

Conceptions of Assessment: Perceptions of Science Teachers in Jordan

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ABSTRACT

This study examines the perceptions of Jordanian science teachers' conceptions of assessment, and how these perceptions are affected by the teacher's gender, length of experience, and subject variables. The teacher conception of the assessment questionnaire was completed by 488 teachers. It consisted of 27 items spread over four dimensions: school accountability, student accountability, assessment improves education, and assessment is irrelevant. Results showed a high mean for assessment being irrelevant, followed by assessment improving education, student accountability, and school accountability. The results also showed significant differences in the teachers' perception of school accountability by gender, as the female teachers' mean score was higher than that of the males. There were significant differences in the perception of assessment that improves education, again by the teacher's gender, with female teachers scoring higher. The results showed no significant differences in the perception of any of the dimensions according to the length of teaching experience. Finally, there were significant differences in perceptions of assessment in student accountability according to the subject, the mean score for physics teachers being higher than that for chemistry and biology teachers. Perceptions of assessment improving education and assessment being irrelevant, also varied according to the subject, the mean score for mathematics teachers being higher than that of the chemistry, biology, and physics teachers.

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Introduction

As a result of the change from the behavioral approach to constructivism and social learning, how we understand effective teaching and learning has also changed. The contemporary concept of learning is based on new knowledge being built on prevailing foundations, which has a significant impact on the way in which learners develop new concepts, and consequently requires changes in classroom assessment methods (Abell & Siegel, 2011; Shepard, 2000). Shepard (2000) stated that support for this learning system required a change in assessment content, methods, and use by teachers, and this new assessment is formative. According to Black and William (1998), formative assessment encompasses actions by teachers and students' self-assessment, which provide feedback used in the modification of teaching and learning activities, actually becoming formative assessment when adaptation is based on feedback evidence. Many attempts have been made to change the content and methods of assessment (Furtak, 2012; Heitink et al., 2016), but in order to adopt formative assessment practices, teachers must first understand the concept and its implementation.

There is wide support for the notion that various forms of assessment greatly affect educational practice (Elwood & Klenowski, 2002); referred to as a cornerstone for improved learning

(Brookhart & Bronowicz, 2003), it influences student motivation (Black & William, 2010) and improves their self-concept. Stiggins (2005) recognized the strategic role of assessment in education as it is used by policymakers as an influential instrument to aid schools in fulfilling their new roles, by means of large-scale testing.

The literature on teachers' beliefs shows that a wide range of terminology and definitions are used. Thompson (1992) and Brown (2004; 2006) used the term '*conceptions*' instead of '*beliefs*', indicating a less specific conceptual structure which included beliefs, meanings, concepts, propositions, rules, mental images, preferences, and so on (Thompson, 1992), while Brown and Hirschfeld (2005) defined conception as a mental construct or representation of reality, communicated in a variety of ways whether by language or metaphor, comprising beliefs, meanings, preferences, and attitudes, to explain complex areas of experience as, for instance, assessment. By using conceptions, knowledge and beliefs may be combined in a single construct rather than differentiating them, thus avoiding some theoretical and operational challenges. Research using this construct was established by Brown (2004; 2006) to explore and measure teachers' beliefs in the field of assessment.

Teacher preparation is vital in understanding and acquiring the knowledge and skills necessary to become informed assessors of their students' academic performances and achievements, or lack of them. Teachers' conception of how to teach content as well as how it is learned is a strong influence on how they teach and what their students learn (Brown et al., 2011).

McMillan (2003), with regard to assessment, concluded that teachers' decision-making is affected by their conception of assessment, which in turn affects their decision of assessment adoption for learning (Black & William, 1998; McMillan, 2003; Remesal, 2007). Remesal (2007) identified four facets of teachers' conception of assessment: its role in learning, teaching, in the certification of learning, and the accountability of learner achievement. The first and second conceptions relate to the notion of assessment for learning, while the third and fourth relate to the notion of assessment of learning.

Further elaboration by Brown and Hirschfeld (2008) emphasized the four most commonly held types of conception are student accountability, school accountability, improvement, and irrelevance. The accountability conception considers assessment as a means of indicating a student's academic level and their suitability for advancement to the next grade level. School accountability considers assessment as a means of evaluating the effectiveness of the school, teachers, and curriculum by high-stake testing and national assessment methods. The improvement conception also referred to as assessment for learning or formative assessment, considers the role of assessment in stimulating, monitoring, and supporting student learning, while its successful implementation may require new roles for both teachers and students, including teacher awareness and the ability to identify and use relevant and appropriate assessment assignments to improve learning. Finally, the irrelevance conception regards assessment as non-beneficial to the teaching and learning process and believes it should be disregarded.

There are two forms of assessment: formative and summative. Formative assessment is the systematic continuous data gathering about learning, also referred to as assessment for learning (Heritage, 2007). This is a system by which, Heritage proposes, data is used to measure students' learning level and also to recommend modifications to lessons and thus help students to achieve identified learning objectives (Hargreaves, 2007; Popham, 2008).

Summative assessment is also called assessment of learning (Black & William, 1998) and is a system of documenting students' levels of achievement at given intervals throughout their academic career (Hill, 2000). Within this system, researchers have specified three main purposes: to report student achievement and progress, to summarize achievement for the purpose of selection and qualification, and to offer utilized data for determining teacher, school, and system effectiveness (Brown, 2003; Hill, 2000). Assessment literacy refers to teachers' ability and knowledge to enable their use of assessment to aid learning (Abell & Siegel, 2011). Assessment expertise is an alternative term for assessment literacy (Lyon, 2013).

Eggen and Kauchak (2001) found strong indications of the significant impact on teachers' assessment practices of the beliefs, conceptions, and perceptions regarding assessment practices, as well as in their classroom behavior. Conception refers to the use of experience-based values in the evaluation of activities and actions of others and, as such, is a key construct in teachers' assessment practices. However, Heitink et al. (2016) have shown that despite a positive response to the value of assessment to the teachers themselves and their students, many teachers find it difficult to put this knowledge to practical use in the classroom. Accordingly, the practical transition of conception and implementation of assessment in the classroom is even more complex for prospective teachers (Siegel & Wissehr, 2011; Otero, 2006; Volante & Fazio, 2007). This being so, teacher preparation and perception of assessment for learning, in addition to practicing assessment in support of learning, will be a significant method of aiding prospective teachers' assessment literacy. According to Heritage (2007), studies have illustrated the difficulty of replacing traditional conceptions of assessment; even though teachers understand the advantages of modern assessment practice, they continue to use the traditional practices in the classroom.

This situation is due mainly to the fact that as both students and teachers their main practical experience has been of traditional assessment, with scant experience of more successful assessment practices. Siegel and Wissehr (2011) and Otero (2006) point out the impact of their teacher training courses and assessment practices on their understanding and implementation of modern assessment practice. Siegel and Wissehr (2011) also noted that studies of pre-service teacher education have specifically shown the importance of its influence in changing teachers' traditional conception of classroom assessment.

Several authors (Brown & Remesal, 2012; Remesal, 2007; Stipek et al., 2001); Van den Ber, 2002) found a strong correlation between conceptions of assessment and classroom practice, while Brown and Hirschfeld (2007) and Sato and Kleinsasser (2004) commented on indications that teachers' conception of assessment was an important variable affecting classroom choices. Stipek et al. (2001) found evidence that the criteria used by teachers in assigning scores and grading students were strongly influenced by their own beliefs, and concluded that given the linkage between beliefs and practice, equal emphasis must be given to both if teachers' professional development is to be successful. As illustrated in previous studies, understanding teachers' beliefs is of key importance in the endeavor to enhance, adapt, or completely change classroom practices; teachers' conceptions of assessment affect their teaching and assessment practices (Brown, 2011; Leung, 2004; Shohamy, 2004).

Given the existing evidence, it is imperative therefore that we reach a better understanding of teachers' conceptions of assessment, since their conceptions of teaching, learning, and curricula exert a strong influence on their teaching methods and what students learn or achieve (Calderhead, 1996; Pajares, 1992; Thompson, 1992). In support of these opinions, Brown (2004) agreed that all instructional actions, including teachers' perceptions and evaluations of student behavior and performance, are influenced by their conception of teaching, learning, assessment, curricula, and teacher efficacy. Borko et al. (1997) stressed the necessity for such conceptions and inter/intra relationships to be made clearly and explicitly. This is particularly necessary when it is practical or prudent for teachers' conceptions to be reformed, which is the basis of professional development.

It is noted from the review of previous studies that they were conducted in Western countries and there are no Arabic studies dealing with teachers' perceptions and conceptions of assessment among science subject teachers. This study is important in addressing the perceptions of Jordanian Science Teachers of the conception of assessment, as it is the first to do this, to the researcher's knowledge. The current study also aimed to examine the differences in teachers' perceptions of assessment according to gender, subject, and years of teaching experience. The results may help those in charge of the educational process in the Ministry of Education to clearly understand what is happening in the field and to be aware of the perceptions of science teachers of the conceptions of assessment. More specifically, this study tried to answer the following questions:

Question one: What are the perceptions of Science Teachers regarding assessment in Jordanian schools?

Questions two: Are there any significant differences in science teachers' perceptions of assessment according to gender, subject, and years of teaching experience?

Methodology

Research design

The descriptive approach was used in the current study because it is the appropriate approach for the purpose of this study.

Study sample

Participants in this study were all teachers of science subjects in public and private schools in the Zarqa governorate. The study sample consisted of 488 teachers, 264 males and 224 females; 118 physics, 112 mathematics, 138 chemistry, and 120 biology; 162 had 1-5 years of teaching experience, 1586-10 years, and 168 more than 10 years. The ages of the study sample ranged from 25-45 years.

Study Instrument

Teachers Conceptions of Assessment Instrument(TCAI)

The TCAI developed by Brown (2006) and consists of 27 items to assess four subscales: school accountability (3 items), student accountability (3 items), assessment improves education (12 items), and assessment is irrelevant (9 items). TCAI responses were measured on a 6-point Likert scale, ranging from (1) strongly disagree to (6) strongly agree. Brown (2006) found internal consistency of the TCAI by using Cronbach's Alpha (0.81, 0.75, 0.92, and 0.91) respectively for school accountability, student accountability, assessment improves education, and assessment is irrelevant.

To achieve the internal validity of the Arabic version of TCAI, Pearson's correlation was calculated between the total scale and its dimensions, as presented in Table 1.

Table 1

Pearson Correlation Between TCAI and Its Dimensions

Variables	School accountability	Student accountability	Assessment improves education	Assessment is irrelevant	Total scale
School accountability	1				
Student accountability	0.78*	1			
Assessment improves education	0.62*	0.72*	1		
Assessment is irrelevant	0.12*	0.18*	0.52*	1	
Total scale	0.70*	0.77*	0.94*	0.67*	1

Note. (Level of significance = 0.01)

The correlation between TCAI and its dimensions ranged from ($r= 0.67$) to ($r= 0.94$), and between the TCAI dimensions from ($r= 0.12$) to ($r= 0.78$).

In the current study, internal consistency of the TCAI was verified using Cronbach's Alpha (0.86, 0.87, 0.77, and 0.77) respectively for school accountability, student accountability, assessment improves education, and assessment is irrelevant.

Data Collection and Analysis

The TCAI was translated from English into Arabic and a pilot study comprising of 40 male and female teachers was completed to verify validity and reliability; members were identified as teaching physics, chemistry, mathematics, and biology. The data from the full study sample was entered into the SPSS and processed to obtain means, standard deviations, and MANOVA for analysis. The following standard was adopted for teachers' perceptions of assessment: (4-6) high, (2-3.99) moderate, and (1-1.99) low.

Result

Results of Question One

Means and standard deviations of teachers' perceptions of assessment are presented in Table 2.

Table 2

Means and Standard Deviation for Teachers' Perceptions of Assessment

Variable	Mean	SD
School accountability	4.05	1.31
Student accountability	4.08	1.24
Assessment improves education	4.11	0.84
Assessment is irrelevant	4.33	0.77

Perceptions of assessment as irrelevant received the highest mean score (M= 4.33), followed by assessment improves education (M= 4.11), student accountability (M= 4.08), and school accountability (M= 4.05).

Results of Question Two

Means and standard deviations of teachers' perceptions of assessment based on gender, subject, and years of teaching experience are presented in Table 3.

Table 3

Means and Standard Deviation for Teachers' Perceptions of Assessment Based on Study Variables

Variable	Level	School accountability		Student accountability		Assessment improves education		Assessment is irrelevant	
		M	SD	M	SD	M	SD	M	SD
Gender	Male	3.94	1.24	4.00	1.33	4.03	0.85	4.29	0.77
	Female	4.17	1.38	4.16	1.12	4.19	0.82	4.36	0.77
Subject	Mathematics	4.02	1.41	4.23	1.27	4.47	0.86	4.62	0.73
	Chemistry	3.93	1.35	3.87	1.41	3.98	0.97	4.15	0.70
	Biology	3.98	1.01	3.82	0.96	4.00	0.73	4.33	0.71
	Physics	4.29	1.40	4.42	1.14	4.01	0.65	4.24	0.87
Teaching experience	1-5 years	3.91	1.37	3.94	1.29	4.03	0.85	4.22	0.86
	6-10 years	4.11	1.36	4.25	1.25	4.07	0.75	4.33	0.66
	More than 10 years	4.13	1.18	4.04	1.16	4.21	0.90	4.43	0.78

To identify significant differences according to gender, subject, and teaching experience, MANOVA analysis was used; the results are shown in Table 4.

Table 4

Results of MANOVA Analysis

Variables	Source	Sum of squares	df	Mean square	F	Sig
School accountability	Gender	7.848	1	7.848	4.635	0.03
	Subject	10.785	3	3.595	2.123	0.09
	Years experience	6.794	2	3.397	2.006	0.13
	Error	814.441	481	1.693		
	Corrected total	837.504	487			
Student accountability	Gender	4.117	1	4.117	2.795	0.09
	Subject	29.121	3	9.707	6.591	0.00
	Years experience	6.421	2	3.211	2.180	0.11
	Error	708.401	481	1.473		
	Corrected total	749.052	487			
Assessment improves education	Gender	3.151	1	3.151	4.686	0.03
	Subject	17.732	3	5.911	8.792	0.00
	Year experience	1.579	2	0.789	1.174	0.31
	Error	323.387	481	0.672		
	Corrected total	347.237	487			
Assessment is irrelevant	Gender	0.677	1	0.677	1.176	0.27
	Subject	13.083	3	4.361	7.576	0.00
	Year experience	2.603	2	1.301	2.261	0.10
	Error	276.873	481	0.576		
	Corrected total	294.416	487			

The results of the MANOVA analysis showed significant differences by gender in the teachers' perception of assessment in school accountability, with the mean score among female teachers ($M= 4.17$) higher than among male teachers ($M= 3.94$). No significant differences were shown by subject or teaching experience in the teachers' perception of assessment in school accountability, student accountability, assessment improves education, or assessment is irrelevant. However, significant differences were shown in the teachers' perception assessment improves education, according to teacher gender, with the mean score for assessment improves education among female teachers ($M= 4.19$) higher than that of the male teachers ($M= 4.03$). There were no significant differences in the teachers' perception of assessment in student accountability, and assessment is irrelevant, according to gender. Finally, the results of MANOVA analysis showed significant differences in the teachers' perception of assessment in student accountability, assessment improves education, and assessment is irrelevant, according to the teacher's subject; the Scheffe test was used to confirm this, as shown in Table 5.

Table 5

Results of Scheffe Test Based on Teacher Subject

Variable	Subject	Mean	Mathematics	Chemistry	Biology	Physics
Student accountability	Mathematics	4.23				
	Chemistry	3.87				-0.55*
	Biology	3.82				-0.60*
	Physics	4.42		0.55*	0.60*	

Assessment improves education	Mathematics	4.47		0.49*	0.47*	0.46*
	Chemistry	3.98	-0.49*			
	Biology	4.00	-0.47*			
	Physics	4.01	-0.46*			
Assessment is irrelevant	Mathematics	4.62		0.47*	0.29*	0.38*
	Chemistry	4.15	-0.47*			
	Biology	4.33	-0.29*			
	Physics	4.24	-0.38*			

The mean score for physics teachers was higher than that for chemistry and biology teachers. There are significant differences by subject for assessment improves education and assessment is irrelevant, the mean score for mathematics teachers being higher than those for chemistry, biology, and physics teachers.

Discussion

This study aimed to identify the perceptions of Science Teachers in Jordan regarding their conceptions of assessment. The results showed the highest mean of teacher conceptions of assessment as the type of assessment being irrelevant to the education ($M= 4.33$), with the study sample in strong agreement that assessment is useless for education. This view may be the reaction of teachers who view it negatively, either due to its challenge to teachers' autonomy or the mistaken view that assessment is equal to teaching (Brown, 2002). The mean score of teacher conceptions of assessment for assessment improving education ($M=4.11$) showed the study sample to be in strong agreement that assessment was a valuable tool when used to develop teaching and learning. Brown (2002) stated that the aim of this conception was to both improved teaching quality and students' own learning.

A study by Yuce (2015) to investigate conceptions of assessment and assessment practices held by pre-service teachers illustrated similar results, with the participants showing moderate agreement with the use of assessment for student and teacher improvement. These results could reflect the participants' preference for using assessment for personal improvement in their own teaching and student learning performance. In their study of students' conceptions of assessment, Brown and Hirschfeld (2008) found that when students believed that assessment was a means of evaluating their individual learning it was viewed positively and their levels improved.

The mean scores of teachers' conceptions of assessment as student accountability ($M= 4.08$), and school accountability ($M= 4.05$) indicate that the study sample mostly agreed with both these conceptions and therefore supported the conceptions of assessment to be used for accountability. In her study, Vardar (2010) investigated the assessment conceptions of 6th, 7th, and 8th grade teachers, resulting in a moderate agreement that assessment should be beneficial for student accountability. It can therefore be concluded that participants in the present study valued the accountability roles of assessment because of the competitive nature of the Jordanian education system, and consequently consider accountability to be an important purpose of assessment.

The results showed significant differences by gender in the teachers' perceptions of assessment as school accountability, with female teachers giving it greater importance. There were also significant differences by gender in the teachers' perception of assessment improving education, again with the mean for female teachers being higher than for male teachers. The results showed no significant differences by teaching experience in the teachers' perception of any of the four dimensions. However, there were significant differences by the subject taught in perceptions of assessment in student accountability, with the mean score for physics teachers being higher than those for chemistry and biology teachers. Finally, there were significant differences by subject in perceptions of assessment improving education and assessment being irrelevant, with the mean score for mathematics teachers being higher than those for chemistry, biology, and physics teachers.

According to Gatbonton (1999) and Tsui (2005), the literature regarding existing studies on assessment in the classroom suggests that teacher conceptions concerning the purposes and expediency of assessment are influenced by a number of independent variables, including, the years of teaching experience, whether the teacher has received professional assessment training, and the age and gender of the teacher.

In general, teachers with five or more years of teaching experience are classified as experienced. Woorons (2001) stated that highly experienced teachers have the ability when observing a class or learning environment to recognize critical indications providing the insight and understanding necessary to the making of informed intuitive decisions. Schempp and Johnson (2006) commented that less experienced teachers see the same indications but are unaware of their significance.

A study by Alsarimi (2000), investigating classroom assessment beliefs and practices of preparatory science teachers from 112 schools, found no significant difference in teachers' beliefs due to either gender or years of teaching experience. A study in Turkey by Yetkin (2018) investigated the perceptions of prospective English teachers regarding assessment conceptions in the Turkish environment, and found positive correlations between the notions of improvement, school accountability, and student accountability conceptions; no statistically significant differences were found in their conceptions based on the variables gender, age, or teaching experience. In contrast, however, Sahikarakas (2012) found that the number of years of teaching experience did affect the perceptions of language teachers, where the perception of more experienced teachers toward assessments was more negative than that of less experienced teachers, with the researcher explaining the difference by the notion that the experienced teachers regarded themselves as above the need to have to prove their teaching value and efficacy.

Brown and Gao (2015) found variations in conceptions due to teacher gender and teaching experience; male teachers and teachers with twenty or more years of experience endorsed the use of assessment in sponsoring improvement in teaching and learning by inspecting and controlling the school, staff, and students. Ndalichako (2015) discovered that more female than male teachers were in favour of classroom assessment, and found significant statistical differences between them in respect of using assessment as a tool to facilitate and support teaching.

Benson (2014), in a study examining 6th, 7th, and 8th grade teachers' conceptions regarding a group of practices including assessment, found no gender impact on their conceptions of assessment. The study also revealed that in regard to years of teaching experience, younger teachers aged 25-30 and older teachers aged 43 and above held similar views regarding the irrelevance conception of assessment.

Mehrgan et al. (2017) investigated the impact on teachers of English as a foreign language of a number of variables (age, educational background, instructional experience, and gender) on opinions about formative assessment; they found no statistically significant effect of age on teachers' views on formative assessment but found that their teaching experience had a statistically significant influence on their views. In addition, no gender influence was found on teachers' views regarding formative assessment.

Similarly, in an earlier study, Chan (2006) investigated English foreign language teachers' beliefs and practice of multiple assessments and found no statistically significant relationship between their age and belief, implying that their views on multiple assessments were not influenced by age, although a significant contrary relationship was found between teachers' beliefs and years of teaching experience.

The findings of Izci and Caliskan (2017) showed that having attended a comprehensive assessment course, teachers' conceptions of assessment remained positive except for the irrelevance conception. In similar studies (Brown & Hirschfeld, 2008; Levy-Vered & Alhija, 2015), researchers found that neither attending an assessment course nor participating in further training improved teachers' conceptions of assessment. However, according to De Luca et al. (2013) and Smith et al.

(2014), some development was seen in teachers' conceptions of assessment following periodic training sessions.

Conclusion and Suggestions

The educational process consists of a series of elements interacting with each other which affect students' achievement. The teachers' conception of assessment is one of the most influential of these elements in the educational process. There is no doubt that the educational process seeks to know which goals it has achieved, and this is only done through the assessment process. The study results showed a high mean of teacher perceptions of assessment as being irrelevant, followed by assessment improves education, student accountability, and school accountability. The results also showed significant differences in the teachers' perception of assessment in school accountability according to gender. The results showed no significant differences in their perception of assessment in school accountability, student accountability, assessment improves education, and assessment is irrelevant, according to their teaching experience. Finally, results showed significant differences in perceptions of assessment in student accountability according to the subject. There were significant differences by subject in perceptions of assessment in assessment improving education and assessment being irrelevant.

This study was limited to a sample of teachers of science subjects in schools in Zarqa governorate, Jordan. Future studies might compare teachers' conceptions of assessment between working school teachers and student teachers, in addition to holding workshops and training courses aimed at changing the perceptions of science teachers regarding the relevance of assessment.

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