

Effectiveness of Assessment patterns in chemistry Learning¹Maboud Omid*, ²Y.N. Sridhar, ³Kiumars Azizmalayeri¹ Research scholar in Department of Education, University of Mysore Manasagangothri, Mysore-57006, India

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²Professor in Department of Education, University of Mysore Manasagangothri, Mysore-57006, India E-mail: dr.ynsridhar@gmail.com³Assistant professor in Department of Education, University of Malayer, 4 km of Arak road, Iran E-mail: K_azizmalayeri@yahoo.com**Abstract**

This study aims at determining: (a) whether there is any difference between chemistry learning achievements of students taking the chemistry class with the implementation of Performance Assessment and ones joining the class without the implementation of Performance Assessment if the prior knowledge was statistically controlled, (b) Differences of scores in male and females' students after the implementation of performance assessment and traditional assessment in class. The experiment was conducted in 2 high schools in Malayer. The subjects were 92 pre-university science students (46 boys and 46 girls) that were selected from population through random, multi-step and cluster sampling methods and then randomly assign patterns to experimental group and control group. Research instruments used included academic achievement pretest and post test that was prepared by researcher and teachers. The results have provided sufficient evidence for the context validity of these two instruments. Cronbach coefficient alpha reliability of chemistry academic achievement pre test was .81 and post test was .83. Two-factor covariance analysis method (ANCOVA) was utilized for data analysis. The results showed: (a) there were significant differences on chemistry learning achievement with and without the implementation of Performance Assessment on pre-university chemistry students. (b) Based on the statistical analysis of ANCOVA of same subjects, it showed that there was a significant increase of scores of females' students to learn chemistry in classes with the implementation Performance Assessment. [Omid M, Sridhar Y.N., Azizmalayeri K, **Effectiveness of Assessment patterns in chemistry Learning**. *Life Sci J* 2012;9(3):1979-1982]. (ISSN: 1097-8135). <http://www.lifesciencesite.com>. 285

Key words: Performance assessment, Traditional assessment, Academic achievement, Chemistry**1. Introduction**

In the classroom, teaching cannot be truly effective if it is not linked to some form of authentic assessment (Joughin, 2010). Likewise, assessment is useless if it is not based on what has been, or is to be, taught. Although this may sound obvious, teachers sometimes forget the close relationship between the two. Assessment is one of the crucial components of the instruction (Cooper & Coweive, 2010). People within the educational community have different ideas regarding the implementation of assessment strategies. While some believe traditional assessment methods are more effective, others think that alternative assessment tools are superior. Researchers and educators use the term performance-based, alternative, and authentic assessment inter-changeably. Performance-based assessment is suitable for assessing nearly all types of science learning. Performance-based assessment allows the student to construct his or her own answers as opposed to choosing from a group of answers (Lingtan & Towndrow, 2009). Performance-based assessments "can be a learning experience in themselves. They can actually motivate students to learn more about the subject matter" (Doane, Rice, and Zachos 2006). Assessment tasks must be a part of the regular teaching and learning program. There is a widely held belief that assessment drives student learning (Joughin, 2010).

Many of researches have shown strong links between the implementation of performance assessment and high quality learning (Wang, 2010., Azar, 2009., Yi Chang & Ting Chen, 2009., Ashwin, 2008., Tapia & Pardo, 2006., Bailey, 2005., Brown, 2005., Darling-

Hammond & Snyder, 2000). The use and implementation of performance assessment has two significant features; it has the ability to reengage students in the development of content-based knowledge through strengthened links with the outside world (Kearney & Perkins, 2011); and, it has the capacity to enhance student learning through the provision of skills such as metacognition, critical thinking and creativity (Darling-Hammond & Snyder, 2000).

Sari & Wiyarsi (2011) investigated the effect of performance assessment on chemistry learning achievements of students in Yogyakarta. The results showed a significant difference on chemistry learning achievement with and without the implementation of Performance Assessment on students of class.

Kearney & Perkins (2010) examined the relationship of performance assessment and students learning in the classroom. The results indicated students that were more engaged, had increased efficacy and felt that they were a part of the educative process, rather than being subjected to it. Bedir, Polat & Sakacı (2009) studied that using the performance assessment in one lesson, improve students' learning, and eventually serve students to become lifelong learners.

Chuang (2009) investigated the effect of oral performance assessment in class. The results showed that using oral performance assessment as a necessary and practical way to enhance students' speaking skills and ability.

According to Kabba (2008), Performance-based assessment requires students to demonstrate their

learning and understanding by performing an act or a series of acts.

Muller (2005) conducted a study that indicate application of performance assessment promote student engagement in substantial learning that connects to real-world. Lubezky, Dori & Zoller (2004) indicated that switch from traditional assessment to performance assessment promote chemistry higher cognitive learning in students. Klein & et al., (1997) examined whether the differences in mean scores among gender on science performance assessments are comparable to the differences that are typically found among these groups of traditional multiple-choice tests. To do this, several hands-on science performance assessments and other measures were administered to over 2,000 students in grades five, six, and nine as apart of a field test of California's statewide testing program. Girls tended to have higher overall mean scores than boys on the performance measures.

According to Ricketts & Rudd's study (2002), there is a significant difference in cognitive skills such as critical thinking in boys and girls. This research seeks to investigate whether the using performance assessment method can be effective in the improvement of students' chemistry academic achievement? In order to respond to the question above, the following hypotheses were outlined and examined:

1. There is a significant difference between the performance assessment group and the traditional assessment group in chemistry academic achievement.
2. There is a significant difference between boys and girls in chemistry academic achievement in performance assessment group and traditional assessment group.

2. Materials and method:

2.1 Participants

Participants in the present study were 92 chemistry pre-university students studying in Malayer city of Iran. Forty six of the participants were male students, and 46 were female students.

2.2 Design of the study

This research with a design including two patterns of performance assessment and traditional assessment was a quasi-experimental research to determine the effect of these patterns on academic achievement in chemistry. The best design for this research from among different kinds of quasi experimental design was an independent bi- group design with pretest and post test. The most common quasi experimental research design includes two groups: An experimental group and a control group. The researcher selected the sample from population by multi-step and cluster sampling methods and then randomly assigns patterns to experimental group and control group.

2.3 Instruments

Academic achievement pretest and posttest in chemistry: The academic Achievement pretest and post-test in chemistry were prepared by the researcher and teachers and were used to measure the academic achievement of pre university students on the subject chemistry. Context validity of the academic achievement pretest and post-test were investigated by teachers who were professional in chemistry. The results have provided sufficient evidence for the context validity of these instruments. Cronbach coefficient alpha reliability of chemistry academic achievement pre test was .81 and post test was .83.

2.4 Sample and population

The sample included for this research was 92 students from pre university students who were studying in 4 schools in Malayer city (2011-2012). At the first stage from among 20 schools (1050 students), 4 schools were selected randomly (boys and girls pre university schools). At the second stage from each school 1 class was selected and assigned to experimental and control group randomly.

2.5 Procedure of data collection

Multi stage cluster random sampling in selection of schools and classes of Malayer city was used. After choosing the samples, in the first step the teachers were acquainted to the performance- based assessment method and the experimental group students have also been completely justified on the new method and their participation. Before using the method a test was taken on chemistry as a pre-test on both groups (male and female). Because the test was done in the second half of the academic year, the chemistry pretest was only from the first half of the book. The tests were same in this stage for both groups. In the second step, in both classes of experimental groups the teaching and the other activities of the teachers by performance- based continued for 4 months to assess the level of learning of the students and planning on reactions to improve their learning. In the third step at the end of the semester, post-test in chemistry was done on both groups in the same condition. The post-test was contained the second half of the book.

2.6. Analysis and Interpretations of results

In the present study, descriptive statistics were used to show mean and standard deviation of chemistry achievement in both groups. Two factors covariate analysis (ANCOVA) were used to investigate the impact of performance assessment on chemistry achievement with regarding to effect of pretest and IQ.

3. Results

Mean and standard deviation of chemistry academic achievement post test based on the gender and group before controlling pretest are presented in the following table.

As seen as table 1 the mean of girls' post test of chemistry academic achievement scores in performance assessment group is about 6 scores higher than the mean of girls' scores in traditional assessment group, as from

the table 1 it is evident that mean of chemistry academic achievement scores for boys in performance assessment group is about 5.5 scores higher than boys' mean in traditional assessment group. A close look at the table further revealed that girls' means in both group of experimental and control group were higher than the boys' means. Two factors covariate analysis test to comparison of mean of the students' post test of chemistry academic achievement scores in performance assessment group and traditional assessment group based on the gender are presented in the following table.

According to (table 2) two factors covariate analysis, it is found that the performance assessment has significant influence over mean scores on post test of chemistry academic achievement, as the obtained F value was found to be statistically significant ($F=59.075$; $p=.000$) and also significant at 0.05 levels, indicating that a significant difference is between the performance assessment group and the traditional assessment group in post test of chemistry academic achievement. So it is found that the gender has significant influence over mean scores on post test of chemistry academic achievement, as the obtained F value was found to be statistically significant ($F=5.944$; $P=.017$) and also significant at 0.05 levels. The interaction between performance assessment group and gender was found to be non-significant ($F=.345$; $p=.559$).

4. Discussion

This study investigated the effects of performance assessment on chemistry achievement of pre university students and analysis of results showed that there is a significant influence of performance assessment on academic achievement, in traditional assessment groups scored significantly lower than students who were in performance assessment group. In other words, performance assessment had positive impact on chemistry achievement of students. In order to confirm or reject the hypotheses formulated, we have tried to compare our results with further studies done in the same area.

Sari & Wiyarsi (2011), Kearney & Perkins (2010), Wang (2010), Azar (2009), Yi Chang & Ting Chen (2009), Bedir, Polat & Sakacı (2009), Chuang (2009), Ashwin (2008), Tapia & Pardo (2006), Bailey (2005), Brown (2005), Muller (2005), Lubezky, Dori & Zoller (2004), Darling-Hammond & Snyder (2000), studies' showed effectiveness of performance assessment on academic achievement in students. In regard to

Table 1: Mean and standard deviation of chemistry academic achievement post test before control based on the gender and group

Sex	Group	Mean	S.D
Boy	Experimental	12.19	1.83
	Control	6.81	3.04
Girl	Experimental	14.19	2.62
	Control	7.92	1.86

coordination research results of other researchers and the result of this study, the first hypothesis "There is a significant difference between the performance assessment group and the traditional assessment group in chemistry academic achievement", is confirmed. These results are due to performance assessment features in comparison with traditional assessment. Performance-based assessment allows the student to construct his or her own answers; Performance-based assessment is an active learning experience and actually motivates students to learn more about the subject matter, they demonstrate scientific knowledge and understanding through performance. This method of assessment is coordinated to constructivism view of learning, while traditional assessment is adjusted to behaviorism view. Also the results of this research indicate that the second hypothesis "There is a significant difference between boys and girls in chemistry academic achievement in performance assessment group and traditional assessment group", is confirmed. In regard to differences between two genders in learning, the following researches results (Ricketts & Rudd, 2002; Klein & et al., 1997) were consistent with the findings of this study. Girls' higher scores mean can be due to more tendency of girls to participate in cultural activities. As seen rate of girls' participation in higher education have increased. Also more females' tendency to social activities can be due to their warm reception in academic achievement. Most of teachers do not have awareness about the new forms of assessment, so they are not interested in this method of assessment. Furthermore some suggestions may be addressed to the concerned educators in order to increase students' learning. The organization of some training, seminars and workshops of pre-university school teachers have to be organized in order to learn them some updated method of assessment and improving their experience. The school headmasters have to create a good environment to facilitate the pre-university teachers to perform new method of assessment as possible as they can.

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Table 2: Covariate analysis to comparison of mean in post test of chemistry academic achievement based on the gender

Source	SS	df	Ms	F	Sig
Covariant (Pretest)	36.8	1	36.8	9.14	.003
Covariant (IQ)	54.3	1	54.3	13.50	.000
Group	237.4	1	237.4	59.07	.000*
Gender	23.9	1	23.9	5.94	.017*
Interaction	1.38	1	1.38	.345	.559

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