processes in addition to simply being aware of one's ideas. In order to manage the efficacy of one's thinking, one must be aware of their techniques and coping mechanisms as well as any biases or assumptions that may influence their thinking (Moshman, 2018). Individuals that are metacognitive about their thinking are typically more self-aware, analytical, and introspective. They can organize, monitor, and evaluate their learning or problem-solving efforts more effectively; they can also better regulate cognitive processes and change course as necessary. Growing metacognitive awareness can help learn, solve problems, and make decisions.

1.1 Statement of the Problem

The impact of chemistry laboratory usage on students' metacognitive self-consciousness at the secondary level both during and after academic sessions remains poorly understood. In science fields, metacognition, the understanding of one's own learning and thought processes is a crucial competency that improves academic performance and problem-solving skills.

With the ultimate goal of improving student results in science education, this research aims to close the gap by examining the effects of secondary students' use of the chemistry laboratory both during and after academic sessions on their metacognitive self-Consciousness.

1.2 Objective of the Study

To compare the effect of chemistry laboratory usage before and after academic sessions on students' metacognition self-consciousness at secondary level.

1.3 Hypotheses of the Study

- i. There is no significant difference between mean score of pretest and posttest on students' metacognition self-consciousness by using chemistry laboratories during academic session at Secondary level.
- ii. There is no significant difference between mean score of pretest and posttest on students' metacognition self-consciousness by using chemistry laboratories after academic session at secondary level.
- iii. There is no significant difference between the Mean gain score of students' metacognition self-consciousness by using chemistry laboratories during and after academic session at Secondary level.

2. Methodology

2.1 Population and Sampling

The population of my study was students enrolled in Grade 9th Government Girls High School Phalia, Tehsil Phalia, and District Mandibhauin.

Type of sampling is simple random sampling. After conduction of pre-test students further divided into two groups A and B. Group A was treatment Group and Group B was the Control Group. Group A was Taught through usage of chemistry laboratories during session and group B was taught through usage of chemistry laboratories after session.

Nature of this study is an experimental. A pretest-Posttest design was used on two groups of students enrolled in public sector secondary schools. Sixteen students (16) were selected randomly and divided into two groups eight (8) in each. Controlled and uncontrolled groups were designed. Treatment was given for 1month.

2.2 Tool of the Study

Data was collected through Pre-test and post-test. The test was administered by the researcher herself to avoid biases. Test was based on Multiple choice Questions. Time Allowed for test was one Hour. Test total marks were 50.



2.3 Tool validity and reliability

Instrument validity check after expert opinion taken from 14 experts. Content Validity index (CVI) calculated value is 0.78 and Content validity Ratio checked after pilot testing. Content Validity ratio calculated is 0.84

3. Data Analysis

Data were analyzed by SPSS version 24. Independent sample t-test was use of test of significance (Frankel 2012).

Table 4.1: Comparison of mean score of pretest and posttest by using biology laboratories during academic session

Group	N	Mean	S.D	Df	t-value	Sig
Experimental	16	20.0	1.41	30	2.32	.000
Control	16	9.00	1.21			

Table 4.1 reflects the results of t-test, of experimental and control group. There is significant difference in mean gain scores of students for experimental group (M=20.0, S.D =1.41) as compared to control group (M=9.00, S.D =1.21); t=30, p<.05. Hence null hypothesis (**H₀1**:There is no significant difference between mean score of pretest and posttest on students' metacognition self-consciousness by using chemistry laboratories during academic session at Secondary level)is rejected.

Table 4.2: Comparison of mean score of pretest and posttest by using biology laboratories after academic session

Group	N	Mean	S.D	Df	t-value	Sig
Experimental	16	15.18	1.64	30	2.2	.002
Control	16	8.68	1.19			

Table 4.2 reflects the results of t-test, of experimental and control group. There is significant difference in mean gain scores of students for experimental group (M=15.18, S.D =1.64) as compared to control group (M=8.68, S.D =1.19); $t=2.2$, $p<.05$. Hence null hypothesis (**H₀₂**: There is no significant difference between mean score of pretest and posttest on students' metacognition self-consciousness by using chemistry laboratories after academic session at secondary level.) is rejected.

Table-4.3: Comparison of mean score of pretest and posttest by using biology laboratories during and after academic session

Group	N	Mean	S.D	Df	t-value	Sig
Experimental	16	10.8	1.62	30	6.70	.000
Control	16	6.12	1.79			

Table 4.3 reflects the results of t-test, of experimental and control group. There is significant difference in mean gain scores of students for experimental group (M=10.8, S.D =1.62) as compared to control group (M=6.12, S.D =1.79); $t=6.70$, $p<.05$. Hence null hypothesis (**H₀₃**: There is no significant difference between the Mean gain score of students' metacognition self-consciousness by using chemistry laboratories during and after academic session at Secondary level.) is rejected.

4. Conclusion

This study is conducted to investigate the effect of chemistry laboratory usage during and after academic session on students metacognition self-consciousness at secondary level. Chemistry laboratories usage during session as a substitute of after academic session improves students metacognition and self-consciousness at secondary level.

4.1 Recommendations

Examine how peer evaluation promotes metacognitive self-reflection and development in lab settings.
Analyse the effects that adding particular metacognitive strategies to lab activities has on students' learning results and self-consciousness.
Examine the differences in the metacognitive growth of students who regularly use chemical labs against those who do not.

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