Music Teacher Candidates' Views About Nature of Scientific Knowledge

Müzik Öğretmen Adaylarının Bilimin Doğası Hakkında Görüşleri

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ABSTRACT

Views about knowing and learning science and the nature of science have been probed in the past by focusing on different groups and sub-groups of learners and citizens. Since science literacy is now being aimed for everyone in many international documents, we were interested in probing and cross comparing the views of prospective music teachers' views about science. For this purpose, in this descriptive study, we utilized the Nature of Scientific Knowledge Scale and administered this instrument to prospective music teachers. We also administered the instrument to graduate students enrolled in the music education program. It was found that music education graduate students scored higher. The music education undergraduates scored lower and the mean differences were statistically significant. This finding suggest that cross-disciplinary courses such as nature and history of science should be offered and can be useful for developing scientific literacy for music education majors.

Keywords: Nature of Science, Music Education

ÖZET

Bilim öğrenimi ve bilimin doğası hakkındaki görüşler geçmişte birçok farklı grup ve alt gruplardaki öğrenci ve yurttaşlara odaklanarak ölçülmüştür. Şimdilerde, birçok uluslararası belgede bilimsel okuryazarlık herkes için amaçlanmaktadır. Bu yüzden biz de müzik öğretmen adaylarının bilim hakkındaki görüşlerini ortaya çıkarmayı ve kendi aralarında karşılaştırmayı amaçlayan bir betimsel çalışma gerçekleştirdik. Bu amaca yönelik olarak Bilimsel Bilginin Doğası Ölçeği kullanılmış ve müzik öğretmen adaylarına ve lisansüstü öğrencilerine uygulanmıştır. Sonuçta lisansüstü öğrencilerin daha yüksek puan aldıkları bulunmuştur. Lisans öğrencilerinin puanlarının daha düşük olduğu görülmüş ve farklar da istatistiksel olarak anlamlı bulunmuştur. Bu bulgular bilimin doğası ve tarihi gibi disiplinler arası derslerin farklı programlar için ilginç

gelecek tarzda geliştirilip açılmasının, bilimsel okuryazarlığın geliştirilmesinde faydalı olacağı düşünülmektedir.

Anahtar Kelimeler: Bilimin Doğası, Müzik Eğitimi

INTRODUCTION

In current international documents scientific literacy is meant for all citizens. Developing necessary knowledge and skills for understanding science and technology is now a general requirement for all. It is especially true for teachers of science and other disciplines. In the past various different instruments were developed and used to probe such understandings (Taşar, 2006). Rubba's (1976) *Nature of Scientific Knowledge Scale* is one of the most widely used such instruments world wide despite its known defects (Lederman, 2000; Taşar, 2006). In this study an adopted version of NSKS into Turkish by Taşar (2006) was used.

The research questions in this study were as follows:

1) How do prospective music teachers understand the nature of scientific knowledge?

2) How do music teaching graduate students understand the nature of scientific knowledge?

3) Is there a statistically significant difference between the undergraduates and graduates?
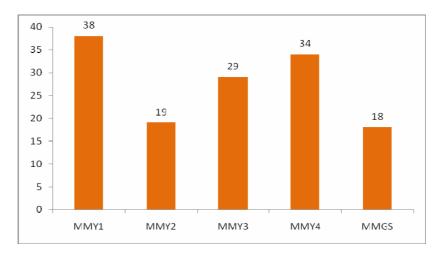
Significance

It is deemed that probing different groups of individuals' learning and understanding of the nature of science is important. Especially, for learning groups, non-science majors should be researched to see how their prior learning contributes to their understandings of science and its processes. Therefore in this study we focused on prospective music teachers, as a group of non-science major, to probe their understandings of the nature of science and compare and contrast to that of the graduate students in the same major.

DESIGN AND PROCEDURE

The Participants

A total of **138** music education majors participated in this study. The distribution of participants according to years is given below (see Figure1).

MM: Music Education Majors, **Y**: Year, **GS**: Graduate Students

Figure 1. The number of participants and their distribution according to years in the sample.

The Instrument – Turkish Version of the NSKS

The reliability estimate Cronbach alpha of the Turkish version of NSKS instrument was calculated in this study as 0.78 which is high.

In the original instrument 6 dimentions (subscales) were identified. These are shown in Table 1.

Table 1. Subscales of the original NSKS instrument and the related questions.

The NSKS Subscales	Positive Item Numbers	Negative Item Numbers
Amoral	4, 5, 8, 48	7, 18, 21, 36
Creative	17, 20, 28, 32	1, 23, 34, 41
Developmental	16, 26, 37, 42	25, 27, 31, 43
Parsimonious	2, 6, 29, 46	14, 15, 39, 40
Testable	12, 22, 38, 45	9, 11, 13, 33
Unified	3, 30, 35, 47	10, 19, 24, 44

In the Adopted Turkish version of the NSKS 7 factors could be identified (see table 2 below).

Table 2. Identified factors in the adopted Turkish version of the NSKS.

Identified Factors	Item Numbers
Factor 1	10, 19, 21, 39, 11, 45, 38, 9, 7, 31, 24, 3, 37, 48, 22, 44, 26, 30, 33
Factor 2 (creativity)	23, 28, 20, 32, 17, 34, 41, 1
Factor 3	47, 12, 5, 6
Factor 4	2, 16, 43, 25
Factor 5	46, 40, 36, 15
Factor 6	5, 18, 4, 29
Factor 7	42, 35, 14
Cannot be grouped in any of the above factors	8, 13, 27

Table 2 shows that factor 2 items exactly match those of the creativity subscale items in the original instrument. For others there are only partial matchings. It is also seen that three items could not be fit in any of the seven factors.

Data Analysis

The data were analyzed by using the SPSS software (version 11.5). The descriptive statistics is shown in Table 3. It is seen that the mean scores of undergraduate music education majors were lower than the music education graduate students and science education majors. However at this point it is not know if the differences were statistically significant. In order to determine if the differences were significant a one-way ANOVA test with multiple comparisons (i.e. Tukey HSD, Scheffe, Dunnett T3) was conducted. Table 4 shows the Tukey test results.

Table 3. Descriptive statistics for the data.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	Between-Component Variance
						Lower Bound	Upper Bound			
MMY1		38	163.34	14.780	2.398	158.48	168.20	127	200	
MMY2		19	160.79	18.923	4.341	151.67	169.91	137	192	
MMY3		29	157.97	9.796	1.819	154.24	161.69	144	184	
MMY4		34	154.32	13.722	2.353	149.54	159.11	137	180	
MMGS		18	175.94	6.795	1.602	172.57	179.32	167	192	
Total		138	162.47	64.02	12.51	786.5	838.23	712	948	
Model	Fixed Effects			13.064	.982	162.28	166.15			
	Random Effects				3.438	155.80	172.63			69.400

The Tukey HSD test results revealed that there were no statistically significant differences between the undergraduate music education majors (years 1-4), however the differences between them and the remaining three groups of participants (music education graduate students, science education year 1 and 3

students) were significant. Also there were no statistically significant differences between music education graduate students, science education year 1 and year 3 students. Therefore it can be concluded that music education graduate students, science education year 1 and year 3 students better understand the nature of science than the music education undergraduate students as measured by the adopted Turkish version of the NSKS. The mean scores are shown in Figure 2.
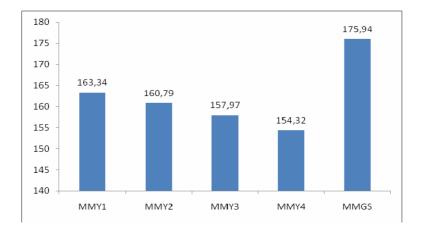

Figure 2. Obtained mean NSKS scores of the seven groups of participants in the sample.

Results

It is seen that the mean scores of music education majors' is gradually and steadily decreasing as years they are enrolled is increased. This finding can be attributed to the fact that in Turkey all high school students take mandatory science courses. However, the data reveals that their understanding of the nature of science is impeded in subsequent years. It is very notable that music education graduate students scored on the average significantly very high as compared to the undergraduates. Therefore, it is concluded that their understanding of the nature of science is *somehow* elevated to a more desirable level. This is a desirable but not a surprising finding of this study. It can

be explained as follows. The graduate students take research courses and get engaged in educational research and prepare and defend thesis during their carrier. Hence, although have not taken any history or the nature of science courses, they get to better understand the nature of science (their mean score was the highest among the seven groups of participants).

The findings also show that the highest mean scores were below 75 % level of the maximum obtainable scores by individual participants. This suggests that there is still room for further development for even the best scorer groups of this questionnaire. Perhaps more authentic and/or explicit approaches to the teaching of the nature of science should be adopted in order to be able to obtain better results in the future.

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