

Perceptions of Secondary Education Science Teacher Candidates on Their Teaching Profession Competencies

Ortaöğretim Fen Öğretmen Adaylarının Öğretmenlik Mesleği Yeterlilikleri Hakkındaki Algıları

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Abstract

The purpose of this study was to determine the perceptions of secondary education science teacher candidates on their teaching profession competencies. Quantitative data were collected via "Teacher Competencies Scale" according to some variables. The study was conducted with 155 secondary education science teacher candidates. Two-way ANOVA test results showed significant difference in terms of the type of the program but no significant differences were detected in terms of field, gender and age. It was concluded that secondary education science teacher candidates perceive themselves adequate for teaching profession competencies in general. They perceived themselves most adequate for topics such as "listening to students with interest", "providing a democratic learning environment," and "associating subjects with life."

Keywords: Teaching Profession Competencies, Perception, Secondary Education Science Teacher Candidate, Teaching Profession

Özet

Bu çalışmanın amacı ortaöğretim fen öğretmen adaylarının öğretmen mesleğine yönelik yeterlilikleri hakkındaki algılarını belirlemektir. Bu amaçla öğretmen yeterlilikleri ölçeği ile bazı değişkenlere göre nicel veriler elde edilmiştir. Araştırma 155 ortaöğretim fen öğretmen adayı ile yürütülmüştür. İki faktörlü ANOVA test sonuçları program türü açısından anlamlı farklılık göstermiş fakat alan, cinsiyes ve yaş açısından anlamlı bir farklılık ortaya çıkmamıştır. Çalışmada ortaöğretim fen öğretmen adaylarının genel olarak öğretmenlik mesleği yeterlilikleri açısından kendilerini yeterli olarak algıladıkları sonucuna ulaşılmıştır. Öğretmen adaylarının kendilerini en fazla yeterli algıladıkları konular; "öğrencileri ilgi ile dinleme", "demokratik bir öğrenme ortamı sağlama" ve "konuları yaşamla ilişkilendirme" dir.

Anahtar Kelimeler: Öğretmenlik Mesleği Yeterlilikleri, Algı, Ortaöğretim Fen Öğretmen Adayı, Öğretmenlik Mesleği

1. Introduction

Education, as an important factor in developing countries, is seen as a profitable investment on the future of humanity. One of the most important educational factors towards fulfilling the public's expected values is the teacher. Excellent classrooms, curriculum and instructional materials have important role in students' learning, but they are not adequate on their own. The quality of teaching must complement these components. And there is a direct relationship between the quality and effectiveness of teaching and the quality of the teacher. So it is important to educate qualified teachers to meet the needs of today's and tomorrow's children.

The literature (Chapman & Mählck, 1997; Châu, 1996; Darling-Hammond, 1999; Kanu, 1996; Mendro, 1998; Miguel & Barsaga, 1997; Nye, Konstantopoulos, & Hedges, 2004; Wright, Horn, & Sanders, 1997) indicates a positive relationship between teacher quality and student achievement. To be a good teacher, Shulman (1986) stated it is insufficient having knowledge of only subject matter and general pedagogical strategies. He addressed the dichotomy of these two domains in teacher education programs, and proposed the blending of content and pedagogy by introducing the notion of PCK (Pedagogical Content Knowledge). Mishra and Koehler (2006) argued technology integration in teaching and learning, and introduced the Technological Pedagogical Content Knowledge (TPCK). According to this model, knowledge about Content (C), Pedagogy (P), and Technology (T) is central to develop excellent teaching skills. This model emphasizes the connections, interactions, affordances, and constraints between and among content, pedagogy, and technology (Mishra & Koehler, 2006).

Many governments have, increasingly, begun to teacher education reforms to regulate for the quality and outcome of teacher education (Moon, 2007; Pantic' & Wubbels, 2010). Taking into consideration the exchange of scientific and technological developments in the field of education, Turkish Republic General Directorate of Teacher Training conducted a series of studies. One of these studies is "Generic Teacher Competencies." Competency was explained by OECD as: "Competency is more than knowledge and skills. It involves the ability to meet complex demands by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context. For example, the ability to communicate effectively is a competency that may draw on an individual's knowledge of language, practical IT (Information Technology) skills, and attitudes towards those with whom he or she is communicating." (2005, p.4). Two perspectives relate to the concept of competency in education. According to theoretical perspective, competency is comprehended as a cognitive structure that facilitates specified behaviors. From an operational perspective, it covers a broad range of higher order skills and behaviors that represent the ability to cope with complex, unpredictable situations (Westera, 2001). Currently, this operational definition is popular in the educational field.

The “Generic Teacher Competencies”, released by Turkish Republic General Directorate of Teacher Training includes teacher competencies such as knowledge, skills, and attitudes that teachers should have for implementing new curricula and to prepare students for the 21st century. Generic Competencies are grouped under six headings; “Personal and Professional Values-Professional Development,” “Knowing the Student,” “Learning and Teaching Processes,” “Monitoring and Evaluation of Learning and Development,” “School-Family and Society Relationships,” and “Knowledge of Curriculum and Content” (Ministry of National Education (MoNE), 2012). Sub-competencies related to learning and teaching process are “Planning the Lesson”, “Materials Preparation”, “Organizing Learning Environments”, “Organizing Extra-Curricular Activities”, “Diversifying Education by Taking into Account the Individual Differences”, “Time Management”, and “Behavior Management” (MoNE, 2012).

Existing studies related to teachers’ competencies and their professional development (Beijaard, Verloop, & Vermunt, 2000; Bozkurt Bostancı & Kayaalp 2011; Büyüктаşkapu Soydan & Dereli, 2014; Holm & Kajender, 2015; Karacaoğlu, 2008; Khatoon, Azeem, & Akhtar, 2011; Kösterelioğlu & Akın Kösterelioğlu, 2008; Salamuddin, Harun, & Abdullah, 2011) shed light on pre-service and in-service teacher training. However, determining how teacher candidates perceive their competencies about the teaching profession will be an early step on behalf of resolving their deficiencies before they begin the profession. In literature, there are also studies (Erişen & Çeliköz, 2003; Köksal, 2014; Öksüzoğlu, 2009) examining the perceptions of teacher candidates’ on teaching profession competencies. But, there are quite limited studies (Çocuk, Yokuş, & Tanrıseven, 2015; Elkatmış, Demirbaş, & Ertuğrul, 2013; Göksoy, 2014) on this issue with teacher candidates, especially about the ongoing Pedagogical Formation Certificate Program. Also, some of these studies do not contain all teaching profession competencies. For example, Göksoy (2014) examined pedagogical formation teacher candidates’ communication skills based on their perceptions. But communication is only one dimension for teacher competencies. Studies with pedagogical formation teacher candidates are important as others because of students completing the Pedagogical Formation Certificate Program can be appointed as teachers in Turkey.

In this study, the aim was to determine how secondary education science teacher candidates, who received pedagogical courses, perceived their competencies on teaching profession. Thus, determining the deficiencies in line with the beliefs of teacher candidates on their competencies in the class related to the “subject field and field education” and “teaching-learning process” and rectification of these deficiencies are important on behalf of training qualified teachers for the future.

1.1. Significance of the Study

Pre-service teacher training programs of institutions of higher education can make

a difference on teacher candidates' professional identity (Tural & Kabadayı, 2014). Seeing how teacher candidates perceive their teaching profession competencies will provide teacher educators with the clues about the deficiencies of the current teacher training programs. So, data from such researches may lead to develop reorganizations for these programs and contribute to educate qualified teachers. The relevant literature generally presents the teachers' professional competencies. Studies related to perceptions of teacher candidates on their teaching profession competencies mostly concentrated on students continuing teaching programs in educational faculties, not on students who are out of the teaching programs and who receive vocational courses later within Pedagogical Formation Certificate Program processes. The present research provides information about the perceptions of secondary education science teacher candidates considering each program related to their teaching profession competencies. This research also provides comparative information about whether there is a difference between the programs in terms of perceptions.

1.2. The Purpose of the Study

The purpose of this study was to determine the perceptions of secondary education science teacher candidates on their teaching profession competencies. The following research questions are the frame for this study.

1. How do secondary education science teacher candidates perceive themselves on their teaching profession competencies?
2. Do perceptions of secondary education science teacher candidates about their teaching profession competencies vary in terms of gender?
3. Do perceptions of secondary education science teacher candidates about their teaching profession competencies vary in terms of age?
4. Do perceptions of secondary education science teacher candidates about their teaching profession competencies vary in terms of educational programs?
5. Do perceptions of secondary education science teacher candidates about their teaching profession competencies vary in terms of field?

2. Method

This research is designed with the Relational Survey Model. The Relational Survey Model is defined as a research model aimed to determine the presence of variance or degree between two or more variables (Karasar, 2005). The quantitative data were collected to determine the teacher candidates' perceptions on their teaching profession competencies, according to "gender," "age," "program," and "field" variables.

2.1. Sample

This research was conducted with secondary education science teacher candidates from a university in the Black Sea Region of Turkey. There were 166 secondary edu-

education science teacher candidates who received pedagogical courses as instructional technologies and material design, special teaching methods, teaching practice, introduction to education, measurement and evaluation in education, education psychology, and classroom management in the university during the research period. 155 of the teacher candidates were available for the study. So, the research was conducted with 155 secondary education science teacher candidates. Thirty-seven percent of the sample participants were in year 5 (last year) of their teacher education program. Thirty percent of the sample participants were graduated from physics, chemistry, and biology programs, and were in the last semester of their Pedagogical Formation Certificate Program. Thirty-three percent of the sample participants were in year 4 (last year) of their undergraduate program (physics, chemistry, biology) and in last semester of their Pedagogical Formation Certificate Program (Table 1).

Table 1. Distribution of the Variables

Variable	Group	f	%
Gender	Female	83	54
	Male	72	46
Age	20-24	86	55
	25 and above	69	45
Program	(A) Secondary education science programs (students continuing last year of physics, chemistry, or biology teaching at the educational faculty).	58	37
	(B) Pedagogical Formation Certificate Program (students graduated from physics, chemistry or biology).	46	30
	(C) Pedagogical Formation Certificate Program (students continuing last year of physics, chemistry or biology in the faculty of science and arts).	51	33
Field	Physics	57	37
	Chemistry	50	32
	Biology	48	31

2.2. Instrument and Procedures

In this study the “Teacher Competencies Scale” developed by Şeker, Deniz, and Grgen (2004), consisting of 33 items was used. The “Lesson Observation Form” (Council of Higher Education (CoHE), 1998) related to teaching practice course assessment was made use of in developing the Teacher Competencies Scale. Şeker, Deniz, and Grgen (2004) removed Items 5, 6, 18, 31 and 33 in this form by a final analysis.

Items in the scale include teacher competencies in the class related to the “subject field and field education” and “teaching-learning process”. Competencies related to “subject field and field education” included the dimensions as “subject field knowl-

edge” (Items 1 - 4), “field education” (Items 5 - 7). Competencies related to “teaching-learning process” included the dimensions as “planning” (Items 8 - 13), “teaching process” (Items 14 - 20), “classroom management” (Items 21 - 28) and “communication” (Items 29 -33).

The Alpha Reliability value of the scale was 0.9169; and the two half-reliabilities were calculated as 0.8783. Teacher candidates’ competency perceptions were assessed using a 3-Point Likert-type scale with the categories “adequate,” “partially adequate,” and “inadequate” (Şeker, Deniz, & Görden, 2004). In this study, degrees were converted into scores as “adequate” (3 points), “partially adequate” (2 points), and “inadequate” (1 point).

2.3. Data Analysis

SPSS 17.0 package program was used to analyze the data. The width of the score space in groups was identified to evaluate of the responses to the scale. In this study, the value of the group space coefficient was calculated by dividing the difference between the maximum and minimum values of the measurement results series to the number of groups as Kan (2009) stated. In evaluating the responses of the teacher candidates, the evaluation range was determined as $(3-1)/3=0.67$. Accordingly, the following ranges were determined as: Inadequate (1.00 to 1.67), Partially Adequate (1.68 to 2.34), and Adequate (2.35 to 3).

Wherever possible, primarily parametric tests are desired to apply in terms of reliability and generalizability of the research results. For this reason, necessary assumptions for parametric test were examined. SPSS 17.00 package program was used for statistics. $\alpha = .05$ level was used as the criterion for statistical significance. Scale scores in this study were within range scale. Measures of central tendency and *Kolmogorov-Smirnov Test* were performed. Measures of central tendency (mean, median and mode) were found to be close to each other. Also *Kolmogorov-Smirnov Test* result showed that the data are normally distributed.

For data analysis, arithmetic mean, Two-way Variance Analysis (ANOVA), and Dunnett’s C multiple comparison test were employed.

3. Results

In this part, the results of the analysis of the secondary education science teacher candidates’ perceptions on their teaching profession competencies in general, and in terms of gender, age, program, and field are presented.

On the basis of all teacher candidates participating in the survey, means for scale items about secondary education science teacher candidates’ perceptions about their teaching profession competencies range from 2.21 to 2.65 (Table 2).

Table 2. Means and Standard Deviation Values of Teacher Candidates' Scale Scores

	Items																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Mean	2.41	2.57	2.53	2.48	2.41	2.44	2.57	2.41	2.54	2.46	2.39	2.37	2.52	2.42	2.40	2.21	2.39
N	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155
Std. D.	.56	.51	.57	.56	.57	.58	.55	.66	.55	.56	.60	.57	.60	.61	.60	.65	.56

	Items															
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Mean	2.53	2.63	2.39	2.52	2.56	2.63	2.34	2.37	2.39	2.61	2.39	2.52	2.54	2.56	2.65	2.46
N	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155
Std. D.	.57	.54	.56	.57	.56	.52	.59	.57	.56	.54	.59	.56	.58	.65	.58	.62

General mean: 2.43

“Subject Field Knowledge” (Items 1 - 4) “Field Education” (Items 5 - 7) “Planning” (Items 8 - 13) “Teaching Process” (Items 14 - 20) “Classroom Management” (Items 21 - 28) “Communication” (Items 29 - 33).

The general mean value (\bar{x} =2.43) showed that teacher candidates perceive themselves adequate on teaching profession competencies. Only items 16 and 24 were in “partially adequate” range. These items were “continue to education according to individual differences” (\bar{x} =2.21) in teaching process dimension and “provide continuity of interest and motivation to course” (\bar{x} =2.34) in classroom management dimension. Three items in which teacher candidates’ perceptions about their teaching profession competencies had the highest mean values were Items 32, 23, and 19 (Table 3). These items were; “listening the students with interest” (\bar{x} =2.65) in communication dimension, “to provide a democratic learning environment” (\bar{x} =2.63) in classroom management dimension and “associate subjects with life” (\bar{x} =2.63) in teaching process dimension, respectively. Three items in which teacher candidates’ perceptions about their teaching profession competencies had the lowest mean values were Items 16, 24, 25, and 12. Items 12 and 25 shared the same mean value. These items were, “continue to education according to individual differences” (\bar{x} =2.21) “provide continuity of interest and motivation to course” (\bar{x} =2.34) “take appropriate precautions against interruptions and obstacles” (\bar{x} =2.37) and “determine evaluation forms suitable to target behaviors” (\bar{x} =2.37) respectively. Considering the mean values, item 16 (\bar{x} =2.21) and item 24 (\bar{x} =2.34) were in “partially adequate” range. Items 12 and 25 (\bar{x} =2.37) were in “adequate” range.

Table 3. Means and Standart Deviation Values According to Scale Dimensions

Dimensions	N	Mean	Std. Dev.
Subject Field Knowledge	155	2,50	,39
Field Education	155	2,47	,41
Planning	155	2,45	,36

Dimensions	N	Mean	Std. Dev.
Teaching Process	155	2,42	,35
Classroom Management	155	2,48	,33
Communication	155	2,54	,39

Teacher candidates' scale mean values range from 2.42 to 2.54 according to dimensions (Table 3). So, teacher candidates' perceptions for all scale dimensions were in "adequate" range.

Table 4. Two-way ANOVA Test Values

Source	Sum of Squares	df	Mean Square	F	p
Field	,249	2	,125	1,551	,215
Program	,684	2	,342	4,262	,016
Gender	,056	1	,056	,696	,405
Age	,058	1	,058	,725	,396
Error	11,882	148	,080		
Total	960,806	155			

According to the p values in ANOVA table, no significant difference was found between the teacher candidates' professional competence perception scores according to field, gender and age variables ($p > .05$). There is a statistically significant difference according to the program variable ($p < .05$). Multiple comparison test was done to find the source of this difference. Since the variances between groups were not equal (Table 5) Dunnett's C test was used. Multiple comparison test results are presented in Table 6.

Table 5. Levene's Test

F	df1	df2	p
1,566	30	124	,047

Table 6. Multiple Comparison Test Values

Program(I)	Program(J)	Mean Difference (I-J)	Std. Error	p
A	B	-,166*	,066	,013
	C	-,124*	,055	,027
B	A	,166*	,066	,013
	C	,042	,071	,552
C	A	,124*	,055	,027
	B	-,042	,071	,552

It can be said that there is a difference between the programs when the average difference values are examined in the multiple comparison test. There are significant differences in favor of program 'B' between A and B programs and in favor of pro-

gram 'C' between A and C programs according to Table 6.

4. Discussion

The findings of this research, which studied the perceptions of secondary education science teacher candidates on their teaching profession competencies, are discussed below within the frame of research problems.

The mean value ($\bar{x} = 2.43$) in "teacher competencies scale" showed that teacher candidates generally perceive themselves adequate on their teaching profession competencies. In a study conducted by Güven (2009) with 318 non-thesis graduate program (4+1.5) students, professional competency perceptions of students were compared before and after receiving vocational courses. One of the sub-dimensions of the scale was the teaching-learning process. Students were provided with a pre- and post-test when relating to teaching-learning process. The mean score of the post-test was higher. It was reported that students perceived themselves more adequate when relating to the teaching-learning process after receiving vocational courses.

When items were examined individually, it was observed that teacher candidates perceived themselves "partially adequate" only for "continue to education according to individual differences" (item 16, $\bar{x}=2.21$) and for "provide continuity of interest and motivation to course" (item 24, $\bar{x}=2.34$). The third lowest mean value belongs to items 12 and 25 ($\bar{x}=2.37$), respectively "determine evaluation forms suitable to target behaviors" and "take appropriate precautions against interruptions and obstacles". But the mean values of these two items show "adequate" range. Even so, these topics should be considered for a qualified teacher education. Especially about measurement and evaluation issues, teachers also experience problems and perceive themselves as inadequate in measurement and evaluation practices as indicated in the related studies (e.g. Anıl & Acar, 2008; Bıçak & Çakan, 2004; Çakan, 2004; Daniel & King, 1998; Gök & Şahin 2011; Karacaoğlu, 2008; Temel, 1991; Yanpar, 1992). Also, Kur-naz (2014) examined teacher candidates' conceptual understanding of the reasons for measurement and evaluation and for determining the learning change to ascertain if trained teacher candidates met the required expectations. The findings showed that the candidates had no clear conceptual understanding about the measurement and evaluation required for determining and defining a learning change. It was concluded there were obvious deficiencies in the teacher training for new candidates with regards to the expectations in the new teaching program. The research conducted by Güven (2009) showed that at the end of a three-semester master program, there was no significant change in teacher candidates' perception of the sub-competences on the fields of measurement and evaluation. So, in teacher education programs, teacher candidates should be provided with more adequate measurement and assessment skills with "Measurement and Evaluation" courses. This can be ensured with micro teaching applications. Also, teacher candidates should be orientated to apply more

measurement and evaluation exercises during “Teaching Practice” courses at schools.

Individual differences have an important role in students’ learning. Teachers should be aware of individual differences of students to use appropriate methods and techniques for learning outcomes. The present study indicated teacher candidates perceive themselves “partially adequate” about continuing to education according to individual differences. Güven and Sözer (2007) investigated 158 elementary school teacher candidates’ views toward individualized instruction. They concluded that preschool teacher candidates had a significant difference from other programs. This conclusion may have originated from the lessons that are intended to recognize individual differences being included in preschool teacher programs. As stated in the study, a course related to individualized instruction may be added to teacher training programs

To sustain interest and motivation to courses is one of the most challenging topics for educators. The findings of the present study showed that teacher candidates perceive themselves “partially adequate” on this issue. Teachers share their experiences in classrooms on this issue with teacher candidates when they go schools for “Teaching Practice”. Students need to know why a lesson or topic is important to learn. So, reminding this point to teacher candidates by lecturers and teachers and explaining them ways of linking topics to real world, selecting different methods, activities and materials may help them to sustain interest and motivation in their courses.

Considering all responses, it was determined that teacher candidates perceived themselves most adequate at “listening to the students with interest,” “to provide a democratic learning environment,” and “associate subjects with life.”

The present study showed that secondary education science teacher candidates’ competency perceptions did not show a significant difference according to gender, age and field. The finding that gender does not affect teaching profession competence perception is consistent with the findings of researches conducted by Erişen and Çeliköz (2003), Pendergast, Garvis, and Keogh (2011), Öksüzoğlu (2009), Saracaloğlu, Aslantürk, and Çengel (2006), Mulholland, Dorman, and Odgers (2004), Savran and Çakıroğlu (2003), Kapıcı (2003), Milner and Hoy (2002), and Tschannen-Moran and Hoy (2002). But this finding is inconsistent with the findings of researches conducted by Köksal (2014), Saracaloğlu, Kumral, and Kanmaz (2009). The finding that age does not affect teaching profession competence perception is consistent with the finding of research conducted by Pendergast, Garvis, and Keogh (2011).

Teacher candidates’ competency perceptions constitute a significant difference according to program variable. This difference is in favor of Pedagogical Formation Certificate Programs (B and C Programs). It may be due to the reason of their taking these courses in a collective manner and so focusing on only these pedagogical courses.

5. Conclusions

The purpose of this study was to determine the perceptions of secondary education science teacher candidates on their teaching profession competencies. The results are valid for the study group who participated in the present study. And the study does not intend to generalize the results to a larger universe. It ensures significant results in itself. It was concluded from the results of the study that;

- All secondary education science teacher candidates, who received vocational courses in the study and who participated in the study, perceive themselves adequate on their teaching profession competencies. This conclusion also shows similarity with the study of Güven (2009).
- Perceptions of secondary education science teacher candidates on their teaching profession competencies do not vary in terms of gender, age and fields. As noted above, there are different results in the literature, especially for the gender variable.
- Perceptions of secondary education science teacher candidates on their teaching profession competencies vary in terms of programs. Teacher candidates from Pedagogical Formation Certificate Programs perceive themselves more adequate on teaching profession competencies than teacher candidates from Secondary Education Science Programs.

The present study is limited with the data collected from the participants of one university. A similar study can be conducted at other universities that have Secondary Education Science Programs and Pedagogical Formation Education Programs to see similarities or differences in the perceptions of teacher candidates towards their teaching profession competencies.

6. References

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