Comparison between Self-Assessment and Assessment by the Teacher in Physics at Secondary Level

Tariq Javed[*]
Muhammad Aslam Asghar[**]

Abstract

Self-evaluation and evaluation by teacher are considered as the basic ingredients or tools to create awareness about the strengths and weaknesses of the students during the teaching and learning process, through which students are prepared to achieve high academic achievement. The purpose of the study was to compare self-assessment and assessment by the teacher groups in the subject of physics for class IX students. The study was experimental in nature, and 72 secondary school students were distributed equally in experimental and control groups on the basis of their academic achievement in class VIII. Total thirty six students were taken from each group. Eighteen students from each group were designed as high achievers on the basis of their academic performance, while eighteen students were designed as low achievers in each group (High achievers in both groups = 50% and above, Low achievers in both groups = 33% - 49%). Furthermore, high and low achievers were sub divided into self-assessment and assessment by the teacher groups for different types of treatment received. Formative tests were the research tool. The table of specification was constructed in the light of the content to be covered during each week. Teacher made tests were developed and administered for ten continuous weeks. Formative tests were constructed according to table of specifications. The lower order of thinking was specified under the topics remembering, understanding and applying while the higher order of thinking was specified under the topics analyzing, evaluating and creating. The post-test collected data were analyzed through statistical t-test and mean. It was found the performance of the self-assessment, group was better than assessment by the teacher group.

Keywords: Self-assessment, Assessment by the teacher, Assessment, Academic achievement, Feedback.

[*] SST, Federal Government Public School No. 2 (Boys), Tariqabad, Rawalpindi, Pakistan. Email: tariqjavedmiu@gmail.com
[**] Mohi-Ud-Din Islamic University Nerian Sharif, AJ&K. Email: info@miu.edu.pk

Introduction

Assessment is a continuous process which is used to develop teaching practices and continuous professional development of teachers. Assessment is promoted to enhance the academic achievement as well as the skills and abilities of students (Deneen etal. 2019; Leong & Tan, 2014; Deneen & Bound 2014; Bennett, 2011). Educational assessment is an inexorable part of the teaching learning process because it may directly influence the learning, and it provides feedback towards improvement. The strengths and weaknesses of students during the learning process can be recognized through assessment, therefore, it serves as a multiple tool towards enhancement in learning (Mousavi, 2012). Various approaches to assessment have many merits as well as demerits. Some methods of evaluation do not focus the insight of the learner, whereas learner is the most important evaluator of himself because it is the learner who is closer to work, therefore, self-directed approach towards learning encourages students to become critical judges of the quality of their own work.

The motivational level of students' towards the learning can be improved or destroyed with unsuitable tools of assessment. The teacher's most important challenge is to effectively manage the relationship between assessment and student motivation. Self-assessment creates motivation and determination in learner towards the learning process. It provides a check and balance system among students. Students have keen interest to achieve goals through self-evaluation. Self-evaluation promotes motivation and maintains determination and interest of the learner. Motivation is such element through which an individual can achieve goals. According to cognitive theory, motivation of the learner is better than finding mistakes. Sometimes the learner exceeds his goal after receiving feedback, and shows better performance in future. Studies have shown that alternative assessment practices like self-assessment is a very successful tool for achievements of high school students. Students who were trained in judging their work against evaluative criteria were later better able to judge their own writing. After self-evaluation, training, students become errorless and even low achievers change gradually in their achievement. Thus, self-evaluation in areas like writing and other subject areas may have positive effects on student achievement.

Literature Review

The connection between abstract principles of physics and depth of understanding is essential in order to construct comprehensive establishment of knowledge, skills, and capabilities in science education (Wilcox & Lewandowski, 2016) which can be achieved through an active learning approach in physics. Active learning approach facilitates autonomy along with accountability and confidence (Silberman & Biech, 2015) that may be promoted through two way communication between teacher to student; and student to student in the form of discussion, which provide stimulus to students towards an active learning approach in physics, and encourages students to self-directed learning (Bennett, Hogarth, Lubben, Campbell, & Robinson, 2010). In the same context, group discussion provides awareness about weaknesses and strengths to students (Handayani, 2019).

McDowell, Wakelin, Montgomery & King (2011) has suggested the suitable learning environment for assessment, which includes:
a. Self-directed learning approach is promoted through the proper feedback of the teacher,
b. Peer communication system provides opportunities towards effective learning,
c. Specific and achievable assessment task is given to students,
d. Accommodate learners towards autonomy and independence of self-learning,
e. Equilibrium between formative and self-directed learning.

Assessment is an essential part of the learning process, which is used to estimate knowledge, skills, and capabilities of students at certain levels. Educational institutions emphasize to focus on self-paced learning in order to enhance the educational achievement level (Karnilcowicz, 2012). The objectives of formative assessment can be achieved through self-directed learning, which is placed as a fundamental pillar in the teaching learning process, therefore, a strong relationship exists between self-directed approach of learning and formative assessment (Panadero, Andrade, & Brookhart, 2018).

Self-evaluation is considered as self-regulated learning under the domain of metacognitive learning (Hofer & Sintara, 2010) which provides opportunities to investigate thoughts and actions and to focus on weaknesses and strengths (Dinsmore, Alexander & Loughlin, 2008). While on the other hand, evaluations of students by the teacher during classroom instructions are commonly used in the education (Pritchard & Potter, 2011) that provides important feedbacks regarding improvement

and advancement during the teaching learning process (Lindahl & Unger, 2010). Student assessments are important to pinpoint the level of students' satisfaction in the process of educational attainment (Hill & Epps, 2010) as well as improving the quality of teaching (Zabaleta, 2007). It was found that there is significant affirmative correlation between deep learning approach and assessment for learning, furthermore, negative correlation exists with surface learning approach (Gan, Liu, & Yang, 2017).

Positive feedback during self-assessment promotes deep thinking among students, which can be seen as a change behavior in performance (Snead & Freiberg, 2019). On the contrary, it was also observed that teachers pay less attention during the classroom assessment process (Looney, Cumming, Kleij & Harris, 2018).

Assessment during the teaching learning process is placed as an essential ingredient in system of education. There exists a significant variability among teachers' approaches towards assessment. The dimensions of classroom assessment involves purpose of assessment, process of assessment, equitable, and standardized measurement in relation to theory. It was found that there is a noteworthy differentiation between dimensions of classroom assessment practices (DeLuca, Valiquette, Coombs, McEwan & Luhanga, 2018).

Self-assessment is an effective strategy which is used to create encouragement among students in order to take more responsibility during the evaluation process, and in this way students get autonomy over task performance. It was found that students can improve their assessment skills through self–assessment (Seifert & Feliks, 2019).

Self-directed learning provides the opportunities to organize cognitive, affective and behavioral domains of learning, which directed the learners towards the accomplishment of educational objectives (Panadero, Andrade, & Brookhart, 2018).

Self-directed learning provides baseline for lifelong learning because it facilitates learners to contrive knowledge on the basis of learning objectives under the domain of self-management and self-assessment. It was found that students become self-regulated in learning process due to engagement in formative assessment under the guidance of teacher, because the deep learning approach through formative assessment promotes self-regulation in the learning process (Xiao & Yang, 2009). It is assumed that active learners achieve educational objectives through self-management. Self-directed learning approach among learners can be transformed through quiz, debates, group activities, discussion, and

formative tests, which leads the students towards higher order thinking (Jones, 2019).

Fulmer, Tan & Lee (2019) have stated that assessment by teacher involves accountability and improvement of school and students. However, as teachers, assessors are qualified, but they are not trusted by students due to irrelevant assessment process. Teachers should prepare for assessment of students because the academic success is directly linked with society's success.

The academic achievement of students can be strengthen with the intervention of formative tests during the teaching learning process. It was confirmed from the study that the educational procurement of students is increased by 10% with the help of formative assessments (Chng & Lund, 2018).Strengths and weaknesses of the students can be identified with the interventions of formative assessment feedback during classroom assessment, which reflects in the form of high academic achievement (Krasne, Wimmers, Relan & Drake, 2006).

Teachers and students can get benefit from formative assessment in the form of feedback. There is a wide chance of correction of errors available under the guidance of instructor, which leads effectiveness towards educational attainment. Feedback is the real path of intensification in the quality of education. Researches indicate that learner enhance their quality of education through feedback in result of formative assessment. Students feel satisfaction with progress of learning. Feedback is necessary for students during instruction. Leigh (2010) has stated that

a. The role of the instructor is very important in collection of feedback. Students are asked about evaluation at least one day earlier, so that they can take suitable time for thinking of learning experiences.
b. Necessary instructions and plan should be given to students about feedback. Students must precise during sharing, which is helpful in improvement of knowledge.
c. Feedback can improve the trust among the students, which is very helpful during   learning.

The immediate and proper feedback may be applied to escalate the learning procedure. Effective evaluation approaches to appraise and provide continual feedback to teachers enhance the teaching learning process in the classroom (Leigh, 2010). At the moment, the most important evaluator is some person out of town who knows nothing of the teaching situation. In fact, the student who is closest to the work, ought to be and is the most important evaluator. Cognitive theory explains that learners seek new knowledge on the basis of preexisting

knowledge. Self-monitoring creates motivation for new learning. Students have intelligence and awareness about the use of existing skills.

Statement of the Problem

The focus of research was to compare the self-assessment and assessment by the teacher in the subject of Physics in relation to the academic achievement at secondary level.

Objectives

i) To explore the influence of formative assessment on the educational accomplishment in physics at secondary level.
ii) To compare the achievement of assessment by teacher group with self-evaluation group of physics at secondary level.

Hypotheses

In order to meet up with the objectives, the following null speculations were constructed on the basis of review literature:
i) There is no significance differentiation in the levels of attainment of higher achievers and low achievers in both groups.
ii) There is no significance differentiation in experimental group between mean score of educational procurement of high performers in self-evaluation group.
iii) There is no significance differentiation in experimental group and in control group between mean academic achievements of low achievers of teacher-evaluation group.

Methodology

The research was an exploratory in nature, and was carried out at Federal Government Public High School Daryabad Rawalpindi Cantt. The design of this study was described as a 2x2 randomized block factorial design with no replication and utilizing the posttest only. Seventy four (74) students of science group within two sections of class IX, during the session 2011-2012 was comprised the population of the research. Two groups (Experimental & Control) were formed for the study purpose. Teacher made tests were constructed, administered, and collected data were examined through t-test statistics for comparison of

self-evaluation group & teacher evaluation group. The flow chart of the experiment is given in figure 1.
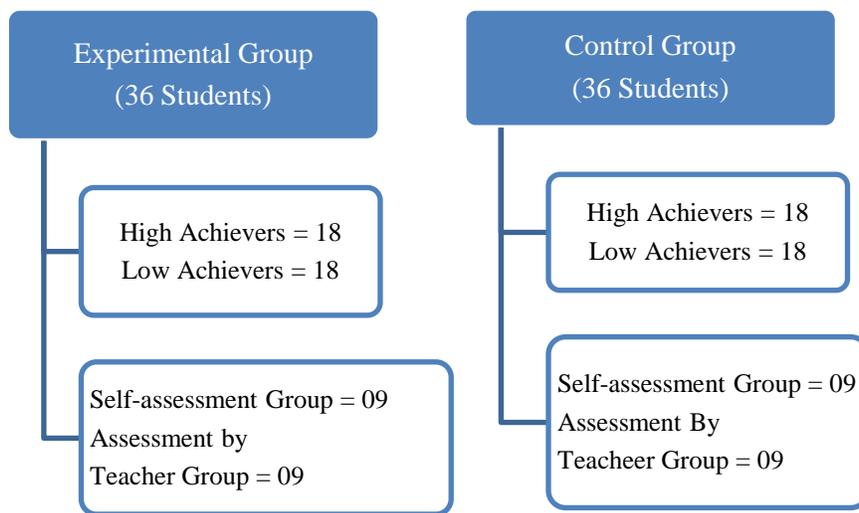
Figure 1: Flow Chart of Experiment

Results

The collected data of posttest of the academic achievers (High & Low) of both groups (Experimental & Control) were analyzed through mean scores and statistical t – test. The results are given in following tables:

Table 1:
Mean score in posttest by high achievers

Group	No. of Students	Total Marks	Total Score	Mean Score
Control	18	80	838	46.55
Experimental	18	80	1083	60.16

Table 1 designates that mean scores of marks in posttest for both groups (control & experimental) by high achievers, reflects that the experimental group (high achievers) during posttest was 60.16, which shows that their achievement is much above the 50% of the total marks of the test, while

in the control group mean score was 46.55, showing that result achievement is above 50% of the total marks of the test

Table 2:
Mean score in posttest by low achievers

Group	No. of Students	Total Marks	Total Score	Mean Score
Control	18	80	643	35.72
Experimental	18	80	834	46.33

Table 2 represents that average score of marks in posttest (experimental & control groups) by low achievers, exposes to view that score of the experimental group was 46.33, while in control group mean score of low achievers was 35.72, showing that higher score in experimental group.

Table 3:
Comparison of high achievers of teacher and self-assessment groups

Groups	N	Mean Score	SD	t-calculated	t-tabulated
Assessment By Teacher	9	58.77	70.8	-0.139	1.746
Self- assessment	9	61.55	11.35		

(df = 16 at level of significance 0.05)

Table 3 shows that calculated value of t was -0.139 which is much less than the tabulated value i-e 1.746, and was significant = 0.05 level. Therefore, it resulted in the rejection of the second null hypothesis.

Table 4:
Comparison of low achievers of teacher and self-assessment groups

Groups	N	Mean Score	SD	t-calculated	t-tabulated
Assessment By Teacher	9	46.22	12.61	-0.221	1.746
Self- assessment	9	46.44	11.09		

(df = 16 at level of significance 0.05)

Table 4 shows that calculated value of t was -0.221 which is much less than the tabulated value i-e 1.746 at degree of freedom 16, and was significant = 0.05 level. Therefore, it resulted in the rejection of the null hypothesis (iii).

Discussion

The self-assessment approach among students in Physics can be promoted through the intervention of instructional gadgets like contrasting examples are used to improve self-assessment approach in science education (Jax, Ahn, & Lin-Siegler, 2019). The students are provided guidelines to assess own performance with reference to the guidelines or even solution to the problem. The student feel independence and take interest in knowing their own level of achievement, as a result they perhaps become more motivated to increase their level of performance, which may likely develop better understanding of scientific concepts and their applications in daily life. Many research studies have been conducted to compare the outcome between self-assessment and assessment by the teacher, the level of the educational (academic) procurement is enhanced through self-directed approach of learning. The results of the study were consistent with the study conducted by Deneen and Bound (2014); Mousavi (2012); and Karnilcowicz (2012).Although the study was clamped down under small sample size, but the prefatory outcome of the research provides direction towards future research in the field of science education. The results in relation to student evaluation can be utilized to enhance the achievement level of students in the subject of physics.

Conclusion

The staging of high achievers in the self-assessment, group have shown superior in physics as compared to assessment by the teacher group. Self-assessment provides opportunities for students to recognize their weaknesses and strengths during the learning of physics. It can be concluded that the performance of the self-assessment, group is better than assessment by the teacher group.

References

Bennett, J., Hogarth, S., Lubben, F., Campbell, B., & Robinson, A. (2010). Talking   Science: The research evidence on the use of small group discussions in   science teaching. *International Journal of Science Education*, 32(1), 69–95, doi: 10.1080/09500690802713507

Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in   Education: Principles, Policy & Practice*, 18(1), 5-25.

Chng, L., Lund, J. (2018).The Impact of Formative Assessment on the Success and Response Rate in a 6th Grade Physical Education Badminton Unit. *International Journal of Kinesiology in Higher Education*, 3(1), 12-22, doi: 10.1080/24711616.2018.1509680

Deneen, C. C., Fulmer, W. G., Brown, L. T. G., Tan, K., Leong, S. W., Tay, Y. H. (2019). Value, practice and proficiency: Teachers' complex relationship with

assessment for learning. *Teaching and Teacher Education*, 80, 39-47, doi: 10.1016/j.tate.2018.12.022

Deneen, C. C., Boud, D. (2014). Patterns of resistance in managing assessment

change. *Assessment & Evaluation in Higher Education*, 39(5), 577-591.

DeLuca, C., Valiquette, A., Coombs, A., McEwan, L. D., Luhanga, U. (2018). Teachers' approaches to classroom assessment: a large scale survey. *Assessment in Education: Principles, Policy & Practice*, 25(4), 355-375, doi: 10.1080/0969594X.2016.1244514.

Dinsmore, D. L., Alexander, P. A., Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and and self-regulated learning. *Educational Psychology Review*. 20, 391-409, doi: http://doi.org/c77zjd.

Fulmer, W. G., Tan, K. H. K., Lee, H. C. I. (2019). Relationship among Singaporean secondary teachers' conceptions of assessment and school and policy contextual factors. *Assessment in Education:*

Principles,   Policy   &   Practice,   26(2),   166-183, doi:10.1080/0969594X.2017.1336427

Gan, Z., Liu, F., Yang, C. C. R. (2017). Assessment for learning in the Chinese   context: Prospective EFL teachers' perceptions and their relations to learning   approach, *Journal of Language Teaching and Research*,   8(6),   1126-1134,   doi: 10.17507/jltr.0806.13

Handayani, R. D. (2019). Empowering physics students' performance in a group   discussion through two types of peer assessment, *International Journal of   Instruction*, 12(1), 655-668.

Hill, M. C. Epps, K. (2010). The impact of physical classroom environment on   student satisfaction and student evaluation of teaching in the university   enviornmrnt. *Academy of Educational Leadership Journal, 14*(4), 65-79.

Hofer, B. K., Sinatra, G. M. (2010). Epistemology, metacognition, and self-regulation: Musings on an emerging field. *Metacognition and Learning*, 5,113-120, doi: http://doi.org/bj3h86.

Jax, J., Ahn, J. N., Lin-Siegler, X. (2019). Using contrasting cases to improve self-   assessment in physics learning, *Educational Psychology*,   39(6),   815-838,   doi: 10.1080/01443410.2019.1577360

Jones, J. A. (2019). Scaffolding self-regulated learning through student-generated   quizzes, *Active Learning in Higher Education*, 20(2), 115-126, doi: 10.1177/1469787417735610

Karnilowicz, W. (2012). A Comparison of Self-assessment and Tutor assessment of   undergraduate   psychology   students.*Social Behavior and Personality*, 40 (4),   591-604, doi:10.2224/sbp.2012.40.4.591.

Krasne, S., Wimmers, F. P., Relam, A., Drake, A. T. (2006). Differential effects of two types of formative assessment in predicting performance of first-year medical students. *Advances in Health Sciences Education*, 11(2), 155-171.

Leigh, A. (2010). Estimating teacher effectiveness from teo-year changes in students' test scores. *Economics of Education Review, 29*, 480-488.

Leong, W. S., & Tan, K. (2014). What (more) can, and should, assessment do for

learning? Observations from 'successful learning context' in Singapore. *Curriculum Journal*, 25(4), 593-619.

Linddahl, M. V., Unger, M. (2010). Cruelty in student teaching evaluations. *college Teaching, 58*, 71-76.

Looney, A., Cumming, J., Kleij, D. V. F., Harris, K. (2018). Reconceptualising the role of teachers as assessors: teacher assessment identity. *Assessment in Education: Principles, Policy and Practice*, 25 (8), 442-467 doi: 10.1080/0969594X.2016.1268090.

McDowell, L., Wakelin, D., Montgomery, C., & King, S. (2011). Does assessment for   learning make a difference? The development of a questionnaire to explore the   student response. *Assessment & Evaluation in Higher Education,* 36(7): 749-765.

Mousavi, S. A. (2012). *An encyclopaedic dictionary of language testing*. Tehran: Rahnama Press.

Panadero, E., Andrade, H., & Brookhart, S. M. (2018). Fusing self-regulated learning   and formative assessment: A roadmap of where we are, how we got here, and   where   we   are   going. *The Australian   Educational   Researcher,   45*(1),   13-31.   doi:10.1007/s13384-018-0258-y

Pritchard, R. E., Potter, G. (2011). Adverse changes in faculty behavior resulting fro   use of student evaluations of teaching: A case study. *Journal of College   Teaching & Learning, 8*(1), 1-7.

Seifert, T., Feliks, O. (2019). Online self-assessment and peer-assessment as a tool to enhance student-teachers' assessment skills. *Assessment & Evaluation in Higher Education,* 44(2), 169-185,doi: 10.1080/02602938.2018.1487023

Snead, O. L., Freiberg, J. H. (2019). Rethinking Student Teacher Feedback: Using a Self-Assessment Resource with Student Teachers. *Journal of Teacher Education,* 70 (2), 155-168, doi: 10.1177/0022487117734535

Silberman, M., & Biech, E. (2015). *Active Training a Handbook of Techniques,   Designs, Case Examples, and Tips*. Canada: John Wiley & Sons, Inc.

Wilcox, B. R., & Lewandowski, H. J. (2016). Students' epistemologies about   experimental physics: Validating the Colorado Learning Attitudes about   Science Survey for experimental physics. *Physical Review Physics Education Research*, 12(1), 1–11, doi: 10.1103/PhysRevPhysEducRes.12.010123

Xiao, Y., Yang, M. (2009). Formative assessment and self-regulated learning: How   formative assessment supports students' self-regulation in English language   learning, *Science Direct*, 81, 39-49, doi: 10.1016/j-system.2019.01.004

Zabaleat, F. (2007). The use and misuse of student evaluations of teaching. *Teaching in Higher Education, 12*(1), 55-76.