

**Effectiveness of Self Assessment Practices on Achievement in Science of
Secondary School Students**

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Abstract

The present study investigates the impact of integrating science teaching with self-assessment practices on the academic achievement of secondary school students. Self-assessment is a potent tool for personal growth, and among various methods, this study focuses on two practices: self-assessment Rubric and Diary. This experimental study involved a total sample of 80 students, with 40 in both the Experimental and Control groups. Appropriate tools and statistical techniques were employed for analysis. The findings revealed that the Experimental group exhibited improved achievement in Science compared to the Control group. Specifically, the use of self-assessment Rubric and Diary after each chapter enabled students to assess their own progress. This innovative approach holds promise for the future, as it aligns with the evolving nature of education. Schools of the future will not only be designed for learning but also for cultivating critical thinking skills. In conclusion, the integration of science teaching with self-assessment practices, such as the Rubric and Diary, encourages students to adopt the right thinking patterns and enhances the overall learning experience

Key Words: Self- Assessment Practices, Achievement, Secondary School Students

Introduction

Education serves as a potent and compelling instrument for the progress of any nation. The quality of learning is defined through assessment, and any enhancements in education hinge ultimately on the quality and improvement in assessment. Similar to how physicians cannot effectively practice without good assessment, teachers require skills related to effective assessment (Nenty, 2005). Classroom assessment practices serve as a crucial link between the curriculum, instructional mechanisms, and students' learning outcomes—an essential element in the teaching-learning process. Self-assessment practices empower students to engage with learning content, develop thinking patterns, and enhance their confidence in acquired skills. According to Andrade and Valtcheva (2009), self-assessment is a process in which students collect information about their own performance, compare it to explicitly stated criteria, goals, or standards, and make revisions accordingly. Assessments identify students' weaknesses and strengths, allowing teachers to provide targeted academic support.

Assessment plays a pivotal role in education, determining students' performance. Self-assessment involves students monitoring and evaluating the quality of their learning, identifying strategies for improvement. Brown and Harris (2013) define self-assessment as a "descriptive and evaluative act carried out by the student concerning his or her own work and academic abilities." If students can assess their progress, it may serve as a motivating factor for further learning. A qualitative study explored the role of reflective diaries as a form of formative assessment in promoting self-regulated learning (Alabidi et al., 2022), elucidating the impact of reflective diaries on increasing student motivation. Building upon these findings, a new study was conducted to employ diverse self-assessment practices to

enhance students' achievements. This study facilitates the monitoring of students' academic improvement through the implementation of self-assessment rubrics and diaries. In the current study, self-assessment practices, such as Self-assessment Rubric and Diary, were employed to monitor changes in the achievement of secondary school students in science.

Objectives

1. To find out the effectiveness of Self-assessment practices on Achievement in science of students at secondary level

Hypotheses

1. There is no significant difference in the Achievement in science in experimental and control group students at secondary level

Methodology

The present study investigated the Effectiveness of self-assessment practices : Self-assessment Rubric and Diary on achievement in science of secondary school students. The design employed for conducting the present study is pre-test quasi experimental design. For the purpose of present study, the Pre-test Post-test Non – equivalent Groups Design (specified by Best and Khan,2007) were adopted. The experimental method is one of the best methods to conduct the research.

Experimental research was applied in a classroom setting where the investigator has some degree of control over the variables involved and conditions under which the variables are observed. For that the investigator selected a control group and an experimental group, where the experimental group is taught a concept and allowed students to assess themselves with the help of self-assessment practices such as Rubrics and Diary. An achievement test was conducted to evaluate the difference in achievement

of students in both groups.

Sample

Considering the nature of the study, a random sampling technique was used for the selection of schools in Ernakulam district. For the study, a sample of 40 students are taken as control group and another set of 40 students were taken as experimental group from two different classes in the same level in secondary schools

Tools used for the study

The following tools were used in the present investigation:

1. Self-assessment rubric
2. Self-assessment Diary format
3. A standardized Achievement test in science for standard VIII was prepared by the researcher
4. Lesson transcripts Based on Science teaching with self-assessment rubric
5. Lesson transcript based on prevailing method of science teaching

Statistical Techniques employed for the study

The statistical techniques used include ANOVA, ANCOVA and adjusted means.

Analysis and Discussion

Comparison of the score of Achievement of students in Experimental and Control Groups using ANOVA

To determine the effectiveness of Self- Assessment Practices on the achievement in Science over the prevailing method, analysis of covariance (ANCOVA) was conducted to analyze pre-test and post-test scores of experimental and control groups. As a preliminary analysis, the scores were subjected to analysis of variance (ANOVA). The data and results of ANOVA are presented in table 1

Table 1
Summary of ANOVA of Pre-test and Post-test Scores of achievement in science of
Experimental and Control Group students

Source of variation	df	SSx	SSy	MSx	MSy	F-ratios
Between groups	1	8.015	1080.136	8.015	1080.136	$F_x = 6.505$
Within groups	78	78.848	232.484	1.232	3.632	$F_y = 297.347$
Total	79	86.863	1312.621			

The critical value of F (df = 1/78) is 4.00 at .05 level and 7.08 at .01 level. The calculated value of F_x is 6.505. The calculated value is greater than the critical value (4.00) at .05 level of significance. From this we can understand that there is significant difference between the pre-test scores of the experimental and control group. The value obtained for F_y is 297.347. It is higher than the table value (7.08) at .01 level. Thus, it can be stated that there is significant difference between the post-test scores of the experimental and control group.

The summary obtained for ANCOVA of pretest and post-test scores of experimental and control group students are given below in table 2

Table 2

**Summary of ANCOVA of Pre-test and Post-test Scores of achievement in science of
Experimental and Control Group students**

Source of variation	df	SSx	SSy	SSxy	SSy-x	MSy-x	SD yx
Between	1	8.015	1080.136	93.045	937.709	937.709	
Within	77	78.848	232.484	20.181	227.319	3.608	1.899
Total	78	86.863	1312.621	113.227	1165.029		

$$F_{yx} = \frac{MS_{x(\text{between})}}{MS_{(\text{within})}} = 259.88$$

From table, for $df = 1/77$, critical value of F at .01 level = 7.08. The calculated value of F_{yx} is 259.88. It is higher than the critical value (7.08) and is significant at 0.01 level. From the F_{yx} ratio we can understand that there is significant difference in the pre-test and post-test scores of both groups. The adjusted means of post-test scores (Y means) were computed, their difference between the adjusted Y means was tested for finding the significance. The details are given in table 3

Table 3

Data and Test result of the Significance of Difference between Adjusted Means of Post test Scores

Groups	N	M _x	M _y	M _{y-x} (Adjusted)	SE _D	t
Control	40	7.43	13.05	13.786		
Experimental	40	8.80	15.75	15.78	0.424	18.628

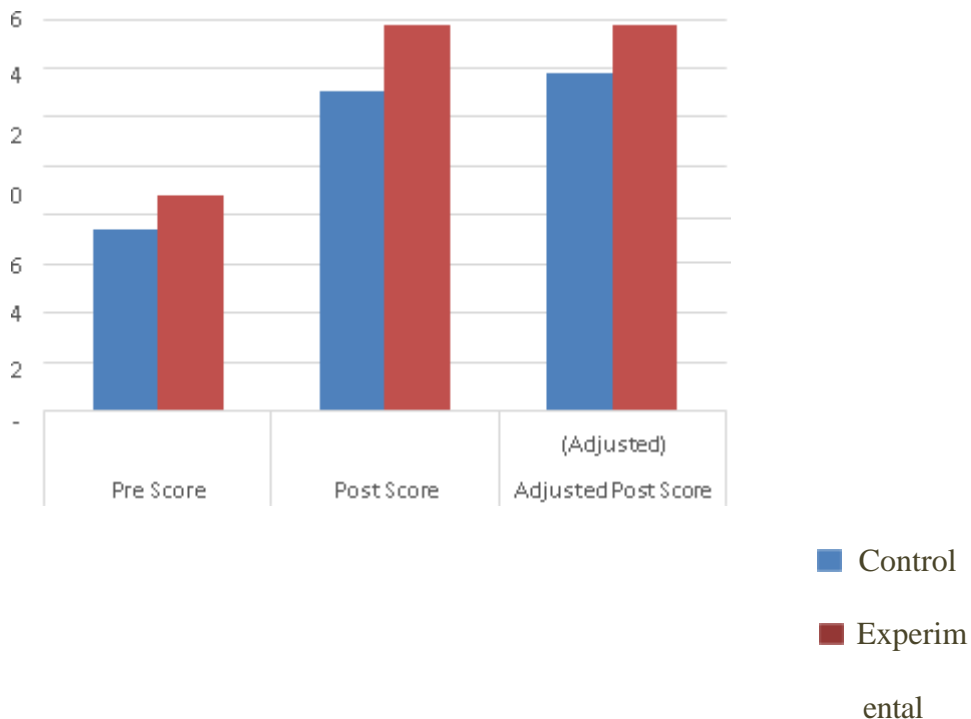
The critical value of t is 2.66 at .01 level of significance. The calculated t value is 18.628. Since it exceeds the critical value, it is significant at 0.01 level. The significant difference in adjusted Y means shows that the experimental and control groups differ significantly in the achievement in post-test. Thus, the adjusted mean of the experimental group (15.78) is greater than the adjusted means of control group (13.05). By the use of self-assessment practices, students came to be capable of understanding their mistakes. They started thinking about their role in learning. By the regular practice of self-assessment Rubric after each class and writing a Diary as their reflection about the class according to the given criteria, students developed their thinking skills. This helped in developing the metacognition of students and their interest in science. Thus we can arise at the conclusion that Self- Assessment

Practices are more effective than the prevailing method in enhancing the achievement in Science of students in secondary level. From the above findings it can be

stated that the teaching learning process along with the Self-Assessment Practices are more effective than the prevailing method for increasing the achievement in Science among students in secondary level.

Figure 1

Graphical representation showing the effectiveness of Self-Assessment Practices on Achievement in Science of secondary school students



The figure above illustrates that the pre-test mean scores of the experimental and control groups are comparable. However, the adjusted mean score of the experimental group surpasses that of the control group, indicating that the experimental group achieved higher scores in science. Consequently, it can be concluded that teaching science blended with self-assessment practices is effective in enhancing the achievement in science for secondary-level students .

The graph provides evidence that students exposed to self-assessment practices exhibited significant improvement in science achievement compared to the control group,

which followed the conventional transactional method. This improvement may be attributed to the efficacy of selected self-assessment practices, such as self-assessment rubric and diary, which contributed to strengthening learning and establishing a holistic conceptual framework. This framework serves as an intellectual initiation for students to take control of their own learning

Educational implications

From the study, it was found that teaching science with Self-Assessment practices is more effective over the prevailing method for better achievement in science by the students at secondary level. The study highlights the effectiveness of self-assessment practices as a crucial step in enhancing achievement in science, suggesting its potential application in other subjects such as Social Science, Arts, Mathematics, and English. Student engagement in self-assessment not only improves their learning but also enhances metacognition .

Furthermore, the study indicates that self-assessment practices offer students opportunities for reflection on learning and performance, enabling them to monitor their progress and providing motivation for academic success. Rubric-referenced self-assessment positively influenced students' learning strategies and attitudes in this study. Additionally, the impact of reflective diaries on students' cognition, metacognition, and increased motivation is evident. Consequently, students in the experimental group achieved higher marks than their counterparts in the control group, underscoring the effectiveness of self-assessment practices compared to the prevailing method .

Hence, teachers should encourage the use of Self- Assessment practices while teaching the subject. Teachers shall design their teaching learning endeavor blending Self-Assessment practices. This method of science teaching blended with Self-Assessment

practices should be incorporated in the curriculum of pre-service teachers training programme. In-service teacher training should be provided at secondary level based on this method of teaching. The implications of the study are not confined only to the students. The teacher and the educational system also benefit from the study.

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