Effect of Feedback on Accuracy of Self-assessment of Achievement in Chemistry in the Context of Self-confidence and Bias of Eleventh Graders

Poonam Tyagi[1] and H.R. Pal[2]

[1]Assistant Professor, Shri Jain Diwakar College, Indore, India
[2]Retd. Professor, Devi Ahilya University, Indore, India

Corresponding author: sktyagi.sk@gmail.com

ABSTRACT

Results of inaccurate Self-assessment by candidates in today's competitive world are frequently disastrous for them. Self-assessment does not always happen totally in isolation. It is partly influenced by the feedback aspirants receive from their peers or external experts in the form of teachers, parents and tutors at coaching centres. Accuracy of Self-assessment varies in different students, presumably because of differences in personality characteristics. It is interesting to understand the dynamics of this influence through research. The present study is precisely an attempt in this direction.

Keywords: Accuracy of self-assessment, bias in self-assessment, self-concept, self-confidence, intelligence

Boud (1995) defines Self-assessment as "The involvement of students in identifying standards and/or criteria to apply to their work and making judgments about the extent to which they have met these criteria and students." For Boud, Self-assessment involves two clear stages: The identification (and learner understanding) of standards and criteria and making of one's own judgments against these criteria.

This two-part process necessarily involves students reflecting on their own learning. Self-assessment is used as both a process as well as an activity. It is a practice in which to engage as well as a goal to which to aspire. It is important to make a distinction because Self-assessment is a goal of higher education which may be pursued through course design which does not involve Self-assessment exercises as such.

Types of Self-assessment

There can be two kinds of Self-assessments, i.e., qualitative and quantitative. In case the test outcomes are in the form of grades, the Self-assessment too, is in terms of grade estimations. Similarly, if the scoring of the test is done numerically, the students are asked to estimate their raw scores rather than grades.

Self-assessment is of three kinds in terms of the time of making Self-assessment. Self-assessment can be made before entering into the examination hall, immediately after handing over the answer sheet to the investigator and after a time interval allowing students to discuss the test among themselves or with the teacher.

Accuracy of Self-assessment

Accuracy of Self-assessment can be studied in terms of quantum of deviation from teacher assessment. It refers to the extent to which estimated scores are close to the obtained scores on a test. The deviation of estimated score from the obtained scores in absolute terms (without direction) is taken to be the measure of accuracy.

Bias in Self-assessment

Bias refers to the direction of deviation of estimated scores from the actual scores. In case of estimated scores being less than the actual scores, there is negative bias or under assessment. If reverse is the case, it is positive bias or over assessment.

Rationale of the Study

Review of literature reveals that most of the studies on Self-assessment have been co-relational. For instance, relationship between Self-assessment and other measures, peer and expert assessment had been studied by Indian Institute of Psychometry (1982), Kruger and Dunning (1999), Saddler and Good (2001) etc. In a Meta analysis Falchikov and Boud (1989) reported that expertise within a particular field influenced the Accuracy of Self-assessment. It can be easily observed that Experimental studies exploring causal relationships are conspicuously absent.

The effect of techniques of improving Self-assessment has been studied by Jain (1971), Palmer *et al.* (1985), Fox and Dinur (1988), Shrauger and Osberg (1989), Clare and Mark (2002), Gupta (2003), and Rees and Shepherd (2005). They found that some Self-assessment improvement techniques such as video tape replay, audio taped group discussion do not play an important role to enhance the Self-assessment ability where as Self-assessment training, instructional manipulation and meditation improve the Ability of Self-assessment in students. Jain (2007) found that Accuracy of Self-assessment of student-teachers improved with increased quantum of feedback. Boud and McDonald (2003) reported improvement in students' performance after the teachers were trained in Self-assessment. In view of effectiveness of some and the ineffectiveness of other techniques for improving Accuracy of Self-assessment, further research in the area is utmost needed.

Although there are studies on Self-assessment in relation to the characteristics of the assessors-particularly their competence or achievement, majority of these are focused on the phenomenon of bias i.e. over and under estimation rather than the Accuracy. Studies related to student competence have been conducted by Balch (1992), Longhurst and Norton (1997), Dunning *et al.* (2003), Mettheos *et al.*

(2004), Hartman (2001) etc. These studies indicated that less competent students grossly over-estimated themselves while more competent ones made much realistic Self-assessment. No study exploring the effect of other important cognitive and effective domain variables related to the students such as Self concept, Self confidence, Intelligence, Independence on the Accuracy of Self-assessment was found to have been so far undertaken. Moreover, except for Indian Institute of Psychometry (1982), Jain (1971), Gupta (2003), Jain (2007) and Yadav (2008) all other studies have been conducted on foreign soil. Hence studies in Indian settings are needed.

Objectives

Following were the objectives of the study:

1. To study the effect of Treatment, Self-confidence and their Interaction on Accuracy of Self-assessment of Achievement in Chemistry by considering Intelligence as covariate.

2. To study the relationship between Bias in Accuracy of Self-assessment of Achievement in Chemistry with Achievement, Self-confidence, Self-concept and Intelligence respectively.

Hypotheses

The hypotheses of the study were:

1. There will be no significant effect of Treatment, Self Confidence and their Interaction on Accuracy of Self-assessment of Achievement in Chemistry by considering Intelligence as covariate.

2. There will be no significant association between Bias in Accuracy of Self-assessment of Achievement in Chemistry and each of Self-concept, Self-confidence, Intelligence, and Achievement respectively.

Sample

The present study was experimental in nature, which was conducted on Eleventh Grade students studying in senior secondary schools of Indore and Dewas city of Madhya Pradesh. To obtain the desired sample a renowned coaching institute of the town was selected. This coaching institute attracts students from a wide variety of CBSE and MP Board

Schools of Indore. Therefore one could get a fairly representative sample conveniently at one place.

Table 1: Treatment Wise distribution of Sample

Treatment	Total
Teacher Feedback	28
Peer Feedback	38
No Feedback	58
Total	**124**

Experimental Design

The present study was experimental in nature and designed as per the following lay out :

$$X_1 \quad O$$
$$X_2 \quad O$$
$$O$$

Where, X represents Treatment and O represents Observation. The dotted lines mean non-equivalence among groups.

As depicted above the sample of the study comprised of three groups of students of class XI. There were three kinds of Treatments namely Teacher Feedback, Peer Feedback and No Feedback. These Treatments were assigned randomly to the three selected groups. Thus, there were two experimental groups, differing in terms of kind of treatment and one control group which was not offered any treatment.

Tools

The variables assessed in this study were Accuracy in Self-assessment of Achievement in Chemistry (ASAAC), Self-concept, Intelligence, and Self-confidence. Assessment of Achievement in Chemistry was done with the help of three Achievement Tests in Chemistry developed by the Investigator. Self-assessment of Achievement in Chemistry was done with the help of Response Analysis and Self-assessment Performance developed by the Investigator. The independent variables namely: Self-confidence, Self-concept, and Intelligence were assessed with the help of appropriate standardized tests.

Self-assessment of Achievement in Chemistry

In order to get Self-assessment of Achievement in Chemistry a Response Analysis and Self-assessment Performa was prepared for each of the three tests. It contained response error analysis to help students identify the mistakes they might have committed in responding to the questions.

The Self-assessment Performa also contained Q. No. and marks allotted to each questions. After analyzing their responses, students were supposed to predict their marks in each of the questions.

Intelligence

There are many standardized Intelligence tests for the 15-17 year age group. Out of these tests, some are verbal, others non-verbal. Some are in Hindi and others in English. The non verbal standardized Intelligence tests for the specified group were Culture Fair Intelligence Test scale 3 by R.B. Cattel, Standard Progressive Matrices by J.C. Raven, J.H. Court and J. Raven. The standard progressive matrices Test was selected for assessing Intelligence in the study.

Self-confidence

Self-confidence can be defined as one's faith in his or her own ability enabling the individual to function autonomously. Self confidence was assessed with the help of Self Confidence scale developed by Bhawalkar, 1992. This scale consists of 23 statements. Each statement is followed by three options. Each selected alternative had a scale value. This could differ from item to item. Item wise score values for alternatives is given below in the table.

The Test Retest Reliability reported by the Authors was 0.76. Also the Split-Half reliability coefficient was 0.84.

Self-concept

Self concept is defined as an attitude towards one-self. It consists of perceptions, feelings, attitudes, aspirations and values of one-self concerning one-self. Self-concept is formed as a result of interactions with the environment.

Self-concept was assessed with the help of Self-concept List of Pratibha Deo. The checklist has 90 adjectives which cover almost all the important aspect of personality. The words relate to the dimensions of intellect, emotions, character, sociability and asthetics of Self-concept. Each of the 90 adjectives is to be checked on 5 alternatives.

The reliability coefficient obtained through Test Retest Method was in the range of 0.62 to 0.86 for different time intervals ranging from 15 days to 3 months.

Procedure of Data Collection

The present study was an attempt to find out the effect of different kind of Feedback on Accuracy of Self-assessment of Achievement in Chemistry (ASAAC).

The subjects were first of all oriented towards the purpose and broad procedure of the experiment. In the first week of the experiment, the investigator administered Achievement Test in Chemistry I and got personal information filled up. The scoring of the answer scripts and analysis of the responses was done next. Feedback strategy was chalked out and the First experimental group i.e. Teacher Feedback group was given Feedback by the Teacher (Investigator). After Teacher Feedback group the students were asked to self-assess themselves with the help of Response Analysis and Self-assessment Performa by filling up expected marks questions-wise.

The same procedure was adopted for the Peer Feedback group and No Feedback group. The only difference was that in the PFB group, the Feedback was received by the subjects from their peers through teacher supervised discussion in small groups. At the end of feedback they were asked to self-assess themselves by giving expected marks question-wise in the Response Analysis and Self-assessment Performa. The No Feedback group did not receive Teacher Feedback or Peer Feedback. They were also asked to self-assess themselves with the help of Response Analysis Self-assessment Performa. This whole cycle was repeated for Achievement Test in Chemistry II and Achievement Test in Chemistry III.

In between these cycles the data with respect to the other independent variables and covariates were obtained. The subjects were told their scores in each of the Achievement test in Chemistry and on the other tests/scales.

Data Analysis

The data were analyzed objective-wise as follows:

❑ For studying the effect of Treatment, Self-confidence and their Interaction on Accuracy of Self-assessment of Achievement in Chemistry by considering Intelligence as covariate, the data were analyzed with the help of 3×2 Factorial Design ANCOVA.

❑ For studying the association between Bias in Accuracy of Self-assessment of Achievement in Chemistry and each of Self-concept, Self-confidence, Intelligence and Achievement respectively, Coefficient of Association was used.

RESULTS AND INTERPRETATION

1. Effect of Treatment, Self-confidence and their interaction on Accuracy of Self-assessment of Achievement in Chemistry (ASAAC) by considering Intelligence as covariate

The first objective of the research was to study the effect of Treatment, Self-confidence and their interaction on ASAAC by considering Intelligence as covariate. Besides three levels of Treatment, there were two levels of Self-confidence namely Average and Above Confidence and Below Average Confidence. Thus, the data were analyzed with the help of 3×2 Factorial Design ANCOVA where Intelligence was taken as covariate.

Table 2: Summary of 3×2 Factorial Design ANCOVA for ASSAC of students by taking Intelligence as covariate

Source of Variation	df	$SS_{y.x}$	$MSS_{y.x}$	$F_{y.x}$
Treatment	2	3788.78	1994.39	27.89
Self-Confidence	1	2.86	2.86	0.04
Treatment × Self-confidence	2	173.32	88.66	1.21
Error	117	8367.37	71.52	
Total	**122**			

Effect of Treatment on ASAAC by taking

Intelligence as covariate

From Table, it can be seen that adjusted F value for Treatment is 27.89, which is significant at 0.01 level of significance with df =2/117 when Intelligence was taken as covariate. It indicates that the adjusted mean scores of ASAAC of students treated with Teacher Feedback, Peer Feedback and No Feedback

differ significantly when Intelligence was taken as covariate. In the light of this the null hypothesis that there is no significant effect of Treatment on ASAAC when Intelligence is taken as covariate is rejected.

To study as to where the differences in ASAAC lie, pairwise comparisons of the three Treatment group were undertaken.

Table 3: Pair wise comparison of ASAAC of the three Treatment groups by considering Intelligence as covariate

Treatment Pairs		Mean difference (I-J)	Standard error
(I)	(J)		
Peer Feedback	Teacher Feedback	16.51**	2.81
No Feedback	Teacher Feedback	17.83**	2.44
No Feedback	Peer Feedback	1.31	2.28

It is observed from the Table that out of three pairs of Treatment groups the difference in mean scores of ASAAC of students in two pairs are significant at 0.01 level of significance whereas in third pair this difference is not significant at 0.05 level of significance. The difference in mean scores of ASAAC between the Peer Feedback group and Teacher Feedback group is 16.51 is significant at 0.01 level of significance. This means that the Teacher Feedback was found to be more effective in terms of ASAAC than Peer Feedback. Likewise, the difference between mean scores of ASAAC of No Feedback group and Teacher Feedback group was found to be 17.83, which is also significant at 0.01 level of significance. It means that the Teacher Feedback was also found to be superior to the control/No Feedback in terms of ASAAC of students. The difference in mean scores of ASAAC of No Feedback group and Peer Feedback group was found to be 1.31, which is not significant at 0.05 level of significance. This means that the two groups were not found to be different from each other as far as ASAAC of students is concerned provided Intelligence was taken as covariate.

Effect of Self-confidence on ASAAC by taking Intelligence as Covariate

The adjusted F value for Self-confidence is 0.04, which is not significant at 0.05 level of significance

with df =1/117. It shows that adjusted mean scores of ASAAC of students belonging to two Self Confidence groups did not differ significantly. Thus, there was no significant effect of Self-confidence on ASAAC when Intelligence was taken as covariate. In the light of this the null hypothesis that there is no significant effect of Self-confidence on ASAAC when Intelligence was taken as covariate is not rejected.

Effect of Interaction between Treatment and Self-confidence on ASAAC by taking Intelligence as covariate

The adjusted F value for the interaction between Treatment and Self confidence was found to be 1.21, which is not significant at 0.05 level of significance with df =2/117. It indicates that there was no significant effect of the resultant of interaction between Treatment and Self-confidence of ASAAC of students when Intelligence was taken as covariate. In the light of this the null hypothesis that there is no significant effect of interaction between Treatment and Self-confidence on ASAAC of students when Intelligence was taken as covariate, is not rejected.

It may therefore be concluded that ASAAC was found to be independent of interaction between Treatment and Self-confidence when Intelligence was taken as covariate.

2. Association between Bias in Accuracy of Self-assessment of Achievement in Chemistry with Achievement, Self-confidence, Self-concept and Intelligence respectively

The second objective of the research was to study the association between Bias in Accuracy of Self-assessment of Achievement in Chemistry with Achievement, Self-confidence, Self-concept and Intelligence respectively.

Each of these variables viz. Bias, Achievement, Self confidence, Self-concept and Intelligence were nominal scale variables having two levels each. Cross-tabulation of Frequencies was set up in each case and Coefficients of Association were calculated using SPSS.

From the Table 4 it can be seen that the Coefficients of Association between Bias and each of Intelligence, Self Confidence, Self-concept and Achievement respectively were found to be around zero. None of the Coefficients of Association were found to

Table 4: Coefficients of Association between Bias in Accuracy of Self-assessment of Achievement in Chemistry and Achievement, Self-concept, Self-confidence and Intelligence respectively (N=124) and their probabilities of significance

Bias	Intelligence	Self-confidence	Self-concept	Achievement
Coefficient of Association	-.01	-.03	.02	-.13
Significance (p)	.93	.72	.85	.15

be significant at 0.05 level of significance. (Since each p-value is greater than 0.05). Thus, it can be inferred that Bias in Accuracy of Self-assessment of Achievement in Chemistry was found to be independent of Gender, Intelligence, Self-confidence, Self concept and Achievement respectively.

Findings of the Study

1. Accuracy of Self-assessment of Achievement in Chemistry was found to be significantly affected by Feedback when the groups were equated on Intelligence. Students were most accurate in Self-assessment of Achievement in Chemistry when given Teacher Feedback as compared to the Peer Feedback or No Feedback.

2. Accuracy of Self-assessment of Achievement in Chemistry was found to be unaffected by Self-confidence. It was also independent of Interaction between Treatment and Self-confidence.

3. Bias in Accuracy of Self-assessment of Achievement in Chemistry was found to be Independent of each of the variables viz. Gender, Dependence Achievement, Self Confidence, Self-concept and Intelligence.

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