CHAPTER I
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Introduction

1.1 INTRODUCTION

Evaluation is an integral part of our educational system and can be of immense value in maintaining and enhancing the quality of teaching and learning. Education is chiefly concerned with developing and modifying the patterns of behavior in human beings, in the realms of thinking, feeling and acting. It uses the prescribed curriculum as a means for bringing about these changes. Every curriculum aims to bring about desired changes in the learner. Therefore, first of all, the intended learning outcomes or the Instructional Objectives must be identified in two dimensions behavioral Processes and Content of the curriculum. These are written in terms of what the students will be able to do, after receiving the learning experience. Instructional objectives provide proper direction to both the teachers and the learners. The instructional objectives are the starting points for planning of effective learning experiences. Learning experiences are to be provided in relation to the instructional objectives. For effective learning experiences, the teacher is supposed to acquaint himself with the entering behavior of the students, i.e. what they already know, standard achieved and level of maturity. In accordance with the necessary background, learning experiences are provided otherwise remedial teaching is resorted to, before starting the teaching of new learning experiences. The last step in the teaching i.e., evaluation or performance assessment is resorted to, before starting the teaching of new learning experiences. This is necessary for making judgment of the extent to which the intended learning outcomes have been achieved. Evaluation is also necessary to judge the effectiveness of the learning experiences. When the performance of most of the students is not satisfactory on a particular concept the learning experiences should be planned again on the basis of available evidence. Organize re-teaching, using revised instructional material and re-evaluation. It is only after careful analysis of the results of re-evaluation, that we can judge the suitability of the instructional objectives. Thus Evaluation helps us to validate the whole teaching-learning process and is directed towards its improvement through regular feedbacks. Teaching and testing are complementary and are not to take place in isolation. Classroom assessment can be used to enhance learning when assessments,
curriculum materials, and instruction align to reinforce common learning goals (Pellegrino, Chudowsky & Glaser, 2001).

Assessment, evaluation and communication of student achievement and growth are essential parts of the teaching and learning processes. Each part of the teaching and learning process should be a positive experience for students and promote personal growth (Alberta, 2003). Assessment is an important part of teaching and learning process that aims at the evaluation of the learners’ activities and learning results, and directs in their learning process and performance. There are lots of different definitions for the word assessment. Assessment is a data collecting process about learners in order to help appropriate decision making about their achievement and growth (Cooper & Coweive, 2010; Gullickson, 2003).

Evaluation should be an integral part of the teaching-learning process, be a planned, continuous activity that reflects the intended outcomes of the curriculum, assists teachers in meeting individual needs and encourages active participation and student self appraisal to foster life long learning (Saskatchewan Education, 1991).

The ultimate goal of assessment is developing independent, life long learners who regularly monitor and assess their own progresses (Manitoba Education and Youth, 2003). This kind of attitude change toward goal and assessment process is a result of the basic changes in the view points of learning psychology.

Since the very beginning of 20th century up to its two last decades, behaviorism psychology was dominating educational view, so the dominate approach of the learning assessment was affected by this point of view. Learning assessment in behaviorism approach is based on measuring learning objectives. Methods and tools used for this purpose are basically objective tests. Multiple choice questions are the most popular ones.

From the last decades of 20th century, modern psychological approaches like cognitive and constructivism were developed, and the basic psychological hypothesis were put into challenge. The basic hypotheses of the cognitive and constructivism is that the authentic learning, even in its very beginning level, requires the learners active efforts to build up knowledge through thinking and reasoning. Thinking plays an important role in this point of view.
Cognitive and constructivist approaches have such an influence on education that now thinking skills are the center of more attention than any other time (Dembo, 1994). Learning and educational experts on complex learning have emphasized that objectives, methods and assessment tools should be selected and applied in a way that can assess comprehension, problem solving, thinking skills and the application of learned knowledge in real life. This can not be done by most of the common objective tests which are based on behaviorism theories.

What has been said shows that there are two sets of completely different methods of learning assessment. It is recommended to consider them as an integrated unit.

Three purposes of assessment provides a detailed description of the three purposes of assessment that form the frame work for thinking about how to select or develop assessment tasks, how to use them, and how to communicate about them with students parents, and others: assessment for learning, assessment as learning and assessment of learning.

Assessment for learning is designed to give teachers information to modify and differentiate teaching and learning activities. It acknowledges that individual students learn in idiosyncratic ways, but it also recognizes that there are predictable patterns and pathways that many students follow. It requires careful design on the part of teachers so that they use the resulting information to determine not only what students know, but also to gain insights into how, when, and whether students apply what they know. Teachers can also use this information to streamline and target instruction and resources, and to provide feedback to students to help them advance their learning.

Assessment as learning is a process of developing and supporting metacognition for students. Assessment as learning focuses on the role of the student as the critical connector between assessment and learning. When students are active engaged and critical assessor they make sense of information relate it to prior knowledge and use it for new learning. This is the regulatory process in metacognition. It occurs when students monitor their own learning and use feedback from this monitoring to make adjustments adaptations and even major changes in what
they understand. It requires that teachers help students’ development and become comfortable with reflection and with a critical analysis of their own learning.

Assessment of learning is summative in nature and is used to confirm what students know and can do, to demonstrate whether they have achieved the curriculum outcomes, and, occasionally, to show how they are placed in relation to others (Western and Northern Canadian protocol for collaboration in education 2006).

Assessment of learning and assessment for learning have been emphasized and found to directly impact on student learning and achievement (Black et al., 2004; Black et al., 2003; Black & Wiliam, 1998). Many teachers and students see assessment as an unpleasant necessity in the educational process, often disrupting the curriculum and becoming an end in itself. There are concerns that assessment drives learning, with teaching geared towards the examination.

Applying these goals to assessment methods result in two poles. One pole emphasizing on completely exact and detailed goals (based on classic learning theories) and the other one, the general complicated goals (based on modern learning theories). None of these two poles is exact and accurate by itself. Here, the best condition is that the teachers have access to various quantitative and qualitative methods for education and benefit from them in various learning and educational conditions. Traditional assessment approach that follows a linear pattern was put into question in 1960s and 1970s when modern learning theories were developed. Education have traditionally relied on assessment that compares students with more successful peers as a means to motivate students to learn, but recent research suggests students will likely be motivated and confident learners when they experience progress and achievement rather than the failure and defeat associated with being compared to more successful peers (Stiggins, 2002).

1.2 ALTERNATIVE ASSESSMENT

In order to apply new views of assessment, we need alternative assessment patterns. These patterns labeled authentic assessment. Performance assessment is a type of authentic assessment. Authentic assessment performance assessment’s greatest value is that the learning demonstrated is more integrated, more lasting and more authentic (Doris, 1993).
Alternative assessments share several common characteristics. Herman, Aschbacher, and Winters (1992) provide an excellent listing of such characteristics: (a) Ask students to perform, create, produce, or do something; (b) tap higher level thinking and problem-solving skills; (c) use tasks that represent meaningful instructional activities; (d) invoke real-world applications; (e) people, not machines, do the scoring, using human judgment; and (f) require new instructional and assessment roles for teachers (p. 6).

Clearly, the abilities needed to implement a reformed vision of curriculum and classroom assessment are daunting—reminiscent of Cremin’s (1961) earlier observation that progressive education required “infinitely skilled teachers.” Being able to ask the right questions at the right time, anticipate conceptual pitfalls, and have at the ready a repertoire of tasks that will help students take the next steps requires deep knowledge of chemistry. Teachers will also need help in learning to use assessment in new ways. They will need a theory of motivation and a sense of how to develop a classroom culture with learning at its center. Given that new ideas about the role of assessment are likely to be at odds with prevailing beliefs, teachers will need assistance to reflect on their own beliefs as well as those of students, colleagues, parents, and school administrators. Because teachers’ beliefs, knowledge and skills are pivotal in bringing about change in assessment practices, teachers’ knowledge and beliefs should be too important to notice.

In Wilson and Sloane’s (in press) study of the Alternative Assessment System, for example, improvements like those found by Frederiksen and White (1997) were again obtained in students’ learning over and above the benefits from curricular change and teacher professional development. In addition, as a result of using the BEAR assessments and participating in scoring moderation sessions, teachers exhibited greater collegiality and used open-ended questions more than teachers in a reform oriented comparison group, “which retained their rosy perceptions of alternative assessment strategies, but never really used them” (Roberts, Wilson, & Draney, 1997).

Nonetheless, this vision should be pursued because it holds the most promise for using alternative assessment to improve teaching and learning. To do otherwise means that day-to-day classroom practices will continue to reinforce and reproduce
the status quo. Each time that teachers hold conferences with students, grade papers, ask students to explain their answers, or use results from a quiz to reorganize instruction, they are either following in the rut of existing practices and beliefs or participating in transforming the culture of the classroom. The task of implementing new assessment practices can be made easier if specific innovations are chosen to support and complement concomitant changes in curriculum and instruction. Indeed, attempts to improve instruction without corresponding changes in assessment are likely to be thwarted by powerful assumptions underlying assessment practices.

1.3 PERFORMANCE ASSESSMENT

Different authors use the term “performance assessment” to mean different things. Some emphasize the cognitive processes demanded of the students, some the format of the desired response, and others the nature and content of the actual response (Palm, 2008).

For many educators, performance assessment is most easily defined by what it is not; specifically, it is not multiple-choice testing. In performance assessment, rather than choosing among predetermined options, the examinee must construct or supply an answer, produce a product, or perform an activity (Madaus & O’Dwyer, 1999). From this perspective, performance assessment encompasses a very wide range of activities, from completing a sentence with a few words (short-answer) to writing a thorough analysis (essay) to conducting a laboratory investigation and writing a descriptive analysis of the process (hands-on) (Stecher, 2010).

Performance assessment is by nature a process that requires extended engagement by students in order to demonstrate their proficiency. They may conduct multistep experiments, write well-documented research papers, organize and supervise group problem solving, or present a description of previously developed work. Although the exact nature of these tasks may differ in terms of subject matter, time for performance, flexibility or choice of topics, and the amount of external support for the student, they share the common characteristic of requiring that students plan, organize and execute complex tasks.

There are many assumed advantages of alternative assessments, for example, that such assessments should result in more effort expended and perhaps less anxiety.
Further, such assessments should engage students in higher level thinking or meta-cognitive skills.

The purpose of assessment in classrooms must be changed fundamentally so that it is used to help students learn and to improve instruction rather than being used only to rank students or to certify the end products of learning. But changing assessment pattern is the most difficult because of the continued influence of external standardized tests and because most teachers have had little training beyond objective writing and familiarity with traditional item formats to help them know how to assess their students’ understandings by new methods of assessment such as performance assessment.

1.4 METACOGNITION

Meta-cognition is thinking about thinking. Meta-cognitive skills are usually conceptualized as an interrelated set of competencies for learning and thinking, and include many of the skills required for active learning, critical thinking, reflective judgment, problem solving, and decision-making. Adults whose meta-cognitive skills are well developed are better problem-solvers, decision makers and critical thinkers, are more able and more motivated to learn, and are more likely to be able to regulate their emotions (even in difficult situations), handle complexity, and cope with conflict. Although meta-cognitive skills, once they are well-learned, can become habits of mind that are applied in a wide variety of contexts, it is important for even the most advanced adult learners to “flex their cognitive muscles” by consciously applying appropriate meta-cognitive skills to new knowledge and in new situations (Dawson, 2008).

Many as Thomas (Thomas, 2006) have reflected “what other long-life attributes, apart from learning and understanding science, might and should be developed in students within their science learning environments?” Effective chemistry science instruction should not only increase chemical learning and understanding but also promote students’ learning autonomy and prepare them to be life long learners (Schraw, Crippen, & Hartley, 2006). This consideration gains relevance when one thinks that most students will not even move on to higher level chemistry courses. Teaching for meta-cognition enhancement has been identified in science education literature as a way to achieve this broad objective and in fact it has
been suggested that it is strategic use more than knowledge in itself that ultimately improves learning (Schraw, Brooks, & Crippen, 2005).

Meta-cognition is a process consisting of planning, monitoring, cognitive strategies and awareness. The measure has been validated in a series of experimental studies (Khabiri, 1993; Kosmicki, 1993; O’Neil, Sugrue, Abedi, Baker, & Golan, 1992; Yap, 1993).

Their concept of meta-cognition is derived from that of Pintrich and DeGroot (1990). They suggested that meta-cognition consists of strategies for planning, monitoring and modifying one’s cognitions. O’Neil & Abedi (1996) also view meta-cognition as composed of planning, monitoring or self-checking, and cognitive strategies. They have added the construct of awareness as they believe there is no meta-cognition without being consciously aware of it (see also Flavell, 1979).

The cognitive revolution reintroduced the concept of mind. In contrast to past, mechanistic theories of knowledge acquisition, we now understand that learning is an active process of mental construction and sense making. From cognitive theory we have also learned that existing knowledge structures and beliefs work to enable or impede new learning, that intelligent thought involves self-monitoring and awareness about when and how to use skills, and that “expertise” develops in a field of study as a principled and coherent way of thinking and representing problems not just as an accumulation of information. At the same time, rediscovery of Vygotsky and the work of other Soviet psychologists led to the realization that what is taken into the mind is socially and culturally determined. Fixed, largely hereditarianism theories of intelligence have been replaced with a new understanding that cognitive abilities are “developed” through socially supported interactions. Although Vygotsky was initially interested in how persons learn to think, over time the ideas of social mediation have been applied equally to the development of intelligence, to development of expertise in academic disciplines, to development of meta-cognitive skills, and to the formation of identity. Indeed, a singularly important idea in this new paradigm is that development and learning are primarily social processes (Shepard, 2000).

These insights from learning theory then lead to a set of principles for curriculum reform. The slogan that “all students can learn” is intended to refute past beliefs that only an elite group of students could master challenging subject matter. A
commitment to equal opportunity for diverse learners means providing genuine opportunities for high-quality instruction and “ways into” academic curricula that are consistent with language and interaction patterns of home and community (Au & Jordan, 1981; Heath, 1983; Tharp & Gallimore, 1988). Classroom routines and the ways that teachers and students talk with each other should help students gain experience with the ways of thinking and speaking in academic disciplines. School learning should be authentic and connected to the world outside of school not only to make learning more interesting and motivating to students but also to develop the ability to use knowledge in real-world settings. In addition to the development of cognitive abilities, classroom expectations and social norms should foster the development of important dispositions, such as students’ willingness to persist in trying to solve difficult problems and their identities as capable learners.

To reach this goal of teaching and learning and reinforcement of meta-cognitive skills in pre university chemistry students, classroom assessment must change in two fundamentally important ways. First, its form and content must be changed to better represent important thinking and problem-solving skills in each of the disciplines. This means assessing learning based on observations, oral questioning, significant tasks, projects, demonstrations, collections of student work, and students’ self-evaluations, and it means that teachers must engage in systematic analysis of the available evidence. Second, the way that assessment is used in classrooms and how it is regarded by teachers and students must change. This literally calls for a change in the culture of classrooms so that students no longer try to feign competence or work to perform well on the test as an end separate from real learning. Instead, students and teachers should collaborate in assessing prior knowledge, probing apparent misconceptions, and resolving areas of confusion because it is agreed that such assessments will help students understand better. Students should engage in self assessment not only to take responsibility for their own learning but to develop meta-cognitive skills by learning to apply the standards that define quality work in a field to their own work. Similarly, teachers should demonstrate their own willingness to learn by explicitly using assessment data to evaluate and improve instruction.
1.5 NEED OF THE STUDY

In spite of the developments, many teachers continue using traditional methods and tools in assessment greatly because of the lack of familiarity with cognitive science results, and also the lack of experience in modern methods and skills of assessment. Consequently, they do not believe in strong learners’ roles in learning process and self evaluation.

In this approach, tests and test results shape the educational processes. In a measurement driven instruction, the teacher tries to increase the level of students’ scores by emphasizing on the tips which will be presented in examinations. It usually occurs but can be followed by very unpleasant results such as: limiting the curriculum, illiteracy of the learners (Cizek, 1993). Also, teachers whose educational methods are based by "surface" assessments educate learners with low thinking skills (Lefrancois, 2000). Therefore, a lot emphasis on traditional methods and goals in assessment leads to the memory load and getting away from deep learning of basic thinking skills in education and training.

To know whether a person could tie her shoe, parent would probably ask her to show you rather than use a set of multiple-choice item, and your assessment would be based on performance of a criterion task. Although multiple choice tests are useful for ascertaining a child’s conceptual knowledge, an assessment of actual performance like skill learning may be more appropriate in some situations. Science education assessment may be one of these situations. Science performance assessment poses a problem and put students in a mini-laboratory to solve it, evaluating the solution as to its scientific orientation (Shevelson, Baxter, & Pine, 1991). These assessments have captured the attention of researchers and policymakers for the last 10 years (Messick, 1994; Ruiz-Primo & Shevelson, 1996). Performance assessments are interpreted as capturing a student's scientific reasoning and procedural skills (California state Board of Education, 1990) and are believed to require the application of scientific knowledge and reasoning in simulated real-world situations as well as in situations similar to what scientists do (National research Council, 1996).

Performance assessment is one of the many issues examined in the education reform literature of recent years (Berk, 1986). Critics have discounted the traditional “input” model of assessment that measures what is put into the educational setting,
such as the dollars spent for child or the number of books in the library. They are calling instead for an “out come” model that gives information about what children have actually learned and can demonstrate in performance (Spady, 1992).

Assessment is one of the greatest challenges chemistry teachers face. The practices that make chemistry classrooms vital and effective (promoting student choice, assessing processes, and assessing the subjective aspect of learning) make assessment a complex matter.

Classroom assessment is an integral part of chemistry instruction. Assessment could be described as the systematic process of gathering information about what a student knows, is able to do, and is learning to do. The primary purpose of classroom assessment is not to evaluate and classify student performance, but to inform teaching and improve learning, and to monitor student progress in achieving year-end learning outcomes. Rather than emphasizing the recall of specific, detailed and unrelated ‘facts’, assessment in science should give greater weight to an assessment of a holistic understanding of the major scientific ideas and a critical understanding of science and scientific reasoning.

Classroom assessment is broadly defined as any activity or experience that provides information about student learning. Teachers learn about student progress not only through formal tests, examinations, and projects, but also through moment-by-moment observation of students in action. They often conduct assessment through instructional activities.

Much of students’ learning is internal. To assess pre university students’ chemistry knowledge, skills and strategies, and attitudes, teachers require a variety of tools and approaches. They ask questions, observe students engaged in a variety of learning activities and processes, and examine student work in progress. They also engage students in peer-assessment and self-assessment activities. The information that teachers and students gain from assessment activities informs and shapes what happens in the classroom; assessment always implies that some action will follow.

To determine whether student learning outcomes have been achieved, student assessment must be an integrated part of teaching and learning. Assessment of student learning involves careful planning and systematic implementation.
The present research tries to identify the impact of performance assessment patterns on students’ meta-cognition and achievement by developing assessment model in an experimental study. Such an assessment requires the learners’ meta-cognitive skills growth which is totally ignored in the traditional pattern.

1.6 STATEMENT OF THE PROBLEM

The present study is entitled as: “Effect of Assessment Patterns on Meta-Cognitive Skills among Pre-University Science Students.

1.7 OBJECTIVES OF THE STUDY

The following are the objectives of the study:

1- To study the effect of assessment patterns (performance and traditional assessment) on meta-cognitive skills of pre university students in chemistry.

2- To study the difference between boys and girls in meta-cognitive skills.

3- To study the effect of assessment patterns (performance and traditional assessment) on monitoring subscale of pre university students in chemistry.

4- To study the difference between boys and girls in monitoring subscale.

5- To study the effect of assessment patterns (performance and traditional assessment) on planning subscale of pre university students in chemistry.

6- To study the difference between boys and girls in planning subscale.

7- To study the effect of assessment patterns (performance and traditional assessment) on cognitive strategy subscale of pre university students in chemistry.

8- To study the difference between boys and girls in cognitive strategy subscale.

9- To study the effect of assessment patterns (performance and traditional assessment) on awareness subscale of pre university students in chemistry.

10- To study the difference between boys and girls in awareness subscale.

11- To study the effect of assessment patterns (performance and traditional assessment) on academic achievement of pre university students in chemistry.

12- To study the difference between boys and girls in academic achievement in chemistry.
1.8 HYPOTHESIS OF THE STUDY

The following are the hypotheses of the study:

H1: There is a significant difference between the performance assessment group and the traditional assessment group in meta-cognitive skills.

H2: There is a significant difference between boys and girls in meta-cognitive skills.

H3: There is a significant difference between the performance assessment group and the traditional assessment group in monitoring subscale.

H4: There is a significant difference between boys and girls in monitoring subscale.

H5: There is a significant difference between the performance assessment group and the traditional assessment group in planning subscale.

H6: There is a significant difference between boys and girls in planning subscale.

H7: There is a significant difference between the performance assessment group and the traditional assessment group in cognitive strategy subscale.

H8: There is a significant difference between boys and girls in cognitive strategy subscale.

H9: There is a significant difference between the performance assessment group and the traditional assessment group in awareness subscale.

H10: There is a significant difference between boys and girls in awareness subscale.

H11: There is a significant difference between the performance assessment group and the traditional group in academic achievement in chemistry.

H12: There is a significant difference between boys and girls in academic achievement in chemistry.

1.9 DELIMITATIONS OF THE STUDY

The present study will be delimited to the following:

1- The pattern designed for assessing according to performance assessment will be carried out only in the units of chemistry in pre-university.

2- The target groups are the students of pre-university in four pre-university schools (boys’ school & girls’ school) Malayer city- Iran (country).
1.10 VARIABLES USED IN THE STUDY

Present study is based on the following variables:

A. Dependent variables

1. Meta-cognitive skills
2. Academic achievement in chemistry

B. Independent variables

1. Assessment patterns   Performance and Traditional assessment
2. Gender               Male and Female

1.11 OPERATIONAL DEFINITION OF THE KEY TERMS USED

1.11.1 Performance assessment pattern

Performance assessment pattern in this study refers to method of learning assessment that in this method, process and products of learners assess directly. Students demonstrate their knowledge and skills in chemistry by engaging in a process or constructing a product. For this purpose, teachers have to provide condition to observe and assess learners’ behavior directly.

1.11.2 Traditional assessment pattern

Traditional assessment pattern in this study refers to pencil-paper test such as short answer test, true-false test, matching test, multiple-choice test and essay test. These tests are teacher made and performed in classroom by teacher. In this study traditional assessment is a pattern that chemistry teachers usually use in their classroom to assess students’ learning.

1.11.3 Meta-cognitive skills

In this study, meta-cognitive skills refer to pre university students' responses to different components of O’Nils and Abedi (1996) meta-cognitive skills test. Meta cognitive skills consist of (a) planning, (b) monitoring, (c) cognitive strategy, and (d) awareness (O’Nils and Abedi 1996).
1.11.4 Academic achievement

In this study academic achievement refers to pre university students' pre test and post test scores in chemistry by teacher made academic achievement test. Academic achievement is learners’ mastering on predetermined learning objects. Evaluation of academic achievement is learners’ performance assessment and comparing the results to determined educational objects in order to making decision about teaching and learning activities’ efficiency.

1.11.5 Pre university students

Pre-university in Iran is a course of study after high school and before the university course. The age of pre university students in Iran is between 17-18 years.

Iran educational system consists of the following courses:

1- Pre-school(one academic year)
2- Primary school(five academic years)
3- Middle school(three academic years)
4- High school(three academic years)
5- Pre university( one academic year)

1.11.6 Effects of assessment patterns

In this study, effect of assessment patterns refers to the impact of an intervention program on the performance assessment group and traditional assessment group. The intervention program consists of specially design activities and test items in pre-university chemistry.