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Relationship between Teacher Candidates' Literacy of Science and Information Technology

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This study aims to determine the science teacher candidates' literacy levels of science and information technology and intends to find out the relationship between them. In the study, correlational research methodology was used in the scope of correlational screening model. Research sample consists of totally 264 teacher candidates who are in their 3rd and 4th years and studying at the Department of Science and Technology Education in Amasya University. As the data collection instruments, the science literacy test developed by Bacanak (2002) and the information technology literacy scale developed by Varış (2008) were used in the study. Data were analyzed by using SPSS 18.0 program. Results showed that teacher candidates' levels of science literacy were low and their levels for information technology literacy were sufficient. No significant relationship was found between levels of science literacy and information technology literacy. Necessary and feasible suggestions were put forward for whom it concerns.

1. Introduction

Developments in science and technology are expanding at a rapid pace and it is difficult to follow them. As it is known, taking the developments in science and technology into consideration, developed countries pay great attention to educate individuals who are literate in terms of science and technology (Liu, 2009). Accordingly, developing countries should also endeavor to educate their individuals as "literate in science and technology" so they can understand and accord with the rapidly changing developments in science and technology (Şimşek & Belhan, 2012). Within this context, the aim of the "Science and Technology Course" put into practice in 2004 in order to realize the aforementioned attempts is "to grow each student as literate in science and technology regardless of their individual differences" (MEB, 2005). Although there is no clear cut definition for the science and

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technology literacy, it can be defined as assisting for growing skillful and responsible individuals in the society; helping individuals to develop their own logical and critical thinking skills for the potentially probable personal, social, political and economic scientific-related problems which they can encounter during their lives (Hurd, 1998). There are two main objectives in science and technology literacy. First, is to develop the understanding of science and technology. Secondly, to educate efficient and productive members for the community (Çepni, Ayvacı & Bacanak, 2009). Teachers are one of the important factors that affect students' knowledge, skills, attitudes and values for students' literacy of science (Yetişir & Kaptan, 2008). Therefore, teachers should develop themselves by following developments in their fields (Çepni, Ayvacı & Bacanak, 2009).

In the related literature, there are studies about science and technology teachers' science literacy level (Bacanak, 2002; Bacanak & Gökdere, 2009; Özdemir, 2010; Yetişir & Kaptan, 2008). These studies concluded that science literacy of the preservice teachers is low and they have difficulties to understand nature of science. In this context; it is thought that to determine the factors affecting teachers' science literacy levels will provide a positive contribution to improve the quality of science education. On the other hand, it is seen that rapidly development in technology has affected education as well as science education. When technology used appropriately in educational environment, it can improve educational output. Therefore, for science and technology teachers, technology literacy is one of the important factors for their students' success. Teachers should use technology effectively in their teaching activities. As for the information technology literacy, it can be defined as having the ability to use the digital technology, communication and networking tools legally and ethically for realizing its function in the information society; namely for accessing information, managing information, integrating, evaluating and producing information (ETS, 2002).

Teachers who implement the science education programs in secondary schools are expected to be literate in science and technology in order to educate their students as literates in science and technology. Within this context, it is critically important for teacher candidates who are to graduate from their departments to have the necessary science and technology literacy. It is thought that determining the factors which have an effect on the teacher candidates' science and technology literacy levels will be beneficial in terms of facilitating the science education. Accordingly, it is required to determine how information technology literacy affects science literacy. Aim of the present study is to determine the relationship between the levels of science and information technology literacy.

2. Methodology

2.1. Research model

In the study, correlational survey research methodology was used in the scope of relational screening model. Correlational research model aims to understand together the presence or degree of change among two or more variables (Karasar, 1999). In this present study, correlational research method was chosen to determine relationship between science literacy and information technology literacy.

2.2. Population and sample

Population of the study consists of totally 387 teacher candidates who are in their 3rd and 4th years in 2012-2013 academic year in Amasya University and studying at the Department of Science Education at the Faculty of Education. As for the sample group, there

are 125 students who are in their 3rd years and 139 students who are in their 4th years with a total of 264 teacher candidates (96 male and 125 female) on a voluntary basis. Additionally purposive sampling strategy was employed while defining the population and sample group and it was required for the participants to have attended to the Basic Physics, Basic Chemistry, Basic Biology, Computer I and II courses in which basic terms related to science and information technology were introduced.

2.3. Data collection instruments and data analysis

In the study, Science Literacy Test (SLT) developed by Bacanak (2002) and the information Technology Literacy Scale (ITLS) developed by Markauskaite (2005) and translated into Turkish by Varış (2008) were used in the study. Content validity of SLT was provided in the light of expert opinions, Sperman-Brown reliability coefficient was found as 0,86 (Bacanak, 2002). In addition, content validity of ITLS was provided with expert opinions and cronbach alpha internal reliability coefficient was found as 0.98 (Varış, 2008). SLT and ITLS were conducted and data was analyzed via SPSS 18.0 by calculating descriptive statistics (means, percentage, and frequency distributions), and Pearson correlation test was run for data analysis.

3. Findings

Findings were presented under two sub-headings as the one for teacher candidates' science and information technology literacy scores and the other for the relationship between teacher candidates' science and information technology literacy.

3.1. Distribution for SLT and ITLS scores of teacher candidates

Table 1: Distribution for Candidates' Science and Information Technology Literacy Scores

Instruments	N	X	Min.	Max.	Sd
Science Literacy Test	264	48,35	24	76	10,32
Information Technology Literacy Scale	264	71,29	26,32	95,78	13,39

Table 1 shows that mean of candidates' SLT scores is 48,35 out of 100 and mean scores for ITLS is 71,29 out of 100. It is clearly seen that science literacy scores of the prospective teachers are very low. Meanwhile, information technology literacy scores of the prospective teachers are high. It can be said that candidates of teachers are good enough for technology literacy.

Table 2: Distribution for Candidates' scores in terms of the sub-factors of ITLS (N=264)

Sub-Factors	X	Min.	Max.	Sd
Problem Solving Skills	73,31	40,00	100,00	12,13
Communication Skills and Meta-Cognitive Skills	75,49	20,00	100,00	13,72
Basic Information Technology Skills	74,04	0,00	100	19,52
Analysis and Production Skills	70,06	10,00	100,00	17,73
Skills related to Knowledge and Internet	69,77	23,33	98,33	16,45
Skills for sustaining and transferring	62,27	0,00	100,00	21,63

Table 2 shows that among the sub-factors of information technology literacy scale for teacher candidates, while "Communication Skills and Meta-Cognitive Skills" has the highest mean X=75,49, "Skills for sustaining and transferring" has the lowest mean X=62,27. It is seen that candidates of teachers' communication and meta-cognitive skills are higher than their skills for sustaining and transferring when use technology in their teaching activities.

3.2. Relationship between teacher candidates' SLT and ITLS scores

Pearson Correlation Test examining the relationship between teacher candidates' science and technology literacy was presented in Table 3.

Tablo 3: Pearson Correlation Test for Candidates' SLT and ITLS scores

		Information Technology Literacy
Science Literacy	PearsonCorrelation	,015
	Sig. (2-tailed)	,812
	N	264

*p<0,05

It can be inferred from the Table 3 that there is not any statistically significant relationship between the mean scores of the participants' science and information technology literacy (r=0,015, p=0,812). This results show that as SLT scores of candidates are increase, their scores of ITLS are not change

4. Discussion

According to the findings of the study, mean for candidates' science literacy scores was determined as 48,35 out of 100. This score is thought to be low for the science teacher candidates who will grow literate individuals in science and technology in the future. By taking the answers given to the items into consideration, this may arise from the fact that teacher candidates have wrong information about the concepts related to science and laws of science, nature of science and relevant key concepts. This situation is in line with the studies in the literature (Bacanak, 2002; Bacanak & Gökdere 2009; Özdemir, 2010; Shamos, 1995; Yetişir & Kaptan, 2008). As a matter of fact, in their studies, Aslan, Yalçın and Taşar (2009) and Yetişir and Kaptan (2008) found out that teacher candidates did not understand the nature of science adequately; and Özdemir (2010) concluded that teacher candidates misunderstood the concepts and laws related to science. Aforementioned studies also support the findings of the present study.

According to the PISA 2009 assessment, Turkey is ranked as the 32nd out of 34 OECD countries, while it is ranked as the 42nd out of 65 countries participating to the study (OECD, 2010). This level is known to be low for the students. One of the most significant factors influencing this level in a negative way is teachers' science literacy levels. Therefore, it is evident that teacher candidates' low levels of science literacy may adversely affect students. Teacher candidates' information technology literacy levels are notable for them to integrate technology into their lessons, to use information technology sources and to use information technology sources for material development. According to the findings, teacher candidates' information technology literacy levels was found out as 71,29 out of 100. Based on this, the level of teacher candidates' information technology literacy can be mentioned to be sufficient. These findings are in parallel with the findings of the studies conducted by Markauskaite (2007) and Varış (2008) which means that the findings are supported by the mentioned research in the literature.

Teachers help their students to understand the relationship between science and information technology. In the light of the findings, there is no significant relationship between teacher candidates' literacy levels of science and information technology (r=0,015, p=0,912). This may be due to the fact that teacher candidates cannot adequately benefit from information technology in order to access and communicate information and they practice new technology

in their lives without knowing the basics. Accordingly, teacher candidates' ability to use technology effectively when they begin their profession plays an important role in students' overall attainment (McGrail, 2005).

5. Conclusion and Implications

Based on the findings of the study, it was concluded that science teacher candidates have low levels of science literacy and their levels of information technology literacy was sufficient. No significant relationship was found between science and information technology literacy levels.

In the light of the results, implications were presented as it follows:

- Seminars on science literacy might be given to the teacher candidates in order to help them become aware of the importance of science literacy.
- Throughout the Science and Technology course, there might be more opportunities for learning experiences which will help them to understand the scientific discoveries and their multifaceted effects and to guide them for using technology in an effective and conscious way.
- Some courses which will improve science and technology literacy levels might be implemented in the curriculums of secondary and high schools and existing relevant courses should be ameliorated.
- Scientific Research Methods courses in the science education programs are one of the theoretical courses (2-0) taken during the fall semester of the third year. It might be better to improve the course by adding one course hour for the practice or to implement another applied course which will be taken in the spring semester of the third year. Thus, teachers can reach scientific knowledge by using technology.
- By using the tests including the sub-factors of science literacy, the relationship between sub-factors of science literacy and information technology literacy may be examined.
- Science literacy of the elementary school students and teachers who practice the science and technology course can be examined and longitudinal studies can be conducted to find out how the individuals' science literacy changes from year to year.

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