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Are Computer Teachers Trained for the Teaching Profession? An Assessment of a Computer Teacher Training Program

Bilgisayar Öğretmenleri Öğretmenlik Mesleği İçin Eğitiliyorlar mı? Bir Bilgisayar Öğretmeni Yetiştirme Programının Değerlendirilmesi

Recep Çakır and Soner Yıldırım
Middle East Technical University

Abstract

This paper presents perceptions about the teaching profession and the characteristics of prospective computer teachers. This study investigated the pedagogical and subject matter domain competencies of pre-service computer teachers. Moreover, this paper presents the views of prospective computer teachers with regard to successful technology integration. Three questionnaires were administered to 2nd 3rd and 4th year computer teachers enrolled at the Middle East Technical University (METU) in Turkey, in order to examine their perceptions of teaching as a profession and their progress in competencies in the domain of pedagogy and subject matter. The results revealed that prospective computer teachers' perceptions regarding the teaching of Computer as a profession were not high and their perceptions decreased more and more over time. Moreover, the results additionally showed that prospective computer teachers at METU feel fully competent within the subject matter domain and their pedagogic competencies increased as time passed.
Key words: Teacher education, Computer Studies teacher, teacher competencies, technology integration

Öz

Bu çalışma, bilgisayar öğretmeni adaylarının öğretmenlik mesleği hakkındaki düşüncelerini ve onların karakteristik özelliklerini ortaya koymaktadır. Ayrıca bu çalışmada, bilgisayar öğretmeni adaylarının pedagojik ve konu alanı yeterliklerinin gelişimleri incelenmiş, onların teknoloji entegrasyonu hakkında düşünceleri irdelenmiştir. Bu amaç için, Orta Doğu Teknik Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi bölümü 2. 3. ve 4. sınıf öğrencilerine yönelik 3 bölümden oluşan bir anket uygulanmıştır. Çalışmanın sonuçları göstermektedir ki, bilgisayar öğretmen adaylarının öğretmenlik mesleği hakkındaki algıları düşük çıkmakta ayrıca algıları yıllar arasında gittikçe düşmektedir. Diğer bir sonuç ise, bilgisayar öğretmeni adayları konu alanı olarak kendilerini tamamen yeterli görmekte iken pedagojik alandaki yeterlikleri yıllar arasında gelişim göstermektedir.
Anahtar sözcükler: Öğretmen eğitimi, Bilgisayar öğretmenliği, öğretmen yeterlikleri, teknoloji entegrasyonu

Arş. Gör. Recep Çakır, Orta Doğu Teknik Üniversitesi Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü, Ankara

Doç. Dr. Soner Yıldırım, Orta Doğu Teknik Üniversitesi Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü, Ankara

Introduction

Since we are now in the Information Age, information technologies such as computers, telecommunications, and digital cameras are becoming more common both in our formal and informal educational system. As technological developments rapidly increase in every field, the integration of technology into education is also unavoidable. Indeed, many studies have proved that technology is an important component of modern-day education. For example, Pierson (2001) stated that integrating technology tools into the teaching and learning programs is an inseparable part of good teaching. Yildirim (2000) also claimed that teachers should have or receive the appropriate technology competences during their pre-service education in order to later meet their students' needs. Teachers are expected to integrate technology into education which will result in student learning. (Ross, Hogaboam -Gray & Hannay, 2001).

Moreover, teaching is the process of carrying out certain activities in order to effectively ensure that students attain essential skills and attitudes. According to Arends (2001) contemporary teachers are held accountable for using teaching practices that have been shown to be effective, just as members of other professions are accountable for the tools and methods they use. Arends also states that teaching is an art based on teachers' experiences and the wisdom of practice.

Prospective teachers' characteristics and their opinions regarding teaching as a profession play a noteworthy role in shaping their future careers. Jonassen (2000) suggests that when educators apply the use of varied teaching strategies, they are supporting a belief in individual learning styles and preferences, and they are more apt to engage students in the successful acquisition of knowledge. However, one of the most consistent findings concerning teaching is that effective teachers maintain a balance between specific strategies designed to manage student behavior in the classroom and instructional strategies (Gilberts & Craft, 1997). Today's schools require teachers who have a varied repertoire of effective teaching strategies so that the needs of all the students can be met. A teacher's repertoire consists of the number of teaching approaches and strategies he or she is able to use to help students learn effectively. Effective teaching requires careful and reflective thought about what a teacher is doing and the effects of his or her action on students' social and academic learning (Arends, 2001). On the other hand, Hunter (1976) affirmed that successful teaching was not based on what a teacher was, but depended on what a teacher did in planning and implementing those plans in the teaching- learning process.

In order to be a successful teacher in their teaching careers, prospective teachers must be competent both pedagogically and in the subject matter field. Pierson (2001) supports this idea by claiming that teachers need content subject matter integrated with both technological and pedagogical expertise. Since one of the most essential roles of computer teachers is to provide for and guide the integration of technology in schools, computer teachers' competencies, their thoughts about teaching, their interaction both with students and with other teachers in schools and the problems which are faced regarding technology integration are all critical factors effecting the use of technology effectively in schools. Therefore, in this study, prospective teachers' pedagogical and subject matter competencies were examined. According to Arends (2001) increasingly, teachers are expected to have advanced preparation and are also expected to demonstrate their knowledge of both the subject matter and pedagogy. Moreover Shulman also affirmed that pedagogical content knowledge is what allows for the meaningful blending of content and pedagogy in teaching (cited in Segall 2004).

In a previous study, Saban (2003) stated while there is a significant amount of research dealing with pre-service teachers' reasons for teaching, beliefs about teaching and learning, and attitudes to the teaching profession from all over the world, further investigation is needed in order to illuminate the similarities and differences in teaching images that prospective teachers bring with them as they enter teacher training programs in different socio-cultural contexts. Prospective teachers' preconceptions about the teaching profession are a worthwhile subject, since it is very likely that these teacher training students will one day be the teachers in schools.

Besides these points, many educators have agreed that integrating technology into the curriculum plays a major role in providing a rich teaching and learning environment. However, putting technology into the classroom is only a part of the task. The ultimate goal when integrating technology is that the students should be able to use it with the same ease with which they use books, maps, pencils and pens. According to Brush et al. (2003) in spite of the technologies available in schools, a large number of teachers report little or no use of computers for instruction. While many school and university students are using technology in their personal lives in a wide variety of ways, they are not using computers very extensively in classrooms to learn effectively in a variety of subject areas.

There is a significant body of literature addressing the premise that the successful use of technology by students in the classroom is dependent on their teachers' views (Becker, 1994; Yildirim, 2000; Pierson, 2001; Ross, Hogaboam & Hannay, 2001; Christensen, 2002; Jacobsen, Clifford, & Friesen, 2002). However, there are some factors that contribute to the integration of technology when teachers use technology in their teaching activities. For example, Christensen (2002) stated that teachers' attitudes towards computers are important factors while using computers in the classroom.

Teachers take some courses concerned with integrating technology throughout their pre-service education. Teacher preparation has emerged as the critical factor affecting the contributions of new technologies to improved learning. Therefore, pre-service teachers' training programs have important role to play regarding the acquisition by teachers of the skills related to integration technology. According to Yildirim (2000), teacher training programs need to provide prospective teachers with technology training, which can satisfy their needs in the schools at which they will work.

Method of the Study

Instruments

In this study, three questionnaires were used to collect data from prospective teachers in the department of Computer Education and Instructional Technology at METU.

The first one included demographic information about the participants and their beliefs about teaching as a profession.

Because an appropriate instrument in the literature was not found, researchers developed an instrument about computer teaching perception by utilizing Saban's previous study (2003). Also expert opinions were taken to ensure content validity of the instrument. There were 16 items in this part with 5-likert type scales from "strongly disagree" to "strongly agree" statements with a low score being equivalent to a low degree of agreement with the proposed item while a higher score reveals a higher level of agreement. According to Beijaard, Verloop, and Vermunt (2000) teachers' perceptions of their own professional identity affect their efficacy and professional development as well as their ability and willingness to cope with educational change and to implement innovations in their own teaching practice. In this study, therefore, prospective teachers' preconceptions about teaching were observed, before they employed teaching as a profession. The second questionnaire included prospective teachers' competencies in the pedagogical and subject matter domains which are determined by YOK (Higher Education Council). Higher Education Council (YOK) redesigned the curricula of schools of education in 1998. According to the council, preparation for the teaching profession requires the acquisition of knowledge and skills in the three domains. These domains are the specialist subject matter domain, the pedagogical domain and the general cultural domain. The pedagogical domain consists of 30 credit hours; the specialist subject teaching domain consists of 109 credit hours and the rest 13 credit hours are related to the general culture domain in the schools of education. Furthermore, the teaching practicum takes in three sessions throughout the 4-year teacher training program. One is school experience during the second semester of the first year, and the other two take place in the first and second semesters of the fourth year. Ministry of National Education authorities and experts have conducted some studies and workshops to determine the teachers' competencies. Teachers, instructors, primary school inspectors and measurement and evaluation experts participated in these studies (MEB, 2005). After

these studies, Ministry of Education authorities determined competency categories. In this study, a competency questionnaire was adapted from these categories by researchers. This part includes totally 60 likert type items from strongly incompetent to strongly competent statements, 33 of them are about pedagogic competency and 27 of them are subject matter competency.

The third questionnaire which was adapted from Brush et al (2003) was about environmental resource barriers to determine prospective teachers' views. This questionnaire consists of 16 likert-type items which include the opinions of prospective teachers related to barriers to technology integration

Participants

The questionnaires were administrated to 160 prospective computer teachers and the findings are presented comparatively based on the student teachers' year in the program.

Findings

The data were collected consecutively from the participants who are 2nd (n= 53) 3rd (n= 51) and 4th (n= 49) year computer education student teachers enrolled in the Middle East Technical University (METU) in Turkey. Actually, seven data were eliminated from the collected data, because of missing information.

One of the objectives of this study was to compare the perceptions of the prospective computer teachers according to their academic year. Second, 3rd and 4th students were chosen, because it is important to understand prospective teachers' progress about perceptions and characteristics which are pedagogic and subject matter competencies throughout the years of their training. The participants were informed that all responses would be kept completely confidential and they agreed to participate in the study voluntarily. The first part of the questionnaire included demographic information, such as gender, age and secondary schooling, etc. Of the participants, 67% were male, 33% were female. Most of the students (73.2%) had graduated from vocational or Anatolian vocational high schools in their secondary schooling. In Turkey, secondary education is general with vocational or technical high schools giving an additional three or four years of training. The demographic information regarding the subjects is given in table 1.

In line with the second part of the study, prospective computer teachers' perceptions about teaching as a profession and their subject matter and pedagogic domain competencies were investigated. Means and standard deviations of the observed variables for the participants are presented in Table 2. From the table, it can be seen that student teachers' perceptions of computer teaching as a profession were highest in second year students of the all three class status. However, the mean scores of the perceptions of computer teaching decrease over the following years. On the other hand, subject matter competencies, which are generally, basic operations, productivity software, communication and collaboration and electronic references, are very high for all three years, though they were highest in the fourth year (M= 4.66 and SD= .44). In addition,, pedagogic competencies, which are instructional planning, instructional process and communication, increase over the years. The highest mean score belonged to the fourth-year students (M= 4.16 and SD= .46).

The perception of teaching as a profession, subject matter competencies and pedagogic competencies measured according to student teachers' year in the program were analyzed using one way multivariate analysis of variance (MANOVA) to examine if the mean differences were significant. The results showed that the perceptions of prospective computer teachers were not significant, $F(2,150) = 1.285$, $p = .28$. It means that there is no significant change in the perception of students about computer teaching as a profession throughout the years. On the other hand, subject matter competencies, $F(2,150) = 6.128$, $p = .003$, and pedagogic competencies, $F(2,150) = 304.39$, $p < .001$, were significantly changed comparatively based on student teachers' year in the program.

Post hoc analysis (Tukey's HSD) was used to make comparisons between class status means for subject matter and pedagogic domain competencies. The results are presented in table 3. The results showed that there were no significant differences between 2nd and 3rd year student teachers regarding subject matter

Table 1
Demographic information about the participants (N=153)

Characteristics	N	(%)	Characteristics	n	(%)
Current status			*Father's education*		
Second year	53	(% 34.6)	Primary school	43	(% 28.1)
Third year	51	(% 33.3)	Middle school	18	(% 11.8)
Fourth year	49	(% 32)	High school	40	(% 26.1)
			Post secondary	50	(% 32.7)
Gender			None (Illiterate)	2	(% 1.3)
Male	103	(% 67.3)			
Female	50	(% 32.7)	*Mother's occupation*		
			Housewife	107	(% 69.9)
Age			Teacher	12	(% 7.8)
19-21	73	(% 47.7)	Civil Servant	13	(% 8.5)
22-24	76	(% 49.7)	Retired	12	(% 7.8)
25 and above	4	(% 2.6)	Other	9	(% 5.9)
Secondary schooling			*Father's occupation*		
General	13	(% 8.5)	Self employed	21	(% 13.7)
Anatolian	28	(% 18.3)	Worker	19	(% 12.4)
Vocational /Technical	45	(% 29.4)	Teacher	23	(% 15)
Anatolian vocational /Technical	67	(% 43.8)	Civil Servant	15	(% 9.8)
			Farmer	4	(% 2.6)
Mother's education			Police Officer	4	(% 2.6)
Primary school	76	(% 49.7)	Retired	56	(% 36.6)
Middle school	17	(% 11.1)	Other	11	(% 7.2)
High school	26	(% 17.0)			
Post secondary	23	(% 15.0)			
None (Illiterate)	11	(% 7.2)			

competency. However, there were significant differences between 2nd and 4th year in favor of 4th year student teachers. Additionally, 4th year students were more competent in relation to the subject matter domain in comparison with 3rd year student teachers. Regarding the pedagogic domain competency, it can be clearly seen that there are significant differences between the groups. Fourth year preservice computer teachers were more competent in the pedagogic domain in comparison to 3rd and 2nd year student teachers. Moreover, there were significant differences between 2nd and 3rd year students in favor of 3rd year computer teacher trainees.

Participants' responses for items which are environmental barriers to integrating technology are presented in Table 4. According to students, the most effective barrier is item 2 (M=4.30), which is "In order

Table 2
Summary Statistics of Observed Varigables: Mean Scores and Standard Deviations

Variables	Class Status	*M*	SD	*N*
Perception	2	3.26	.48	53
	3	3.13	.49	51
	4	3.12	.48	49
	Total	3.17	.48	153
Subject Matter Competency	2	4.40	.42	53
	3	4.42	.51	51
	4	4.66	.44	49
	Total	4.49	.44	153
Pedagogic Competency	2	2.24	.33	53
	3	2.81	.41	51
	4	4.16	.46	49
	Total	3.05	.89	153

Table 3
Mean Differences of Dependent Variables Throughout the Years

Dependent Variable	**(I) Current Status**	**(J) Current Status**	**(I-J) Mean Difference**	*p*
Perception	2	3	.13	.356
		4	.14	.345
	3	2	-.13	.356
		4	.0037	.999
	4	2	-.14	.345
		3	-.0037	.999
Subject Matter Competency	2	3	-.02	.970
		4	-.27*	.004
	3	2	-.02	.970
		4	-.25*	.010
	4	2	.27*	.004
		3	.25*	.010
Pedagogic Competency	2	3	-.58*	.000
		4	-1.93*	.000
	3	2	.58*	.000
		4	-1.35*	.000
	4	2	1.93*	.000
		3	1.35*	.000

* Significant at the, 05 level.

Table 4
Participants' Responses to Environmental Barriers for Intergrating Technology (N = 160)

Items	Mean	SD
It is easier to use technology with smaller class sizes	4.15	1.11
In order for technology integration to be successful, teachers should have more access to computer labs	4.30	0.97
There is not enough time in class to implement technology-based lesson	1.97	1.10
Technology-integrated curriculum projects require too much preparation time	2.68	1.23
An unsuccessful technology-integrated lesson is usually the result of a lack of teachers' technology skills	2.30	1.02
Schools do not provide enough support to teachers for technology integration	2.11	1.04
A teacher with novice technological skills can deliver an effective lesson integrating technology	3.46	1.21
A teacher must have advanced technological skills to effectively use technology in a lesson	2.65	1.26
Lower elementary students (K-2) can not effectively use technology as a learning goal	3.70	1.22
For effective technology integration in a lesson, a teacher needs to adapt his or her teaching strategies to become more student-centered	2.88	1.21
A teacher must have advanced technological skills to effectively integrate technology	1.95	1.06
Lack of knowledge about ways to integrate technology into the curriculum is a barrier to technology integration	3.51	1.01
More teachers would integrate technology if they had more training on how to use technology	3.45	1.14
There is not enough technological support in schools today	2.61	1.25
It is more difficult to deliver a technology-integrated lesson in a classroom with 1-4 computers than in a computer lab	3.95	0.99
My university assignment does not require effective use of technology	2.10	1.03

for technology integration to be successful, teachers should have more access to computer labs". The second most effective barrier to successful technology integration is item 1 (M=4.15), which is "It is easier to use technology with a smaller class size". Student teachers identified that the least effective barrier for technology integration is item 11 (M=1.95), which is "A teacher must have advanced technology skills to effectively integrate technology". Moreover, student teachers disagree with "There is not enough time in class to implement technology-based lessons" (item 3, M=1.97).

Conclusion and Discussion

This study investigated the general characteristics of prospective computer teachers at the Middle East Technical University (METU) in Turkey. Moreover, their perceptions about computer teacher as a profession and their pedagogic and subject matter domain competencies were also analyzed in this study. Additionally, this study considered the general views of prospective computer teachers regarding successful technology integration. According to findings of this research, some major results have come out. Firstly, an

analysis of the demographic information of the subjects provided insight into who is currently entering computer studies teacher training programs at METU in Turkey. From the analysis of the study data, it is proper to state that the majority of the participants come from relatively middle level socio economic backgrounds. For example, the educational background of participants' parents shows that approximately half of the mothers have a primary education and more than half of the fathers (90) have high school or post secondary education. While the fathers' occupations vary from self employed to retired, most of the mothers (% 70) are housewives. Additionally, it appears that the majority of preservice computer teachers come from vocational or technical high schools. The reason for this situation could be that vocational high school students prefer faculties of education according to their program because they receive a score advantage over other high school students in the university entrance exam.

Another interesting result is that prospective computer teachers' perceptions about computer studies teaching as a profession are not high and their perceptions decrease more and more over the years. Saban (2003) has found similar results in relation to perceptions of elementary teaching as a profession in his study. Indeed, there is no difference between male and female in terms of feelings about computer studies teaching as a profession. There are several possible reasons for this situation. For example, a teacher's salary in Turkey is very low compared to other professions. On the other hand, METU is one of the most eminent universities in Turkey and some departments such as civil engineering, computer engineering and the department of administration and economy are more respected than the faculty of education by students. Moreover, in a further research, qualitative data such as interviews and observation can be conducted to deeply understand prospective teachers' thoughts about the teaching profession.

In adddition, the present study provides important data on the subject matter and pedagogic domain competencies of prospective computer teachers. Results show that prospective computer teachers at METU feel that they are fully competent in the subject matter domain. The reason for this is that approximately all of them acquired information about their subject matter in their high school years because they had graduated from vocational or technical high schools. For example, they are already familiar with computers and their applications before entering the university education. However, the pedagogic competencies of prospective computer teachers were very low in the first years of their education. In this present study, it appeared that pedagogic competencies increased throughout years. Candidate computer teachers feel pedagogically more competent as they take the pedagogic courses in the university. Finally, when prospective computer teachers finish their university education, they are competent in both the subject matter and pedagogic domains. According to Geddis and Wood (1997), knowledge transformations depend on teachers' capacity to recognize and manage dilemmas in the practical context. Since they will one day be computer teachers in schools and one of their most important roles will be to integrate technology, especially computer technology, into their lessons, they must be competent in both the subject matter and pedagogic domains before becoming teachers. Brush et al. (2003) also stressed the fact that planning and preparation were major themes for incorporating technology. Moreover, one of the most consistent findings concerning teaching is that effective teachers maintain a balance between specific strategies designed to manage student behavior in the classroom and instructional strategies (Gilberts & Craft, 1997).

The other aim of this study was to investigate the general views of prospective computer teachers about successful technology integration in Turkey. It is important to understand their thoughts about technology integration because they will be teachers in the future. It is important to understand whether they are aware of the importance of integrating technology in their teaching and learning activities. According to the results of this study, prospective teachers believed that there are many factors that contribute to the successful or unsuccessful integration of technology in schools. These factors can be summarized as follows;

- Limited access to computers in schools
- Crowded classrooms
- Number of computers in labs
- Teachers' knowledge and competency about technology integration

- Lack of software and hardware availability
- Lack of training in how to use technology and so on.

However, it is an interesting result that prospective teachers do not think there is not enough time to implement technology-based lessons in the classroom. Moreover, according to pre-service teachers, there is adequate technological support in our schools. For the effective use of technology in classrooms, these barriers should be eliminated by the educational authorities, such as the administrations of schools and the Ministry of Education. Teacher training programs need to provide technology training for prospective teachers (Yildirim, 2000) and also prospective teachers should be equipped with knowledge regarding new technological developments so that they can satisfy the needs of the schools at which they will work .

These results are generally supported by other studies which have been conducted concerning technology integration. For example, Glazewski et al (2002) found that pre-service teachers' perception towards technology were positive. In their studies, pre-service teachers also mentioned the barriers to integrating technology. However, in Turkey, there have been only a few studies regarding preservice teachers' ideas about technology integration. Cagiltay et al (2002) conducted studies about in-service teachers' situations for technology integration. Actually, their findings are generally similar to this present study. They investigated teachers' perception about using computers in schools. According to their results, teachers believed that the use of computer technology in schools is beneficial for teaching and learning activities. However, they found that in-service teachers' competencies are not enough to integrate technology. In the present study, pre-service teachers think that their education is adequate to integrate technology. This situation may result from the characteristics of the participants because they are computer studies trainees.. Therefore, similar studies should be conducted by other departments of education faculties to understand how teacher preparation programs would be impacted by the findings.

Finally, the results of this study indicate the emphasis of technology integration from the perspective of prospective computer teachers; they will be teachers after they graduate from university. Therefore, much of the research conducted indicates that teachers' use of technology in classroom is quite important to integrate technology into learning and teaching activities. Moreover, future studies that examine the other pre-service teachers in different departments, such as art, science, math and language are needed in order to compare results. Consequently,, current situations about pre-service teachers' views about the integration of technologies into the teaching and learning process will appear in Turkey.

In conclusion, this study draws attention to the perceptions and qualities of prospective computer teachers at METU. The results of this study also show who comes for computer teacher education, what their characteristics are and how they feel about their competencies.

For further research, this study should be replicated in other universities in order to make generalizations since the participants of this study are limited to computer studies trainee teachers at METU.

References

Arends R., I. (2001). *Learning to Teach.* Fifth ,ed. McGraw-Hill Companies, NewYork

Becker, H. J. (1994). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. *Journal of Research on Computing in Education*, 26(3), 291–321

Beijaard, D., Verloop, N., Vermunt, J., D. (2000) Teachers' perceptions of professional identity: an exploratory study from a personal knowledge perspective. *Teacher and Teaching Education*, 16, (749- 764)

Brush, T., Glazewski, K., Rutowski, K., Berg, K., Stromfors, C., Van-Nest, M., Stock, L., Sutton, J. (2003). Integrating Technology in a Field-Based Teacher Training Program: The PT3@ASU Project. *Educational Technology Research and Development*, 51(2), 57-72.

Christiensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students. *Journal of Research on technology in Education*, 34(4), 411-433

Geddis, A., N. & Wood, E. (1997). Transforming Subject Matter and Managing Dilemmas: A Case Study in Teacher Education. *Teacher and Teaching Education* 13, (611- 626)

Gilberts, H., G., & Kraft, B., L, (1997). Classroom management and instructional Competencies for preparing elementary and special education teachers. *Teacher and Teaching Education* 13, (597- 610)

Jacobsen, M. Clifford, P. & Friesen, S. (2002). Preparing teachers for technology integration: Creating a culture of inquiry in the context of use. Contemporary Issues in Technology and Teacher Education. Retrieved May 20, 2005 from the World WideWeb: http://www.citejournal.org/vol2/iss3/currentpractice/article2.cfm

Hunter M., (1976). Teacher competency, problem, theory and practice. *Theory into Practice*. 15(2), 162-171

Jonassen, D.H. (2000). Computers as Mindtools for Schools: Engaging critical thinking 2nd ed. Prentice Hall: New Jersey

MEB Öğretmen Eğitimi Genel Müdürlüğü, (2005). *Bilgisayar Öğretmenlik Mesleği Özel Alan Yeterlikleri*, MEB, Ankara

Pierson, M. (2001). Technology practice as a function of pedagogical expertise. *Journal of Research on Computing in Education*. 33(4), 413- 430

Ross, J.A., Hogaboam-Gray, A., & Hannay, L. (2001). Effects of teacher efficacy on computer skills and computer cognitions of Canadian students in grades k-3. *The Elementary School Journal*, 102, 141-156.

Saban A., (2003) A Turkish Profile of Prospective Elementary School Teachers and Their Views of Teaching. *Teacher and Teacher Education* (19) 829- 846

Segall A., (2004) Revisiting pedagogical content knowledge: the pedagogy of content/the content of pedagogy. *Teaching and Teacher Education* 20 489–504

Yildirim, S. (2000). Effects of an educational computing course on preservice and inservice teachers: A discussion and analysis of attitudes and use. *Journal of Research on Computing in Education*, 32(4), 479 – 495

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