Subject-specific science teachers' views of alternative assessment*

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Contents

Abstract

This study aimed to discover subject-specific science teachers' views of alternative assessment. The questionnaire by Okur (2008) was adapted and deployed for data collection. The sample consisted of 80 subject-specific science teachers drawn from the cities of Trabzon, Rize and Erzurum in Turkey. In analyzing data,

descriptive analysis was employed for identifying how often the subject-specific science teachers use the alternative assessment and which of the alternative assessment techniques are frequently preferred. Also, how gender variable affects their preference and/or self-competency was analyzed via independent samples t-test. In light of the results, it can be deduced that the subject-specific science teachers tended to use such traditional assessment techniques as multiple choice test, concept map, written test, and matching test. Further, the main barrier to involve the alternative assessment in science classes seems to be the high-staking nation-wide exams in Turkey that deploy only multiple-choice questions. Therefore, any change in assessment strategy of the high-staking nation-wide exams may foster teachers to enrich their preferences of alternative assessment and empower its possible use in science classes.

Keywords: Alternative Assessment Technique, Measurement and Assessment, Subject-Specific Science Teachers

Introduction

Multiple choice tests, true-false tests and short-answer questions as the commonly used traditional assessment tests include a limited number of options suggested by teachers (DeMauro, Helphrey, Schram, & Spiekermann, 2001; Dikli, 2003) and focus superficial knowledge on assessing lower-order skills (Miesels, 1995). In a similar vein, classical tests do not provide detailed information about students' development and are ineffective in facilitating students' understanding (Şaşmaz Ören and Tatar, 2007; Zessoules and Gardner, 1991). On the other hand, alternative assessment approaches (e.g., open-ended questions, exhibition, demonstration, experimental practices based on hand skills, computer simulations, concept maps, performance evaluation, self-peer assessment and portfolios) are more realistic, and student-centered as compared to traditional one (Naser, 2008; Struyven, Dochy, Janssens, Schelfhout, & Gielen, 2006).

Competitive learning environments in a globalized world require strong mathematics and science skills for young students. Unfortunately, Turkey has fallen behind industrialized/developing countries given international examination scores such as the Trends in International Mathematics and Science Study (TIMMS, 2013) and Program for International Students Assessment (PISA 2013). Since highly industrialized/developed countries (i.e., Singapore, Hong Kong, Japan, South

Korea and Taiwan) have consistently performed the best scores on the aforementioned examinations (Evans, 2014), the quality and status of teaching and assessment are viewed as the most important common factor to achieve relevant goals in science curricula. Further, teachers play a pivotal role in achieving these goals in practicum (i.e., Çalık & Cobern, 2017).

Alternative assessment determines how learning occurs and progresses rather than learning outcomes/scores in traditional assessment. Hence, it not only handles learning process as a whole but also assesses learning process and outcome together within a multiple framework. Alternative assessment gives an opportunity for teachers to monitor and see student learning/development. Thereby, students may get effective feedbacks for their learning as well as parents may be well-informed about their children's capacities. Given complementary roles of alternative assessment in learning process, Ministry of National Education (MoNE) in Turkey has paid more attention to its usage in school. As a result, MoNE has integrated the alternative assessment into all school curricula (Baki, 2008; Çalık & Ayas, 2008; Çalık, 2016).

Dramatically changes of measurement-assessment in science curricula (Care, Scoular & Griffin, 2016) require teachers to re-build their own competencies, knowledge and self-confidence of measurement and assessment, especially alternative assessment. However, the related literature denotes that teachers lack of these new requirements of the alternative assessment and have pitfalls in effectively implementing messages/demands from curricula (Aydın, 2005; Bulut, 2006; Cheng, 2006; Çakır and Çimer, 2007). Similarly, pre-service teachers have similar deficiencies in comprehending alternative assessment (Çalık, 2007; Yayla, 2011). This means that both in-service and pre-service teachers need to be equipped with the requirements of the alternative assessment. To highlight content and context of the alternative assessment in any in-service and/or pre-service education, teachers' competencies and self-confidence levels should be investigated. Because Turkish MoNE has employed a positive discrimination towards females, the current study involved gender as a variable (Osborne et al., 2003; Kurbanoğlu, 2014; Çalık et al., 2015). Hence, the author would like to test whether gender variable influences subject-specific science teachers' views of alternative assessment. The current study purposes to fill in this gap in related literature by discovering subject-specific science teachers' views of the alternative assessment.

Methodology

The Sample of the Study:

The sample consisted of 80 subject-specific science teachers (45 Males and 35 Females) drawn from the cities of Trabzon, Rize and Erzurum in Turkey. Because the author had worked as a chemistry teacher prior to continuing his career in the university, he invited his colleagues to participate in the current study through convenient sampling. All subject-specific teachers have been teaching independent-subject specific courses (physics- chemistry-biology teachers) in upper secondary schools (from grade 9 to grade 12) financed by Ministry of National Education. In point of Çalık (2016)'s view, newly released science curricula have changed measurement and assessment systems and asked teachers for taking part in in-service education concerning the alternative assessment. That is, in-service education and newly released science curricula foster these teachers to learn the alternative assessment techniques.

Data collection:

A survey developed by Okur (2008) was preferred in that it included 'knowledge, frequency of usage, and preference' sub-factors as a holistically alternative assessment. This survey was adapted and then administered to subject-specific science teachers on face-to-face meetings. The survey with three sub-headings measured their views of alternative assessment (knowledge, frequency of usage, and preference). The first sub-heading included a total of 21 items measuring teachers' views of traditional and alternative assessments. The second one, which elicited how often teachers use alternative assessment (ranging from Frequently--3 points-- to Never--1 point) and how good they are at implementing alternative assessment (ranging from Competent--3 points to Incompetent--1 point). A 32-item third one drew out teachers' attitudes towards the alternative assessment ranging from Strongly Agree (5 points) to Strongly Disagree (1 point). Its reliability coefficient was found to be 0.76 which is higher than the acceptable value suggested by Hair et al. (1998).

Data Analysis

In analyzing data, descriptive analysis (Yıldırım and Şimşek, 2006) was employed for identifying how often the subject-specific science teachers use the alternative

assessment and which of the alternative assessment techniques are frequently preferred. Also, how gender variable affects their preference and/or self-competency was analyzed via independent samples t-test through SPSS 15.0™.

Findings

This section presents findings about the subject-specific science teachers' views of the alternative assessment.

Table 1. Results of independent samples t-test for gender variable

Group	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Male	45	2.25	.49921	.0558	.758
Female	35	2.12	.67868	.0758	

As seen in Table 1, there was no significant difference between mean scores of females (X=80.32) and males (X=81.44) ($p > 0.05$) (Table 1).

As can be seen in Table 2, the subject-specific science teachers mainly preferred the traditional assessment techniques in their classes.

Table 2. Frequencies and Percentages of the Subject-Specific Science Teachers' Preferences of Measurement and Assessment Techniques

Measurement and Assessment Techniques	f	%
Multiple Choice Tests	62	77
True-false questions	51	64
Completion (Gap Filling) Questions	48	60
Short Essay written exams	52	65
Project	32	40
Portfolio	24	30
Concept map	58	73
Self-Assessment	10	13
Performance Evaluation	45	56
Matching Questions	60	75

Word Association	36	45
Open-ended exams	32	40
Drama	8	10
Written Reports	10	13
Group and / or Peer Review	24	30
Posters	28	35
Demonstration	8	10

As observed in Table 3, most of the subject-specific science teachers preferred Multiple Choice Tests (f: 62; 77%), Matching Questions (f: 60; 75%) and concept map (f: 58; 73%). Also, minority of them referred to drama and demonstration (f: 8; 10%).

Table 3. Frequencies and Percentages of the Subject-Specific Science Teachers' Self-Competency Levels of the Alternative Assessment Techniques

The Alternative Assessment Techniques	**Incompetent**		**Partial Competent**		**Competent**	
	f	**%**	**f**	**%**	**f**	**%**
Performance Evaluation	8	10	40	50	32	40
Portfolio	14	18	38	47	28	35
Group and / or Peer Review	22	27	40	50	18	23
Structured Grid	24	30	36	45	20	25
Poster	12	15	33	41	35	44
Drama	15	19	25	31	40	50
Concept map	6	8	24	30	50	63
Diagnostic tree	8	10	21	26	51	64
Self-Assessment	6	7	30	38	44	55
Word Association	4	5	39	49	37	46
Project	10	13	25	31	45	56
Interview	3	4	20	25	57	71
Written Reports	4	5	22	27	54	68
Demonstration	6	7	18	23	56	70

As seen in Table 3, 70% and 68% of the subject-specific science teachers felt themselves as 'competent' at demonstration, and in written reports respectively. Moreover, half of them depicted themselves as partial competent in performance assessment and group/peer review. In a similar vein, almost half of them addressed partial competent at word association and portfolio. Few of them felt themselves as incompetent in interview (f: 3; 4%), written reports (f: 4; 5%), word association (f: 4; 5%) and demonstration (f: 6; 7%).

Table 4. Frequencies and Percentages of the Subject-Specific Science Teachers' Use of the Alternative Assessment Techniques

The Alternative Assessment Techniques	Never		Seldom		Often	
	f	%	f	%	f	%
Performance Evaluation	7	9	49	61	24	30
Portfolio	6	8	60	75	14	17
Group and / or Peer Review	12	15	48	60	20	25
Structured Grid	18	22	38	48	24	30
Poster	21	26	42	53	17	21
Drama	18	22	40	50	22	28
Concept map	4	5	8	10	68	85
Diagnostic tree	6	8	14	18	60	75
Self-Assessment	10	13	58	72	12	15
Word Association	5	6	62	78	13	16
Project	13	16	52	65	15	19
Interview	5	6	60	75	15	19
Written Reports	10	13	25	31	45	56
Demonstration	12	15	13	16	55	69

As observed in Table 4, the subject-specific science teachers frequently preferred concept map (85%), diagnostic tree (75%) and demonstration (69%) as alternative assessment techniques in their classes. Nearly three fourth of them employed word association (78%) and demonstration (75%) rarely as alternative assessment techniques in their classes. The highest percentages for 'never' category appeared at poster (26%), drama (22%) and structured grid (22%).

Discussion, Conclusions and Implications

Because constructivism has underpinned Turkish science curricula, the alternative assessment (learning process) is as important as traditional one (learning outcomes). Further, Anderson (1998) claims that constructivism supports alternative assessment practices rather than traditional teaching and assessment methods. Since alternative assessment aims to reveal students' knowledge and skills in cognitive, psychomotor, and affective domains through various ways, students need to display their performances/capacities in these domains (Şaşmaz Ören, et al, 2011). The subject-specific science teachers under investigation stated their wishes to employ alternative assessment techniques in their careers/classes. Also, they emphasized learning process by using alternative assessment. This may stem from a need stressed by the Turkish MoNE. That is, science curricula newly launched by the Turkish MoNE has promoted them to evaluate their students' learning processes along with learning outcomes.

Even though the Turkish MoNE has employed a positive discrimination towards females (e.g., Çalık et al., 2015), the current study found no significant difference between mean scores of gender variable (see Table 1). This implies that the subject-specific science teachers dealt with the alternative assessment in the same way ($p > 0.05$). This is in a harmony with those of Forgasz (1991) and Yaman (2011).

The results of the current study (see Table 2) showed that the subject-specific science teachers tended to use such traditional assessment techniques as multiple choice test, concept map, written test, and matching test. This may stem from their inability to implement the alternative assessment (e.g. Acad and Demir, 2007; Gömleksiz and Kan, 2007). A lack of knowledge of alternative assessment calls for a provisional approach for integrating into science classes (Corcoran et al., 2004). The main barrier to involve the alternative assessment in science classes seems to be high-staking nation-wide exams in Turkey that only deploy multiple-choice questions. Therefore, any change in assessment strategy of the high-staking nation-wide exams may foster teachers to enrich their preferences of alternative assessment and empower its possible use in science classes. In light of the results, the current study suggests to design and implement in-service education for the subject-specific science teachers. Also, the Turkish MoNEshould create on-line and/or off-line software to easily share alternative assessment materials. Further, a

national measurement-assessment bank controlled by the Turkish MoNE may be built for the use of the subject specific science teachers. Hence, they may be easily access to related materials.

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Appendix

The form entitled "Subject-Specific Science teachers' views of the alternative assessment" (Adapted from Okur (2008), p. 103)

KİŞİSEL BİLGİLER VE ALTERNATİF DEĞERLENDİRME

GÖRÜŞ FORMU

1. BÖLÜM

1. Cinsiyetiniz:

   Erkek ( ) Kadın ( )

2. Mezun olduğunuz son okul/ Enstitü/ Fakülte:

   ( ) Eğitim Yüksek Okulu.
   ( ) Eğitim Enstitüsü.
   ( ) Eğitim Fakültesi.
   ( ) Fen/Edebiyat Fakültesi.
   ( ) Diğer (Lütfen Yazınız).....

3. Öğretmenlik mesleğindeki hizmet yılınız:

   ( ) 0-5 ( ) 6-10 ( ) 11-15 ( ) 16-20 ( ) 21-25 ( ) 26 ve üzeri

4. En son mezun olduğunuz okulda, öğretmenliğe başlamadan önce ya da başladıktan sonra ölçme ve değerlendirme dersi veya kursu aldınız mı?

   ( ) Evet ( ) Hayır

5. Öğrenciyi değerlendirirken kullandığınız teknikler nelerdir? (Birden çok işaretleme yapabilirsiniz)

   ( )Çoktan Seçmeli Testler ( ) Tamamlama (Boşluk Doldurma) Soruları
   ( )Eşleştirme Soruları ( ) Kısa Cevaplı Yazılı Yoklamalar
   ( )Uzun Cevaplı Yazılı Yoklamalar( ) Ürün Seçki Dosyası (Portfolyo)
   ( )Doğru Yanlış Soruları ( ) Performans Değerlendirme
   ( )Kavram Haritaları ( ) Yapılandırılmış Grid

( )Görüşme ( ) Kelime İlişkilendirme
( )Tanılayıcı Dallanmış Ağaç ( ) Gösteri
( )Grup ve/veya Akran Değerlendirmesi ( ) Kendi Kendini Değerlendirme
( )Yazılı Raporlar ( ) Soru Cevap
( )Drama ( ) Poster
( )Proje

2. BÖLÜM 6. Aşağıda verilen alternatif ölçme ve değerlendirme teknikleri hakkında bilgilerinizi nasıl buluyorsunuz?	**Yeterli**	**Kısmen Yeterli**	**Yetersiz**
1.Performans Değerlendirme			
2.Ürün Seçki Dosyası (Portfolyo)			
3.Grup ve/veya Akran Değerlendirmesi			
4.Yapılandırılmış Grid			
5.Poster			
6.Drama			
7.Kavram Haritaları			
8.Tanılayıcı Dallanmış Ağaç			
9.Kendi Kendini Değerlendirme			
10. Kelime İlişkilendirme			
11.Proje			
12.Görüşme			
13.Yazılı Raporlar			
14.Gösteri			

7. Fen ve Teknoloji dersinde öğrencinin değerlendirilmesinde, aşağıdaki alternatif ölçme ve değerlendirme tekniklerini ne ölçüde kullanmaktasınız?	**Sıklıkla**	**Nadiren**	**Hiç**
1.Performans Değerlendirme			

2.Ürün Seçki Dosyası (Portfolyo)			
3.Grup ve/veya Akran Değerlendirmesi			
4.Yapılandırılmış Grid			
5.Poster			
6.Drama			
7.Kavram Haritaları			
8.Tanılayıcı Dallanmış Ağaç			
9.Kendi Kendini Değerlendirme			
10. Kelime İlişkilendirme			
11.Proje			
12.Görüşme			
13.Yazılı Raporlar			
14.Gösteri			

3. BÖLÜM Fen ve teknoloji dersinde alternatif değerlendirme tekniklerinden**KULLANDIĞINIZ** yöntemleri kullanma nedenlerinizi belirlemek amacıyla aşağıdaki ifadeler hazırlanmıştır. Lütfen her bir ifadede size uygun seçeneği seçiniz.	**Tamamen Katılıyorum**	**Katılıyorum**	**Kararsızım**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
1.Alternatif değerlendirme teknikleri sadece ürünü değil, öğrenme sürecini de değerlendirdiği için kullanıyorum.					
2. Alternatif değerlendirme tekniklerini isteyerek kullanıyorum.					

3. Alternatif değerlendirme tekniklerini kullanmayı geleneksel değerlendirme tekniklerine tercih ediyorum.					
4. Alternatif değerlendirme tekniklerini kullanmak benim için çok büyük kolaylık.					
5. Öğrencinin gerçek yaşamla kendi bilgisi arasında ilişki kurmasını sağladığı için kullanıyorum.					
6. Fen öğretiminde, kullanılan ölçme araçları bireysel yetenekleri öne çıkarmaktadır.					
7. Öğrencilerin özelliklerini merkeze aldığı için kullanıyorum.					
8. Öğrencinin karşılaştığı problemlere çoklu çözüm yolları üretmesine olanak sağladığı için kullanıyorum.					
9. Öğrenciyi çoklu değerlendirme fırsatı sağladığı için kullanıyorum.					
10. Alternatif değerlendirme tekniklerini isteyerek kullanmıyorum.					
3. BÖLÜM Fen ve teknoloji dersinde alternatif değerlendirme tekniklerinden**KULLANDIĞINIZ** yöntemleri kullanma nedenlerinizi belirlemek amacıyla aşağıdaki ifadeler hazırlanmıştır. Lütfen her bir ifadede size uygun seçeneği seçiniz.	**Tamamen Katılıyorum**	**Katılıyorum**	**Kararsızım**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**

11. Yeni öğretim programında özellikle vurgulandığı için kullanıyorum.					
12. Diğer öğretmen arkadaşlarım kullandığı için kullanıyorum.					
13. Öğrencinin kendi kendini ve grubunu değerlendirmesini sağladığı için kullanıyorum.					
14. Alternatif değerlendirmeler, öğrencilerin Fen ve Teknoloji dersindeki farklı becerilerini değerlendirme olanağı sağladığı için kullanıyorum					
15. Öğretmene, öğrenciye ve veliye birçok avantaj sağladığını düşündüğüm için kullanıyorum.					
16. Veliye öğrenci hakkında daha ayrıntılı (bireysel gelişim dosyaları ile) bilgi vermemi sağladığı için kullanıyorum.					
17. Alternatif değerlendirme teknikleriyle öğrencilerin eksikliklerini daha iyi görebiliyorum.					
18. Öğrencilerin sorumluluk duygularını geliştirdiğini düşündüğüm için kullanıyorum.					
19. Alternatif değerlendirme tekniklerini kullanarak öğrencileri daha iyi değerlendirdiğimi düşünüyorum.					

3. BÖLÜM Fen ve teknoloji dersinde alternatif değerlendirme tekniklerinden**KULLANDIĞINIZ** yöntemleri kullanma nedenlerinizi belirlemek amacıyla aşağıdaki ifadeler hazırlanmıştır. Lütfen her bir ifadede size uygun seçeneği seçiniz.	**Tamamen Katılıyorum**	**Katılıyorum**	**Kararsızım**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
20. Ne öğrettiğimi, gerçekte ne öğrendiklerini kanıtlayabilmem için kâğıt kalem testlerini kullanmak zorundayım.					
21. Alternatif değerlendirme teknikleri hakkında yeterli bilgiye sahip olmadığım için kullanmıyorum.					
22. Öğrenciye ve veliye alternatif değerlendirme tekniklerini zor ve yoğun bulduğu için kullanmıyorum.					
23. Alternatif değerlendirme teknikleriyle öğrenciyi objektif bir değerlendirme yapabileceğimi düşünmediğim için kullanmıyorum.					
24. Geleneksel değerlendirme teknikleriyle öğrenciyi daha iyi değerlendirdiğimi düşündüğüm için kullanmıyorum.					
25. Zamansal kayıp olarak düşündüğüm için kullanmıyorum.					
26. Sınıf mevcudumun çok fazla olmasından dolayı kullanmıyorum.					
27. Elde edilen verilerin analizi ve değerlendirme kriterlerinin belirlenmesi zor geldiğinden kullanmıyorum.					

28. Geleneksel ölçme değerlendirme tekniklerinin öğrencileri değerlendirmek için yeterli olduğunu düşündüğüm için kullanmıyorum.					
29. Yapılan çalışmaların depolanması zor geldiğinden kullanmıyorum.					
30. Alternatif değerlendirme tekniklerine uygun ölçekler oluşturmanın zor olduğunu düşünüyorum.					
31. Fazladan yük getirdiğine inandığım için kullanmıyorum.					
32. Geleneksel ölçme değerlendirme tekniklerini kullanan öğretmenler için değerlendirmenin daha kolay olduğunu düşünüyorum.					