



Investigating Classroom Teaching Competencies of Pre service Elementary Mathematics Teachers

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The study has sought answers to two major questions: What is the current situation in Elementary Mathematics Education programs at Faculty of Education in terms of classroom teaching competencies? To what extent do pre service teachers acquire these competencies? The research was conducted on 202 senior pre service teachers studying at the Department of Elementary Mathematics Education at a State University in Turkey during the 2012-2013 academic years. An observation form developed by the researcher was used to collect data about the pre service teachers' classroom competencies. Data were analyzed using descriptive statistics. The findings indicated a significant and positive relationship between the sub dimensions of pre service teachers' teaching competencies. In addition, there was a significant difference between competency score in terms of different grade levels. According to observation scores, pre service teachers were significantly competent in 6th grade classrooms than in 8th grade classrooms.

Keywords: primary mathematics teacher, pre service teachers, teaching skills, class

INTRODUCTION

Today, teachers' roles and responsibilities have changed, because of the way that students understand teachers, and the qualifications of the teaching-learning process itself have changed. Traditional teachers were always considered to be the source of knowledge and were expected to transfer that knowledge to their students. Nowadays, thanks to improvements in instructional technologies, having access to knowledge is easier, and this has brought about a change in the teachers role in the classroom. Having high self-efficacy, a teacher can succeed teaching even those children who have difficulty in learning. In teaching efficacy, teacher and student achievement is associated with traits belonging to only a few (Woolfolk, 1998; Borko, 2004). The thoughts and expectations of individuals with a sense of competency, as

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well as knowledge and skills are associated with the profession (Isiksal-Bostan, Sahin, & Ertepinar, 2015; Darling-Hammond, 2012). Teachers need to organize activities considering students' psychological stability, social interactions, gender and cultural background. These requirements are just a few of the ever increasing responsibilities of teachers (Coupé & Esteve, 2000;). Pre service teachers' training is closely related to how the status of the teaching profession is perceived in the country (Darling-Hammond, 2012). To succeed in the teaching profession, a person should love teaching first (Scott, 2008). Education is the field of learning, teaching and assessment approaches in parallel with the radical changes in mathematics education (Hudson, Kloosterman & Galindo, 2012).

In teaching mathematics, teaching mathematical real targeted individual susceptibility (tendency to do the math) is important to realize and the process has many gains (Knuth, 2002 & Tella, 2007). Mathematics, among all branches of science is an applied subject that has a special place in education (Jankvist & Kjeldsen, 2011 & Soyulu, Işık, & Konyalıoğlu, 2004). Effective mathematics teaching is based on many factors, but the most important factors are the roles and the responsibilities of teachers (Lee, 2012 & Coats, 2013). Previous research in educational sciences has proved that qualification of teachers affects the number of qualified students. The more teachers are qualified, the more their students are successful (Guo, Connor, Yang, Roehrig, & Morrison, 2012 Wake & Burkhardt, 2013).

The teacher is the person who facilitates learning. Learning gains are obtained by the students themselves. The teacher's duty is taking advantage of a variety of teaching methods and techniques in order to organize learning experiences and assess whether the desired behavior has been achieved by the students or not (Krathwohl, 2009). In education, thanks to teachers, students achieve the desired level of proficiency. Recently, a frequently used concept of teacher qualification demonstrates the skills of teachers in terms of some concepts adopted by most educators (Borko, 2004). Qualified pre service teachers in the teaching profession and their competency are very important for effective outcomes. If pre-service teachers develop positive attitudes towards the teaching profession, they will improve their success in school and as a result they will become qualified teachers (Bayraktar, 2011).

The profession of teaching should be systematic and sound in the classroom. The school grounds, library and gyms are places that teaching continues, even outside of the school. However, among them, classes are the places that have a special meaning as, for the job of teaching, it is a specially designed area (Bayraktar, 2011 & Borko, 2004). The most general meaning of the concept of competence is completing a task and being able to effectively fulfill the necessary knowledge, skills and attitudes (King, & Newmann, 2001). Bandura developed a sense of competence by cognitive mechanisms (Leyser & Wertheim, 2002). Pre service training is an internship period all teachers go through to be prepared for the job. According to Sabazia (2004), every year 100,000 staff who takes in-service training are really trying to meet these needs.

State of the literature

- Mathematics, among all branches of science is an applied subject that has a special place in education
- Education is the field of learning, teaching and assessment approaches in parallel with the radical changes in mathematics education
- The profession of teaching should be systematic and sound in the classroom. The school grounds, library and gyms are places that teaching continues, even outside of the school

Contribution of this paper to the literature

- Prospective teachers, especially in non-verbal communication where certain deficiencies may arise, may be said to have problems to fulfill this aspect of the teaching profession
- As a result of the present research, pre service teachers were found to perform adequately. However, in lesson planning and course measurement tools, teachers had the most questions with specific deficiencies.

Studies very often emphasize the need for in-service training (Sabazia, 2004; Bowers & Demirel, 2003; King, & Newmann, 2001). Research about improving the quality of teaching is important for effective interventions. Teachers' and prospective teachers 'gain ideas from training throughout their lives and teacher training institutions affect teachers' personal characteristics, learning and teaching (Ashton, 1984; Carter & Norwood, 1997; Ashton & Webb, 1986; Brousseau, Book, & Byers, 1988, Dushchl, 1983; Tobin, Tippin, & Gallard, 1994; Lortie, 1975; Tschannen-Moran & Woolfolk Hoy, 2001; Woolfolk, Rosoff, & Hoy, 1990; Isiksal-Bostan, Sahin, & Ertepinar, 2015).

THE PURPOSE OF THE STUDY

This study has sought answers to following research questions:

1. What is the current situation in terms of classroom teaching competencies of pre service teachers at Elementary Mathematics Education Department at the Faculty of Education, and to what extent do pre service teachers acquire these competencies?
2. Are pre service teachers prepared for the profession?
3. Are pre service teachers competent to gain from the faculty?
4. Are pre service teachers competent to use instructional methods correctly?
5. Are the instructional materials used by pre service teachers useful?
6. Are the measurement and evaluation methods used by pre service teachers convenient?
7. Are pre service teachers able to manage the classroom?
8. Is there a statistically significant relationship between the sub-dimensions of pre service teachers' classroom competencies?
9. Are class-level variables, classroom teaching skills of the teachers on their ability effective?

METHODOLOGY

This research is based on a descriptive survey model. (Karasar, 1999). Accordingly, Teaching competencies of senior elementary mathematics teaching students' undertaking a teaching practice course were investigated in this research.

Data are obtained using an observation form developed by the researcher. Participants were 202 students studying in their final year of the Elementary Mathematics Education Department program at a State University, Turkey. The data were collected in the form of peer observations of their classmates as a part of teaching practice courses. A pretest was applied to 40 students. Writing, spelling, expression errors were revised according to the feedbacks. After field experts reviewed a draft of the observation form, any necessary corrections were applied in accordance with their recommendations and observations. The final observation form included 25 competency statements, presented in 5-point Likert form. Responses for each competency statement included 'completely adequate', 'adequate', 'partially adequate', 'inadequate', and 'completely inadequate'. In the observation form, different thoughts and feelings of the subject to open-ended questions were also included. The obtained data was entered into the SPSS 17 software program.

After the application, the Cronbach's alpha reliability coefficient of the items in the observation form was determined to be 0.8210 for the instrument in general. Reliability coefficients estimated for each of the sub dimensions were 0.8104 for gains, 0.7545 for content, 0.8332 for ability to use teaching methods, and 0.8128 for

Table 1. Pre service teachers' classroom competencies based on observation data

Pre service teachers' competencies about objectives	N	X	Fd
Ability to determine the lesson objectives	202	3.82	.840
Classification of gains qualifying	202	3.50	.872
Gains the ability to exercise	202	3.71	.881
Advantages of proficiency testing	202	3.96	.765
Mean score for the sub dimension	202	3.76	.840

Table 2. Pre service teachers' competency to organize lesson content

Pre service teachers, organizing content oriented qualifications	N	X	Fd
Organizing Content Oriented Qualifications	202	3.98	.809
Content-aim relationship with the organizing capabilities	202	3.42	.984
Content-time adequacy	202	3.48	.982
Content-curriculum adequacy	202	3.78	.876
Mean score for the sub dimension	202	3.67	.912

Table 3. Pre service teachers' competencies to use teaching methods

Pre service teachers' competencies to use the teaching methods	N	X	Fd
Using effective teaching methods	202	3.11	.984
Using a combination of different teaching methods	202	2.78	.995
Acquisition method of teaching competence to establish marrow	202	3.21	.895
Teaching methods used by	202	3.38	.902
Mean score for the sub dimension	202	3.12	.944

Table 4. Pre service teachers' competencies to use teaching materials and equipment

Pre service teachers' ability to use tools and materials in a course	N	X	Fd
Competencies to select appropriate lesson content	202	2.95	.995
Ability to select materials appropriate to the level of students	202	3.64	.826
Ability to use tools when necessary	202	3.70	.832
The applicability of equipment	202	3.80	.845
Mean score for the sub dimension	202	3.52	.875

ability to use materials and tools, 0.8007 for measurement and evaluation, and 0.7954 for classroom management skills. Pearson correlation coefficients were estimated for the relationships between the sub dimensions of classroom competencies of participant. Additionally, one way ANOVA test was used to find out whether or not pre service teachers' teaching competencies differ significantly according to different grade levels. Scheffe test was used to determine the source of differentiation between groups.

RESULTS

According to Table 1, pre service teachers' competencies regarding the objectives had mean scores between 3.50 and 3.96. Whereas the average was $X = 3.76$. For prospective teachers, the gains are sufficiently attained. As seen in Table 2, teachers course competencies in terms of organizing content had values between 3.48 and 3.98, with an average of $X = 3.67$. Using Table 3, prospective teachers' competencies to use teaching methods during the course took values between 2.78 and 3.38. The

Table 5. Candidate teachers' competency to measure and evaluate the students

Pre service teachers' ability to assess the level of student	N	X	Fd
Ability to develop appropriate measuring instruments	202	3.81	.858
Reinforcement and receive appropriate feedback competencies	202	3.98	.700
Ability to ask questions and make corrections instantly	202	3.77	.852
Ability to consolidate the competencies to use their skills	202	3.56	.895
Mean score for the sub dimension	202	3.80	.826

Table 6. Pre service Teachers' Competency of Classroom Management

Pre service teachers' competencies in classroom management	N	X	Fd
The ability to create classroom rules	202	4.73	.598
The ability to prevent problem behaviors	202	3.37	.887
Communication skills and competencies to use	202	2.86	.998
Mean score for the sub dimension	202	3.67	.827

Table 7. Comparison of sub dimensions of classroom teaching competencies

Comparison between sub dimensions of teaching competencies	N	X	Fd
Classroom Management	202	3.67	.827
Using Teaching Methods	202	3.12	.944
Using Teaching Materials and Equipment	202	3.52	.875
Measurement and evaluation	202	3.80	.826
Organizing Content	202	3.67	.912
Lesson Objectives	202	3.76	.840
Mean score for the sub dimension	202	3.59	.870

Table 8. Relationship between sub dimensions of pre service teachers' competencies

Relationship between pre service teachers' competency dimensions							
Classroom Management (n=202)	-						
Using Teaching Methods (n=202)	.720*	-					
Using Teaching Materials and Equipment (n=202)	.675*	.720*	-				
Measurement and evaluation (n=202)	.644*	.615*	.593*	-			
Organizing Content (n=202)	.520*	.482*	.443*	.568*	-		
Lesson Objectives (n=202)	.632*	.486	.490*	.593*	.553*	-	

average was $X = 3.12$. As seen in Table 4, teacher candidates' scores about using tools and materials in course ranged from 2.95 to 3.80. The average was $X = 3.52$. Pre service teachers can be said to be competent in using materials and tools effectively.

According to the statistics in Table 5, pre service teachers' competency scores in terms of measurement and evaluation, ranged between 3.56 and 3.98. The average for this subtest was $X = 3.80$. Based on these findings, pre service teachers can be said to be competent in assessment. As seen in Table 6, the pre service teachers' classroom management competencies were scored between 2.86 and 4.73. And the average was $X = 3.67$. Thus it can be said that pre service teachers are competent in classroom management. As seen in Table 7, mean scores for each of the sub dimensions regarding the teaching competencies of pre service teachers ranged between 3.12 and 3.80, and the average score for the overall instrument was $X = 3.59$. In general, pre service teachers can be said to have an 'adequate' level of teaching competencies.

As can be seen in Table 8, there were moderate-to-high levels of positive and statistically significant correlations between the sub dimensions of pre service teachers' teaching competencies ($p < .01$). The highest correlations were between sub-dimensions of the competency to Use Teaching Methods and Classroom

Table 9. One-way analyses of variance: pre service teachers' competency/ course stages

Grade level		Sum of Sq	Df	Mean Sq	F	p
Classroom Management	Between groups	1,608	2	.790	1.967	.160
	Within Groups	71,406	172	.415		
	Total	72,984	174			
Using Teaching Methods	Between groups	828	2	.414	.825	.440
	Within Groups	86,256	172	.501		
	Total	87,084	174			
Materials and Equipment	Between groups	1,680	2	.840	1.393	.251
	Within Groups	103,115	171	.603		
	Total	104,795	173			
Measurement & Evaluation	Between groups	1,477	2	.739	1.561	.213
	Within Groups	80,439	170	.473		
	Total	81,917	172			
Organizing Content	Between groups	4,108	2	2.054	4.897	.009
	With Groups	71,718	171	.419		
	Total	75,826	173			
Lesson Objectives	Between groups	1,410	2	.705	1.462	.235
	Within groups	82,923	172	.482		
	Total	84,333	174			

Management ($r = .720$) and between the competency to Use Teaching Methods and the competency to Use Teaching Materials and Equipment ($r = .720$).

As seen in Table 9, a statistically significant difference was found between pre service teachers' competency scores according to course stage only for the sub dimension of Content Organization ($F(2, 171) = 4.897, p < .01$).

According to the Scheffe test results (Appendix), Content Organization competencies of preservice teachers are statistically significantly better in 8th grade classes than their competencies in 6th grade classes

DISCUSSION AND CONCLUSION

Preparing- preservice teachers so as to acquire classroom teaching competencies is one of the fundamental functions of education faculties. This study mainly aimed to investigate the prospective teachers' level of classroom teaching competencies. The results showed that prospective teachers performed "adequate" about classroom communication skills. In particular, they are better at actively listening to students. However, prospective teachers' communication skills are not fully adequate. They are less qualified to give a speech in the class with the correct intonations and stress. This finding is consistent with Caliskan (2003) and the University of Missouri's (1998) research results.

In this study, it was identified that teachers were less competent to use body language, where male teachers had greater scores than females. Effective communication is closely related with effective instruction. Effective use of body

language, however, is considered one of the essential qualities of a teacher (McPherson, Kearney, & Plax, 2003; Stronge, 2007 & Moore, 2014).

Accordingly, prospective teachers, especially in non-verbal communication where certain deficiencies may arise, may be said to have problems to fulfill this aspect of the teaching profession. Prospective teachers performed well about using teaching methods; however they have problems using blended teaching techniques. Furthermore, as indicated by the research, prospective teachers who are making active use of blended teaching methods and techniques are creating more effective learning environment and students gain more competences. Focusing on the importance of modern education is one of the teacher efficacies, teaching aids and materials in the classroom (Gagné, Briggs, & Wager, 1992; Gagné, 1987; Isiksal-Bostan, Sahin, & Ertepinar, 2015). The teacher must be competent in selecting equipment and materials, preparing and handling his/her own area of specialization (HEC, 1999). There are research results showing that prospective teachers are inadequate in terms of material and equipment use. (Bowers & Demirel, 2003)

As a result of the present research, pre service teachers were found to perform adequately. However, in lesson planning and course measurement tools, teachers had the most questions with specific deficiencies. For measurement and evaluation purposes, test execution and observation, different methods can be used (Thompson, 1994). Teachers prefer questions which are one of the major measurement tools (Morgan & Saxton, 1994; Thompson, 1994). Questions are also raised more often in recent years on the application of active learning which is one of the indispensable tools (Kauchak & Eggen, 1998; Morgan & Saxton, 1994). Therefore, questions are often used by teachers. Most of the teachers of the course use question and answer as part of their research activity (Buyukalan Scion, 2002; Kauchak & Eggen, 1998;).

According to this study, considering six subscales of teaching qualifications, prospective teachers are most qualified in the area of measurement and evaluation, and the least qualified in the area of managing the teaching activities. This situation can be explained by considering the fact that the amount of subject area courses prospective teachers take are less than the amount of practice lessons. It is also possible to say that it is not effective, thereby causing prospective teachers' inadequateness. Classroom teaching skills of prospective teachers are positively and significantly correlated. In each sub-dimension, prospective teachers show the skills and competencies that affect each other in the same direction. Each of the sub-dimensions affects each other, and that is the reason why all of the dimensions need to be addressed through a holistic approach.

Prospective teachers' demonstrated improved teaching competencies in higher grade classes. Students and teachers who are from different major areas did not display effective communication and interaction competencies because of insufficient orientation. On the other hand, 8th grade students' maturity level is higher, since the Secondary Education Examination is directed towards knowledge-intensive teaching therefore they should be more able to communicate and interact effectively. Prospective teachers identified sub-dimensions with respect to sufficient classroom teaching skills. However, prospective teachers used specifically nonverbal communication skills in relation to blended teaching techniques where different tools and materials to the benefit of the students. In determination of the size of the sub-competencies, teaching techniques and methods and to use them effectively in their courses should be given more importance in order to gain competence. Learning and teaching skills to gain proficiency should be given hands-on training; applications, where possible, similar to the actual teaching environment should be attempted. It is advised to offer an uninterrupted internship in which students have teaching practice course in a similar classroom environment. Application possibilities and features for in service and pre service teachers must be better publicized. Prospective teachers,

students and school staff must gain competencies regarding those teaching techniques. Prospective teachers in their delivery of education and their classroom teaching competencies must be considered separately; making sure that each phases' competences are also considered separately.

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Appendix 1. Teachers' classroom teaching qualifications and Scheffe test results.

Grade level	Variance	N	X	Fd	Scheffe
Classroom Management	(1) 6. Class	77	3.70	.678	
	(2) 7. Class	62	3.88	.674	
	(3) 8. Class	63	3.82	.560	
Using Teaching Methods	(1) 6. Class	77	3.57	.732	
	(2) 7. Class	62	3.73	.773	
	(3) 8. Class	63	3.78	.645	
Materials and Equipment	(1) 6. Class	77	3.30	.865	
	(2) 7. Class	62	3.42	.818	
	(3) 8. Class	63	3.56	.676	
Measurement & Evaluation	(1) 6. Class	77	3.7	.727	
	(2) 7. Class	62	3.98	.690	
	(3) 8. Class	63	3.98	.682	
Organizing Content	(1) 6. Class	77	3.88	.730	p<.05
	(2) 7. Class	62	4.42	.664	(1-3)
	(3) 8. Class	63	4.54	.587	
Lesson Objectives	(1) 6. Class	77	3.92	.767	
	(2) 7. Class	62	4.04	.712	
	(3) 8. Class	63	4.12	.654	