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## Prospective teachers' perceptions of using technology in three different ways

Mevhibe Kobak<sup>a</sup> \*, Nazli Ruya Taskin<sup>b</sup>

<sup>a</sup> Department of Secondary Science and Mathematics Education, Balikesir University Necatibey Faculty of Education, Balikesir 10100, Turkey

<sup>b</sup> Department of Secondary Science and Mathematics Education, Balikesir University Necatibey Faculty of Education, Balikesir 10100, Turkey

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### Abstract

The aim of this study is to determine prospective teachers' perceptions of using technology. In this study, data is collected through "Technology Perceptions Scale", visual association test and technology metaphors. The participants of the study are 104 senior prospective teachers who are studying at Balikesir University Necatibey Faculty of Education. In this descriptive study, the obtained quantitative data was interpreted together with qualitative data. Based on the data obtained, even though prospective teachers' perceptions of using technology are positive, there is no significant relation in terms of gender and undergraduate program. According to the results of visual association test, it can be said that prospective teachers ranked smartboard, internet and computer in the first three rank and portable media player, mobile phone and video/camera in the last three(rank). Besides prospective teachers' metaphors about technology are analyzed and classified under 9 categories: 1)developing and changing technology, 2)rapidly progressing technology, 3)limitless, endless technology, 4)beneficial technology, 5)harmful technology, 6)both beneficial and harmful technology, 7)unputdownable technology, 8)technology as a necessity, 9)all inclusive technology. At the end of the study, those nine categories which were acquired using the content analysis technique are presented in a table form which shows the interaction between categories in a holistic view.

*Keywords:* Technological perceptions, technology integration, visual association, metaphors

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### 1. Introduction

People's desire to live in a more modern world increases day by day and technology develops expeditiously in parallel with this situation (Yenilmez and Karakuş, 2008). Hence, using various technologies become inevitable to solve problems in education (Çankaya and Karamete, 2008) and integrating technology into teaching and learning situations become the focus of many educators (Almekhlafi and Almeqdadi, 2010).

When the national and international studies examined it can be pointed out that there is not a standardized description of technology integration. For example; while Hew and Brush (2007) considered technology integration as teacher's using of any technology to increase learner achievement, some researchers explained this as a forming of learning activities by teachers in the classroom (Hennessy, Ruthven, and Brindley, 2005) or revealing learner's creative learning abilities (Lim, *et al.*, 2003). According to Perkmen and Tezci (2011) the core of technology integration is "using technology into class in a way that there can not be any method to teach in that way but with the technology" (p.4). However, the multi dimensional characteristic of technology brings the problem about knowing how to use technology is not enough for successful technology integration (Perkmen and Tezci, 2011). Various researchers made different categorization of this multi-dimensionality of technology integration. For

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\* Mevhibe Kobak. Tel.: +090-507-657-3121

E-mail address: [mevhibekobak@balikesir.edu.tr](mailto:mevhibekobak@balikesir.edu.tr)

example; According to Mishra and Koehler (2006) technology integration has three dimensions: content knowledge, pedagogical knowledge and technological knowledge.

In effective integration of technology into education learner's perception of technology also has a role in addition to using it efficaciously (Mazman and Koçakel Usluel, 2011; Çelik and Kahyaoglu, 2007). For this reason, determining the prospective teachers' perception of technology comes to an important point to develop strategies providing successful technology integration and to lead strengthening teacher education curriculum since they will need to use these technologies effectively in the future (Öksüz and Ak, 2009). Also, in Teo and Lee's study, it is found out that prospective teachers existing behavioral approaches perceptions in terms of the technologies which they will be using in their classroom have a strong influence on their future perceptions and willingness of using technology in their teaching situations(2010). When prospective teachers have adequate instruction during their education they have positive ideas for instruction with technology and they believe in the effectiveness of it (Morrison and Jeffs, 2005) education faculties have the great importance since they are primarily responsible for teacher training.

Within this context, this study aims to determine prospective teacher's perceptions in terms of using technology supported with visual and metaphorical images. In this way, we tried to answer these sub purposes.

1. What are the prospective teachers' perceptions in terms of using technology?
  - a) Is there any significant difference in prospective teachers' perceptions of using technology in terms of gender?
  - b) Is there any significant difference in prospective teachers' perceptions of using technology in terms of undergraduate program?
2. Which technology represents the concept of using technology in education the most according to prospective teachers?
3. Which metaphors represent prospective teachers' technology concept?

## 2. Methodology

### 2.1. Design of the Study

In this study, descriptive survey design has been used to determine prospective teachers' (studying at secondary science and mathematics education) perceptions of technology (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz and Demirel, 2010).

### 2.2. Participants

The participants were 104 senior prospective teachers who are studying at secondary science and mathematics education department (physics ed., chemistry ed., biology ed. and mathematics ed.) at Balıkesir University Necatibey Faculty of Education in Turkey in 2011-2012 fall semester. Distribution of prospective teachers in terms of gender and undergraduate program are shown below in Table-1.

Table 1. Distribution of prospective teachers in terms of gender and undergraduate program

		Undergraduate Program								Total	
		Mathematics Ed.		Biology Ed.		Chemistry Ed.		Physics Ed.		f	%
		f	%	f	%	f	%	f	%		
Gender	Female	20	19.2	23	22.1	12	11.5	7	6.7	62	59.6
	Male	17	16.3	9	8.7	9	8.7	7	6.7	42	40.4
Total		37	35.6	32	30.8	21	20.2	14	13.5	104	100.0

### 2.3. Data Collection Tools

**Technology Perception Scale:** "Technology Perception Scale", which was developed by Tınmaz (2004), is used to measure prospective teachers' perceptions of using technology. The scale is a 5 point likert scale which consists of 28 items. In reference to validity and reliability assessment scores, the scale has two factors which are "belief on positive effect of technology in education" and "effects of undergraduate program" and Cronbach Alpha coefficient of factors are .89 and .81 respectively. Internal consistency coefficient for the whole test is .86

**Visual Association Activity:** This activity is developed by the researchers through literature and receiving field experts' opinion. It consists of 11 images which can be used as educational tools. The reason of having 11 images is

not to get people confused since it is a ranking activity which should not normally be presented with more than 10 or 12 items (Anderson and Arsenault, 1998). In the activity, there are 11 images to be listed in order of importance. It is a useful variation of these types of questions according to Anderson and Arsenault (1998). Prospective teachers are asked to list the images as the first three and the last three. The main purpose of the activity is to elicit prospective teachers’ perceptions of using technology by associating the images in order of importance which represent their concept of using technology in education.

**Metaphors:** Metaphors used in education contribute to reveal some concepts, perceptions and attitudes in some subjects which are not fully understood or hard to understand (Döş, 2010). For this purpose prospective teachers are given a form written “Technology is like....., because.....” on and are asked to give free answers. The answers are analyzed with metaphorical analysis methods to determine their perceptions of using technology.

**3. Data analysis**

The statistical analyses of the quantitative data collected are done via SPSS 17 package program in the .05 significance level. The metaphors which are the qualitative data in this study are analyzed through content analysis method. In this method, categories are organized by clearing up the reasons for that metaphor. While transferring prospective teachers’ expressions about metaphors, their names are numbered and coded according to department of study to protect their privacy. For example physics prospective teacher number one is coded as P1. (Chemistry Ed.; C1, Mathematics Ed.; M1, Biology Ed.; B1)

**4. Findings**

*4.1. Findings of first sub-problem:*

Table 2 shows values concerning prospective teachers’ perceptions of using technology.

**Table 2** Values concerning prospective teachers’ perceptions of using technology

n	M	SD
104	3.83	.46

When Table 2 is examined, prospective teachers’ mean scores of technology perception scale is  $\bar{X} = 3.83$ . Since the highest mean score for the perception scale is 3, prospective teachers’ average score is higher than the highest mean score. This finding can be interpreted as prospective teachers’ perceptions of using technology are positive.

To control whether prospective teachers’ scores of technology perception scale is normal or not, Kolmogorov-Smirnov Test is used and results are shown below in Table 3 (Buyukozturk *et. al.*,2010)

**Table 3** Kolmogorov- Simirnov Test of Normality Results

Kolmogorov-Simirnov Test of Normality			
	Statistic	Df	Sig.
Perception Scale	.131	104	.000

As a result of test of normality scores, the significance of perception scale is found as  $p = .000 < .05$ . It can be said that distribution is not normal since the significance value of perception scale scores is less than .05.

Mann Whitney U test is used to determine whether prospective teachers’ perceptions of using technology have significant difference in terms of gender or not. Table 4 shows Mann W.U Test results according to gender.

**Table 4** Mann W.U. Test Score Results for Perceptions of Using Technology Scale In Terms Of Gender

Gender	N	Mean Rank	Sum of Ranks	U	p
Female	62	52.13	3232	1279	.879
Male	42	53.05	2228		

The result of Mann Whitney U Test is used as distribution is not normal for prospective teachers’ perceptions of using technology in terms of gender shows that there is no significant difference between males and females

( $u=1279$ ,  $p>.05$ ). In other words this finding can be seen as male and female prospective teachers have similar perceptions of using technology.

To determine whether there is significant difference in prospective teachers' perceptions of using technology in terms of undergraduate program Kruskal Wallis H test is used since data gathered are non parametric.

**Table 5** Kruskal Wallis H Test Results for Perceptions of Using Technology In Terms of Undergraduate Program

Perception	N	Mean Rank	sd	$\chi^2$	p
Physics Ed.	14	53.39	3	5.844	.119
Chemistry Ed.	21	54.81			
Biology Ed.	32	42.34			
Mathematics Ed.	37	59.64			

When Table 5 is examined, it can be seen that there is no significant difference in prospective teachers' perceptions of technology in terms of undergraduate program ( $\chi^2(3) = 5.844$ ,  $p>.05$ ). This finding indicates that prospective teachers who are attending different undergraduate programs have similar perceptions.

#### 4.2. Findings of second sub-problem:

Table 6 indicates the results of visual association activity which aims to reveal prospective teachers' representations regarding the concept of using technology in education the most.

**Table 6** Results of Visual Association Activity

		Smart Board	Overhead Projector	Simulator	Mobile Phone	Camera/ Video	Mp3 player	Projection	Television	Internet	Educational Softwares	Computer
<b>First three</b>												
1.rank	f	37	4	16	3	0	0	4	0	16	8	16
	%	35.6	3.8	15.4	2.9	0	0	3.8	0	15.4	7.7	15.4
2.rank	f	15	7	7	3	1	0	18	1	17	11	24
	%	14.4	6.7	6.7	2.9	1	0	17.3	1	16.3	10.6	23.1
3.rank	f	10	15	5	2	3	1	15	0	27	13	13
	%	9.6	1.4	4.8	1.9	2.9	1	14.4	0	26.0	12.5	12.5
1 <sup>st</sup> Total Rank	f	62	26	28	8	4	1	37	1	60	32	53
	%	59.9	24.9	26.9	7.7	3.9	1	35.5	1	57.7	30.8	51.0
<b>Last three</b>												
1.rank	f	2	16	11	18	15	15	5	11	1	8	2
	%	1.9	15.4	10.6	17.3	14.4	14.4	4.8	10.6	1.0	7.7	1.9
2.rank	f	1	6	10	29	14	29	3	9	0	3	0
	%	1.0	5.8	9.6	27.9	13.5	27.9	2.9	8.7	0	2.9	0
3.rank	f	3	9	18	10	14	45	0	1	0	4	0
	%	2.9	8.7	17.3	9.6	13.5	43.3	0	1.0	0	3.8	0
2 <sup>nd</sup> Total Rank	f	6	31	39	57	43	89	8	21	1	15	2
	%	5.8	29.9	37.5	54.8	41.4	85.6	7.7	20.3	1	15.5	1.9

According to the results of Table 6, prospective teachers mostly range smart board, internet and computer in the first three rank as can be seen from the first total rank row in Table 6. It means they think these technologies represent the concept of using technology in education the most. Since using smart board, which is described as computer-projection-board connection (Tataroglu, 2009), is recently increasing in educational institutions, it can be said by looking at the ranks that computer and projection technologies fall behind them. Besides, prospective teachers in our study are familiar with the smart board for having this technology integrated in learning activities in their faculty. Therefore, smart board is ranked in the first rank by a majority.

Prospective teachers also range camera/video, mobile phone and portable media players (mp3/mp4) in the last three rank as can be seen from the second total rank row in Table 6. This situation can be interpreted as they don't associate camera/video, mobile phone and portable media players with the concept of using technology. Although learning via video has some benefits like increasing motivation and visualizing knowledge (Pekdag, 2010) it is mostly represented at the last three ranks. Mobile technologies in our pockets (mobile phone, portable media players (mps/mp4)) (Bulun, Gülnar and Güran, 2004; Küçükarslan, Koçak and Kara, 2009) and podcasts (Gülseçen, Gürsul, Bayrakdar, Cilengir and Canım; Işık, Özkaraca ve Güler, 2011) are offering chance to be used as time and place independent and are started to be used in education increasingly however, it is seen that prospective teachers mostly ranked these technological tools in the last three ranks which means they don't consider these technologies as the most useful ones to be used in education.

#### 4.3. Findings of third sub-problem:

Prospective teachers in our study developed 104 metaphors about technology concept. These metaphors are analyzed and divided into nine categories which are developing and changing technology, rapidly progressing technology, limitless, endless technology, beneficial technology, harmful technology, both beneficial and harmful technology, unputdownable technology, technology as a necessity and all inclusive technology. Table 7 shows the metaphors regarding nine categories, their frequencies and percentages.

Table 7 Prospective Teachers' metaphors about technology concept

Categories	Metaphor Name	Metaphor Frequency(f)	Metaphor Percentage (%)
<i>developing and changing technology</i>	Energy (f=2), Newborn baby (f=1), Life (f=3), Fashion (f=3), Tree (f=3), Zygote (f=1), Cell (f=1), Person (f=2), Race Horse (f=2), Flu Bug (f=2), Rain (f=1)	21	20
<i>rapidly progressing technology</i>	Clock (f=1), High Speed Train (f=1), Mathematics (f=4), Time (f=2), Rain (f=3), Series (f=1)	12	12
<i>limitless, endless technology</i>	Ocean (f=3), Universe (f=4), Humankind (f=4), Bottomless pit (f=1), Indefinite integral (f=1), Sky (f=3), Numerical axis (f=1)	17	16
<i>beneficial technology</i>	Sun (f=3), Book (f=3), Simulation (f=1), Green House (f=1), Door (f=1), Formula (f=3), Light (f=2), Newsmonger (f=1)	15	14
<i>harmful technology</i>	Tropical fruit (f=2), Paparazzi (f=1)	3	3
<i>both beneficial and harmful technology</i>	Atomic bomb (f=3), Uranium (f=2), Food (f=2), Magic wand (f=1), Medicine (f=3), Bank (f=1)	12	12
<i>unputdownable technology</i>	Toy (f=3), Illness (f=1), Video camera (f=1), Cigarette (f=3)	8	8
<i>technology as a necessity</i>	Breathing (f=1), Touch (f=1), Air and Water (f=3), Staple Food (f=1)	6	6
<i>all inclusive technology</i>	Bag (f=1), Computer (f=1), Earth (f=2), Life (f=2), Library (f=1), Gene Pool (f=1), Subconscious (f=1), Garbage (f=1)	10	10

When Table 7 is examined, it is seen that prospective teachers frequently developed 21 metaphors in "developing and changing technology" category. Their metaphors in "harmful technology" category are less in number with regard to other categories. Table 8 shows examples of some metaphors developed by prospective teachers.

Table 8 Examples of metaphors by category

Categories	Expressions
developing and changing technology	"Technology is like a zygote, because when something is explored, it grows and develops by adding new properties" (B23)
	"Technology is like life, because it grows like a human who grows mature in his life by passing through different life periods"(C3)
	"Technology is like a flu bug, because it changes constantly in the same way with the virus and we can not accommodate it (M18)
rapidly progressing technology	"Technology is like mathematics, because even we think that we learnt everything about mathematics it is not true, while we try to catch up on, every day new things are added and it is hard to reach its speed." (M23)
limitless, endless technology	"Technology is like universe, because we don't know exactly the limits and incorporations of it." (P4)
	"Technology is like indefinite integral because it is not definite where it starts and goes. Technology changes by years according to the quality of the outcomes."(M29)
beneficial technology	"Technology is like the sun, because it opens the way for people and enlightens their way."(C10)
	"Technology is like a greenhouse because in a greenhouse you can get the best of the crops you product. It is the same when we use technology and try to reach the best student." (M14)
harmful technology	"Technology is like a tropical fruit, because it seems delicious and nutritious but it is expensive and it is not good for budget." (B7)
both beneficial and harmful technology	"Technology is like an atomic bomb, because it is actually a great power but if we do not use it consciously or use it for bad, it causes a widespread devastation but if we use it for good it supports the development of brains and help us reach the things we would never have without it." (P3)
uninputdownable technology	"Technology is like a toy because it is hard not to play with it since it is fun." (C1)
	"Technology is like a cigarette, because it causes addiction" (M22)
technology as a necessity	"Technology is like air and water, because it is indispensable and societies without technology can not reach highest levels of life quality"(M1)
all inclusive technology	"Technology is like garbage because, with the disorganized developing technology digital data bank became very chaotic and reaching the true knowledge became very hard."(P12)
	"Technology is like a bag because it includes everything we need or not need."(C8)

## 5. Conclusions and Recommendations

The outcomes of this study which aims to determine prospective teacher's perceptions of technology supported with visual and metaphorical images are:

It is found out that prospective teachers' mean scores of technology perception scale is  $\bar{X} = 3.83$ . Considering that average score of the perception scale is three, it can be said that prospective teachers have positive perceptions concerning technology. This result is parallel with several studies (Abboud-Blanchard, 2005; Eyyam, Meneviş and Doğruer, 2010; Tınmaz, 2004; Usta and Korkmaz, 2010) Also, there is no significant difference between prospective teachers in terms of gender in this study. This finding supports Korkmaz and Yeşil's (2011) study. On the other hand; Demirci and Yadigaroglu (2011) found out that female prospective teachers' perceptions of technology are more positive than male prospective teachers'. Contrary to this study, in his dissertation Tınmaz (2004) reported that female prospective teachers have more positive perceptions of technology than male prospective teachers. This contradiction in different studies can reveal that educational institute which prospective teachers studied may have different approaches against technology or prospective teachers who participated in different studies may not have enough exposure to technology.

Also, it is found out that there is no significant difference between prospective teachers in terms of undergraduate program. This finding indicates that prospective teachers who are studying in different undergraduate programs have similar perceptions of using technology. In Demircioğlu and Yadigaroglu's (2011) study prospective teachers' which are studying at Physics Ed., Chemistry Ed., Biology Ed. and Mathematics Ed. perceptions of using technology in learning situations showed no significant difference in terms of undergraduate program.

The results of visual association activity which aims to reveal prospective teachers' representations about the concept of using technology in education the most show that prospective teachers ranked smart board, computer and internet in the first place and camera/ video, mobile phone which they commonly associate them with the

technology using concept in education and portable media players (mp3/mp4) in the last place which shows that they don't commonly associate them with the technology using concept in education.

Prospective teachers in this study developed 104 metaphors which are divided into nine categories as *developing and changing technology*, *rapidly progressing technology*, *limitless, endless technology*, *beneficial technology*, *harmful technology*, *both beneficial and harmful technology*, *unputdownable technology*, *technology as a necessity* and *all inclusive technology* about technology concept. The categories which have the maximum number of metaphors are “developing and changing technology” with 21 metaphors and minimum number of metaphors is “harmful technology” with 3 metaphors named tropical fruit and paparazzi. In other words prospective teachers perceive technology mostly as a concept which “changes and develops” and lastly a concept which “harms”. These results are consistent with Gök and Erdoğan's (2008) study which also used metaphor analysis to find out prospective teachers' perceptions of technology. In their study, prospective teachers' metaphors are mostly emphasized on ‘developing technology’. Also these findings indicate that prospective teachers' perceptions of technology are positive.

In the light of these conclusions some suggestions may be put forward:

When teachers are constantly educated about the changing information technologies with pre and in service education for improving their abilities of using technology effectively, it help increase their perceptions and facilitate the integration of technology in education. For this reason, in pre and in service educations it is vital to give enough consideration in terms of using technology and raise teachers' awareness.

Having adequate instruction during their education, prospective teachers can develop positive ideas in terms of instruction with technology and they can believe in the effectiveness of it. Therefore, instructors, facilitators have to use technology effectively in education faculties.

This study is practiced upon prospective teachers. Similar studies can be made on teachers to determine their perceptions in terms of using technology. Furthermore, prospective teachers' representations of technology concept can be taken into account and new studies can be made by considering their reasons.

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