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Contact Addresses

Prof. Dr. Zeki Kaya, Gazi Üniversitesi, Gazi Eğitim Fakültesi, Eğitim Bilimleri Bölümü Teknik Okullar Ankara/Türkiye
E. Mail: ijonte2010@gmail.com

Prof. Dr. Uğur Demiray, Anadolu Üniversitesi, İletişim Bilimleri Fakültesi, Yunusemre Kampüsü, 26470 Eskişehir/Türkiye
E. Mail: ijonte2010@gmail.com Phone: +905422322167

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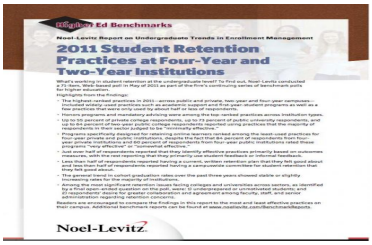

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We wish you success and easiness in your studies.

Cordially,

1st January, 2017

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INTERNET USE AMONG RETIRED TEACHERS

Prof. Dr. Emine DEMIRAY
Anadolu University
Eskişehir- TURKEY

Assist. Prof. Dr. Özden CANDEMIR
Anadolu University
Eskişehir- TURKEY

Abstract
Internet access tools and devices are developing with the prevalence of the Internet, which is considered revolutionary in information and communications technology. Beside the widespread use of the Internet among young people, statistics show that the number of older people that use the Internet is also on the rise. The purpose of the study is to identify the Internet use habits of the retired teachers who are registered members of Retired Teachers Association. The sample of the study is composed of the teachers who are members of Eskişehir Retired Teachers Association. A two-part questionnaire was implemented. The first part includes six questions of demographics and the second includes 16 questions related to Internet use habits. The data was analyzed on SPSS 23 software. The results show the Internet use habits of retired teachers who are members of the association.

Keywords: Information society, Information and communications technology, retired teachers, Internet.

INTRODUCTION

The widespread use of information technologies has led the societies to become "information societies" today. New technologies have affected both finance and social and educational system. Therefore, societies have to follow technological developments (Akkoyunlu, 1995:206).

Today, information and communications technologies are in almost every area of society and they are getting more important every day. These technologies have also become a part of life and this makes people's daily lives and work easier. For some people, adapting to present or developing technologies and learning how to use them affectively can be a result of an easy process. However, for some, this process may take more time. This difference is thought to stem from the fact that individuals generally carry the characteristics of the era that they were born in (Çukurbaşı and İşman, 2014: 29).

In recent years, the fast development of technology has created generation gaps as big as canyons. These gaps have ramifications on people's daily lives. For example, the people that were born right into this constantly changing and developing technology era have different life views than older generations. As a result, in certain areas like education, new needs and requirements arise due to new technologies. In line with the effects of the developing technology and its place in our lives, there have emerged two different groups in the society: the ones who were born into the developing technology and the ones who were born before and trying to keep up (Bilgiç, Duman and Seferoğlu, 2011:2).

The people who were born in the analog world and grew up using analog technologies are defined as "digital immigrants" and the people who were born later and growing up using mass communication technologies like mobile phones, computers, the internet are defined as digital natives by Prensky. The main distinction is that digital natives were born of after the digital revolution in the 1980s and have been raised in the era of digital technologies. The prominent difference of these two groups is

that digital natives live their lives without having exposed to any analog technology while digital immigrants have a permanent "analog accent" although they try to adapt to the new environment. The reason to use the word "accent" to exemplify this distinction is to emphasize the difference between the people who learn a foreign language and the native speakers of that language. The former inevitably carry traces of their mother tongue in their speech as an accent unlike the latter. Similarly, Digital technology is a foreign language for digital immigrants. (Altunay, 2015, p. 185)

The Internet offers a perfect platform to the elderly when they want to get information. One of the most important advantages of the Internet for adults and the elderly is that it can serve as a medium for socialization. The characteristics that make the Internet the primary leisure time choice of these people are its creative, interactive, comfortable and economical nature. It can also host other leisure time activities such as reading books, magazines and newspapers. The rates of these activities have started to increase as TV watching rates decreases (Yıldırım Becerikli, 2013:24).

The Internet and social media have a great potential to help the elderly socialize, get better at their hobbies and see the family members, which is a source of happiness for them. They can improve their life quality and thus, have a happier life. Although these media are said to be beneficial, the real determinant of whether they will benefit form them or not is bound to their positive opinion and attitude towards social media and Internet (Tekedere and Arpacı, 2016:381).

Current research shows that senior citizens are the last to acknowledge and adopt a new technology. However, it is observed that they do not avoid buying a product or service of one if it meets a need that has not been met before. For example some elders learn to use a computer and prefer to be in touch with their social circle via "e-mail" or "Internet" (Özkan ve Purutçuoğlu, 2010: 41). The elderly population is increasing rapidly like it is in the world. Research suggests that the population over the age 60 will reach 1.2 billion by 2025, and 2 billion by 2050 (http://www.yasadikca.com/teknoloji-kullanimi-yaslilarin-refahini-ve-bagimsizliklarini-ortaya-koyuyor-28657#).

According to households information technology usage survey results, the rate of the elderly people who use the Internet was 5% in 2014 and it rose to 5.6% in 2015. When elderly Internet users compared by gender, it was revealed that men use the Internet more than women and the rate of elder men was 8.8% while the rate of women was 2.8% in 2015 (TUİK, 2016).

METHOD

The purpose of the study is to identify the Internet use habits of the retired teachers of Retired Teachers Association who are considered in the group that is called digital immigrants. The purposive sample of the study is composed of the teachers who are members of Eskişehir Retired Teachers Association. A two-part questionnaire was implemented. The first part includes six questions of demographics and the second includes 16 questions related to Internet use habits. These questions asks which of the information technologies they have, which one they prefer to use the most, where they use them the most, the access conditions to online devices, their user experiences, who they consult when they have a problem about their online devices, how they have learnt to use the Internet and computer, how long they have been using them, how often they use these technologies, which communication channel they use, their personal purpose to use the Internet, who they contact most online, their personal benefits from using the Internet, their opinion on using the Internet, the biggest obstacle that prevent them from using it more and on what areas they would like a training to satisfy their needs about using computers and the Internet. The retired teachers in Eskişehir Retired Teachers Association who use the Internet were included in the sample. The data was analyzed on SPSS 23 software and interpreted with frequency and cross tables.

FINDINGS

118 people participated in the study, 50 of which are male and 68 of which are female retired teachers. The following results were obtained in the two-part study.

Demographic Features of the Participants

57.6% of the participants were female and 42.4% were male. 27,1% is in the age group of 50-60 years and 12,7% is in the age group of 71-80 years. The 61-70 age group was the largest and was represented with the rate of 60.2% in the survey. 85.1% were university graduates while 7% received post-graduate education and 7.9% marked the other option. When the income level of the participants is examined, 59% of them have income of 2000-3000 TL, 27.4% of them have less than 2000 TL, 8.5% of them are between 3000-4000 TL and 5,1% of them have more than 4000 TL income. 71.2% of the respondents had two, 13.6% had one, 5,1% had three, 1,7% had four and more children. 8.5% stated that they do not have children. 37.1% of the participants are class teachers, 12.7% are science, 11% maths, 3.3% social studies and 2.5% are Turkish Language teachers. The rest of the participants are distributed to branches such as music, physical education and foreign language.

The Information Technologies that the Retired Teachers Possess

73.3% of the retired teachers have a smartphone, 55.2% have a desktop computer, 50.4% have a mobile phone, 44.8% have a laptop, and 37.9% have a digital camera . While 29.3% of participants use tablet and flash memory, 38.8% of those stated that they had fixed phone in their home. The finding that about ¾ of the retired teachers have smartphones, and more than half of them have desktop computer is an indication that they are not so distant to information technologies. Participants have selected more than one option in this question.

Information Technology Preferences of the Retired Teachers

Retired teachers prefer to use smart mobile phones among other online devices with a rate of 56.6%. The second choice is the laptop with 21,1%. When gender is taken into account, smart mobile phone preferences of women are 69%, while it is 41.2% for men. On the other hand, the percentage of women in laptop preferences is 11.9%, while that of men is 32.4%.Choice of desktop computers is 20.6% for males and 9.5% for females. While women use smartphones more than men, men use laptop and desktop computers more often than women. According to these results, it can be said that retired teachers are not far away from information technologies and use them at high rates. Table 1 shows which online devices participants preferred to use the most.

Table 1: Which of the following online devices you prefer to use the most?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Laptop**	16	13,6	21,1	21,1
	PC (Desktop)	11	9,3	14,5	35,5
	Tablet	5	4,2	6,6	42,1
	Smart mobile phone	43	36,4	56,6	98,7
	Other	1	,8	1,3	100,0
	Total	76	64,4	100,0	
Missing	**System**	42	35,6		
Total		118	100,0		

The Places Where Retired Teachers Prefer to Use Online Devices

73.7% of the participants stated that they use online devices at home. This rate is 75.5% for women and 71.7% for men. Table 2 shows where participants use the devices with internet connection the most.

Table 2: Where Do You Mostly Use online devices such as Desktop Computer, Laptop, Tablet, and Smartphone?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Home**	73	61,9	73,7	73,7
	At friends or relatives	1	,8	1,0	74,7
	Anytime anywhere	24	20,3	24,2	99,0
	Other	1	,8	1,0	100,0
	Total	99	83,9	100,0	
Missing	**System**	19	16,1		
Total		118	100,0		

The Access Conditions to Online Devices

94 % of the participants stated that they own a device connected to the Internet and they access the Internet via their own devices. This rate is 89,1% for women and 100% for men. The rate of the participants who use their children's devices is 3,9% and all of these participants are women. It is important for retired teachers to have access to Internet-connected devices in their own right and this is notable in terms of their freedom of use and the need for Internet use. Table 3 shows the access conditions of participants to online devices.

Table 3: State Your Access Conditions to Online Devices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**I have my own device.**	96	81,4	94,1	94,1
	I use my children's devices.	4	3,4	3,9	98,0
	I use my spouse's device	1	,8	1,0	99,0
	Other	1	,8	1,0	100,0
	Total	102	86,4	100,0	
Missing	**System**	16	13,6		
Total		118	100,0		

Internet Usage Experiences of Retired Teachers

When the experience of retired teachers using the internet was examined, It was found that the rate of those who have no experience in this matter is 11%. These are all females. This group describes themselves as inexperienced with the use of the internet. Participants rated their experience of using the Internet as somewhat 44% and 5.5% very experienced. The percentage of women who have some experience is 42.9% while the proportion of men is 45.7%. The rate of women who regard themselves as very experienced in internet use is 3.2% and the male ratio is 8.7%. 89% of retired teachers have had Internet experience at diffrenet levels. Table 4 shows the participants' experience using online devices.

Table 4: State your Internet Usage Experience Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**None**	12	10,2	11,0	11,0
	Limited	16	13,6	14,7	25,7
	I have little experience	48	40,7	44,0	69,7
	I have some experience	27	22,9	24,8	94,5

	I have a lot of experience	6	5,1	5,5	100,0
	Total	109	92,4	100,0	
Missing	**System**	9	7,6		
Total		118	100,0		

The Person Who They Consult When They Have a Problem About Their Devices

57.7% of the participants consult their children, 14.4% their friends, and 12.4% computer technicians when they face a problem that they can not solve with their devices. While the proportion of women who consulted their children was 63%, the proportion of men was 53.5%. Men are consulting their friends with a rate of 20.9% when they have a problem, while 9.3% of women do the same. It has been seen from the answers to this question that women consult their children more and men consult their friends. Table 5 shows who They consult when they face a problem they could not solve about their online devices.

Table 5: Who Do You Consult When You Have Problems About Your online Devices?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Computer technicians**	12	10,2	12,4	12,4
	My children	56	47,5	57,7	70,1
	My grandchildren	7	5,9	7,2	77,3
	My friends	14	11,9	14,4	91,8
	Other	8	6,7	8,2	100,0
	Total	97	82,2	100,0	
Missing	**System**	21	17,8		
Total		118	100,0		

How the Participants have Learnt to Use Computers and Internet

While 34.8% of the participants stated that they have learnt to use computers and Internet to from their children, this rate is 68.8% for females and 31.3% for males. The rate of self-teaching by means of trial-and-error is 30.4%. This rate is 67.9% for males and 32.1% for females. The rate of those who can not say that they have learned to use a computer is 5,4%. It is seen that retired teachers regard their children and their grandchildren as a tutor. Another important point is that 12% of the people take time and money to learn how to use computer and get a special training. This result shows that retired teachers are perceive learning how to use internet and computers as a necessity. Table 6 shows how participants learnt to use computers and the internet.

Table 6: How Have You Learnt to Use Computers and Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**I joined a course in our Retired Teachers Association**	4	3,4	4,3	4,3
	I taught myself by trial and error.	28	23,7	30,4	34,8
	I learnt from my children	32	27,1	34,8	69,6
	I learnt from my grand children	2	1,7	2,2	71,7
	I joined a private course	11	9,3	12,0	83,7
	I learnt from my friends	4	3,4	4,3	88,0
	I cannot say I have learnt	5	4,2	5,4	93,5

	Other	6	5,1	6,5	100,0
	Total	92	78,0	100,0	
Missing	**System**	26	22,0		
Total		118	100,0		

How Long They Have Been Using the Internet

Retired teachers stated that they have been using the Internet for 1-5 years with a rate of 35.8% and for 6-10 years with a rate of 30.5%. The rate of those who have been using the Internet more than 11 years is 26.3%. While the proportion of men who use Internet for more than 11 years is 36.2%, the proportion of women is 16.7%. While the rate of women using the Internet for 1-5 years range is 45.8%, the rate of men is 25.5%. Table 7 shows how long the participants have been using the Internet.

Table 7: How Long Have You Been Using the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 year	7	5,9	7,4	7,4
	1-5 years	34	28,8	35,8	43,2
	6-10 years	29	24,6	30,5	73,7
	More than 11 years	25	21,2	26,3	100,0
	Total	95	80,5	100,0	
Missing	System	23	19,5		
Total		118	100,0		

Internet Usage Frequency of the Participants

When the frequency of participants' usage of the internet is examined, it was found that 83.3% of the respondents used the internet constantly and spent several hours every day. The rate of women who use the internet constantly every day is 34%, while this rate is 26,1% for men. The percentage of men who use the internet for a few hours every day is 58.7%, while this rate is 48% for women. According to the results, internet is perceived and used as a daily necessity. Table 8 shows the usage frequency of the Internet.

Table 8: How Often Do You Use the Internet?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Constantly everyday**	29	24,6	30,2	30,2
	A few hours a day	51	43,2	53,1	83,3
	A few hours a week	12	10,2	12,5	95,8
	A few hours a month	3	2,5	3,1	99,0
	Other	1	,8	1,0	100,0
	Total	96	81,4	100,0	
Missing	**System**	22	18,6		
Total		118	100,0		

The Communications Channels That the Participants Use the Most

The communication channels most frequently used by retired teachers were Facebook with 92%, Messenger with 49%, e-mail with 44% and Skype with 30%. The most important difference between men and women is seen in the use of Messenger and Skype. For Messenger the rates are 29% for women, 20% for men and For Skype the rate of women is 18%, while it is 12% for men. According

to these results, it can be said that social networking sites are the most frequently used communication channel among retired teachers and visual communication channels are mostly used by female teachers. Participants have selected more than one option in this question.

Participants' Purpose to Use the Internet

The retired teachers use internet to read newspapers, magazines and follow up the news by 78.8%, to follow social networking sites such as Facebook and Twitter by 75.5%, for personal communication like sending and receiving e-mails by 48%, travel and tourism with 41.8%, to get information about health with 35.7% and for E-government with a rate of 26.5%. At the lowest rate of 2%, they use it for job search and job application. From the answers given to this question, retired teachers seem to use the internet at high rates for personal or mass news needs. One of the prominent purposes of use is social networking sites where friendship and sense of togetherness are exhibited. Participants have selected more than one option in this question.

The People They Contact the Most Online

Participants communicate online with their children and friends at the rate of 47%. The proportion of women who communicate with their children is 51.4%, while the proportion of men is 41.9%. The proportion of men who communicate with friends on the Internet is 54.8%, while the rate of women is 40%. Women communicate with their children, while men communicate more with their friends.Table 9 shows the the people participants mostly communicate with on the internet.

Table 9: Who do you Communicate online with?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**My children**	31	26,3	47,0	47,0
	My friends	31	26,3	47,0	93,9
	People I do not know	2	1,7	3,0	97,0
	Other	2	1,7	3,0	100,0
	Total	66	55,9	100,0	
Missing	**System**	52	44,1		
Total		118	100,0		

Personal Benefits from Using the Internet

Participants stated that the Internet contributed them as a pass time activity with a rate of 91.5%, 90.8% of them responded that it facilitated access to information, 89.7% said it allowed them to improve their general knowledge, 87.9% said they provided communication with the environment. 43.6% of them said it helped find friends and partners. 1.6% of them marked the "other" option and it included activities like organizing trips. Participants have selected more than one option in this question.

Participants' Opinion on using the Internet

Retired teachers' opinions on internet use are as follows. 79.7% of them stated that it is impossible to be proficient on using computers and the Internet as young people. 77.3% of them said they can adjust the volume of a computer and 74.6 % said they can recognize icons. 72% of them responded that they are not competent on internet concepts and 70.2% said they follow new information technologies but not buy them. 69.6% said that they cannot make use of the Internet enough and 68.9% said making explorations on the Internet makes them happy. 62.9% stated that they determine the passwords for the sites they visit, 60% said computer and Internet has a big part in their lives and 52.7% of the participants responded that they can set up a password to log on and off the computer. 52.5 said that information technology products are distant to them and 43.6% said they cannot produce quick solutions. 40.4% of them revealed that using the information technologies earns them respect and 37.9% said they panic when they face a problem about the Internet or the computer. 28.6% think their time online is a waste of time and 25.5% said they never trust online devices. 23.4% stated that they are afraid of using Information technology products. According to the

results of the answers given to this question, retired teachers accept that they are digital immigrants. Compared to young people, they find themselves less knowledgeable and think that they can not keep up with these technologies and also they are unfamiliar with foreign internet concepts and terms, material or other reasons. They cannot follow these technologies closely due to financial or other reasons. However, retired teachers know that the use of computers and the internet is a necessity in spite of these drawbacks, and they tend to address their basic needs with consulting their children or friends. The majority of them use computers, they think they have basic skills and they have confidence in this issue. Participants have selected more than one choice in this question.

The Most Important Factors That Prevent Participants from Using the Internet More

The most important factor preventing participants from using the internet more often was the fact that they did not need to use the internet more with a rate of 38.7%. 17.3% said lack of knowledge or skills are the bigest factor. 14.7% responded with lack of time and it is followed by security and privacy with a rate of10.7%. The greatest difference between men and women has emerged in the face of security and privacy concerns. This rate is 75% for women and 25% for men. The inability to find time is seen as the second biggest obstacle with a rate of 63.6% for women, which is 36.4% for men. The lack of time with privacy and security concerns are the biggest abstacles for women while the lack of foreign language and the slowness of the connections used were the first reasons for preventing the use of the internet for men. Table 10 shows the most important factors that prevent participants from using the internet more.

Table 10: What is the Most Important Factor that Prevent you from Using the Internet More?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Lack of time**	11	9,3	14,7	14,7
	Lack of foreign language	7	5,9	9,3	24,0
	Lack of knowledge and skills (Complexity of websites)	13	11,0	17,3	41,3
	Security and privacy concerns	8	6,8	10,7	52,0
	Slow internet connection	5	4,2	6,7	58,7
	I do not need to use the Internet more	29	24,6	38,7	97,3
	Other	2	1,7	2,7	100,0
	Total	75	63,6	100,0	
Missing	**System**	43	36,4		
Total		118	100,0		

The Areas They Would Like Training to Satisfy Their Needs About Using Computers And The Internet

Retired teachers stated that they would like to receive training to use the computer and internet to make up for their incompetence, to use the computer more efficiently, to move the picture from the mobile phone to the desktop, to learn the purpose of the keys, to configure the privacy settings, to open the e-mail, to use internet in more secure way, to learn the programs, to produce information on the social media, to set up a password, to make a video call, to improve their English and on general Internet knowledge. 72% of the participants stated that they did not want to receive any training and they found themselves skillful enough to use a computer and the Internet.

DISCUSSION AND CONCLUSION

The results of the study are summarized as follows:

- Approximately ¾ of the retired teachers have smartphones, and more than half of them have desktop computers. Based on this evidence, it can be said that retired teachers are not distant to information technologies.
- In terms of gender, it is seen that women prefer smart mobile phones and men prefer laptops more.
- 73.7% of respondents stated that they use online devices at home.
- 94.1% of the participants indicated that they have their own device with Internet connection.
- 89% of retired teachers have experience with and use the Internet at different levels.
- Participants are consulting their children, then their friends, and finally computer technicians when they face a problem they cannot solve with their online devices.
- Retired teachers consider children and their grandchildren as a tutor on computers and the Internet. Another important point is that they spend 12% of their time and money learning about computers and have a special training. This suggests that learning to use the Internet and computers is perceived as a necessity.
- Retired teachers have been using the Internet mostly for 1-5 years.
- When the frequency of using the Internet by participants is examined, it was found that 83.3% of them have been using the Internet constantly every day and a few hours a day. According to this result, Internet is now perceived and used as a daily necessity by retired teachers.
- Social sharing sites are the most frequently used communication channels among retired teachers. Female teachers mostly use visual communication channels.
- Retired teachers use the Internet at high rates for personal or mass news needs. One of the prominent purposes of use is social networking sites where friendship and sense of togetherness are displayed.
- Participants use the Internet and specify personal benefits in this order; making leisure time easier, facilitating access to information, enhancing general knowledge, and communicating with the environment.
- Retired teachers find themselves inadequate in computer and Internet compared to young people, they think that they have difficulty in knowing and using the concepts on the Internet, and following and purchasing information technologies. However, retired teachers know that the use of computers and the Internet is a necessity in spite of these negativities. The primary sources of information about using computers and the Internet are the children or friends, who they think are masters. A large majority is confident that they have basic skills in using computers.
- The most important factor preventing participants from using the internet more is lack of knowledge or skills with 17.3%, lack of time with 14.7%, security and privacy with 10.7%. However, "I do not need to use the Internet more" 38.7% is the highest response with rate of 38.7%.
- Retired teachers have stated that they would like to receive training to use the computer more efficiently, to move pictures from the mobile phone to the desktop, to learn the purpose of the keys, to configure privacy settings, to open the e-mail services, to use the internet in a more secure way, to learn programs, to produce information on social networking sites, to set up passwords, to open files on desktop, to make video calls, to study English, and receive general training.

The general conclusion from the study is that retired teachers have minimum basic skills in using computers and the Internet, and they regard the Internet as a part of daily life. However, the feeling of not being able to fully master a learned technology is also true for retired teachers who fall into the so-called digital immigrants group in the literature. This situation brings the need for education in order to make Internet usage better and more efficient. In addition to the help they get from their children and their friends, more professional training opportunities should be provided to retired teachers for hands-on skills in using computers and the Internet.

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BIODATA AND CONTACT ADDRESSES OF THE AUTHORS

Dr. Emine DEMIRAY in 1993, she received doctor's degree with her dissertation titled as "Urban Family in The Turkish Movies Shot Between 1960-1990". Having received her associate professorship degree in Applied Communication in 2005, she was appointed as a professor in Open Education Faculty in 2011. Since then, she has been working as a professor in Anadolu University Open Education Faculty. Her books are "Yirminci Kuruluş Yılında Anadolu Üniversitesi Açıköğretim Sistemi ve Açıköğretim Fakültesi Eğitim Televizyonu" (Anadolu University Open Education System and Open Education Faculty TV in its 20th Foundation Anniversary), Kadın Eğitimi ve Uzaktan Eğitim Kadınların Kendileriyle İlgili Resmi ve Sivil Toplum Kurulusları ile Yasalardan Haberdar Olma Durumu ve Uzaktan Eğitimden Beklentiler [Education of Women and Awareness of Women about Formal and Non-Profit Organizations and Legislations and Their Expectations from Distance Education], and she has many national, international articles and papers about media, women and distance education published in various books and magazines are some of her works.

Prof. Dr. Emine DEMIRAY
International Women Online Journal of Distance Education int.WOJDE
Anadolu University, Yunusemre Campus
Open Education Faculty
26470, Eskisehir- Turkey
URL: http://www.wojde.org
URL: https://academy.anadolu.edu.tr/xdisplayx.asp?kod=0&acc=edemiray
E. Mail(s): edemiray@anadolu.edu.tr or intwojde@gmail.com

Dr. Ozden CANDEMIR is a lecturer at the Anatolian University, Faculty of Open University. Ozden Candemir has completed the undergraduate studies at the, Anadolu University Faculty of Communication Sciences at the section Film and Television in 1982. With completing the graduate study at the Anadolu University Social Sciences Institute of communication main arts, and got her expert title, Ozden Candemir got the degree of proficiency in the Art from the Marmara University Graduate School of fine arts in 1999. Candemir has worked in the production process of the training programs of the television studio of the Anadolu University Distance Education Faculty between 1982-2014. Ozden Candemir has also participated in national level projects in the area of open and distance learning. The interest of the author Candemir are instructional videos, educational television and social anthropology, and also documentary.

Assist. Prof. Dr. Ozden CANDEMIR
Anadolu University, Yunusemre Campus
Faculty of Distance Education, 26470, Eskisehir, TURKEY
E. Mail: ocandemir@anadolu.edu.tr

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THE PLACE OF CULTURE IN FOREIGN LANGUAGE EDUCATION: UNDERGRAD INSIDE

Assist. Prof. Dr. Meliha R. ŞİMŞEK
Mersin University
TURKEY

Abstract
With the ever-increasing globalisation of education, acquisition of cultural skills has established its place as a gold standard for defining competent communicators. Varied frameworks in the famous hubs of ELT require both language teachers and learners to know a foreign language, use it for introducing home culture and getting to know other cultures, and ultimately develop cross-cultural understanding and awareness for a more peaceful global community. However, a comparative analysis of ten undergraduate course contents outlined by language teacher training programs in the UK and Turkey indicated that unlike their British counterparts, Turkish programs paid only sporadic attention to the cultural component of foreign language teaching, because (i) courses related to intercultural communication, language varieties, culture and identity remained elective and marginal; and (ii) culture teaching could receive focus as another topic area in only four compulsory courses thanks to its mention in CoHE's framework for ELT programs.

Keywords: Cross-cultural awareness, undergraduate course contents.

INTRODUCTION

The digital revolution has made the world an even smaller place, where perfect strangers from its opposite ends can come into contact with diverse communities and communicate in the global language of the world, English. Cultural encounters are a part of everyday practice and success in communicative settings involves something more than the knowledge of grammar rules, mastery of four language skills or appropriate choice of functions. Today, competent communicators are identified by their ability to "interact with people from another country and culture in a foreign language" and also "to act as mediator between people of different cultural origins" (Byram, 1997: 71). In foreign language education, this capacity has come to be known as intercultural communicative competence (ICC). As its name implies, ICC is an expanded form of communicative competence, incorporating intercultural competence as well, because two interlocutors with different native languages do not merely exchange meaningful messages through the use of a lingua franca but as people of different social identities, they maintain a shared understanding (Byram, Gribkova & Starkey, 2002; Sercu, 2005).

Having rejected the unattainable ideal of the native speaker, ICC model offers the more down-to-earth role of the "intercultural speaker" for foreign language learners and uses the "sojourner" metaphor to indicate the mutuality of change brought about in both the host society and individual himself as a result of challenging each other's beliefs, behaviours and meanings (Byram, 1997). Similarly, House (2007: 19) stressed the importance of cross-cultural comparisons and remarked that immigrants as successful intercultural speakers have managed to develop their own "third way" between the cultures they are familiar with. Consequently, foreign language learners are expected to develop five different types of knowledge and skills in order to become interculturally competent communicators: (i) *savoirs*, concerning knowledge of products, practices and social groups in one's own and his interlocutor's country; (ii) *savoir comprendre*, relating to one's ability to interpret a text from a foreign culture and relate it to another from his own; (iii) *savoir apprendre*, referring to skills

of acquiring and operating new knowledge and practices in real-time communication; (iv) *savoir s'engager* (critical cultural awareness), corresponding to the ability to critically evaluate products, practices and perspectives of home and other cultures; and finally (v) *savoir être*, meaning one's dispositional curiosity and openness (Byram, 1997). Byram's ICC model has also been adopted by varied frameworks in the famous hubs of ELT. In the USA, *the Standards for Foreign Language Learning in the 21 st. Century* was developed by the American Council on the Teaching of Foreign Languages (ACTFL) and determined five goal areas: communication, cultures, connections, comparisons, and communities. Within these five C's of foreign language education, they want to enable their students to: (i) communicate in a language other than their own, (ii) gain cultural knowledge and understanding, (iii) connect with other disciplines and broaden perspectives, (iv) demonstrate a deeper understanding of language and culture through comparisons, and (v) join in multilingual/global communities for continued learning (Cockey, 2014). The Standards view language as "the primary vehicle for expressing cultural perspectives and participating in social practices"; therefore, the content of the foreign language course shifts from the target grammar and vocabulary to the cultures expressed by that language in the 21 st. century (Cutshall, 2012: 32).

On the other hand, *the Common European Framework of Reference for Languages* (CEFR) was devised in Europe and similarly built upon Byram's savoirs for defining the competences learners need to demonstrate during communicative events. Unlike the *language-related* communicative competences, the *culture-related* general competences consist of four major components: (i) declarative knowledge (savoir), embodying knowledge of the world (new knowledge of the target country), sociocultural knowledge (everyday living, interpersonal relations, cultural values, social conventions, rituals of the target community), intercultural awareness (awareness of the relationship between target and home cultures); (ii) skills and know-how (savoir-faire), concerning practical skills (social/living/vocational/leisure skills) and intercultural skills (cultural sensitivity and mediatory skills between target and home cultures) along with the necessary know-how; (iii) existential competence (savoir-être), referring to the learner's attitudinal and personality factors like their openness, ethical values, religious beliefs, motivations etc., and (iv) ability to learn (savoir-apprendre), including language and communication awareness, general phonetic skills, study skills as well as heuristic abilities (CEFR, 2001: 101-108).

According to Piasecka (2011), the general competences are valid for both learners and teachers as language users; as a result, teachers like learners must as well possess the relevant savoirs in order to be able to educate the intercultural speakers that Byram and Zarate (1997: 11) had described: someone "who crosses frontiers, and who is to some extent a specialist in the transit of cultural property and symbolic values". In the same way, Kramsch (2004) conceptualised the language teacher as a "cultural go-between" and listed the following savoirs they need to have developed: understanding language and culture as discourse, using the language as both insider (native-speaker) and outsider (non-native speaker), distinguishing the multiple meanings of texts, seeing oneself as one of many, and appreciating the political dimensions of language teaching. This reciprocal necessity of developing intercultural skills for teachers has also been acknowledged by two other frameworks for setting teacher standards in foreign language education. The first of these, ACTFL's (2013: 2) *Program Standards for the Preparation of Foreign Language Teachers* described "the knowledge, skills and dispositions" teacher candidates must possess in order to "enable their students to learn to communicate in a foreign language". The second of the six content standards in ACTFL's (2013: 20) document concerns "cultures" and requires pre-service teachers to "demonstrate target cultural understandings and compare cultures through perspectives, products and practices of those cultures". In the realm of cultural knowledge, candidates should be able to (i) describe how their home, target and other foreign cultures resemble and differ and use the cultural framework of the Standards in their own teaching, whereas in the realm of cultural experience, they should be able to expand their cultural awareness through personal experiences (living/studying/working in the target country) or observations from cultural informants (ACTFL, 2013). The second one, EAQUALS' (Evaluation and Accreditation of Quality in Language Services) *Framework for Language Teacher Training and Development*, too, has a culture strand ("Language, Communication and Culture") distinguishes

competent teachers by their knowledge of: (i) the interconnectedness between language and culture, (ii) types of learning and teaching cultures, and (iii) intercultural problems possible in the class (EAQUALS, 2013). As for the skills such teachers display, they can: (i) design materials for promoting "pluricultural understanding", (ii) expand their own and students' understanding of intercultural issues through web searches, projects and presentations, (iii) systematically develop their learners' and less experienced colleagues' capacity for analysing and discussing cultural similarities and differences, and also (iv) predict and effectively manage intercultural conflicts (EAQUALS, 2013: 29).

Although American and European frameworks have put culture at the heart of learner's language and teacher's professional development, the MONE-approved key competencies for Turkish teachers of English concentrate on the desirable practices for materials design, lesson organisation, assessment, skills development, school-parent collaboration and sustained professional development (MONE, 2008). Unfortunately, they made no mention of intercultural communicative competence, cultural awareness, cross-cultural understanding or global citizenship. However, it is "teacher education" that "should provide student teachers with both theoretical and practical support for the responsibilities that intercultural language teaching entails" (Larzen-Östermark, 2009: 402). For this reason, ten undergraduate course contents outlined by language teacher training programs in the UK and Turkey were subjected to comparative analysis in terms of the following: foreign language courses offered, years of study, ratio of culture teaching courses to total courses and course status, so that how much focus intercultural language teaching receives in Turkish and British programs of language teacher training can be estimated. In brief, this study aims to investigate what is taught for intercultural language teaching in Turkish and British undergrad programs, and how Turkish and British teacher candidates are prepared to teach interculturally in their teacher training institutions.

METHOD

In the current study, ten course contents from British and Turkish undergraduate programs of ELT were examined with the purpose of identifying the significance of culture teaching in two different contexts. The research questions of this study can therefore be worded as follows: (i) What kind of courses include culture teaching in British and Turkish undergraduate programs? (ii) What is the ratio of culture courses to total course package in British and Turkish undergraduate programs? (iii) Which context is more conducive to ICC development in preservice English teachers: the UK or Turkey? As a result, ten undergraduate programs from Britain were determined with the help of British Council's search engine at *EducationUK.org*, whereas another ten were purposively selected among the top ELT departments of ten state universities in Turkey. Ten course contents from each context were compared in terms of their offer of foreign language courses, years of study, course ratio and course types (E: elective, C: compulsory) by using descriptive analysis. The results were tabulated for frequencies and thick description was applied for the validity of data analysis.

FINDINGS

When ten course contents from British and Turkish undergraduate programs of ELT were analysed with respect to the status of foreign language courses offered, years of study and weight of culture courses in the overall program, the results in Table 1 were obtained in British context. According to Table 1, British universities highly valued the knowledge of foreign languages other than English, as they provided their candidates with a wide range of courses teaching not only European languages like German, French, Italian and Spanish but also other world languages like Arabic, Chinese, Korean, Russian in order for their trainees to develop proficiency in prospective students' native languages. For instance, the course entitled *Language Carousel* in York St. John University gives the opportunity to learn three languages in 12 weeks' time.

Table 1:The Significance of Culture Teaching in British Undergraduate Programs

University	FL Courses Offered	Years of Study	Course Ratio (Culture Courses/Total Courses)	Courses
Manchester Metropolitan	E	3	5/13 (0.38)	Language in Society (C) Intercultural Communication (E) Language Acquisition (E) Language, Image, Media (C) Issues in Language Teaching and Learning (C)
York St. John	C	3	5/14 (0.35)	Multilingualism (C) World Englishes (C) Introduction to Language and Society (E) Applied Linguistics for Language Teaching (C) Language and Identities (C)
Essex	C	3	2/22 (0.09)	Language Rights (E) Language Variation and Change (C)
Bangor	E	3	4/23 (0.17)	English and Society (C) Language and Culture (E) Integrated English Skills I (C) Academic Speaking and Writing II (E)
Sheffield Hallam	C	4	1/17 (0.05)	Cross-Cultural Awareness (C)
De Montfort	C	3	1/15 (0.06)	Crossing Cultures (C)
Sunderland	C	3	1/8 (0.12)	Language Learning and Intercultural Competence (C)
Central Lancashire	C	4	3/24 (0.12)	Language and Society (C) ESOL and World Englishes (E) Intercultural Communication (E)
Bedfordshire	UA*	3	3/22 (0.13)	Intro to Communication and Culture (C) Language in Society (C) English and Social Context (E)
Cardiff Metropolitan	UA	3	1/15 (0.06)	Learners, Teachers and the Teaching-Learning Context (C)

*UA: unavailable

Although the number of years they spend on a BA degree varies between 3-4 years, student teachers in British undergraduate programs are required only one third of Turkish course load; that is, the number of courses they are expected to take amounts to 20 on average. The concentration of culture courses in six British universities were still higher than the highest of all Turkish universities. Being more abundant in British context, culture-focused courses also differed in status. Intercultural communication and skills received individual attention in both elective and compulsory courses like *Intercultural Communication* and *Language Learning and Intercultural Competence*. In one of these specialized courses, Manchester Metropolitan University requires student teachers to carry out

empirical research in the field of intercultural communication, i.e. analysis of intercultural communication from a language perspective, feature determination of effective communication with people from diverse cultural contexts. In Bangor University, the elective course, *Language and Culture* deals with the study of the relationship between language, culture and identity as well as cultural, political and anthropological issues around multilingualism, minority languages and language policy. Despite not being in the form of an individual course, topics related to the spread of English, its international varieties, effects on other cultures and languages, social and cultural identities, linguistic imperialism were also taken up in courses with almost identical titles: *Language in Society*, *World Englishes*, *Language Variation and Change*, *English and Society*, *English and Social Context*.

The third pattern in which culture was observed in British undergraduate programs was, too, incidental. Language courses like *Integrated English Skills* and *Academic Speaking and Writing* in Bangor University used cultural themes, cross-cultural issues for backgrounding communicative practice. In general methodology courses like *Applied Linguistics for Language Teaching* (York St. John) and *Learners, Teachers and the Teaching-Learning Context*, cultural contexts/backgrounds of English language learners and the differences between their native and target languages found a place on British undergraduate curriculums. Finally, in six of these ten institutions (Manchester Metropolitan, York St. John, Sheffield Hallam, De Montfort, Central Lancashire, Cardiff Metropolitan), preservice English teachers had the chance to spend a year abroad and gain international experience. As a by-product of this teaching placement abroad, they intended to develop their trainees' linguistic, communicative and intercultural skills simultaneously. In point of fact, it is this kind of *internationalisation* in foreign language teacher education that has become the hallmark of British undergraduate programs in comparison with the Turkish understanding of it.

Table 2 below displays the findings from the analysis of course contents in Turkish departments of ELT. According to Table 2, nine out of the top ten undergraduate programs in Turkey offered a second foreign language as part of the four-year process of preservice teacher education, which was indicative of how much they cared about plurilingualism. As for the ratio of culture courses to the total courses on their menu, it was only in one case (İstanbul University) that the attention paid to the teaching of culture approximated British examples. It was evident from Table 2 that although Turkish preservice teachers of English were required to take greater number of courses for graduation, culture teaching methodology courses were of little concern to the majority of the curriculum-makers. Being limited in number, these courses also lacked variety. Four compulsory courses; namely, *Approaches to ELT II*, *Literature and Language Teaching I & II*, *Language Teaching Materials Adaptation and Development*, made occasional mentions of: the relationship between language and culture, comparisons between home and target cultures as well as ICC development. Unlike British context, where individual courses were provided for building up both cultural knowledge and intercultural skills, Turkish undergraduate programs tended to do with these few general methodology courses, which only referred to the teaching of culture as any other topic area to be studied along with others in the same course time.

It also appeared that if it hadn't been for CoHE's imposition in the framework for all ELT programs, there might even have been no trace of culture teaching in Turkish ELT departments. In only three of the course contents (in METU, İstanbul, Gazi University), culture could be raised as an issue in the course, *Approaches to ELT*, while in the rest of the ten course contents, instructors avoided culture teaching altogether, possibly due to lack of time, interest, and pedagogical content knowledge or for their own convenience. Apart from CoHE's four common compulsory courses across universities, traces of culture teaching and ICC development were found in some other methodology and applied linguistics courses, the majority of which were taken in the compulsory status: e.g. in Marmara University, the course, *Second Language Acquisition* dealt with sociocultural factors, communicative and intercultural competence, whereas in İstanbul University, the course, *Specialization in Teaching Methods II* focused on training candidates in developing related knowledge and skills for intercultural competence. There was one compulsory course, *Sociolinguistics and English Language Education* in

Bosphorus University that included topics of intercultural communication, language contact and sociocultural contexts.

Table 2: The Significance of Culture Teaching in Turkish Undergraduate Programs

University	FL Courses Offered	Years of Study	Course Ratio (Culture Courses/Total Courses)	Courses
BOUN	E	4	3/48 (0.06)	Sociolinguistics and English Language Education (C) Varieties of English (E) ELF-Aware Teacher Education (E)
METU	C	4	2/50 (0.04)	Approaches to ELT (C) Language and Culture (E)
Hacettepe	E	4	4/60 (0.06)	*CoHE's Course Structure Approaches to ELT II (C) Literature and Language Teaching I-II (C) Language Teaching Materials Adaptation and Development (C)
İstanbul	C	4	6/61 (0.09)	Approaches to English Language Teaching (C) Specialization in Teaching Methods I (C) Applied Linguistics (C) Cultural Studies (E) Literature and Language Teaching I-II (C)
Marmara	E	4	4/38 (0.10)	Second Language Acquisition (C) Material and Coursebook Evaluation in ELT (C) Course Design and Planning in ELT (E) Language and Culture in ELT (E)
YTU	C	4	4/61 (0.06)	*CoHE's Course Structure Approaches to ELT II (C) Literature and Language Teaching I-II (C) Language Teaching Materials Adaptation and Development (C)
DEU	C	4	2/67 (0.02)	Literature and Language Teaching I-II (C)
Gazi	C	4	3/58 (0.05)	Approaches in ELT II (C) Literature and Language Teaching I-II (C)
Anadolu	UA	4	2/60 (0.03)	*CoHE's Course Structure Approaches to ELT II (C) Language Teaching Materials Adaptation and Development (C)
Uludağ	E	4	4/58 (0.06)	Language and Culture I-II (E) Pragmatics (E) Discourse Analysis (E)

Table 2 indicated that culture-related courses in the elective status were restricted in terms of quantity and variety. For example, METU offered 76 different elective courses in total but the majority

of these electives related to the poetry, drama, novel, short story, mythology, historical and literary periods of the target cultures, mainly British literature. Yet, one elective course, *Language and Culture* on METU's list embodied aspects of the reciprocal relationship between language and culture, i.e. language and world view, language policies etc. Similarly, İstanbul University provides candidate teachers of English with another elective called *Culture Studies*, in order to: (i) familiarize them with other world cultures through the use of English, (ii) raise their awareness of cross-cultural interactions and cultural globalisation, and (iii) to develop an intellectual view of the world. Culture received focus in Uludağ University's two elective courses, *Pragmatics* and *Discourse Analysis*, which aimed to inform student teachers of the variability speech acts may display with respect to language and culture, and sensitize them to cultural features in discourse.

In conclusion, much of the attention culture methodology and ICC could earn in the course contents of top ten Turkish universities tended to come from CoHE's four common compulsory courses. Topics of special interest like intercultural competencies for foreign language learners, culture teaching through varied literary genres, and comparisons of products (history, institutions), practices (rituals, traditions, social roles/relationships), perspectives (beliefs, values, superstitions) between the native and target cultures did not occupy much space in their overall study, whereas second foreign language lessons served to enable preservice teachers to experience themselves language and culture learning through authentic materials. Yet, it was clear that tomorrow's foreign language teachers needed a better cultural background and a more in-depth training in the teaching of culture in order to fulfil the role of cultural mediator in modern foreign language classes of the 21st. century.

DISCUSSION AND CONCLUSION

Although the earliest studies on the place of culture in EFL class dated back to the late 1970s, the need for more culture-focused education has not been met yet (e.g. Moskowitz, 1976; Nerenz, 1979). Not only in the current study but also in most previous studies, the teaching of culture remains a neglected issue in the curriculum of pre-service teacher education. The comparison between Turkish and British course contents revealed that unlike their British counterparts, Turkish undergraduate programs paid only sporadic attention to the cultural component of foreign language teaching, because (i) courses related to intercultural communication, language varieties, culture and identity remained elective and marginal, while (ii) thanks to its mention in CoHE's framework for ELT programs, culture teaching could receive focus as another topic area in only four compulsory courses, though not necessarily present in the given course contents of all institutions. These findings were in line with the previous literature because Grosse (1993), having analysed 157 FL methods course syllabi from 144 colleges and universities, too, found that not even half included culture and less than one week was spared for the teaching of culture in their L2 methods courses. Similarly, Byrd (2007) analysed 20 and Wilbur (2007) 32 methodology course syllabuses at universities and discovered that although the cultural component was not non-existent, there was little guidance on how to teach culture in the curriculums of the colleges. While Lazar's (2006) promising study in Hungary acknowledged the presence of some compulsory and elective courses for teaching the cultural dimension of foreign language instruction, a more recent examination of the ten methods course syllabi by Byrd (2014) indicated that the content failed to reach the level of professional requirements candidates were supposed to be prepared for in order to teach culture in the USA.

The course contents in Turkish teacher education programs showed incompatibility not just with the aforementioned international standards for foreign language learning and teaching, but they were found incongruent with the newly-introduced English curriculum for 9-12th. graders in terms of cultural objectives. It is openly stated in the rationale for curriculum revision that Turkish learners of English need to use English for "shar[ing] their ideas and culture with other people from different cultures and countries" and in order "to communicate internationally", they must learn to communicate "interculturally" (MONE, 2016: 4, 20). Therefore, curriculum-makers in Turkey have already come to the understanding that "understanding a language involves not only the knowledge of grammar, phonology, and lexis but also certain features and characteristics of the culture" (MONE,

2016: 20). However, it was seen in the current analysis that the course contents Turkish candidate teachers of English were provided with cannot be claimed to prepare them for the new English curriculum they will be working with in the very near future. If these student teachers are not provided with the necessary means for becoming intercultural speakers themselves or taught how to teach Tomalin's (2008) "fifth language skill" (culture), it is then worth questioning how their prospective students will be able to develop "cultural awareness" as dictated by MONE's (2016) new curriculum. It was in Atay's (2005) study of Turkish student teachers' ideas about the cultural dimension of language teaching that the same inconsistency had already been identified among the objectives of the national curriculum, coursebooks in use, practice at schools and the training teachers received.

Another problem with the course contents of Turkish ELT departments related to the adopted approach towards the teaching of culture. Because Turkish candidates were mainly exposed to British and American literature during their teacher training, their cultural knowledge can be criticised for being one-sided. Besides this "Big C/achievement culture" of English-speaking countries, it might have been more useful if their course contents were broadened to include culturally-conditioned beliefs and behaviours (little c/behaviour culture), as these are the elements that reflect the living side of a community: traditions, daily routines, leisure activities, festivities, superstitions, idiomatic language uses, and interactional patterns etc. (Tomalin & Stempleski, 1994). When Schulz and Ganz (2010: 177, 189) explored classroom teachers' perceptions about the preparation they received for teaching cultural aspects in the language classroom, they likewise found that most courses devoted to the teaching of culture could easily be labelled "big-C culture courses", as "their coursework focused mainly on literary analyses from critical theory or historical perspectives" and lacked the necessary "examples of daily life products, practices and perspectives" for teaching the target culture. In two other investigations into student teachers' views about the treatment of culture in their undergraduate programs, similar results were obtained. In Larzen-Östermark's (2009) study in Finnish context, it was high culture, "the civilization of the target language culture" being promoted, even though "social practices, customs and lifestyle in the foreign culture" and comparisons between the students' own "values, beliefs and norms" and those of the foreign culture were in need of more attention. Columbian student teachers in Olaya and Rodriguez's (2013: 49, 57) study "lacked full understanding of intercultural competence" and they also wished to learn more about the behaviours, life styles of other people or the "deep culture" during their teacher training.

Nevertheless, if we expect our candidate teachers to act as "cultural mediators" in the foreign language classroom, the given course contents need modification in another aspect other than the kinds of culture being presented. According to Byram (1989), it is not "culture learning" in the true sense of the word, when learners are simply depositing factual knowledge about the target culture because the real experience involves change in learners' attitudes towards other cultures and their own cognitive structures. Therefore, the mode of culture treatment in the given course contents had better be switched from knowledge transmission to empathy and respect building, where student teachers can be enabled to develop a bicultural perspective through third-positioning (Larzen-Östermark, 2008). In the same way, Olaya and Rodriguez (2013: 62) considered it among the responsibilities of teacher education programs to make prospective English teachers realise that culture learning/teaching is not just about giving touristic information but they must be led to know that culture is "part of their teaching career", so that they can "instruct their students on ICC" and help them to face globalisation.

The problems with the treatment of culture did not end here, as Turkish course contents only appeared to have four compulsory courses for training candidates in the teaching of culture. But in fact, even in these few courses CoHE required from all ELT departments in Turkey, the amount of focus culture teaching received depended on the willingness and expertise of the course instructor. While some seemed to comply with CoHE's predetermined content, others omitted ICC from their contents. However, Lazar (2006) advocated that cultural awareness-raising and ICC development must be immediately integrated into language classes as soon as preservice teachers of foreign

languages start their freshman year at their universities. Therefore, the following recommendations can be made for improving the status of culture teaching initially in Turkish ELT programs and subsequently in future foreign language classes: (i) existing course contents need revision, so that culture can no longer be addressed implicitly, peripherally, and supplementarily but systematically; (ii) because culture has become the fifth skill/dimension of foreign language education, compulsory methodology courses must be provided for instructing candidate teachers in how to teach culture; (iii) courses related materials design should be reorganised in such a way as to equip them with critical evaluation and adaptation skills for dealing with the cultural content of EFL coursebooks, especially the local ones with nationwide circulation; and (iv) utopian as it may sound, they can be sent abroad; i.e. to English-speaking countries, as in British example, in order for them to experience cultural immersion; or instead of this seemingly costly alternative, Eramus student teaching practicums may be encouraged for developing ICC in the genuine sense.

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BIODATA AND CONTACT ADDRESS OF AUTHOR

Dr. Meliha R. SIMSEK is currently an assistant professor of foreign language education at the Faculty of Education, Mersin University (Mersin, Turkey), and was previously a teacher trainer at the Faculty of Education, Middle East Technical University (Ankara, Turkey). Born in Mersin, Dr. Simsek was educated at Buca Faculty of Education in İzmir, and graduated with a BA in ELT from Dokuz Eylul University in 2004. She completed her MA (2006) and PhD (2009) in ELT at the Institute of Educational Sciences, Dokuz Eylul University (İzmir, Turkey). Her research interests include applied linguistics, ELT methodology, materials evaluation and development, and teacher education.

Assist. Prof. Dr. Meliha R. ŞİMŞEK
Mersin University, Faculty of Education
Department of Foreign Language Education
Yenişehir, 33000 Mersin- TURKEY
E. Mail: malliday@gmail.com

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COMPARISON OF THE OPINIONS OF THE GRADUATE STUDENTS IN KAZAKHSTAN ABOUT THEIR SCIENTIFIC RESEARCH COMPETENCIES

PhDc. Lyazzat BEISENBAYEVA
L. N. Gumilyov Eurasian National University
Philology Faculty
Astana- KAZAKHISTAN

Prof. Dr. Yücel GELİŞLİ
Gazi University
Gazi Faculty of Education
Department of Educational Sciences
Ankara- TURKEY

Abstract
The purpose of the current study is to compare the opinions of graduate students continuing their graduate studies in Kazakhstan about their scientific research competencies. As the present study aims to compare the graduate students' existing scientific research competencies, it was designed as a descriptive study in the survey model. Survey models are research approaches aiming to describe any state having existed in the past or still existing at present as it was or is.

The study group of the current research consists of graduate students randomly selected from among the students continuing their graduate studies in the fields of educational sciences and subject area education at the universities of Avrasya University, Abay University, Pavlodar State University and Ahmet Yesevi University in Kazakhstan.

In the current study, as the data collection tool, The Scientific Research Competency Scale developed by Lyazzat Beisenbayeva was used. The reliability and validity studies of the scale were conducted (α=0.958). The findings of the study revealed that no gender-based significant difference was found among the opinions stated about the sub-dimensions and the whole of the scale. Depending on the students' graduate education level, a significant difference was found in the opinions stated about the sub-dimensions of measuring tool and data analysis in favor of the master's students.

Keywords: Graduate Students, Kazakhstan, Scientific Research.

INTRODUCTION

The main purpose of science is, on the basis of observations and experiments, to elicit the relationships between phenomena, to generalize the confirmed relationships and to reach theories and laws from generalizations. This objective of science can be accomplished by using scientific method. Scientific method is a combination of induction and deduction, two important means of obtaining information. Scientific method constitutes the process aspect of science. Development of science throughout the history has occurred in a long process. Scientific studies initiated by Mesopotamian and Egyptian civilizations are continuing today at a speed impossible to follow. The most important ground of the developments experienced in the fields of science and technology is undoubtedly scientific research (Yenilmez, Ata, 2012).

There are many definitions of the concept of research. Research, in most of the time, is considered to be made up of only looking at events and collection of information, data and statistics. Of course, during the research process, it is an obligation to investigate cases and collect data. However, the researcher reorganizes his/her observations and collected data, analyzes and synthesizes them, interprets, evaluates and turns them into a coherent unity. This is a very complex activity (Kaptan,

1993: 12). On the basis of its lexical meaning, it is defined as methodological research conducted in relation to science and art. Research is defined as a process of planned and systematic collection, analysis, evaluation, interpretation and reporting of data to seek for reliable solutions (TDK, 2016).

The term of research is generally defined as careful and systematic inquiries and investigations conducted to elicit facts and principles in the domains of information. Research is the most important process that can be resorted to by people to make technological development possible, get to know their environment, make good use of it and to find solutions to problems. The research process should be viewed as a problem solving activity directed towards revealing new findings by using scientific methods approved by science authorities (Kaptan, 1993: 13).

Defining research as a science of methodology, Karasar (1984:10) views research as an important discipline of science. Research symbolizes a scope of science having content like physics, chemistry and history.

Scientific research is the sum of information production activities conducted in relation to determination of problems related to a specific issue, planning of solutions, their application and conclusion, discussion and interpretation of the results (Yenilmez, Ata, 2012). Scientific research is a process of finding reliable solutions to problems as a result of systematic, purposeful and planned collection, grouping, analysis, synthesis, explanation, interpretation and evaluation of data. According to another definition, it is an attempt to get to know man and the universe by producing testable information on the basis of observations and experiments. The main objective of scientific research is to find solutions to problems encountered by individuals and societies and to put some new tools and equipments into the service of humanity (Bayar, at all, 2013).

Scientific research, in general, is a comprehensive and meaningful term covering the processes of collecting, analysis of data to test a hypothesis and reporting of the findings in a systematic and rigorous manner (Boudah, 2011).

For the conduction of scientific research and evaluation of its results, researchers should acquire the competencies required by research techniques. Thus, it seems to be of great importance to impart these competencies to graduate students during their graduate education.

Research instruction can be defined as instruction aiming to inculcate information, skills and scientific attitudes and behaviors in researchers for them to conduct research or to draw on research that has already been conducted (Karasar, 1991).

According to Bökeoğlu and Yılmaz (2005), research instruction is an indispensable part of being a citizen meeting the requirements of our age because one of the most important characteristics of this instruction is its contributing to development of scientific perception, attitudes and behaviors in individuals. Moreover, individuals subjected to research instruction will have low concern of doing research and be willing to take part in research projects or different research activities and to develop their critical thinking.

One of the objectives set by universities for their doctorate programs is to prepare their students so that they can conduct their research on their own. The main goal of doctorate education is to impart skills to its students for them to conduct research on their own, to investigate and interpret scientific incidences from a broad viewpoint and to reach new syntheses. In this regard, there are some competencies to be possessed by students completing or having completed their doctorate studies. These competencies can be listed as being able to follow the scientific developments in their fields, interpret and analyze them and find the connections between them and conduct research on their own (Keskinkılıç and Ertürk, 2009).

Lack of statistical knowledge not only causes problems for a researcher in the stage of conducting research but also in the stages of understanding and making use of research that has already been conducted. When a research encounters such problems, he/she may have to seek for help. For a researcher to be educated well, he/she must read a lot of research and have a good knowledge of research methods and techniques. In this connection, it can be argued that the statistic courses should be required throughout both master's and doctorate education (Akbulut et al., 2013).

Doctorate education is the center of academic applications. The goal of this education is to train academicians, researchers and scientists who can plan, conduct, conclude and publish basic research necessary for economic and technological development. To this end, doctorate education should impart skills in their students for them to conduct research on their own, investigate and interpret scientific incidences from a broader viewpoint and to reach new syntheses (Keskinkılıç and Ertürk, 2009, Akbulut et al., 2013). The objective of research instruction is to train individuals with attitudes and behaviors of a researcher (Köklü et al., 1999).

It has been widely observed that during their graduate education, graduate students encounter different problems so that they gain a lot of experience about dealing with such problems and then they can direct their own research on the basis of their experiences in the future. In light of these findings, it can be argued that problems encountered during the doctorate studies contribute to the development of research skills. Furthermore, if students who will start their graduate education become cognizant of the problems experienced and suggestions made by the participants of the current study, then they will be aware of the possible problems to be encountered during the process and thus they can take some measures against these problems (Akbulut et al., 2013).

Purpose of the study

Lack of competencies related to research techniques is one of the main problems of graduate students. This problem can affect every stage of research process ranging from the construction of the research problem to writing of the research report. Due to their shortcomings in research techniques, many graduate students can continue their academic studies through professional aid or cannot complete their studies and quit their education. As the number of graduate programs is increasing, this problem is gradually becoming more serious (Nartgün, 2010., Saracaloğlu, 2008., Köklü et al., 1999). Thus, it has become an obligation for graduate students to acquire scientific research competencies to conduct their research and make use of the results of existing research.
In the present study, the purpose is to compare the opinions of graduate students continuing their studies in the fields of educational sciences and subject area education in Kazakhstan. To this end, answers to the following research questions were sought.

Sub-problems

1. Do the graduate students' opinions about their scientific research competencies vary significantly depending on their gender?
2. Do the graduate students' opinions about their scientific research competencies vary significantly depending on their grade level?
3. Do the graduate students' opinions about their scientific research competencies vary significantly depending on their state of having taken the courses of scientific research methods and techniques and measurement and evaluation?

METHOD

As the purpose of the current study is to compare the opinions of the graduate students continuing their studies in the fields of educational sciences and subject area education in Kazakhstan about their scientific research competencies, it was designed as a descriptive study employing survey model. Survey models are research approaches aiming to describe a state as it was or is.

Sampling

The sampling of the current study is comprised of 100 graduate students randomly selected from among the students continuing their graduate studies in the fields of educational sciences and subject area education at the universities of Avrasya University, Abay University, Pavlodar State University and Ahmet Yesevi University in Kazakhstan.

Data collection tool

As the data collection tool of the current study, The Scientific Research Competency Scale developed by Lyazzat Beisenbayeva was used. The reliability and validity studies of the scale were conducted (α=0.958). The scale consists of four dimensions and thirty two items. The scale was designed in the form of five-point Likert-type scale and score distribution of the scale is given in Table 1.

Table 1: Distribution of the score intervals of the Scientific Research Competency Scale

Options	Score	Score interval	Scale evaluation
I am completely incompetent	1	1.00 - 1.80	Perception of competency is very low
I am partially competent	2	1.81 - 2.60	Perception of competency is low
I am moderately competent	3	2.61 - 3.40	Perception of competency is medium
I am quite competent	4	3.41 - 4.20	Perception of competency is high
I am completely competent	5	4.21 - 5.00	Perception of competency is very high

Data analysis

The collected data of the study were analyzed in line with the purpose of the study. As the data of the study exhibited a normal distribution, t-test was used to determine whether there is a significant difference between the graduate students' opinions. The obtained findings were tabulated and then interpreted.

FINDINGS

In this section of the study, on the basis of the data collected with the Scientific Research Competency Scale, findings related to the graduate students' scientific research competencies are presented. In Table 2, the distribution of the graduate students by gender is given.

Table 2: Distribution of the graduate students by gender

Gender	f	%
Female	67	67
Male	33	33
Total	100	100

As can be seen in Table 2, of the participating students, 67% are females and 33% are males. Majority of the participants are females. In Table 3, the distribution of the grade levels of the participating students is given.

Table 3: Distribution of the grade levels of the participating students

Grade level	f	%
Master	69	69
Doctorate	31	31
Total	100	100

As can be seen in Table 3, 69% of the participating students are master's students and 31% are doctorate students. Majority of the students are master's students. In Table 4, the distribution of the students according to their state of having taken the courses of scientific research methods and techniques and measurement and evaluation is given.

Table 4: Distribution of the students according to their state of having taken the courses of scientific research methods and techniques and measurement and evaluation

Courses	**Yes**		**No**		**Total**	
	f	**%**	**f**	**%**	**f**	**%**
Measurement and evaluation	22	22	78	78	100	100
Scientific research techniques	74	74	26	26	100	100
Advanced research techniques	8	8	92	92	100	100
Statistics	14	14	86	86	100	100

As can be seen in Table 4, while 78% of the students have not taken the course of measurement and evaluation, 22% of them have taken it; while 74% of them have taken the course of scientific research methods and techniques, 26% of them have not; while 92% of them have not taken the course of advanced research techniques, 8% have; while 86% of them have taken the course of statistics, 26% have not. Thus, it can be said that majority of the graduate students continuing their graduate studies in the fields of educational sciences and subject area teaching in Kazakhstan have taken the course of scientific research methods and techniques; yet, they have not taken enough courses within the context of scientific research competencies. In Table 5, gender-based comparison of the graduate students' opinions about their scientific research competencies is presented.

Table 5: Gender-based comparison of the graduate students' opinions about their scientific research competencies

Dimensions	Gender	N	X	Sd	**df**	t	p
Problem statement	Female	67	18,88	3,36435	63,214	-,460	,647
	Male	33	19,21	3,39814			
Measuring tool	Female	67	25,80	5,11160	76,573	-,741	,461
	Male	33	26,51	4,16924			
Data analysis	Female	67	18,04	3,80364	69,902	1,861	,067
	Male	33	19,45	3,43776			
Reporting	Female	67	57,58	11,03870	76,881	-1,173	,245
	Male	33	60,00	8,96172			
Total	Female	67	120,31	20,08558	76,872	-1,297	,198
	Male	33	125,18	16,30846			

As can be seen in Table 5, the graduate students' opinions about their scientific research competencies do not vary significantly depending on the gender variable. The students' perception of their scientific research competencies was found to be high in general (Female X=120.31, Male X=125.18). In a study conducted by Konokman, Tanrıseven and Karasolak (2013) on the fourth-year pre-service teachers having taken the course of scientific research methods, it was reported that the pre-service teachers have positive attitudes towards educational research. The authors also concluded that gender, the department attended, achievement levels in the courses of measurement and evaluation and scientific research techniques and scientific research experience did not lead to significant differences in the pre-service teachers' attitude scores. In Table 6, a grade level-based comparison of the graduate students' opinions about their scientific research competencies is presented.

Table 6: Grade level-based comparison of the graduate students' opinions about their scientific research competencies

Dimensions	Grade level	N	X	Ss	Sd	t	p
Problem statement	Master	69	19,15	3,41546	60,357	,763	,448
	Doctorate	31	18,61	3,26269			
Measuring tool	Master	69	26,71	4,96784	68,720	2,266	,027
	Doctorate	31	24,54	4,13794			
Data analysis	Master	69	19,04	3,61547	55,811	2,141	,037
	Doctorate	31	17,32	3,76286			
Reporting	Master	69	58,36	11,18819	73,910	-,028	,978
	Doctorate	31	58,41	8,62081			
Total	Master	69	123,27	20,76471	82,595	1,230	,222
	Doctorate	31	118,90	14,06261			

As can be seen in Table 6, the graduate students' opinions about their scientific research competencies do not vary significantly depending on the grade level variable when the total score of the scale is considered. However, when grade level-based comparison was performed for the sub-dimensions, significant differences were found for the sub-dimensions of developing a measuring tool and data analysis. In terms of the sub-dimension of developing a measuring tool, the mean score was found to be X=26.71 for the master's students and X=24.54 for the doctorate students. Thus, for this dimension a significant difference was found in favor of the master's students (t=2.266, p <.05). Again, in terms of the sub-dimension of data analysis, a significant difference was found as a result of t-test in favor of the master's students. In this dimension, the mean score of the master's students is X=19.04 and that of the doctorate students is X=17.32. In terms of the sub-dimension of data analysis, a significant difference in favor of the master's students was found (t=2.141, p <.05). In Table 7, a comparison of the graduate students' opinions about their scientific research competencies in terms of the state of having taken the course of scientific research methods and techniques is presented.

Table 7: Comparison of the graduate students' opinions about their scientific research competencies in terms of the state of having taken the course of scientific research methods and techniques

Dimensions	The state of having taken the course of scientific research methods and techniques	N	X	Ss	Sd	t	p
Problem statement	No	26	19,07	3,80445	38,336	,141	,889
	Yes	74	18,95	3,21997			
Measuring tool	No	26	25,57	5,92063	35,150	-,493	,625
	Yes	74	26,20	4,39171			
Data analysis	No	26	18,38	4,15766	38,952	-,185	,854
	Yes	74	18,55	3,59658			
Reporting	No	26	58,65	11,85898	38,090	,142	,887
	Yes	74	58,28	9,94715			
Total	No	26	121,69	21,37058	38,544	-,066	,948
	Yes	74	122,00	18,22312			

As can be seen in Table 7, the graduate students' opinions about their scientific research competencies do not vary significantly depending on their state of having taken the course of scientific research methods and techniques in terms of the total score taken from the whole scale. In

terms of the sub-dimensions of the scale, again no significant difference was found between the graduate students' opinions about their scientific research competencies. In Table 8, a comparison of the graduate students' opinions about their scientific research competencies in terms of the state of having taken the course of measurement and evaluation is presented.

Table 8: Comparison of the graduate students' opinions about their scientific research competencies in terms of their state of having taken the course of measurement and evaluation

Dimensions	**State of having taken the course of measurement and evaluation**	**N**	**X**	**Ss**	**Sd**	**t**	**p**
Problem statement	No	78	18,87	3,41258	35,472	-,683	,499
	Yes	22	19,40	3,21691			
Measuring tool	No	78	25,70	4,90721	37,443	-1,407	,168
	Yes	22	27,22	4,35269			
Data analysis	No	78	18,29	3,69313	32,750	-1,063	,296
	Yes	22	19,27	3,84438			
Reporting	No	78	58,14	10,87440	41,048	-,485	630
	Yes	22	59,22	8,77188			
Total	No	78	121,08	19,15521	34,897	-,920	,364
	Yes	22	125,13	18,40884			

As can be seen in Table 8, the graduate students' opinions about their scientific research competencies do not vary significantly depending on the state of having taken the course of measurement and evaluation in terms of the total score taken from the whole scale. In terms of the sub-dimensions of the scale, again no significant difference was found between the graduate students' opinions about their scientific research competencies. In Table 9, a comparison of the graduate students' opinions about their scientific research competencies in terms of the state of having taken the course of advanced research techniques is presented.

Table 9: Comparison of the graduate students' opinions about their scientific research competencies in terms of their state of having taken the course of advanced research techniques

Dimensions	**State of having taken the course of advanced research techniques**	**N**	**X**	**Ss**	**Sd**	**t**	**p**
Problem statement	No	92	18,85	3,42769	10,688	-2,015	,070
	Yes	8	20,50	2,07020			
Measuring tool	No	92	25,83	4,89511	10,520	-2,144	,056
	Yes	8	28,37	3,02076			
Data analysis	No	92	18,46	3,62667	7,643	-,292	,778
	Yes	8	19,00	5,04268			
Reporting	No	92	58,10	10,35253	8,044	-,815	,438
	Yes	8	61,50	11,36410			
Total	No	92	121,27	18,97546	8,325	-1,182	,270
	Yes	8	129,37	18,56215			

As can be seen in Table 9, the graduate students' opinions about their scientific research competencies do not vary significantly depending on the state of having taken the course of advanced research techniques in terms of the total score taken from the whole scale. In terms of the

sub-dimensions of the scale, again no significant difference was found between the graduate students' opinions about their scientific research competencies.

Table 10: Comparison of the graduate students' opinions about their scientific research competencies in terms of the state of having taken the course of statistics

Dimensions	State of having taken the course of statistics	N	X	Sd	df	t	p
Problem statement	No	86	18,88	3,49931	23,703	-1,039	,309
	Yes	14	19,64	2,34052			
Measuring tool	No	86	25,72	4,99329	27,495	-2,410	,023
	Yes	14	28,00	2,90887			
Data analysis	No	86	18,44	3,71200	16,951	-,431	,672
	Yes	14	18,92	3,95094			
Reporting	No	86	58,00	10,88118	25,705	-1,264	,218
	Yes	14	60,71	6,73028			
Total	No	86	121,04	19,69408	23,865	-1,525	,140
	Yes	14	127,28	13,08216			

As can be seen in Table 10, the graduate students' opinions about their scientific research competencies do not vary significantly depending on the state of having taken the course of statistics in terms of the total score taken from the whole scale. In terms of the sub-dimensions of the scale, a significant difference was found for the sub-dimension of developing a measuring tool in favor of those having taken the course of statistics ($t=2.410$, $p <.05$).

RESULTS

The findings of the current study revealed that;

1. The participating students of the current study think that their scientific research competencies are quite adequate.
2. On the basis of the gender of the students, no significant difference was found among the students' opinions about their scientific research competencies.
3. A significant difference was found in favor of the master's students in terms of the sub-dimensions of developing measuring tools and data analysis. The master's students think that they are more competent in terms of conducting research than the doctorate students.
4. Depending on the state of having taken courses related to scientific research, no significant differences were found between the graduate students' opinions about their scientific research competencies. On the other hand, a significant difference in favor of the master's students was found for the sub-dimension of developing a measuring tool depending on the state of having taken the course of statistics.

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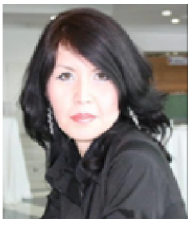
BIODATA AND CONTACT ADDRESSES OF AUTHORS

Yücel GELİŞLİ is currently the director of the Department of Educational Sciences at Gazi Education Faculty at Gazi University, Ankara, Turkey. He holds a Bachelor's degree in Department of Curriculum and Instruction from Gazi Education Faculty of Gazi University, Master's degree in Curriculum Development from the Social Sciences Institute of Balıkesir University, and PhD's degree in Curriculum and Instruction (Social and Historical Foundations of Education) from the Social Sciences Institute of Ankara University.

He worked as a teacher in primary and secondary education institutions in Ministry of National Education between the years of 1987 – 1993. He continued his career as a research assistant in Vocational Education Faculty of Gazi University in 1993. He became an assistant professor in 2001 and an associate professor in 2006.

In 2011, he has become a professor in the department of Curriculum and Instruction in Education Sciences of Gazi Faculty of Education in Gazi University. His main research interests area are Curriculum Development, Teacher Training System and Turkish History of Education.

Prof. Dr. Yücel GELIŞLI
Gazi University, Gazi Faculty of Education
Department of Educational Sciences
Ankara- TURKEY
ygelisli@gmail.com



Lyazzat BEISENBAYEVA, PhD Student, Gazi University, Education Sciences Institute and academic staff in Department of Theory and Practice of Foreign Languages, Philology Faculty L. N. Gumilyov Eurasian National University. Her academic interest areas are learning languages, curriculum and history of Education.

PhDc. Lyazzat BEISENBAYEVA
L. N. Gumilyov Eurasian National University
Philology Faculty Department of Theory and Practice of Foreign Languages
Astana- KAZAKHISTAN
E .Mail: aishalyaz@mail.ru

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DIAGNOSING THE JUNIOR HIGH SCHOOL STUDENTS' DIFFICULTIES IN LEARNING MATHEMATICS

Dr. Heri RETNAWATI
Yogyakarta State University
Mathematics and Science Faculty
Yogyakarta- INDONESIA

Abstract
The improvement of learning quality might be pursued by improving the learning process based on the results of diagnosing the students' learning difficulties. The study then was to diagnose the junior high school students' learning difficulties in completing the mathematics test items of the national examination. The study is a quantitative descriptive study. The diagnosis of learning difficulties was conducted by performing the cognitive diagnostic assessment through using DINA model. The data that had been used in the study were students' responses of math test of national examination of junior high schools located in the Province of Yogyakarta Special Region, Indonesia. The students' difficulties were detected by implementing the CDM package provided by the R program and using the output of the latent classes were identified. The results of the study showed that the students experienced some difficulties in completing the national examination test in many items on number, geometry and statistics, and understanding the narrative text items.

Keywords: Diagnostic, Learning Difficulty, Attribute, DINA.

INTRODUCTION

In an educational system, assessment has been an urgent activity that should be performed. Educational assessment has multiple advantages and one of these advantages namely student evaluations (summative and formative), instructional decisions, selection, placement and classification decisions, policy decisions and counselling and guidance decisions (Reynolds, Livingstone, Wilson, 2010). The specific advantage in relation to understanding the students' learning difficulties, with regards to these advantages, is known as diagnostic. Nitko & Brookhart (2007) state that there are six approaches of diagnostic assessment in relation to the learning problems namely: (a) the approach of strengths and weaknesses on the capacity of a subject; (b) the approach of identifying the prerequisite knowledge weaknesses; (c) the approach of identifying the learning objectives that have not been mastered; (d) the approach of identifying the students' mistakes; (e) the approach of identifying the students' knowledge structure; and (f) the approach of identifying the competencies for completing the narrative test items.

In order to perform such diagnostics, a teacher might perform a test. By performing a test, a teacher might gather accurate regarding information about the concept errors that the students have based on those information (Mehrens & Lehmann, 1984) and might identify multiple difficulties that occur and develop in the past or the present learning process (Thorndike & Hagen, 2005). The test should be specially designed by paying attention to the competencies of the materials that the students consider being difficult (Grondlund, 2011).

In order to identify the students' difficulties, there are several models that a teacher might implement. In relation to these models, the Cognitive Diagnostic Models (CDMs) have been a psychometric model that measure the students' mastery in the cognitive dimension and the mastery or the capacity that will be assessed is the incapability-weakness or the capability-strength of the students toward certain competencies (Chen, et al., 2015). Then, in order to understand the students' difficulties, a teacher should define first the attributes that will be measured on the test that will be

developed or be administered. These attributes have been the knowledge description in completing the tasks for certain domains (Gierl, 2011) and the fundamental cognitive process that will be necessary for completing the test (Zheng et al., 2008; Zhou et al., 2009). In mathematics, the attributes consist of 3 categories namely the content attribute (content-related knowledge and skills), the process attribute (the mathematical thinking skills) and the skill attribute (the special skills unique to item types) (Tatsuoka, 2009).

One of the cognitive models that belong to the form of Cognitive Diagnostic Assessment (CDA) is the Attribute Hierarchy Method (AHM). AHM has been a psychometric method that classifies the item responses into a set of structured attribute patterns in relation to the competencies that are different from the other cognitive model through a task that has been given to the students (Leighton et al., 2007). The cognitive model contains the attributes that have been set as a description of procedural knowledge or the statements that the test participants will need in answering the test items correctly (Leighton & Gierl, 2007; Robert & Gierl, 2010).

The attributes might be defined for each response pattern under observation so that the attributes will provide detail information regarding their performance toward the learning participants (Wang, 2005). There are four forms of fundamental structure that compose a stratified network of the attribute, namely the linear form, the convergent form, the divergent form and the unstructured form (Gierl, Leighton &Hunka, 2007). Next, by viewing the inter-attribute relationship, the next step will be grouping the materials based on the competencies which attributes will be defined, by defining the attributes that will be measured in each item and by designing the attribute hierarchy into a group of items. The attribute hierarchy then will be used for designing the Q-Matrix that has been developed by Tatsuoka (2009). Q-Matrix is a matrix with m rows and n columns and the elements of the matrix consist of 0 and 1. The cognitive capacity and the other necessary capacities in answering the test items by means of the column will be represented by these attributes while the line represents the items. The attributes in an item is the prerequisite materials that the students should master in completing each test item.

There are several that might be selected and be implemented into the AHM. These models are, namely, the compensatory model and the non-compensatory model. In the compensatory model, the students' incapability to complete one attribute might be compensated by the other attributes; meanwhile, in the non-compensatory model all of the attributes should be mastered by the students in order attain the correct answers. The non-compensatory model consists of DINA, NIDA and NC-RUM Model. On the other hand, the compensatory model consists of DINO, NIDO and C-RUM Model (Rupp, Templin & Henson, 2010). There are also some experts who have defined a fusion model (Aryadoust, 2011). In this, the researcher will only implement the DINA (Deterministic-Input, Noisy and Gate) Model that is appropriate to the test that will be analysed. In addition, the model has been selected because, based on the results of a study by Basokcu, Ogretmen & Kelecioglu (2013), the research found "DINA model could give rather better results to estimate student profile in tests where higher level and progressive behaviours are used together."

In the DINA Model, the deterministic input is the first element. The deterministic input takes the form of latent variables in the items and the respondents. The next element is the and-gate, which shows that the students might complete all test items appropriately if they master all of the attributes in those items. Then, the third element is the noise, which takes the form of slip and guessing parameter. A slip occurs if the students master the overall capacity to complete each test item politely but they slip and complete the test items inappropriately. On the other hand, a guessing occurs if the students at least master one of the capacities for completing the test items but they might guess or answer the test items appropriately (de la Torre, 2009). Within a good model, the good slip and guessing parameter should be small. Such criterion is appropriate with the opinion of Rupp, Templin & Henson (2010) that "... the postulated DINA Model is attained when the estimated of the slipping and guessing parameters are small". By using the slip and guessing parameter a teacher might estimate the item differential capacity. Furthermore, by using the estimation a teacher might

generate the percentage of latent class that will be implemented for designing the interpretations and the attributes that the students have not mastered.

Several studies have been conducted in relation to the diagnostic assessment. Sun & Suzuki (2013) implemented a DINA-type CDA for diagnosing the students' difficulties in learning the fraction. The profile of each student was described by using the web diagram. Huebner (2010) tried to develop the CAT cognitive diagnostic. Romero, Ordonez & Ponsoda (2014) detected a misspecification of Q-Matrix. Kusaeri (2014) developed a diagnostic test for the 8th grade Mathematics learning materials and he had been able to identify the students' mistakes in relation to the arithmetic, the verbal-type test items and the basic concept of algebra.

In Indonesia, the students in the final stage of each educational degree should participate in the national examination. The national examination is administered in order to assess the achievement of graduates' competencies that will be used for mapping the program and/or the educational unit quality; for serving as the basis of selection in the higher educational degree; for determining the graduation of learning participants from the program and/or the educational unit; and for developing and providing assistance toward the educational units within their efforts of improving the educational quality (Peraturan Pemerintah No. 19 Tahun 2005). In the national examination, the students' competencies are measured based on certain indicators. One of the advantages that might be gained from administering the national examination is that the results of national examination might be used for mapping the learning capacities and difficulties. By understanding the mapping of learning capacities and difficulties, the teacher might improve the learning process in the upcoming years. With regards to this aspect, the identification of learning difficulties based on the national examination results should be conducted in order to improve the learning process toward the aspects of teaching method, assessment manner, learning implementation decision and learning implementation assessment in the school. The study diagnoses the junior high school students' difficulties in learning Mathematics by using the national examination results. By identifying the students' difficulties in learning Mathematics, the researcher might improve the learning process both in the effort of improving the students' capacity individually and in the effort of improving the class-level or the school-level competency.

METHODS

The study was a descriptive explorative research with a quantitative approach. According to the objective of the study, the data that would be implemented in the study were all responses provided by the Mathematics National Examination participants who completed the Package 1 Test Items from the junior high school degree in the Province of Yogyakarta Special Region in Indonesia. The number of test participants was 1,445 people and the number included all of the test participants from both the state and the private junior high schools. The data were gathered by means of documentation from the national examination administration that had been attained from the Ministry of Education and Culture, the Republic of Indonesia. The test items consisted of 40 multiple choices with dichotomous scoring process (if the test item was answered correctly then the student would gain 1 as the score, but if the test was answered incorrectly then the student would gain 0 as the score).

The steps of diagnosing the students' difficulties in learning the national examination test items referred to the steps of analysis through the CDM implementation that had been suggested by Ravand & Robitzch (2015) namely: designing the attribute specifications, analysing the test items and viewing their relationship to the Q-Matrix, establishing the inter-sub-skills relationship and mastering the test participants' mastery capacity by means of DM. According to these steps, the 40 national examination test items would be classified based on the materials. The materials included the rational numbers and the integers, the exponential number, the rows and lines, the linear equation system, the sets, the function and straight line, the planes, the triangle characteristics, the circular tangent, the solids and the statistics and probability. Based on these materials, the researcher designed 11 Q-Matrixes based on the inter-sub-skills relationship that the students demanded to complete the test

items appropriately. Then, the researcher also grouped the students' responses toward the items that had been in accordance with the Q-Matrix. The further analysis was conducted by implementing the CDM package from the R program that generated the slip and guessing parameter and the latent attributes. Next, these attributes would be interpreted and the interpretation included understanding the sub-skills that had been relatively difficult in comparison to the other sub-skills within a material group based on the attributes within the Q-Matrix.

FINDINGS

After the researcher performed an analysis by means of CDM package from the R program toward each Q-Matrix attained from the Mathematics National Examination Test Items, the researcher found the noise parameter of the DINA Model. These parameters were presented in Table 1.

Table 1: The Parameter Values of DINA Model

Item	Guess	Slip	d	Item	Guess	Slip	d
1	0.267	0.030	0.703	21	0.088	0.180	0.732
2	0.296	0.064	0.640	22	1.000	0.000	0.000
3	0.145	0.104	0.751	23	0.205	0.195	0.600
4	0.036	0.563	0.401	24	0.182	0.140	0.678
5	0.000	0.740	0.260	25	0.067	0.171	0.762
6	0.200	0.036	0.764	26	0.095	0.179	0.726
7	0.148	0.057	0.795	27	0.155	0.042	0.803
8	0.238	0.049	0.713	28	0.315	0.020	0.665
9	0.154	0.073	0.773	29	0.132	0.131	0.737
10	0.227	0.041	0.732	30	0.195	0.084	0.721
11	0.136	0.041	0.823	31	0.110	0.080	0.810
12	0.125	0.042	0.833	32	0.697	0.002	0.301
13	0.089	0.061	0.850	33	0.280	0.014	0.706
14	0.082	0.151	0.767	34	0.102	0.076	0.822
15	0.240	0.022	0.738	35	0.077	0.113	0.810
16	0.047	0.246	0.707	36	0.430	0.018	0.552
17	0.138	0.106	0.756	37	0.115	0.213	0.672
18	0.191	0.042	0.767	38	0.212	0.092	0.696
19	0.112	0.209	0.679	39	0.182	0.030	0.788
20	0.117	0.133	0.750	40	0.325	0.041	0.634

Based on the table, the test items that had the lowest discriminative index (d), according to Table A.1, were the item number 22, number 5 and number 32. From the three items, the one that had the lowest discriminative index was item number 22 namely 0.000. Since the discriminative index of number 22 had been equal to 0.000, the researcher might imply that the item number 22 might not discriminate well the capable and the incapable students. In relation to both parameters of DINA Model, the cause of the low discriminative index in the item number 22 was the guessing parameter of item number 22 had the highest score namely 1.000. Since the guessing score had been equal to 1.00, the researcher might imply that all students had completed the test item number 22 not because of the fact that they had mastered all of the necessary attributes for completing the test item but because of the fact that they had guessed the answer correctly.

The item discriminative index of the item number 5 was equal to 0.260 and had been the second lowest capacity. The reason was that the slip value in the test item number 5 had been the highest one namely 0.740. Therefore, the researcher might imply that around 74.00% of the students who provided the wrong answer had been the students who had all of the necessary attributes for completing the test item correctly but they slipped themselves in the completion process. Then, the third item that had the lowest item discriminative index was the test item number 32 namely 0.301.

In the test item number 32, the guessing parameter was 0.697 and had been the highest guessing parameter after the test item number 22. As a result, the researcher might imply that 69.70% of the students had completed the test item correctly because they guessed the answer.

The further analysis was estimating the percentage of latent capacity for each attribute. The analysis was conducted toward each Q-Matrix in the attribute group for the concordant materials. In accordance with the number of the matrix, the researcher performed the interpretation for 11 times.

The Integers and Fractions (Analysis for the Q1-Matrix)

The Q1-Matrix was established by four test items namely the test item number 1, number 2, number 6 and number 21. From the four items, there were four attributes that the researcher found in the Q1-Matrix. The attributes that established the Q1-Matrix were namely: (A1) fraction operation; (A2) comparison; (A6) social arithmetic; and (A21) comparison in the form of narrative test items. For a better description, the researcher would display the items and the attributes that established the Q1-Matrix in the Table 2.

Table 2: The Items and the Attributes that Established the Q1-Matrix

Item Number	Attribute			
	A1	A2	A6	A21
1	1	0	0	0
2	0	1	0	0
6	0	0	1	0
21	0	0	0	1

There were four attributes that established the Q1-Matrix. From the four attributes, the possible number of latent class would be 16 classes. According to the results of analysis by means of CDM packages provided by the R program, the researcher attained the percentage for each class. In order to identify the difficulties in learning mathematics based on the attribute mastery in the Q1-Matrix according to the latent class percentage, the researcher would like to display Figure 1.

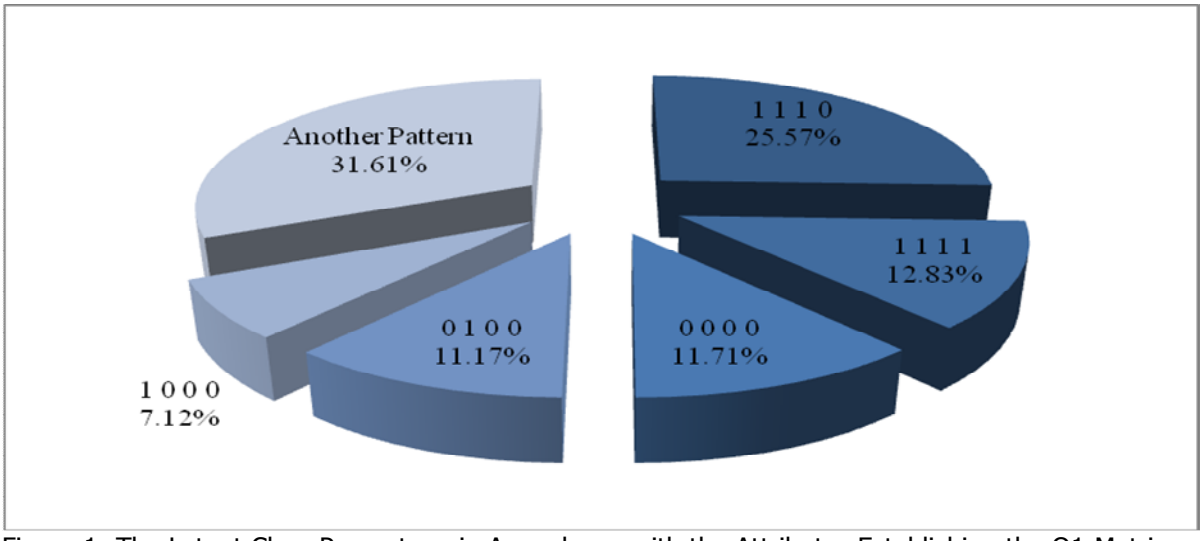

Figure 1: The Latent Class Percentage in Accordance with the Attributes Establishing the Q1-Matrix

Based on Figure 1, the researcher understood that the most dominant latent class percentage had been found in the latent class 1 1 1 0. The percentage of latent class 1 1 1 0 that had been equal to 25.27% showed that around 25.27% of the students had not mastered the attributes (A21) in responding to the comparison within the narrative test items. The A21 Attribute had been the necessary attribute for completing the test item number 21 correctly. In order to complete the test

item number 21 correctly, the students had to master the concept of comparison, to understand the narrative text items and to determine the results of fraction operation. Based on the most dominant percentage in the Figure 1, the researcher detected that most of the students had not mastered the capacity of understanding the narrative test items and determining the results of fraction operation because they had not mastered the concept of comparison.

The Exponentials (Analysis for the Q2-Matrix)

The Q2-Matrix was established by three items namely the test item number 3, number 4 and number 5. From the three items, there were three attributes. The attributes that established the Q2-Matrix were (A3) exponentials operation, (A4) square root operation and (A5) square root operation in the form of rationalizing the denominator. The items and the attributes that established the Q2-Matrix might be viewed in the Table 3.

Table 3: The Items and the Attributes that Established the Q2-Matrix

Item Number	**Attribute**		
	A3	**A4**	**A5**
3	1	0	0
4	0	1	0
5	0	0	1

According to Table 3, there were three attributes that established the Q2-Matrix. The three attributes would generate 8 latent classes. With the assistance of CDM packages in the R program, the researcher might attain the percentage of attribute mastery for each latent class. In order to find the difficulties in learning Mathematics based on the attribute mastery within the Q2-Matrix and in accordance with the latent class percentage, the researcher would like to display the Figure 2.

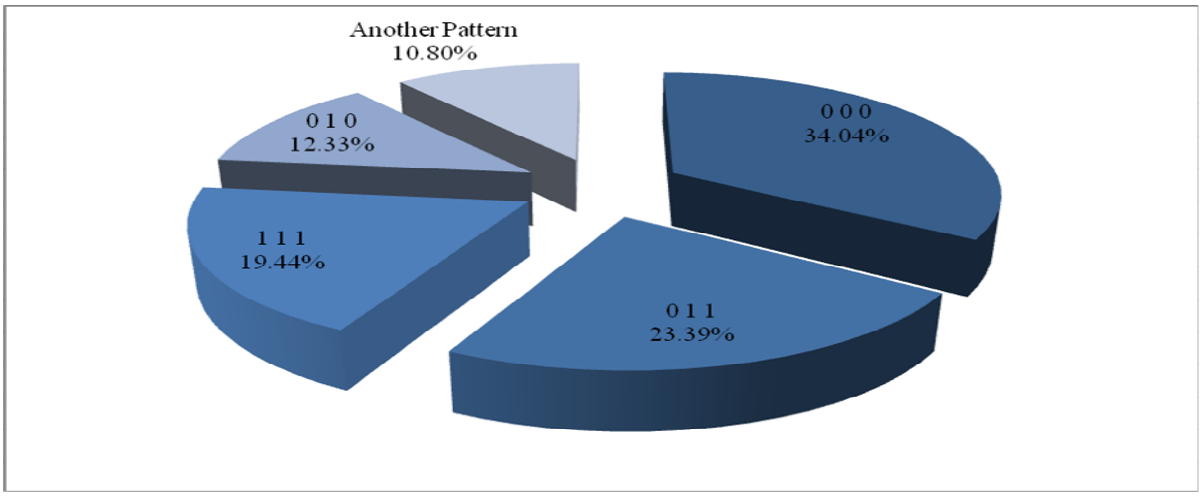

Figure 2: The Latent Class Percentage in Accordance with the Attributes Establishing the Q2-Matrix

Based on Figure 2, the researcher might understand that the most dominant latent class percentage had been found in the latent class 0 0 0. The percentage of latent class 0 0 0 that had been equal to 34.04% showed that around 34.04% of the students had not mastered the three attributes in the Q2-Matrix. The three attributes were found in each attribute from the test item number 3, number 4 and number 5. For the test item number 3, in order to provide the correct answer the students should have the capacity of determining the results of number exponents. Then, for the test item number 4 in order to provide the correct answer the students should have the capacity of determining the results of number exponents operation and of denominator rationalization. Last but not the least, for the test item number 5 in order to provide the correct answer the students should master the capacity of rationalizing the denominator that took the form of fraction. Therefore, the dominant

capacities that had not been mastered by the students were the capacity of determining the number exponent results, of determining the fraction operation and of rationalizing the square root-type denominator.

The Number and Row (Analysis for the Q3-Matrix)

The Q3-Matrix was established by three items namely the test item number 7, number 8 and number 9. The three attributes that established the Q3-Matrix were (A7) arithmetic number, (A8) arithmetic row and (A9) arithmetic row by understanding the narrative text items. In order to understand the Q3-Matrix, the researcher would like to display the items and the attributes that established the Q3-Matrix in the Table 4.

Table 4. The Items and the Attributes that Established the Q3-Matrix

Item Number	Attribute		
	A7	A8	A9
7	1	0	0
8	0	1	0
9	0	0	1

The three attributes in the Table 4 generated 8 latent classes. The percentage of the 8 latent classes in the Q3-Matrix might be used for identifying which attribute that had or that had not been mastered by the students. Based on the results of analysis by means of CDM packages in the R program, the researcher attained the percentage of each latent class as having been displayed in the Figure 3 as follows.

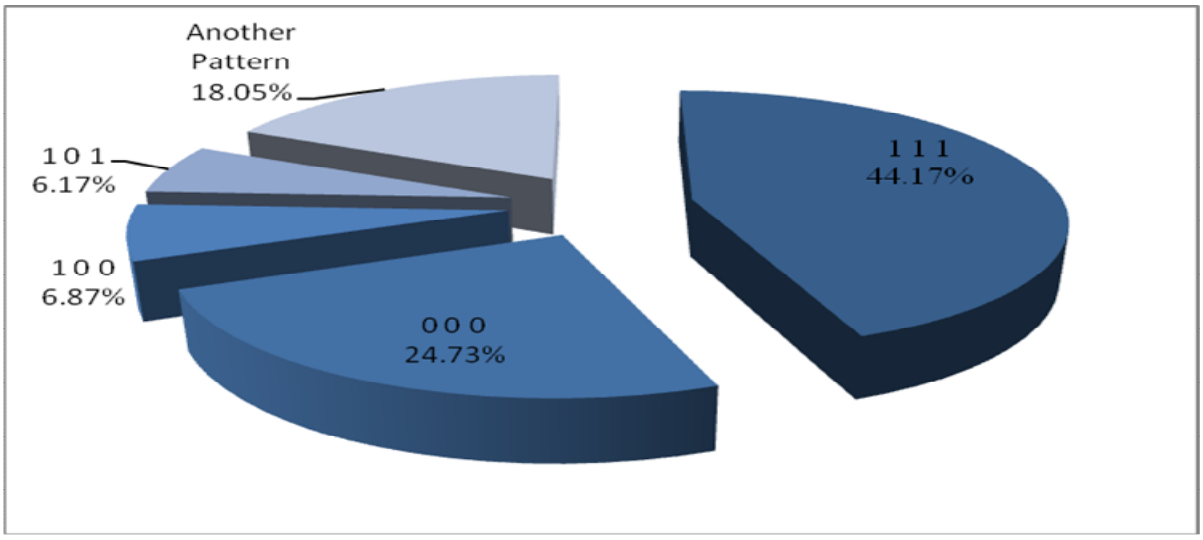

Figure 3: The Percentage of Latent Class in Accordance with the Attributes Establishing the Q3-Matrix

The most dominant latent class percentage shown in the Figure 3 was 44.17% and was found in the latent class 1 1 1. The dominant latent class percentage showed that 44.17% of the students had mastered all of the attributes that established the Q3-Matrix. Since 44.17% of the students had mastered the attributes, the remaining 55.83% students had not mastered at least one of the attributes that established the Q3-Matrix. From Figure 3, 24.73% of the students had not mastered all of the attributes in the Q3-Matrix. Therefore, most of the students had mastered the attributes in the Q3-Matrix for the test item number 7, number 8 and number 9.

The Linear Equation System (Analysis for the Q4-Matrix)

The Q4-Matrix was established by 5 test items namely the test item number 10, 11, 12, 19 and 20. The five attributes that established the Q4-Matrix were (A10) factorization, (A11) one-variable linear equation system, (A12) one-variable linear equation system narrative test item, (A19) two-variable linear equation system and (A20) two-variable linear equation system narrative test item. For a better description, the researcher would display the items and the attributes that established the Q4-Matrix in the Table 5.

Table 5. The Items and the Attributes that Established the Q4-Matrix

Item Number	Attribute				
	A10	A11	A12	A19	A20
10	1	0	0	0	0
11	0	1	0	0	0
12	0	0	1	0	0
19	0	0	0	1	0
20	0	0	0	0	1

The 5 attributes that established the Q4-Matrix, based on Table 5, generated 32 latent classes. The percentage of the latent classes that had been generated by the 5 attributes were displayed in the Figure 4.

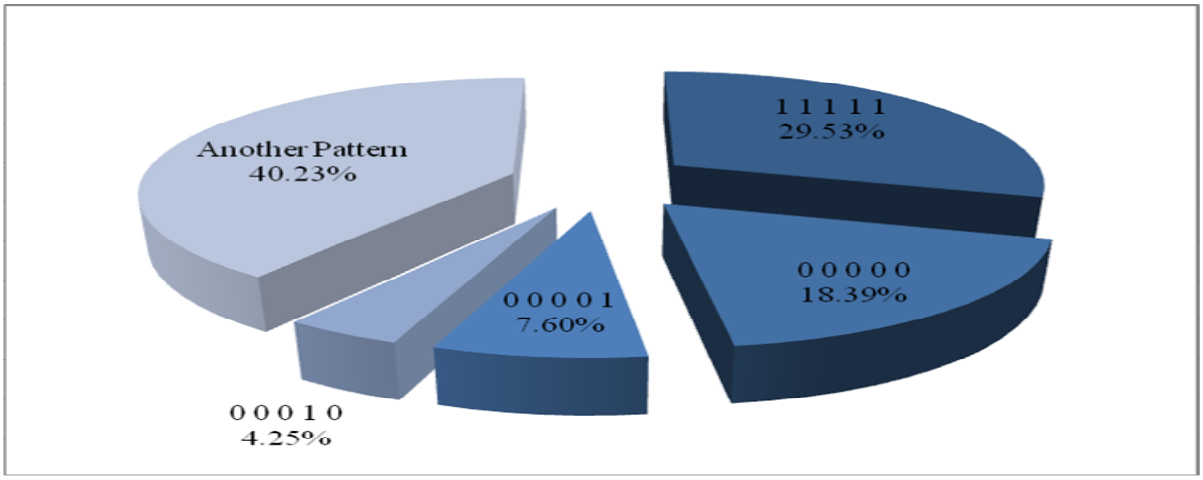

Figure 4: The Percentage of Latent Classes in Accordance with the Attributes Establishing the Q4-Matrix

Based on Figure 4, the most dominant percentage was 29.53% and was found in the latent class 1 1 1 1 1. The percentage of latent class 1 1 1 1 1 that had been equal to 29.53% showed that 29.53% of the students had mastered all of the attributes in the Q4-Matrix. Since there were only 29.53% of the students who had mastered all of the attributes in the Q4-Matrix, there were remaining 70.47% of the students who had not mastered at least one of the attributes in the Q4-Matrix. In the Figure 4, the percentage of the latent class 0 0 0 0 0, 0 0 0 0 1 and 0 0 0 1 0 was 18.39%, 7.60% and 4.25% respectively.

The percentage of the latent class 0 0 0 0 0, 0 0 0 0 1 and 0 0 0 1 0 had been the most dominant percentage after that of the latent class 1 1 1 1 1. The percentage of the latent class 0 0 0 0 0 showed that in this latent class the students had not mastered all of the attributes that established the Q4-Matrix. Then, the percentage of the latent class 0 0 0 0 1 showed that the students had only mastered one attribute namely (A20) the ability of completing the two-variable linear equation system narrative test item. Next, the percentage of the latent class 0 0 0 1 0 showed that the students had

only mastered one attribute namely (A19) the capacity of completing the one-variable linear equation system test item. From the percentage of the latent class 0 0 0 0 0, 0 0 0 0 1 and 0 0 0 1 0 showed that there were three attributes that the students from the three classes had not mastered altogether. These attributes were (A10) the factorization ability, (A11) the concept of one-variable linear equation system and (A12) the concept of one-variable linear equation system narrative text item. Therefore, the most dominant students' difficulties in accordance with the attributes that established the Q4-Matrix were the lack of mastering the factorization ability, the lack of understanding toward the concept of one-variable linear equation system and the lack of understanding toward the concept of one-variable linear equation system narrative text items.

The Sets (Analysis for the Q5-Matrix)

The Q5-Matrix was established by two items namely the test item number 13 and 14. The attributes that established the Q5-Matrix were (A13) partial sets and (A14) intersection of sets. Both of the attributes that established the Q5-Matrix had been the attributes of the test item number 13 and 14 and these attributes would be displayed in Table 6.

Table 6: The Items and the Attributes that Established the Q5-Matrix

Item Number	Attribute	
	A13	A14
13	0	1
14	1	0

According to Table 6, there were two attributes that established the Q5-Matrix. The two attributes would generate 4 latent classes. The percentage of each latent class would be used for identifying the difficulties in learning mathematics according to the attributes of Q5-Matrix that had not been master. For a better description, the researcher would like to display the most dominant percentage from each latent class in the Figure 5.

Based on Figure 5, the most dominant percentage was 44.74% and was found in the latent class 0 0. The percentage showed that 44.74% of the students had not mastered all of the attributes in the Q5-Matrix. The attributes that established the Q5-Matrix were the ones that had been found in the test item number 13, namely (A13), and the test item number 14, namely (A14). In order to provide the correct answer for the test item number 13, the students should be able to count the number of partial sets. Then, in order to provide the correct answer for the test item number 14 the students should be able to determine the members and the intersections of sets. According to the attributes in the Q5-Matrix, most of the students had not been able to determine the number of partial sets as well as the members and the intersections of sets.

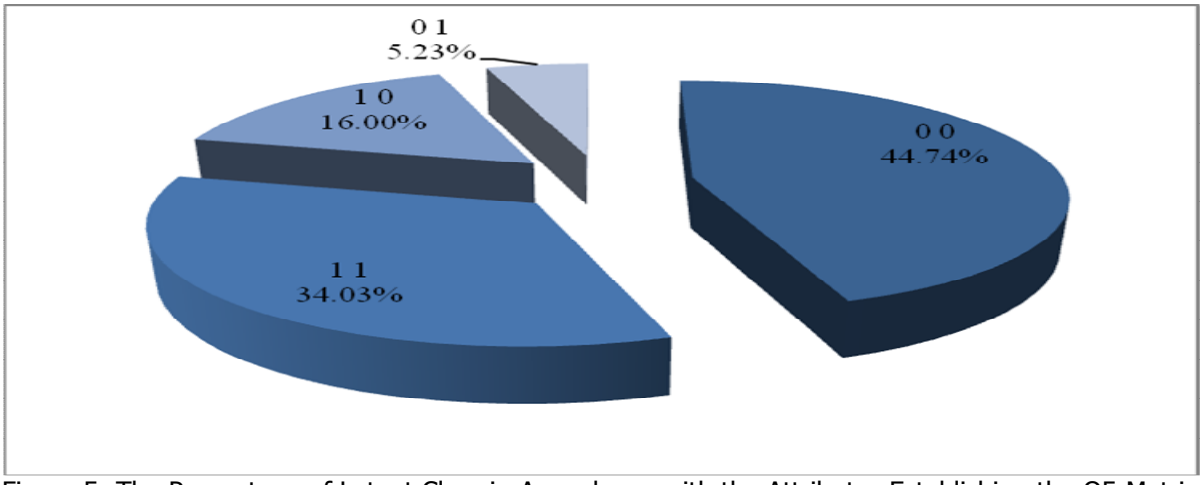

Figure 5: The Percentage of Latent Class in Accordance with the Attributes Establishing the Q5-Matrix

The Line Function and Equation (Analysis for the Q6-Matrix)

The Q6-Matrix was established by four items namely the test item number 15, 16, 17 and 18. Then, the attributes that established the Q6-Matrix were (A15) function, (A16) function graphic, (A17) line equation and (A18) determining the position of a point in the straight line. The items and the attributes that established the Q6-Matrix would be presented in the Table 7.

Table 7: The Items and the Attributes that Established the Q6-Matrix

Item Number	Attribute			
	A15	A16	A17	A18
15	1	0	0	0
16	0	1	0	0
17	0	0	1	0
18	0	0	0	1

The four attributes that established the Q6-Matrix, based on Table 7, generated 16 latent classes. The percentage of the latent classes that had been generated by the four attributes would be presented in the Figure 6.

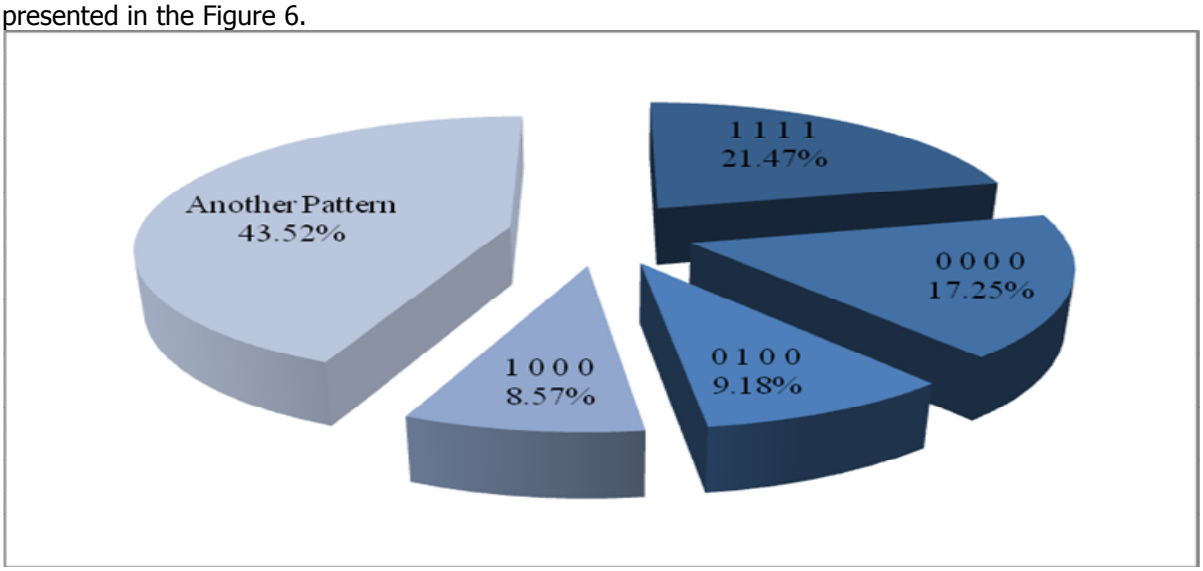

Figure 6: The Percentage of Latent Class According to the Attributes Establishing the Q6-Matrix

Based on Figure 6, the most dominant percentage was equal to 21.47% and was found in the latent class 1 1 1 1. The percentage of latent class 1 1 1 1 that had been equal to 21.47% showed that the students had mastered all of the attributes in the Q6-Matrix. Since there had been 21.47% students who had mastered the attributes in the Q6-Matrix, the remaining 78.53% students had not mastered at least one of the attributes in the matrix. In Figure 6, the percentage of the latent class 0 0 0 0, 0 1 0 0 and 1 0 0 0 was 17.25%, 9.18% and 8.57% respectively.

The percentage of the latent class 0 0 0 0, 0 1 0 0 and 1 0 0 0 was the second dominant percentage after that of the latent class 1 1 1 1. The latent class 0 0 0 0 showed that the students had not mastered all of the attributes that established the Q6-Matrix. Then, the latent class 0 1 0 0 showed that the students had only mastered one of the attributes that established the Q6-Matrix namely (A16) function graphic. Next, the latent class 1 0 0 0 showed that the students had mastered only one of the attributes that established the Q6-Matrix. From the three latent classes, it was apparent that there had been two attributes that had not been mastered by the students altogether in the same time. These attributes were (A17) bee line equation and (A18) determining the position of a point in the straight line. Therefore, the most dominant learning difficulties that the students had, according to the attributes that established the Q6-Matrix, were the capacity of determining the straight line equation and the ability of determining the position of a point in the straight line.

The Planes (Analysis for the Q7-Matrix)

The Q7-Matrix was established by two items namely the test item number 22 and 23. Then, the attributes that established the Q7-Matrix were (A22) planes breadth and (A22) planes periphery. Both of the attributes in the Q7-Matrix would generate four latent classes. For a better description, the researcher would like to describe the two attributes that established the Q7-Matrix in the Table 8.

Table 8: The Items and the Attributes that Established the Q7-Matrix

Item Number	Attribute	
	A22	A23
22	0	1
23	1	0

The percentage of the four latent classes, according to the number of attributes in Table 8, would be used for determining which attribute that the students had not mastered. For a better description on the percentage of each latent class, the researcher would like to display the Figure 7. According to Figure 7, it was apparent that there had been four latent classes generated from the attributes that established the Q7-Matrix. The four latent classes were 1 1, 1 0, 0 1 and 0 0. Each latent class had a percentage that had been in accordance with the results of analysis by CDM packages.

Based on Figure 6, the most dominant percentage was equal to 40.39% and was found in the latent class 1 1. The percentage of latent class 1 1 that had been equal to 40.39% showed that 40.39% students had mastered all of the attributes in the Q7-Matrix. Since there had been 40.39% students who had mastered the attributes in the Q7-Matrix, the remaining 59.61% students had not mastered at least one of the attributes in the matrix. In Figure 7, it was apparent that the latent class 0 1 had the second dominant percentage after that of the latent class 1 1 namely 39.61%. The latent class 0 1 showed that the students in the latent class 0 1 had not mastered the attributes for determining the planes (A22). Therefore, the researcher might conclude that the most dominant attribute that the students had not mastered in the Q8-Matrix had been the ability of determining the planes area.

The Triangle Characteristics (Analysis for the Q8-Matrix)

The Q8-Matrix was established by 5 test items namely the test item number 24, 25, 26, 27 and 28. Then, the attributes that established the Q8-Matrix were (A24) the concept of congruent triangle, (A25) the concept of triangle comparison, (A26) the concept of triangle comparison in the form of statement, (A27) the concept of angles in a triangle and (A28) drawing the dividing/height line. For a better description, the researcher would like to present the items and the attributes that established the Q8-Matrix in the Table 9.

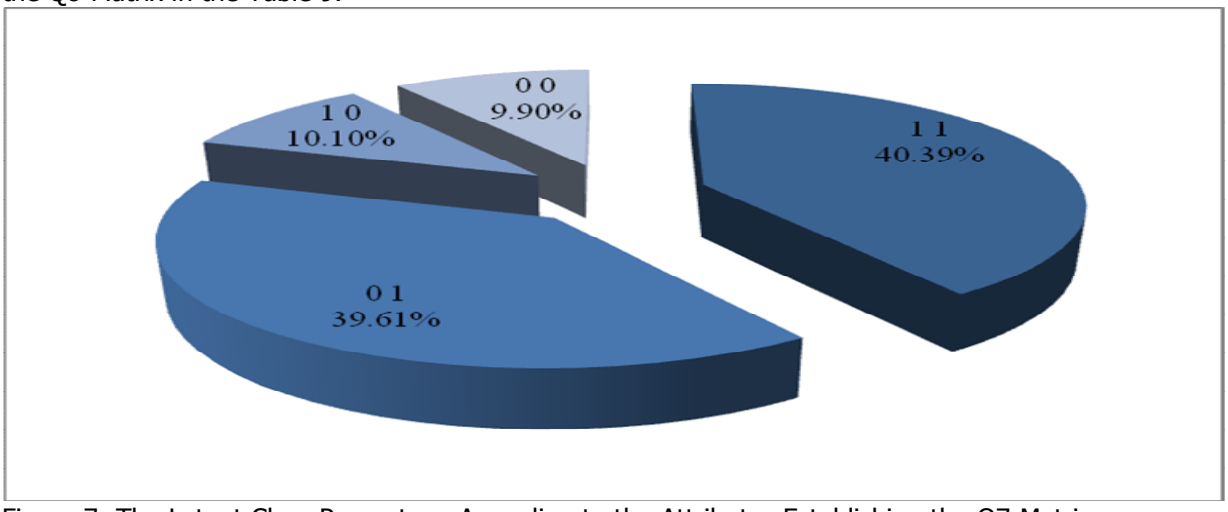

Figure 7: The Latent Class Percentage According to the Attributes Establishing the Q7-Matrix

Table 9: The Items and the Attributes that Established the Q8-Matrix

Item Number	Attribute				
	A24	A25	A26	A27	A28
24	1	0	0	0	0
25	0	1	0	0	0
26	0	0	1	0	0
27	0	0	0	1	0
28	0	0	0	0	1

The 5 attributes that established the matrix, based on Table 9, generated 32 latent classes. The percentage that had been generated by each latent class would be displayed in the Figure 8. In Figure 8, the researcher presented the most dominant percentage of the latent class that had been attained from the results of analysis.

The most dominant percentage in the above figure was 22.49% and was found in the latent class 1 1 1 1 1. The most dominant percentage found in the latent class 1 1 1 1 1 showed that 22.49% students had mastered all of the attributes that established the Q8-Matrix. Since there had been only 22.49% students who mastered all attributes in the matrix, the remaining 77.51% students had not mastered at least one of the attributes that established the Q8-Matrix. Based on the percentage in Figure 8, 13.75% students had not mastered all attributes in the Q8-Matrix namely in the latent class 0 0 0 0 0. The percentage of the latent class was 7.52% which implied that 7.52% students had mastered one of the attributes namely drawing the dividing/height line.

Still according to Figure 8, the percentage of the latent class 1 0 0 0 0 was equal to 6.63% which implied that 6.63% students had only mastered one of the attributes namely (A24) congruent triangle. The other three latent classes, namely the latent class 0 0 0 0 0, 0 0 0 0 1 and 1 0 0 0 0, had been the latent classes that had the second highest percentage after the latent class 1 1 1 1 1. From the three latent classes, the researcher found that the students in the three latent classes had not mastered the following attributes (A25) triangle comparison, (A26) the triangle comparison in the form of statement; and (A27) the angles within a triangle. Therefore, the most dominant attributes that the students had not mastered were the concept of triangle comparison, the triangle comparison in the form of statement and the angles within a triangle.

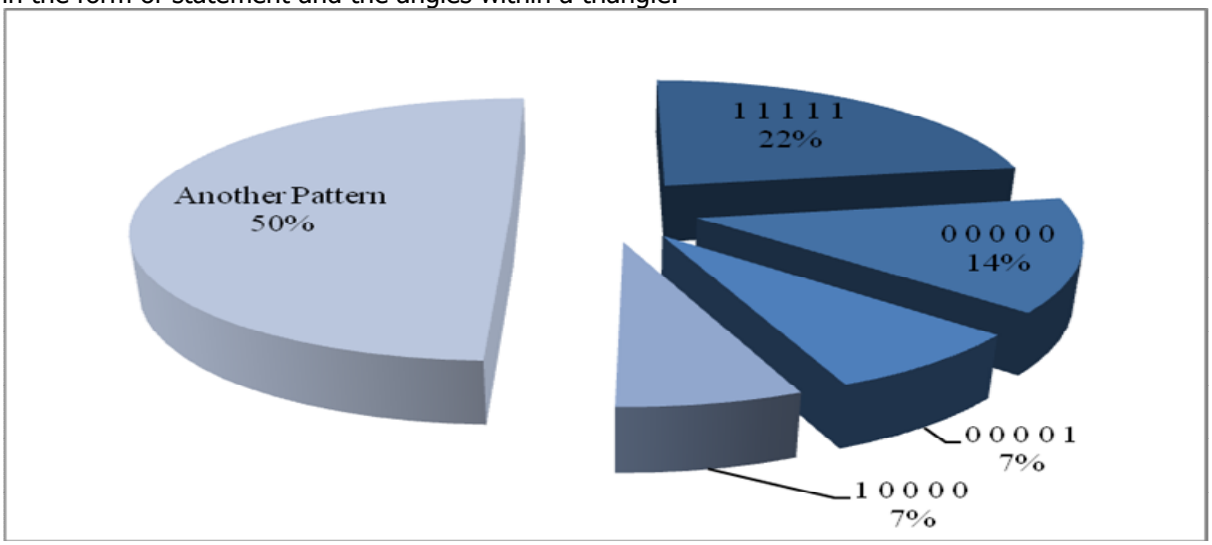

Figure 8: The Percentage of Latent Class According to the Attributes Establishing the Q8-Matrix

The Circle and Its Tangent (Analysis for the Q9-Matrix)

The Q9-Matrix was established by two test items namely the test item number 29 and 30. The attributes that established the Q9-Matrix were (A29) the concept of arch length and (A30) the

concept of inner allying tangent. The items and the attributes that established the Q9-Matrix would be presented in the Table 10.

Table 10: The Items and the Attributes that Established the Q9-Matrix

Item Number	Attribute	
	A29	A30
29	0	1
30	1	0

According to Table 10, there were two attributes that established the Q9-Matrix. The two attributes would generate 4 latent classes. The analysis by means of CDM packages in the R program would generate the percentage for each latent class. The percentage of each latent class would be used for identifying the difficulties in learning mathematics based on the attributes in the Q9-Matrix that the students had not mastered. For a better description, the researcher would like to display the most dominant percentage in the Figure 9.

Based on Figure 9, the most dominant percentage was found in the latent class 1 1 namely 42.35%. The most dominant percentage showed that 42.35% students had mastered all attributes in the Q9-Matrix. The second most dominant percentage was 35.58% and was found in the latent class 0 0. The second most dominant percentage showed that 35.58% students had not mastered all attributes in the Q9-Matrix. Therefore, the researcher might conclude that the most dominant attribute the students had not mastered in the Q9-Matrix had been the concept of arch length and the concept of inner tangent line.

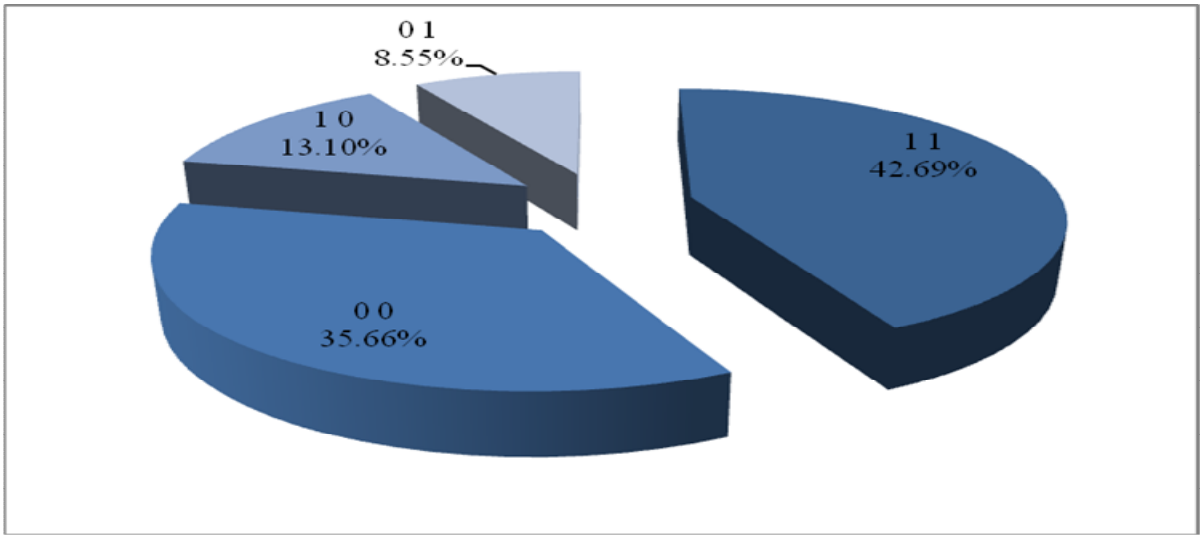

Figure 9: The Percentage of Latent Class According to the Attributes Establishing the Q9-Matrix

The Solids (Analysis for the Q10-Matrix)

The Q10-Matrix was established by five items namely the test item number 31, 32, 33, 34 and 35. Then, the attributes that established the Q10-Matrix were (A31) the prism characteristics, (A32) the cube net, (A33) the prism volume, (A34) the breadth of solids surface (pyramid) and (A35) the breadth of solids surface (cone). The items and the attributes that established the Q10-Matrix would be presented in Table 11.

The percentage of the 32 latent classes, according to the number of the attributes in Table 11, would be used for determining which attribute that the students had not mastered. In order to define the percentage of each latent class, the researcher would like to display the results of percentage

calculation in Figure 10. The percentage of each latent class had been in accordance with the results of analysis by CDM packages.

Table 11: The Items and the Attributes that Established the Q10-Matrix

Item Number	Attribute				
	A31	A32	A33	A34	A35
31	1	0	0	0	0
32	0	1	0	0	0
33	0	0	1	0	0
34	0	0	0	1	0
35	0	0	0	0	1

Based on Figure 10, the most dominant percentage was 31.63% and was found in the latent class 1 1 1 1 1. The most dominant percentage showed that 31.63% students had mastered all attributes in the Q10-Matrix. Since there had been 31.63% students who mastered all attributes in the matrix, the remaining 68.37% students had not mastered at least one of the attributes that established the Q10-Matrix. Still based on Figure 10, 11.97% students had only mastered one of the attributes in the matrix and the percentage was found in the latent class 0 1 0 0 0. The students in the latent class 0 1 0 0 0 only mastered one attribute namely (A32) the concept of cube net. The percentage of the students who had not mastered all attributes in the Q10-Matrix was equal 10 8.95% and was found in the latent class 0 0 0 0 0. Then, the percentage of the latent class 0 1 1 0 0 was equal to 7.12% which implied that 7.12% students only mastered two attributes namely (A32) the cube net and (A33) the prism volume.

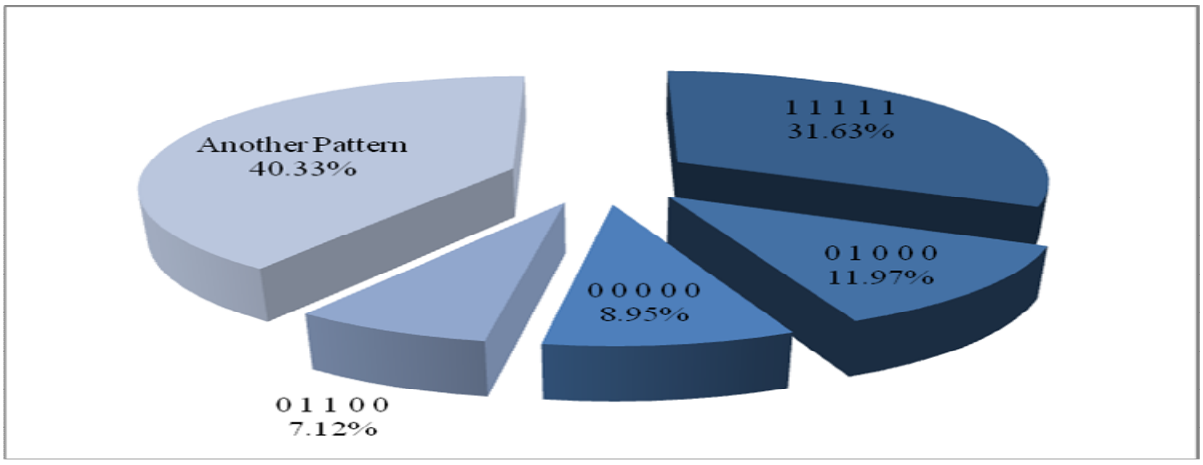

Figure 10: The Percentage of Each Latent Class According to the Attributes Establishing the Q10-Matrix

The three latent classes, namely the latent class 0 1 0 0 0, 0 0 0 0 0 and 0 1 1 0 0 had the highest percentage after that of the latent class 1 1 1 1 1. From the three latent classes, it was apparent that the students in these three classes had not mastered the following attributes: (A31) the prism characteristics, (A34) the breadth of solids surface (pyramid) and (A35) the breadth of solids surface (cone). Therefore, the attributes that the students had not mastered dominantly were the prism characteristics, the breadth of solids surface (pyramid) and the breadth of solids surface (cone).

The Opportunity and Statistics (Analysis for the Q11-Matrix)

The Q11-Matrix was established by five items namely the test item number 36, 37, 38, 39 and 40. Then, the attributes that established the Q1-Matrix were (A36) the median, (A37) the mean, (A38) narrative text items about mean, (A39) the graphic reading and (A40) the opportunity. The test items and the five attributes that established the Q11-Matrix would be clearly presented in the Table 12.

Table 12: The Items and the Attributes that Established the Q11-Matrix

Item Number	Attribute				
	A36	A37	A38	A39	A40
36	1	0	0	0	0
37	0	1	0	0	0
38	0	0	1	0	0
39	0	0	0	1	0
40	0	0	0	0	1

According to Table 12, there were five attributes that established the Q11-Matrix. The five attributes would generate 32 latent classes. The analysis by means of CDM packages in the R program would generate the percentage of each latent class. The percentage of each latent class would be used for identifying the difficulties in learning Mathematics according to the attributes of the Q11-Matrix that the students had not mastered. For a better description, the researcher would like to display the most dominant percentage for each latent class in the Figure 11.

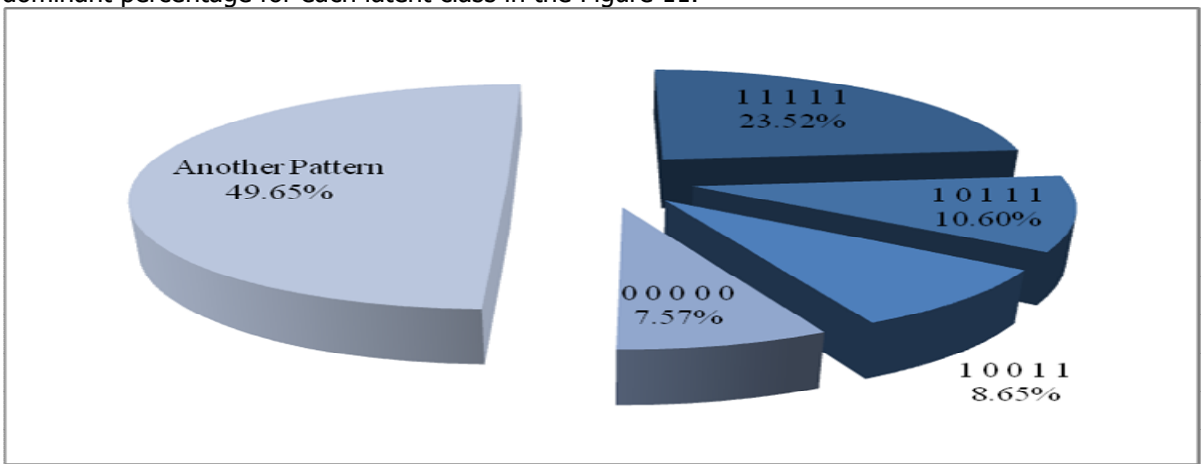

Figure 11: The Percentage of Latent Class According to the Attributes Establishing the Q11-Matrix

Based on the Figure 11, the most dominant percentage was 23.52% and was found in the latent class 1 1 1 1 1. The most dominant percentage showed that 23.52% students had mastered all attributes in the Q11-Matrix. The second most dominant percentage was 10.60% and was found in the latent class 1 0 1 1 1. The second most dominant percentage showed that 10.60% students had not mastered only one of the attributes in the Q11-Matrix namely (A37) the concept of mean. The following dominant percentage was 8.65% and was found in the latent class 1 0 0 1 1. Such percentage showed that 8.65% students had not mastered two attributes namely (A37) the mean and (A38) the mean narrative text. In addition, based on Figure 11 7.57% students had not mastered all attributes in the Q11-Matrix and the percentage was found in the latent class 0 0 0 0 0. The three latent classes that had the most dominant percentage after that of the latent class 1 1 1 1 1 were the latent class 1 0 1 1 1, 1 0 0 1 1 and 0 0 0 0. The students in these three latent classes altogether had not mastered the following attribute: (A37) the concept of mean. Therefore, the attribute that the students had not mastered dominantly in the Q11-Matrix was the concept of mean.

DISCUSSIONS AND CONCLUSIONS

Paying attention to the slip and guessing parameter from the DINA model, the researcher found the test items that had big slip parameter value namely the test item number 4 and 5. Then, the test items that had the big guessing parameter value were the test item number 22 and 32. The test item number 4 was related to the attribute of square root operation, while the test item number 5 was related to the attribute of rationalizing the denominator that contained the square root form. Within the test item number 4 and 5, the slip occurred because the students had mastered all the necessary

capacities for completing both test items correctly but they slipped themselves and they provided the incorrect answer. Then, the test item number 22 was related to calculating the planes breadth in combination with the round symmetry while the test item number 32 was related to the attributes of cube net. Within the test item number 22 and 32, the students actually had not mastered all necessary attributes but they had been able to guess the right answer of both test items. The relationship between the slip and guessing parameter with regards to the item discriminative capacity had been in line with the opinion of Rupp, Templin & Henson (2010).

Based on the results of analysis, the researcher would like to conclude that the students had several difficulties in completing the national examination test items. These difficulties were caused by the fact that the students had not been able to understand the narrative text items and to determine the results of fraction operation, to determine the exponentials, to determine the results of fraction operation and of rationalizing the square root-type denominator, to perform factorization, to understand the one-variable and two-variable linear equation system narrative text item, to determine the number of partial sets, to determine the number of sets member, to determine the intersection of sets, to determine the straight line equation, to determine the position of a point in the straight line, to determine the planes area, to understand the concept of triangle comparison, to understand the concept of arch length, to understand the concept of inner allying tangent, to understand the prism characteristics, to understand the area of solid surface and to understand the concept of mean.

Regarding the difficulties in understanding the narrative text items, the results of the study were in accordance with those of Kusaeri (2014). In the recent study, the students' difficulties that the researcher might describe had been overwhelming. The results might be followed up by the Mathematics teacher or by the schools through the efforts of improving the learning process related to the learning materials. This aspect is in accordance with the function of assessment in its relationship to the instruction decision by benefitting the results of assessment for improving the learning process (Reynold, Livingstone & Wilson, 2010).

Paying attention to the results of the study, the researcher senses that the future studies are still necessary. In order to view the strengths and the weaknesses as having been displayed by the results of diagnostic test, there should be a profile of students' capacity for each of their sub-skills as having been suggested by Sun & Suzuki (2013). The results of DINA-type CDA for diagnosing the students' difficulties might take the form of web flowchart for all sub-skills so that the researcher might figure out the follow-up actions that each student should take. Detecting the misspecification of the Q-Matrix and the importance of developing the CAT cognitive diagnostic might also be pursued especially for detecting the students' difficulties during the national examination, as having been conducted by Romero, Ordonez & Ponsoda (2014) for the detection of Q-Matrix misspecification and by Huebner (2010) for the CAT cognitive diagnostic development. The CAT will ease the teachers and the students to follow up the diagnostic results in order to improve the students' capacity.

BIODATA AND CONTACT ADDRESSES OF AUTHORS

RETNAWATI is a lecturer and researcher in Mathematics Department, Mathematics and Science Faculty, Yogyakarta State University, Indonesia. Her interest of researches are teaching methods and assessment in mathematics education, measurement in education, and psychometric.

Dr. Heri RETNAWATI
Mathematics and Science Faculty, Yogyakarta State University
Yogyakarta- INDONESIA
E. Mail: heri_retnawati@uny.ac.id

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PERCEPTION OF TEACHING EFFICACY BY FACULTY MEMBERS

Assist. Prof. Dr. Gülay Bedir
Department of Educational Sciences, University of Sutcu Imam
Kahramanmaraş- TURKEY

Abstract
The purpose of this research is to determine how university professors perceive their teaching efficacy. Designed in accordance with survey model, this study has been conducted on 516 professors working at 19 universities (10 private and 9 state) during the academic year of 2012-2013. Research data has been collected through teaching efficacy scale containing 6 dimensions and 28 items. Data analysis has revealed that faculty members find themselves most effective in class management. The dimensions of interpersonal relations, course design, teaching strategies, and technology use have been noted as the second, third, fourth, and fifth in terms of teaching efficacy. No significant difference has been identified among the professors in terms of gender as to how efficient they find themselves. The highest level of teaching efficacy perception has been recorded to belong to the members of education faculties.

Keywords: Teaching Efficacy, Faculty Members, Efficacy, University Teaching, Teaching Performance.

INTRODUCTION

Universities are institutions that train individuals on occupations considered to be necessary on both national and international grounds. There are ample amount of factors influencing university students' and graduates' success and failure. One of them, and maybe the most important one, is the success of faculty members working at universities. Professors may have a reputable educational background and they may have a real high command of knowledge regarding their field of study. The success of professors also entails teaching efficacy within the instructional process. Faculty members should be able to conduct efficient teaching by sharing their field-specific (such as Medicine, Education, Economics, Engineering) knowledge and experience with their students through effective use of relevant methods, techniques, and materials in a setting conducive to communication.

Upon the declaration of the Republic, a specific attention was directed to opening higher education institutions in Turkey; for instance, School of Law (1925), Institute of Agriculture (1930), Faculty of Languages, History, and Geography (1935), Faculty of Science (1943), School of Medicine (1945), and School of Religious Studies (1949). The aims and the duties of these schools were to train students in accordance with their skills and interests, carry out scientific education, hold and publish scientific studies (especially for national benefit) in order to solve all scientific, technical, and cultural problems, and to spread science and related data that would increase the general level among the public and that would enlighten them (Kiran, 2004, 142). Velidedeoglu (1990, 13) stated that universities are not occupational schools but centers for scientific research. Gokce (1990, 100) underlined that the mission of universities is to cultivate scientific thinking methodology in individuals.

Well-organized school and classroom settings, well-prepared programs, and highly motivated students do not lead to desired success without proper direction and management. Therefore, both faculty members and other teachers (primary, mid, high school) should be trained about teaching efficacy multi-dimensionally along with field specific education. Sonmez (2007, 149) underpins that teaching is a prominent profession requiring field-specific knowledge, skills, and interest, and that no one without due formation should ever work as a teacher. Furthermore, the author notes that teacher training programs should have a scientific ground and those individuals to be teachers should be processed through these programs. All education faculties of Turkish universities offer pedagogic formation

courses to their students. Yet, university professors working at faculties other than faculty of education do not have adequate amount of training on formation.

A significant number of studies has been directed to determine the qualities necessary for educators. Currently, it is accepted that educators should have a solid field and world knowledge, should be informed about and be able to use various techniques and methods, and should have effective communication skills to build a warm atmosphere appealing to students. Besides, educators should also be adaptive, open to changes, hard-working, presentable, affectionate, open-minded, confident, tolerant, fair, and good at organizing (Johnson, 1980; Barutcugil, 2002; Mujis and Reynolds, 2005; Sonmez, 2007; Gunduz, 2007, Ozden, 1997, Sen and Erisen, 2002).

The mainly studies are shown in the Table 1 about teaching efficacy. Gow and Kember's study contains six dimensions under the two main categories of knowledge transmission and learning facilitation. Brown's study has five dimensions and Chang's study has six dimensions.

Table 1: Teaching Efficacy Dimensions by Different Researchers

Gow and Kember (1993)	**Brown (1993)**	**Chang et.al**
Information Transfer	Course Design	Course Design
Instruction for Specific Occupations	Technology Usage	Instructional Strategy
Information Transfer	Classroom Management	Technology Usage
Disciplinary Knowledge	Student-Teacher Interaction	Classroom Management
Facilitating Learning	Assessment and Feedback	Interpersonal Relations
Problem Solution		Learning Assessment
Student Motivators		
Technology Usage		
Facilitative Teaching		

(Chang, Lin & Song, 2011)

Teachers should have the skill to effectively plan the instructional process. Preparing students to learn can only be achieved by optimizing the learning conditions. This may be possible by taking students' background knowledge, experience, learning needs, and interests into account (Heckhausen, 1969, cited in Ultanir, 2003). Having field-related knowledge, teachers should also consider the program aims, instructional plan, knowing the students, determining learning problems/difficulties, and improving skills and knowledge necessary to teach better (Ekici, 2007, 73). Designing and planning educational/instructional activities requires setting the goals, choosing the content, and making decisions about the instructional process and the assessment phase. Desired knowledge, skills, attitudes, and behaviors and their expected levels should be planned before teaching (Saban, 2000, 2). The success of teaching depends on the consistency between setting goals for each course and practice (Saban, 2000, 16). A well-planned teaching-learning process results in both a productive learning and attainment of goals as quickly as possible (Demirel, 2009, 12).

The teacher should be capable of choosing the best techniques, strategies, and methods compatible with students' characteristics, teaching materials, and physical conditions of the class and the school in order to teach in the best way. Kucukahmet (2008, 54) notes that there is no miracle technique and that teachers should choose the most suitable method and make necessary changes based on students' response.

A good command of communication skills has also been recorded as another quality for teachers (Cafoglu, 2007; Saban, 2000). Communication skill entails being a good listener and providing constructive-assistive feedback (Hughes, 1999). A good teacher should first of all be a good listener. S/he should listen actively, build empathy with students, and should correctly interpret students'

feelings and opinions. Furthermore, a teacher should also have competent oral skills to be successful (Barutcugil, 2002, 155-156). Communication skills are closely related with classroom management skills and those to build an effective learning environment. Teachers are supposed to design and sustain environments conducive to positive social interaction, active involvement, and high motivation (Mansor et.al, 2012; Mehdinezhad, 2012, Suarman and Ruhizan, 2013).

Presently, students make use of many technological gadgets in their daily lives. Teachers are having difficult times to draw and retain students' attention on the course subject since they are always faced with multi-stimuli. Thus, teachers are expected to successfully employ technological devices and materials to increase effectiveness of their classes. Materials may include coursebooks, workbooks, cassettes, CDs, videos, copies of work sheets, newspapers, or a paragraph written on the board (Tomlinson, 2011, 8). What matters is to pick up and efficiently use the best piece of material appropriate for the subject, compatible with students' characteristics, and feasible in terms of the school's and class' conditions. Demirel (2011, 46) emphasizes that use of materials during teaching-learning process brings joy into the class and reduces the amount of time necessary to learn. Moreover, retention of learning will become longer since materials appeal to more than one sense. Learners remember 10% of what they read, 20% of what they listen to, 30% of what they see, 50% of what they both see and listen to, 70% of what they say/repeat, and 90% of what they both do and say (Cilenti, 1997; Yalın, 2007; Yanpar, 2007).

Teachers are supposed to conduct assessments to identify and define their students' deficiencies, and to determine achievement criteria (Fer, 2009, 2003). Assessment is the most significant component of each step in teaching. Valid and reliable assessment tools and methods and standards are compulsory for a correct, reliable, and objective assessment (Kayabasi, 2007). Each country sets assessment standards to evaluate the efficacy of their educational and instructional activities. Yet, assessment of teaching is one of the most troublesome issues in both universities and other educational institutions in our country. This research aims to determine how faculty members working at state and private universities perceive teaching efficacy.

METHODOLOGY

Research Design

Aiming to determine how faculty members perceive teaching efficacy, this study has employed the survey model. In survey model, the opinions and attitudes of the participants are identified through questionnaires and then presented in quantitative and numerical descriptions (Creswell & Miller, 2000).

Study Sample

Within the scope of this study, data collection tool (efficacy scale) was administered at 9 state and 10 private universities during the academic year of 2012-2013. The scale was sent to the faculty members working at private universities (N=1.550) either through mail or e-mail, and 231 professors returned it. Likewise, the scale was handed to the faculty members at state universities (N=700) in person, and 285 of them returned the scale. So, totally 516 faculty members working at both private and state universities participated in the study. Those faculties where less than 10 members returned the scale were excluded. Table 2 presents demographic information about the participants.

Table 2: Demographic Information on the Participants

Demographic Information		**f**	**%**
Gender	Female	161	55.2
	Male	355	44.8
Course Match	Full Match	379	73.4
	Partial Match	137	26.6
Education	Received Training	388	75.2
	No training	128	24.8

Seniority	<6	170	32.9
	6-10	74	14.3
	11-15	109	21.1
	16-20	84	16.3
	>21	76	14.7
Disciplines	Faculty of Education	130	25.2
	Vocational Schools	35	6.8
	Faculty of Economics	101	19.6
	Faculty of Engineering	37	7.2
	Faculty of Medicine	70	13.6
Institution	State University	285	55.2
	Private University	231	44.8

Data Collection Tool

In this research, "*Faculty Members' Perception of Their Teaching Efficacy Questionnaire (FTFQ)*"— developed by Chang et.al (2010)— has been used following its adaptation into Turkish by the researcher. Four-scale likert type questionnaire consists of 6 dimensions (Course Design, Instructional Strategy, Technology Usage, Classroom Management, Interpersonal Relation, Learning Assessment) and 28 items. Cronbach alpha coefficients of the dimensions in the scale are as follows; course design a=.81, instructional strategy a=.82, technology usage a=.82, classroom management a=.61, interpersonal relations a=.63, learning assessment a=. 84.

Table 3: Sample Items from Teaching Efficacy Questionnaire

Dimension	Item	Sample Items
Course Design (CD)	5	Establish comprehensive teaching objectives Select appropriate teaching material
Instructional Strategy (IS)	5 5	Teaching according to students' various levels of readiness Utilize effective teaching methods to improve students grades
Technology Usage (TU)	5	Know how to produce relevant teaching media. Employ software relevant teaching media
Classroom Management (CM)	5	Nurture a pleasant learning environment, Maintain a good relationship with students
Interpersonal Relation (IR)	3	Provide assistance to student whenever they encounter difficulties in learning Provide appropriate assistance to students if they are incapable of completing the assignments
Learning Assessment (LA)	5	Utilize a variety of assessment methods to evaluate students' learning results Improve my teaching according to assessment results

Data Analysis

The analysis of the quantitative data was conducted using parametric test. One-Sample Kolmogorov-Smirnov test was used to determine whether the data followed normal distribution and as a result it was found that the data followed normal distribution.

For the analysis of research data, arithmetic mean, standard deviation, t-test (gender, institutions type, match between background education and courses taught, attending Professional courses), and one-way Anova have been utilized.

RESULTS

This section presents findings related with research questions in table form. All these findings are explained and interpreted. Findings were analyzed in accordance with and in the same order with research questions.

Table 4: Summary of Teaching Efficacy Perception by Faculty Members

Dimensions	$\overline{X}$	SD	Rank
Course Design	3.47	.46	3
Instructional Strategy	3.38	.51	4
Technology Usage	3.29	.61	5
Classroom Management	3.55	.56	1
Interpersonal Relation	3.48	.76	2
Learning Assessment	3.28	.47	6

Note: 4 scale 4= Strongly agree; 1=Strongly disagree.

Table 4 displays the summary of faculty members' opinions about their teaching efficacy. Professors find themselves most efficient in classroom management skill ($\overline{X}$ =3.55). Following are interpersonal relations ($\overline{X}$ =3.48) and course design ($\overline{X}$ =3.47). Learning assessment is the dimension that faculty members deem themselves as inefficient ($\overline{X}$ =3.28).

Table 5: t-test Results of Teaching Efficacy Scale in terms of Institution Type

Dimensions	State (n= 285)		Private (n=231)			
	$\overline{X}$	SD	$\overline{X}$	SD	t	P
Course Design	3.51	.45	3.42	.48	2.23	026*
Instructional Strategy	3.32	.50	3.45	.51	-3.05	002*
Technology Usage	3.37	.51	3.19	.71	3.26	001*
Classroom Management	3.51	.62	3.59	.47	161	136
Interpersonal Relation	3.39	.96	3.58	.39	-3.054	000*
Learning Assessment	3.27	.52	3.52	.37	-6.25	000*

P <.05

Table 5 depicts faculty members' perception of teaching efficacy across different institution types. There seems to be no statistically significant difference with respect to classroom management between the members of state and private universities. As for course design [$t_{(514)}$=2.23, p<.05] and technology use [$t_{(514)}$=3.26, p<.05], members of state universities find themselves more efficient than those working for private universities, On the other hand, there is a meaningful difference between the members of state and private universities, favoring those in private institutions, in terms of instructional strategy [$t_{(514)}$=3.05, p<.05], interpersonal relations [$t_{(514)}$=3.05, p<.05], and learning assessment [$t_{(514)}$=6.25, p<.05].

Table 6: t-test Results of Teaching Efficacy Scale in terms of Gender

Dimensions	Female (n= 161)		Male (n=355)			
	$\overline{X}$	SD	$\overline{X}$	SD	t	P
Course Design	3.47	.43	3.51	.46	-.694	.488
Instructional Strategy	3.30	.44	3.32	.53	-.374	.708

Technology Usage	3.36	.48	3.37	.54	-.067	.947
Classroom Management	3.56	.45	3.48	.61	.987	.324
Interpersonal Relation	3.36	.53	3.40	.85	-.331	.741
Learning Assessment	3,30	.47	3.36	.54	.559	741

P <.05

As can be seen in the Table above, no statistically significant difference has been detected between the male and female participants as to their perception of teaching efficacy across all the dimensions of the scale. However, examination of mean scores reveals that male participants have higher averages than female ones in course design ($\overline{X}$ =3.37; 3.51), instructional strategy ($\overline{X}$ =3.30; 3.32), interpersonal relations, technology usage ($\overline{X}$ =3.36; 3.37)), and learning assessment, but classroom management ($\overline{X}$ =3.56; 3.48).

Table 7: t-test Results of Teaching Efficacy Scale in terms of Course-Match

	Completely (n= 379)		**Partially (n=137)**			
Dimensions	$\overline{X}$	**SD**	$\overline{X}$	**SD**	**t**	**p**
Course Design	3.59	.43	3.32	.44	4.720	000*
Instructional Strategy	3.34	.52	3,26	.46	1.257	210
Technology Usage	3.44	.51	3.20	.50	3.766	000*
Classroom Management	3.52	.49	3.50	.83	.207	838
Interpersonal Relation	3.43	1.13	3.30	.48	1.142	263
Learning Assessment	3.33	.52	3.18	.50	2.251	025*

P <.05

Perception of Teaching Efficacy by university professors is displayed in Table 7 in terms of the match between the educational backgrounds of the faculty members and the courses they teach. A closer look at the Table shows that the average scores of participants whose educational backgrounds and the courses they teach completely match are higher in all dimensions (course design ($\overline{X}$ =3.59; 3.32), instructional strategy ($\overline{X}$ =3.34; 3.26) technology usage ($\overline{X}$ =3.44; 3.20), classroom management ($\overline{X}$ =3.52; 3.50), interpersonal relations ($\overline{X}$ =3.43; 3.30), and learning assessment ($\overline{X}$ =3.33; 3.18)) than those of others with a partial match. Furthermore, this difference is statistically significant on behalf of those with a complete match across the dimensions of course design [$t_{(514)}$=4.72, p<.05], technology usage [$t_{(514)}$=3.76, p<.05] and learning assessment [$t_{(514)}$=2.25, p<.05].

Table 8: t-test Results of Teaching Efficacy Scale in terms of Attending a Course about the Profession

	Yes (n=388)		**No (n=128)**			
Dimensions	$\overline{X}$	**SD**	$\overline{X}$	**SD**	**t**	
Course Design	3.59	.38	3.28	.53	5.328	000*
Instructional Strategy	3.41	.46	3.07	.52	5.350	000*
Technology Usage	3.45	.49	3.14	.54	4.546	000*
Classroom Management	3.61	.57	3.26	.69	3.937	000*
Interpersonal Relation	3.41	.48	3.32	1.66	498	620
Learning Assessment	3.36	.46	3.07	.59	4.461	000*

p <.05

Table 8 presents the data regarding how faculty members who attended a course about their profession and who didn't perceive teaching efficacy. As for having attended a training course about the job or not, there seems to be no meaningful difference between the participants. Nevertheless, there is still a difference between the scores of those participants who attended a course about their profession and the participants across the dimensions of course design [$t_{(514)}$=5.32, p<.05], instructional strategy [$t_{(514)}$=5.35, p<.05], technology usage [$t_{(514)}$=4.54, p<.05], classroom management [$t_{(514)}$=3.93, p<.05], and learning assessment [$t_{(514)}$=4.46, p<.05].

Table 9: Anova Results of Teaching Efficacy Scale in terms of Teaching Experience

Dimensions	< 6 (n=170)		6-10 (n=75)		11-15 (n=109)		16-20 (n=84)		>20 (n=78)		Post hoc	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	F	
Course Design	3.36	.46	3.50	.43	3.56	.42	3.57	.56	3.70	.29	4.31*	1-5
Instructional Strategy	3.26	.49	3.27	.49	3.31	.55	3.38	.54	3.51	.43	1.85	
Technology Usage	3.28	.52	3.37	.54	3.31	.48	3.48	.57	3.50	.45	1.78	
Classroom Management	3.46	.59	3.51	.46	3.55	.96	3.52	.63	3.59	.45	.32	
Interpersonal Relation	3.32	.51	3.51	1.71	3.34	.53	3.31	.59	3.48	.38	.56	
Learning Assessment	3.21	.52	3.29	.45	3.28	.54	3.24	.63	3.49	.43	1.86	

P <.05

Table 9 displays the data regarding faculty members' perception of teaching efficacy across different amounts of work experience. There seems to be a statistically significant difference between those with 1-5 years of experience and those with 20 and more years of experience with respect to the course design dimension of the scale, favoring those with more experience [$F_{(4-275)}$=4.31, p<.05].

Table 10: Anova Results of Teaching Efficacy Scale across Different Faculties

Dimensions	Education (n=13)		Vocational (n=35)		Economics (n=10)		Science (143)		Engineering (n=37)		Medicine (n=70)			Post hoc
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	F	
Course Design	3.67	.38	3.38	.41	3.37	.44	3.53	.37	3.44	.60	3.44	.47	3.46*	1-2 1-3
Instructional Strategy	3.54	47	3.21	.38	3.16	.44	3.37	.45	3.17	.58	3.25	.54	4.82*	1-2 1-3 1-5 1-6
Technology Usage	3.56	.43	3.40	.50	3.26	.44	3.25	.53	3.32	.58	3.28	.58	3.06*	1-4 1-6
Classroom Management	3.80	81	3.37	.44	3.29	.51	3.48	.49	3.36	.65	5.50	.49	4.82*	1-2 1-3 1-5
Interpersonal Relation	3.45	.50	3.65	.37	3.24	.54	3.42	.48	3.21	.64	3.32	.48	1.04	
Learning Assessment	3.50	.48	3.14	.39	3.30	.40	3.33	.45	3.18	.65	3.10	.55	5.09*	1-2 1-5 1-6

P <.05

Analysis of Table 10 indicates that the highest and lowest means across all dimensions belong to the members of education faculties and faculty of economics respectively. Except for Interpersonal Relations, all other dimensions yield a significant difference among the members of different faculties,

all favoring the members of education faculties (Course Design [$F_{(5-274)}$=3.46, p<.05], instructional strategy [$F_{(5-274)}$=4.82, p<.01], technology usage [$F_{(5-74)}$=3.06, p<.05], classroom management [$F_{(5-274)}$=4.82, p<.01], and learning assessment [$F_{(5-274)}$=5.09, p<.05].

DISCUSSIONS

Faculty members perceive themselves the most effective and efficient in classroom management dimension, followed by interpersonal relations, course design, instructional strategy, technology usage, and learning assessment. In their study, Chang et.al, who developed the scale, found out that participants regarded themselves as the most efficient in course design and the least in instructional strategies. Mehdinezhad (2012), however, concluded that communication skills were the highest and technology usage was the lowest efficiency dimensions for the participants. In their study on technology usage by the members of faculty, Cagiltay et.al (2007) noted that students were using communication technologies for learning purposes frequently, but the professors did not include them in their courses. In addition, Sahin (2013) stated that faculty members had positive attitudes towards use of computers and related technologies in their classes, but their skills and knowledge about them were not at a good level. Yesil and Ozbek (2008) reported that students generally believed that faculty members were not competent enough in preparing questions, asking questions, encouraging students, and giving feedback. Kececi and Tasocak (2009) examined the communication skills of professors, and concluded that those skills were really in bad shape. Suarman and Ruhizan (2013) identified that increasing the quality of teaching and learning was one of the most influential factors over advancing the quality of a university in general; and they also concluded that university students were not content enough with their teachers. Holfort and Paykar (2003) stated that the quality of opportunities a university has, learning process, provision of services, the curriculum, and the instructional practice should be increased and improved in order for students to be satisfied with their schools.

Analysis of the perception of teaching efficacy by faculty members of both state and private universities yields no significant difference in terms of classroom management. Yet, there is a meaningful difference in terms of course design and technology usage on behalf of the members of state universities. However, the same meaningful difference shifts on to those working at private universities when it comes to the dimensions of instructional strategy, interpersonal relations, and learning assessment. The reason why interpersonal relations and learning assessment were better dimensions for those at private universities can be attributed to the fact that student satisfaction matters more in those institutions. Chang et.al (2011) found out that perception of teaching efficacy was higher in all dimensions for the members of state universities. Furthermore, teaching efficacy perception by faculty members was determined not to vary across all dimensions in terms of gender. In addition, course design, technology usage, and learning assessment were found to be higher for those members whose educational backgrounds match completely with the classes they teach. This is, in a way, an expected result since it is quite natural for professors to feel more competent when they teach about the field they are trained for. Similarly, those faculty members who attended a job-related training perceive themselves more efficient in course design, instructional strategies, technology usage, classroom management, and learning assessment as opposed to those who didn't receive any tutoring about their profession. Individuals who keep themselves up-to-date about their profession are normally expected to have higher levels of efficacy perception since they perform their tasks better thanks to ongoing development. Suarman and Ruhizan (2013) suggested that faculty members should be provided with current information that would improve their teaching skills. Besides, teachers with 20 and more years of experience were found to have a statistically significant higher levels of teaching efficacy perception in course design as opposed to those with 1-to-5 years of experience. Finally, perception of teaching efficacy was determined to be the highest for the members of education faculties across all dimensions and the lowest for those working at faculties of economics.

CONCLUSION

In the summary the findings of this study indicated that the faculty members' opinions about their teaching efficacy. Themselves most efficient in classroom management and learning assessment is the dimension that faculty members deem themselves as inefficient. No significant difference has been identified among the professors in terms of gender as to how efficient they find themselves. The highest level of teaching efficacy perception has been recorded to belong to the members of education faculties. As for having attended a training course about the job or not, there seems to be no meaningful difference between the participants. Participants whose educational backgrounds and the courses they teach completely match are higher in all dimensions

RECOMMENDATIONS

First of all, faculty members working for any faculty other than education faculty should seriously be provided with teaching formation courses during their graduate studies. Seminars and training programs on teaching skills can be developed and conducted by the specialists of educational sciences working at faculties of education for the members of other faculties. Faculty and department administration boards can pay due attention to the match between the educational backgrounds of the faculty members and the courses to be taught during assignment. Likewise, those in charge of university or faculty management can design training sessions about current issues and technological innovations to keep their members up-to-date. Universities could increase the amount of support they give to their members to partake in international conferences and other educational organizations.

BIODATA AND CONTACT ADDRESS OF THE AUTHOR

Gülay BEDİR is Assistant Professor in Sutcu Imam University, Department of Curriculum and Instruction, Kahramanmaraş/Turkey. She received her bachelor, master and PhD degrees in curriculum and instruction department. Her research interest is especially instruction. Learning styles, active learning practices and peace education are the fields she studied in.

Assist. Prof. Dr. Gülay BEDİR
Sutcu Imam University
Faculty of Education, Educational Sciences
Curriculum and Instruction Department
Kahramanmaraş- TURKEY
E. Mail: gulaybedir@hotmail.com

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COMMUNICATION EDUCATION IN MODERN AGE: CONTEMPORARY REQUIREMENTS

Prof. Dr. Sedat CERECİ
Mustafa Kemal University
Communication Faculty
31030 Hatay- TURKEY

Abstract
This study investigates character of communication education, and evaluates communication need of people, and handles relation between communication and contemporary requirements, and emphasizes contemporary requirements on communication education. Industrial Revolution and technological developments also conributed communication technics and proved numerous technological facilities for communication. Education in the world also use developed technology in any department and communicaiton education especially necessities high technological faciliities in schools. Many high schools and universities have communication departmens and most of them use contemporary technological facilities, but they are not sufficient. Communication departments in educational organizations in Turkey have computer classrooms and monitors and cameras and microphones and telephones and different softwares and others. But despite all this, technological facilities and teaching methods are not sufficient because of contemporary developments. Technology developes rapidly due to hopes of people and technological facilities in education can not catch developments and people always hope more.

Keywords: Communication education, technology, contemporary requirements, technics.

INRTODUCTION

Time passed quickly and almost everything has changed in the world. People moved from rural to urban and left most of their traditions and people have adopted a modern style (Stimeling, 2012: 24). Economical approaches and production changed and culture changed due to economy after Industrial Revolution. Urban areas provided people many different facilities and taught modern approaches (Bellion, 2010, 22). People have never given up education because of necessity of education and always found technichs and instrument for education. Modern age needed new instruments and people developed new tools for modern education too (Steel, 2013, 471). Governments also planned educational policies and provide modern education facilities for people.

Communication education contains to create a modern communication concept and routing the communication process, and to acquire skills to deal with communication problems, and to target communication to be successful in all areas of life, and to use the most available technology to communicate in modern age (Lin and Ha, 2009: 581). Effective communication is necessity of modern age because of modern business conditions and modern life style and effective communication is necessity of modern social conditions and and it is necessary for social cohesion (Randall and Graffagnino, 2012: 730). Effective communication is especially necessary for economical organizations in modern age in which economy is the first dynamic of the world.

Because of the importance and necessity of communication, people expect to learn about communication and they want to use modern technology to communicate. Many people have communication technologies like mobile telephones or like computer or like different softwares, however students and officers and workers and all people want to use communication technologies in optimum manner (Kwilecki, 2009: 124). Communication technologies are especially used in education and in health and in transportation and in security and in banking and in journalism and in social media and in shopping and etc. (Bach, 2013: 257). People try to learn news via online methods and many people use internet to send message and to receive message in modern age.

Information and communication technologies that provide to create knowledge and to reach information are the most popular instruments of modern age. Information and communication technologies are all kinds of audio, visual , print and writing instruments and they are main components of contemporary development (McMahon and others, 2014: 261). Many people use computer and television and camera and telephone and printer and monitors and modem and imaging systems and GPS systems and other for their works and for their daily lives and for their education. Communication education became more important due to technology use and due to global conditions in modern age recently.

There are almost 200 universities and almost 11 thousand high schools and there are communication departments more than 60 faculty in Turkey. There are journalism and radio and television and cinema and public relations and advertising and visual design departments at high schools and at communication faculties and well-educated teachers teach in educational organizations. High schools and universities have many technological facilities for communication education and they try to follow contemporary developments but contemporary conditions developes faster than educational developments (Stambach and others, 2011: 466). Contemporary conditions change due to political plans and economy changes form due to policy and technology developes due to economical plans and people change their lives due to technology. Meanwhile form of education and technics in education naturally change and trainers have difficulty (Zhang, 2012: 415). Beside trainers educational organizations and administers difficulty on contemporary technology because of financial proglems.

Financial lack is one of the reason of technological lack in education but it is not unique reason. Spiritual lack of administraors of educational organizations on technological developments and necessity of technology in education are other reasons and there are a great number of untrained administrators in underdeveloped countries (Kansanen, 2002: 433). Untrained teachers and administrators are always problems eweywhere and governmental and non-governmental educational organizations sometimes neglect training of teachers and admintrators (Akyeampong and others, 2006, 168). Untrained teachers and adminstrators naturally prevent well education.

COMMUNICATION EDUCATION METHODS

The most developed societies and governments realized importance of communication education in modern age and most of them arranged their education methods due to contemporary conditions. Since the field of communications is so broad, there are many career opportunities available for international students studying in the top communications schools in the US. With the newest technology, top ranked professors and a country in which media is at the center, international students seeking to study in the best schools for communication can discover a wide range of opportunity (http://www.internationalstudent.com/, 2016). Communication education requires many modern technics and approaches in modern age.

One of the biggest challenges instructors face in the 21st-century college classroom is the struggle of retaining student interest and engagement while students remain connected to the outside world through their mobile devices. Instructors across institutions of higher education are faced with decisions of whether to allow electronics or instate no-electronics policies in order to create student-centered learning classrooms (Curzan, 2014). It is a common occurrence to observe students who are physically present, yet mentally preoccupied by noncourse-related material on their mobile devices. As mobile devices have deeply saturated the college student population, this problem will likely continue to pose a significant obstacle for faculty (Kuznekoff and others, 2015, 358). Mobile devices and other technological products are especially attracts next generation, teenagers and students in university because of their interests.

Modern life can not be evaluated without modern technology because of common technology use. Among the social changes of the past decade, perhaps none is so ubiquitous as the reconfiguration of

interpersonal relationships by mobile communication technology. Moreover, college students lead other demographic groups in their level of engagement with social communication technology, and instructors have responded with concern about the effect technology access has on student learning. Instructional communication research supports their concerns, with mobile communication use associated with decreased cognitive learning, and lower final course grades (Ledbetter and Finn, 2015, 6). Contemporary conditions conduct people to use technology and technology developes due to people orientation.

Communication education was applied in traditional methods for a long time but conditions changed day by day especially since Industrial Revolution and approaches also changed. Education contains contemporary components and contemporary tools and contemporary methods in modern age any more. Modern communication education contains classical communication process and also information and creating message and announce the message and also creating public and also to persuade people and also affect the world public and also use the technology efficient manner (Lentz, 2014, 196). Communication education also contains psychology and sociology and international relations and electronics and naturally contemporary information because of character of communication (Fortunato and others, 2013, 167). Modern communication education also contains behavioral science because of humanistic character of communication.

Effective communication can ease difficulties and can gather support for an idea or for an approach. Therefore effecftive communication is prefered by administrators and by politicians and by manufacturers and by others who have large target. Effective communication provide people much gain and much prestige due to power of communication. Modern communication education examines details and key points of communication and shows ways of communication succeed and available technichs (Bugs and Crusafon, 2014, 382). Almost all countries are in information competition in 21.st century and all they heed information and communication education. Administrators provide large facilities for educational organizations and for training of trainers in modern age whose base is on information and on communication.

Communication education contains Language and Comunication, and Communication Theory, and Communication Research Methodology, and Cultural Communication, and Organizational Communication, and Rhetoric and Nonverbal Communication, and Listenin and Digital Culture and Communication in some educational organizations and naturally use of communication technology (Dillon, 2004: 140). Contemporary communication education naturally contains conditions of sender and receiver and message and feedback in contemporary conditions too. Communication education also contains calculation of the input and output in communication process (Limburg, 2009: 68). Communication includes many complex components and communication eduaction contains many technical and cultural informations too.

Traditionally, instructional communication researchers have focused on investigating student characteristics, teacher characteristics, or the communicative interaction between teachers and students In order to develop a more comprehensive understanding of instructional communication, however, more recently researchers have extended the investigation of the learning process to include the communicative interactions that students have with one another. Despite the progress these studies have made in understanding student-to-student communication in the classroom, there remains much to be understood in terms of how students influence each other in the learning process. (Johnson and LaBelle, 2015). Communication education is distinguished from other educations because of its contemporary character. Contemporary communication education must be supported by technological facilities.

TECHNOLOGY IN COMMUNICATION EDUCATION

Some educational organizations provide their students technological facilities on communication and media education to train their students to contemporary conditions. Communication, Media, and

Learning Technologies Design (CMLTD) Program provides a cluster of degree programs for students seeking to develop leadership capacities in the use of information and communication technologies in education and society. The program applies to all subject areas and serves students, staff, and faculty members who share a commitment as educators to use digital technologies to improve education at all levels (http://www.tc.columbia.edu/, 2016). Many educational organizations are aware of that technology is base of modern age and communication in contemporary conditions.

Different technics are used in education because of necessity and technics changed when ages changed. Communication education begins literacy and understanding and technics and ways are shown to students (McGhie-Richmond and others, 2013: 228). Radio and television have been used widely as educational tools since the 1920s and the 1950s, respectively. According to trainers, there are three general approaches to the use of radio and TV broadcasting in education; direct class teaching, where broadcast programming substitutes for teachers on a temporary basis; school broadcasting, where broadcast programming provides complementary teaching and learning resources not otherwise available; and general educational programming over community, national and international stations whic h provide general and informal educational opportunities (Deaney and others, 2006: 472). Contemporary education mostly works on technology base and all educational organizations try to obtain technological facilities in possible opportunities.

Traditional technics changed into modern technics and traditional approaches changed into modern approaches in modern age and hope of people changed too. People began to live in a high rhythm world in modern age and fronted to gain much and to have much and left many humanistic values after Industrial Revolution and after urbanization. Communication methods and languages also changed and many different communication technics participated lives of people (Fassett and Nainby, 2016: 120). Next generation adopted contemporary technologies rapidly and others try. Communication education ease to adopt contemporary technics and use of contemporary technologies.

Technology naturally eases learning and naturally provide wide approaches to comprehend. Learning with the technology means focusing on how the technology can be the means to learning ends across the curriculum. It includes presentation, demonstration, and the manipulation of data using productivity tools, and use of curriculum-specific applications types such as educational games, drill and practice, simulations, tutorials, virtual laboratories, visualizations and graphical representations of abstract concepts, musical composition, and expert systems, and use of information and resources on CD-ROM or online such as encyclopedia, interactive maps and atlases, electronic journals and other references. Contemporary conditions naturally presents people many different facilities and ways to communicate (Kem, 2006: 203). Technological literacy is required for learning with technologies to be possible, implying a two-step process in which students learn about the technologies before they can actually use them to learn. However, there have been attempts to integrate the two approaches (Tinio, 2015: 15). Especially electronic technology eases communication education in schools.

Modern age presented people many information and communication facilities and people front to use them. Modern developments in information and communication technologies (ICT) provide exciting possibilities to enhance the quality of education. Interactive education software, open access digital libraries, and cheaper and more intuitive technology may facilitate new forms of interaction between students, teachers, education employees and the community and enhance the quality of education by making it more accessible (http://download.ei-ie.org/). Technology use in communication education is inevitable because of contemporary conditions and expectations, but all educational organizations can not afford for technology or some of them do not think that it is necessary (Chong and Druckman, 2010: 671). Many students use technology better than trainers in schools.

Developing technology presents contemporary world many different facilities and one of the facilities is digital technology. People have been living in a digital world since some time and people form their lives due to digital developments. Digital technology also eases individual communication and mass

communication and numerous messages are conveyed via digital technology (Rye, 2010: 88). Digital technology products and digital technology use must naturally be evaluated a matter of communication education in schools. People live in the midst of a period of dramatic global economic change, co-evolving with and fuelled by an equally dramatic technological revolution (Asselin and others, 2005: 804). The revolution forced all sectors to change and education changes as required. Communication education contains many different technological matters and facilities after the Revolution.

CONCLUSION

People have always fronted to live more comfortable and easier and developed their lives and invented many different tools and technics. People have developed not only physical inventions but philosophical approaches too. Education has developed due to conditions of time and many different educational methods were used in the past. Conditions changed educational methods and instruments and any age developed its own methods. Communication education was applied in traditional ways but it also changed due to contemporary conditions. Traditional communication instruments and technics were mostly left in modern age and technological methods replaced them. Many technological ways are used for communication in modern age and educational organizations necessarily have them and teach them to their students.

Communication one of the most necessity need of people and people have tried to develope different communication instruments and methods for a long time. People have always used their intelligences and developed technics for their lives and taught their children their technics. Any generation developed technics and changed the world with their technics and created revolutions and new styles. Economical conditions, and social life, and educational conditions changed due to developing technologies and education naturally had a contemporary form. Classical informations left their places to contemporary informations and contemporary technologies.

Communication is subject whose teaching is impossible without technological facilities. Because contemporary communication activities are completely based on technological base. Especially computer and digital technology are used much for communication and the schools that have communication departmens absolutely have communication technologies to teach their students contemporary communication. Mobile telephones and cameras and monitors and computer and software and sender and receiver systems are main equipments of schools in modern age. Most of trainers are trained well about contemporary communication and communication technologies and trainers who are insufficient about contemporary communication technologies are continued to train.
Firstly next generations and especially children and then most of people front to use communication technologies, and communication technology is necessarily used in business world, and people who are in education world use communication technology and many others use in modern age. Communication technology provide people many facilities to communicate and many other facilities to spend time. Therefore communication education is a necessity in schools and communication technology naturally has to be taught due to contemporary conditions because of much use.

BIODATA AND CONTACT ADDRESS OF AUTHOR

Sedat Cereci is professor Communication Faculty in Mustafa Kemal University .Studied radio and television broadcasting at Communication Faculty in the Universtiy of Istanbul between 1982 and 1986. He studied on documentary film at doctorate process at the University of Istanbul between 1988 and 1992. He works at magazines and at newspapers as journalist and as redactor and works at Yuzuncu Yil University as professor and teachs radio and television broadcasting. Wrote many essays, participated in conferences and in symposiums all over the world, worked in international projects, wrote for magazines and for websites. He was assigned as Dean of Fine Arts Faculty at Batman

University in 2010 and arranged a multilingual film festival in Batman. He studied classical Turkish music, composed songs in different forms and produced radio programs at TRT Istanbul Radio. He settled a multilingual music group who sings in 5 languages at Fine Arts Faculty and had concerts. He directed documentary films about cultural topics and participate in international film festivals. Beside directing documentary film, he wrote 19 books about communication, and television producing. He also takes photograph and had exhibitions in different cities.

Prof. Dr. Sedat CERECİ
Mustafa Kemal University
Communication Faculty
31030 Hatay- TURKEY
E. Mail: s.cereci@gmail.com

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PRE- SERVICE TEACHERS' ALTERNATIVE CONCEPTIONS CONCERNING THE tRNA CONCEPT

Assist. Prof. Dr. Mehmet YAKIŞAN
Ondokuz Mayıs University, Faculty of Education
Biology Education
Samsun- TURKEY

Abstract
Biology, a branch of science studying living things in all aspects, has a large scope. Besides covering a large content, it also includes abstract concepts in some matters. Especially in the issues of abstract and microscopic biology, various alternative terms are determined at different levels of education. This study aims at determining pre-service teachers' alternative conceptions regarding the tRNA concepts on protein synthesis. 12 first year university students participated in the research. Semi-structured interviews were conducted so as to determine the pre-service teachers' alternative conceptions for the tRNA concept. On analyzing the data obtained through the interviews, it was found that the pre-service teachers had differing alternative conceptions for the concept of tRNA. Those conceptions were tabulated in categories.

Keywords: Alternative concepts, tRNA, Pre-Service Teachers.

INTRODUCTION

Considerable difficulties are encountered by students, teachers and individuals of differing age groups and statuses in learning and comprehending the topics of biology- which include a great number of abstract concepts- meaningfully. Researchers also found that several difficulties were available in teaching and learning the topics of biology, mainly those which were abstract (Wood-Robinson, Lewis & Leach, 2000; Bahar, Johnstone, & Hansell, 1999; Yip, 1998; Turney, 1995; Songer & Mintzes, 1994; Kindfield, 1994; Lazarowitz & Penso, 1992; Westbrook & Marek, 1991). It is pointed out that particularly the abstract issues such as cell division (Lewis, & Wood-Robinson, 2000; Smith, 1991), photosynthesis (Lonergan, 2000; Hazel & Prosser, 1994) and protein synthesis (Fisher, 1985; Johnstone & Mahmoud, 1980) are insufficiently and badly learnt by students of every age and every level. Ambiguity stemming from difficulties in learning the concepts is likely to lead students to form alternative conceptions in their mind (Öztaş, Özay, & Öztaş, 2003).

Several studies regarding biology education show that students of every level of education as well as teacher candidates, and even teachers have alternative conceptions for the terms forming the basis of biology knowledge (Soyibo, 1993). Furthermore, a group of research on students' understanding the concepts of science demonstrates that students hold many alternative conceptions different from the scientific knowledge even after formal education (Wandersee, Mintzes & Novak, 1994; Sanders, 1993).

In addition to that, some research on teacher candidates suggests that pre-service teachers do not possess sufficient knowledge to teach the topics of biology meaningfully and sufficiently, that they hold alternative conceptions for many issues of biology, and that they transfer those alternative conceptions into their students in their teaching career (Soyibo, 1993).

Students' thoughts that they hold as part of their prior knowledge, which are incorrect, have a negative effect on their understanding and mastering more advanced concepts in the forthcoming levels of education (Tsai, 1999). Therefore, Pashley (1994) holds the view that the primary and most

important duty in replacing students' alternative concepts with scientific facts and in raising the number of students achieving this replacement is to determine students' alternative conceptions.

This research aims to determine pre-service teachers' alternative conceptions for tRNA, a basic concept in learning the issue of protein synthesis and its role in protein synthesis.

METHODS AND DATA ANALYSIS

12 pre-service teachers attending the first year courses at university were selected for interviews, and they were given semi-structured interviews.

The data were obtained through interviews containing open-ended questions as well as True-False questions. In the analysis of the data, firstly the voice recordings of interviews were decoded and transcribed. Then, they were encoded through computer programmes by considering the pre-service teachers' responses to the interview questions and their alternative conceptions. All the codes constructed were revised and re-arranged, and thus final codes were formed. The alternative conceptions regarding tRNA possessed by the pre-service teachers were categorized on the basis of similarities, and the categories as well as the related codes were tabulated.

FINDINGS

When the data obtained from the study were analyzed, it was determined that the pre-service teachers had many alternative concepts related to the tRNA concept. The alternative concepts identified from pre-service teachers are presented in four themes. These themes and associated codes are presented in Tables below.

1. The function of tRNA. (What does tRNA carry?)

The most common alternative concepts about tRNA, relate to what the tRNA carries. Based on the name of tRNA, pre-service teachers predict that tRNA carries something, but they develop various alternative concepts about what they carry. Alternative concepts related to this theme are presented in Table 1.

Table 1: Alternative conceptions of pre- service teachers about the function of tRNA. (What does tRNA carry?)

Topics	Alternative Conceptions	
The function of tRNA (What does tRNA carry?)	**1.1.**	tRNA takes a strand of DNA to ribosome, and DNA complements itself with the help of remaining strand.
	1.2.	tRNA, carries mRNA into ribosome.
	1.3.	Since tRNA is a carrier, it carries the received code into ribosome.
	1.4.	tRNA carries nucleic acids into ribosome.
	1.5.	tRNA carries nucleotides into ribosome.
	1.6.	tRNA carries amino acids consisting of 3 nucleotides into ribosome.
	1.7.	tRNA brings amino acids to ribosome, and takes away the proteins formed through reshaping of amino acids in the ribosome.

One of the alternative concepts identified in the pre-service teachers for the function of tRNA is "tRNA takes a strand of DNA to ribosome, and DNA complements itself with the help of remaining strand." Pre-service teacher statements concerning this alternative conception are as follows:
R: What is the role of tRNA?
S: The tRNA carrier is here. He takes one of these strands (one of DNA strand) and takes ribosome. One of the strands was taken from ribosome.
R: The other DNA strand was remained alone. What's happening to that?
S: The remaining strand here completes itself.

R: The strand went to the ribosome. What is going on there?
S: The strand went to the ribosome, where the appropriate bases come in the way that uracil instead of the thymine.

Examining the answers obtained by the pre-service teachers, they are aware of the fact that protein syntheses occur through carrying the code in DNA to the ribosome. However, it is also observed that the pre-service teachers had such alternative conceptions as tRNA's carrying this code and one of DNA's strand's being carried to the ribosome as a code.

Another alternative conception the pre-service teachers had regarding the duty of tRNA was that "tRNA carries mRNA to the ribosome". For example, a pre-service teacher's views, which are similar to the abovementioned conceptions, are as follows.
R: What do you say about tRNA?
S: tRNA carries it to the ribosome.
R: What does tRNA carry?
S: It carries mRNA. It carries mRNA to the ribosome. Then it is paired with the convenient amino acids in the ribosome.
R: Are the convenient amino acids paired with mRNA?
S: Yes.

Differently from the previous alternative conception, in this context the pre-service teachers believe that mRNA is carried to the ribosome by tRNA and mRNA is paired with the convenient amino acids in the ribosome.

Another alternative conception the pre-service teachers had regarding the duty of tRNA is that "tRNA carries amino acids to the ribosome and it takes away the proteins, which emerge after the amino acids change shape in the ribosome". The expression of the pre-service teacher, who reflected this alternative conception, is as follows:
S: mRNA gives the code to the ribosome. There is an amino acid for the code in the ribosome in that environment. Amino acid is carried there via tRNA.
R: Does tRNA bring amino acids?
S: Yes, it brings the amino acids and takes away the proteins.
R: So it brings the amino acids, then what happens to the amino acids?
S: This code gives them a shape. It depends on the code.
R: Does the code change the amino acids?
S: For instance you enter everything about the iron program into the computer. The iron takes its shape according to that code. Something likes that.
R: So it turns raw amino acids into protein?
S: Yes.
R: Does tRNA also carry the proteins?
S: Yes, that is how protein is synthesized.

In the expression above, the pre-service teacher accurately described the duty of tRNA as carrying amino acids to the ribosome. However, the pre-service teacher believes that the amino acids change shape in the ribosome according to the code in mRNA and then are converted to protein and that these proteins are again carried by tRNA. The pre-service teacher has an alternative conception that tRNA brings raw amino acids to the ribosome and takes away the proteins.

Another alternative conception about the duty of tRNA is that "tRNA carries nucleic acids to the ribosome".

S: mRNA penetrates the organelle of the ribosome. There are mRNA, carrier, and then another RNA after the carrier. It penetrated the ribosome. rRNA penetrated the ribosome. Copying takes place there.

R: What is copied?
S: mRNA is copied. It transfers the information to the rRNA. When it penetrates the ribosome, nucleic acids are supposed to come along. So that everything there can be synthesized. tRNA carries those things. The ribosome starts synthesizing proteins after tRNA brings them.
R: What does tRNA bring?
S: It brings nucleic acids.

The pre-service teacher believes that mRNA is copied after penetrating the ribosome and transfers its information to rRNA. Moreover, the pre-service teacher asserts that nucleic acids are required in order to copy mRNA and nucleic acids are brought to the ribosome by tRNA. Another assumption of the pre-service teacher is that the duty of tRNA in protein synthesis is bringing nucleic acids to the ribosome.
Furthermore, some other alternative conceptions regarding the duty of tRNA were detected in the pre-service teachers, such as "tRNA carries nucleotides to the ribosome" and "as a result of being the carrier, tRNA carries the code to the ribosome".

Examining the expressions of the pre-service teachers within that framework, it can be uttered that they all assume tRNA carries something; however, they have developed various alternative conceptions about what tRNA exactly carries.

2. The role of tRNA in protein synthesis

Another alternative conception regarding tRNA, which were observed among the pre-service teachers, is related to "the Role of tRNA in Protein Synthesis". Table 2 presents the alternative conceptions related to this role, which were observed in this study.

Table 2: Alternative conceptions of pre- service teachers about the role of tRNA in protein synthesis

Topics	Alternative Conceptions	
The role of tRNA in protein synthesis	**2.1.**	tRNA combines with amino acids and is included in the protein structure in protein synthesis.
	2.2.	tRNA carrying the codes into ribosome combines with amino acids and protein is synthesized.
	2.3.	Triple nucleotides such as AUG on tRNA pass through ribosome and become amino acids.
	2.4.	tRNA arranges the triple codones that it carries into ribosome, and thus protein is synthesized.
	2.5	The 3 nucleotides brought by tRNA are an amino acid, and they are arranged opposite mRNA, and thus protein is synthesized.

The pre-service teachers, who somewhat associated tRNA with amino acids, yet still had alternative conceptions about this relationship, have reflected their false opinions by saying "in protein synthesis, tRNA is combined with amino acids and becomes a part of protein structure". The expression of the pre-service teacher, who reflected this alternative opinion, is as follows:
A. What type of a relationship exists between mRNA and tRNA?
S: mRNA is only a code for tRNA.
R: What type of a code is that?
S: It is for establishing a relationship between amino acids and peptides. In other words, a merged signal with amino acids.
R: Do tRNAs combine with amino acids?
S: Yes. They overlap them. Then amino acids emerge. Did they remain there after overlapping tRNAs? Well, I know they overlap tRNAs. Then, it moves away. Then this tRNA remains there, mRNA goes this way or tRNA goes out. Meaning, amino acid emerges over this. Afterwards, these amino acids are combined.

R: What happens to tRNAs?
S: tRNAs remains in the protein structure along with amino acids.

Even though the pre-service teacher knows that the duty of tRNA in protein synthesis is to bring amino acids, he/she still thinks that as a result of protein synthesis, tRNA and amino acids merge and become a part of the protein structure. In other words, the pre-service teachers believe that proteins are created by tRNAs, which are combined with amino acids.

Another alternative conception is that "three nucleotides brought by tRNA equal to an amino acid and protein are synthesized by lining these nucleotides across mRNA". The views of the pre-service teacher, who had the abovementioned conception, are as follows.
S: The ribosome reads mRNA. Then, the anticodons brought by tRNA read it once again. These are triple codes, which symbolize a protein. For instance, the "AUC" in mRNA is the code of a protein. 'When the ''TAG" in tRNA corresponds to it, a new protein is created, I don't remember the name of the protein. It must be melanin. You know, there are types of amino acids, I am talking about them. That's how they come together.
R: Is "TAG" trilogy an amino acid?
S: It is an amino acid. Yes.
R: What is the duty of tRNA here?
S: What was it called? It carries nucleotides.
R: To where does it carry nucleotides?
S: It carries them across mRNA.
R: So, does that mean when it brings three nucleotides, it also brings one amino acid?
S: Yes that is what it means.

The pre-service teacher believes that the structures, which consist of 3 nucleotides, are an amino acid. The expression of the pre-service teacher suggests that he believes protein is synthesized when tRNAs carry these structures and line them across mRNA.

3. Where is tRNA synthesized from?

Another alternative conception regarding tRNA, which were observed among the pre-service teachers, is related to "the structure which synthesizes tRNAs". Table 3 demonstrates the alternative conceptions related to this theme.

Table 3: Alternative conceptions of pre- service teachers about where is tRNA synthesized from?

Topics	Alternative Conceptions	
Where is tRNA synthesized from?	**3.1.**	tRNA is manufacture from the whole of a strand of DNA.
	3.2.	tRNAs are synthesized from mRNA.

One of the alternative conceptions observed in this theme assumes that "tRNA is synthesized through mRNA".

…"mRNAs come as triple codons. This slips inside the ribosome until it comes across the stopper codon. mRNA slips. tRNAs are synthesized through mRNAs. Afterwards, a peptide bond is created between tRNAs.
From this expression of the pre-service teacher, it can be inferred that he/she thinks tRNA is synthesized by mRNA.

Another alternative conception is demonstrated as follows:
S: tRNA obtains the codes from DNA.
R: How does tRNA obtain the code from DNA?

S: tRNA takes one of the DNA strands and modifies it according to itself. There is urasil instead of thymine.. For instance; A C T.
R: Why do you draw them as triplets?
S: As triple codes.
R: Is tRNA only produced from this triple code?
S: No, it is produced from all of it.

This expression suggests that the pre-service teacher thinks tRNA is produced from the whole of a DNA one strands.

4. The structure and location of tRNA

Another alternative conception regarding tRNA, which were observed among the pre-service teachers, is about the Structure and Position of tRNA. Table 4 presents the alternative conceptions related to this theme.

Table 4: Alternative conceptions of Pre- service teachers about the structure and location of tRNA

Topics	Alternative Conceptions	
The structure and location of tRNA	**4.1.**	tRNA consists of 3 nucleotides.
	4.2.	tRNAs are connected to each other with peptide ties.
	4.3.	tRNA is in the ribosome.

One of the alternative conceptions about this theme supposes that "tRNAs are interconnected via peptide bonds".
…"mRNAs come as triple codons. This slips inside the ribosome until it comes across the stopper codon. mRNA slips. tRNAs are synthesized through mRNAs. Afterwards, a peptide bond is created between tRNAs.
Considering the expression of the pre-service teacher, it can be inferred that he/she assumes tRNAs are interconnected via peptide bonds.

CONCLUSIONS AND DISCUSSION

In consequence of this research, which was conducted so as to determine the alternative conceptions for tRNA and its role in protein synthesis, teacher candidates were found to have several alternative conceptions. The relevant categories and codes are shown in Tables 1,2,3,4.

Although the pre-service teachers knew tRNA as the carrier RNA, they could not comprehend its function in relation to protein synthesis accurately, and put forward various alternative views. Accordingly, they perceived tRNA as a strand of DNA in protein synthesis, or as a structure responsible for carrying such things as the code received from DNA and nucleotides. Moreover, some of the candidate teachers held the view that protein was synthesized in consequence of tRNA's emergence with amino acids, and thus it was included in protein structure. Apart from that, some thought that tRNA brought about protein synthesis by arranging the nucleotides brought by tRNA opposite mRNA or rRNA. Another misunderstanding commonly seen among the pre-service teachers was about where tRNA was synthesized from. Mostly it was thought to be synthesized from the whole of a DNA strand whereas some thought it to be synthesized from mRNA. As to the structure of tRNA and its location, it was found that some believed that tRNA was composed of 3 nucleotides and that they were connected through peptides ties, and that they were located in ribosome.

One of the most significant reasons for the formation of alternative concepts concerning the topic was that the pre-service teachers could not grasp the concepts of DNA and gene accurately. A couple of studies carried out in the past made it clear that pre-service teachers had limited understanding in relation to the structure, functions and location of genes (Lewis, Leach & Wood-Robinson, 2000). Another reason was that DNA was drawn as two lines and both mRNA and tRNA were represented in

accordance with the nucleotides in a DNA strand, due to its practicalness in teaching. The tRNA or mRNA produced in the drawing is usually the same length as a strand of DNA; a case which may result in pre-service teachers' believing that tRNA is synthesized from the whole of a strand of DNA.

Still another reason for misconception regarding tRNA was overemphasis laid on base matches in the issue of protein synthesis. Due to test questions (as in university entrance exam, ÖSS) about the base arrangement in mRNA and in tRNA according to the base arrangement in DNA, pre-service teachers think about the order bases are arranged opposite a strand. In consequence, they think that tRNA is composed of mRNAs, or that they comprise proteins by forming a series opposite mRNA, which is wrong. Besides, since tRNA is a carrier, they wrongly think that single or triple nucleotides are carried by tRNA opposite a single mRNA strand. In brief, pre-service teachers consider it necessary to put a second strand opposite a strand owing to the fact that base matches are overemphasized in teaching. In other words, this overemphasis may lead to the belief that protein synthesis occurs only through such base matches, which in turn may result in pre-service teachers' forming alternative conceptions for tRNA as in other matters of protein synthesis. Moreover, the main actions and structures in protein synthesis are overlooked due to pre-service teachers' over engagement with the details of base matches.

Alternative conceptions in relation to tRNA as in other subjects of biology were detected among pre-service teachers. Unless these misconceptions are corrected, they will probably transfer those misleading thoughts to their pre-service teachers in their future teaching career (Soyibo, 1993). Hence, the alternative misconceptions held by pre-service teachers must be determined and removed immediately.

The different alternative concepts determined about the tRNA concept prevent student and teacher candidates from correctly perceiving protein synthesis. Therefore, alternative conceptions on tRNA as well as on other issues of biology should be determined and rapidly corrected.

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BIODATA AND CONTACT ADRESS OF AUTHOR

Dr. Mehmet YAKIŞAN is an Assistant Professor in in the Department of Mathematics and Science Education, Biology Education Department at Education Faculty, Ondokuz Mayıs University. He interested in biology education, especially; alternative conceptions, conceptual change and metacognition.

Assist. Prof. Dr. Mehmet YAKIŞAN
Ondokuz Mayıs University, Faculty of Education,
Biology Education, Samsun, Turkey
E. Mail: yakisanm@gmail.com

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DEMOGRAPHIC FACTORS ASSOCIATED WITH PROBLEMATIC INTERNET USE AMONG TURKISH UNIVERSITY STUDENTS

Dr. Canan GÜRSEL
Gazi University Faculty of Education Ankara- TURKEY

Abstract
This study aims to examine the relationship between problematic internet usage and some demographic features among university students. Data was gathered from 342 female (63 %), 200 male (37 %), in total 542 university students. The Online Cognitive Scale (OCS) and Demographic Information Form were used for collecting the data. The time of connecting to internet was mostly at evening and the average of connection time was 0-9 hours per week. There were differences between the means of social comfort, loneliness/depression, diminished impulse control and distraction subscales of OCS according to gender and the age of onset of connecting to internet. Also, a high correlation coefficient was found between the frequency of internet use and the OCS. Females and males differed significantly in their use of internet as regards to the reasons. Internet usage changed according to the subjective evaluation of academic performance of students.

Keywords: Internet addiction, problematic internet use, internet.

INTRODUCTION

Internet continues its rapid growth all over the world. It offers an enormous data base and a great number of web pages with a wide scope of information from many resources. Many people use the Internet without having negative consequences. It is used for communication, information gathering, academic search, and entertainment. As internet access has become widespread, so have reports of its misuse. Some people becoming preoccupied with the internet, are unable to control their use and this causes some problems in their lives. Excessive or inappropriate use of the internet has been the matter of increasing attention in the literature (Lu, Wang, & Huang, 2010; Ni, Yan, Chen, & Liu, 2009; Young, 2012).

Although, the earliest reports about the phenomenon of excessive use of computer dated back to the 1970s, it was not until early 1990s that reports began to appear in the medical and psychological literature. Ivan Goldberg with a joke first proposed in 1995 that Internet addiction may be considered a disorder, and since that time many researchers used the term "internet addiction disorder" (Tao, Huang, Wang, Zhang, & Lie, 2010). Young (1998) suggested a set of criteria for diagnosing this problem based on DSM-IV criteria for pathological gambling. She proposed that internet addiction is very similar to pathological gambling which is addictive in nature (Young, 2004). Because researchers have not come to any agreement on terminology, a variety of terms has been used to describe this behavior (Chakraborty, Basu, & Kumar, 2010; Karim & Chaudhrie, 2012; Yellowless & Marks, 2007). Some investigators have linked internet addiction to addictive disorders, alongside alcohol and drug use disorders. Others have linked internet addiction to obsessive-compulsive disorders or to the impulse control disorders (Shaw & Black, 2008). Thus, for example, in the case of addiction to the internet, "internet addiction" (IA), "internet addiction disorder" (IAD), "pathological internet use" (PIU), "unregulated internet usage" and "excessive internet use "are a few terms used in the earlier literature (Carbonel, Guardiola, Beranuy, & Belles, 2009; Weinstein & Lejoyeux, 2010).

Internet addiction appears to be a relatively common behavioral addiction, the prevalence of which has been estimated to range from 1% to approximately 14% (Tao et al., 2010). In Europe, the prevalence has been reported to range between 1% - 9%. (Cristakis, Jelenchick, Myaing, & Zhou, 2011). Looking at the results of research findings on its prevalence rate, internet addiction ranges

between 2.4 % to 6.44% in Chinese adolescent (Cao & Su, 2006; Ni et al., 2009; Weinstein et al.,2010), 8.2% among Greek adolescents (Siomos, Dafoli, Braimioti, Mouzas, & Angelepoulos, 2008), less than 2% among Finnish adolescents(Heino, Lintonen, & Rimpela, 2004), between 5.1 - 11.6% among Turkish high school students (Canan, Ataoglu, Nichols, Yıldırım, & Ozturk, 2010; Kelleci & İnal, 2010), 4.6% among Australian university students (Thomas & Martin, 2010) and 2.9 – 6.3 % among Korean high school students (Jang, Hwang, & Choi, 2008), it varies from 3.8% to 30% among Iranian students (Alavi, Alaghemandan, Maracy, & Jannatifard, 2012; Ghassemzadeh, Shahraray, & Moradi, 2008). There is currently an increase in computer use and they have access to internet in flexible time schedules. University students use the internet very frequently for various purposes, such as preparing assignments, searching information, communicating with others, and having fun. In particular, people spend more time online and the quality of their social and individual life, as well as their academic or working careers (Ferraro, Caci, D' amico, & Blasi, 2007).

A number of differences have been found to exist between those who use the internet in a healthy way and those who do not. Pathological users would be more likely than others to use the internet for more reasons overall and to use the internet recreationally (relaxing, gambling, playing games, wasting time, using adult-only resources) socially with no-real-life contacts (meeting new people, talking to others with the same interests), and for emotional support (Morahan –Martin & Schumacher, 2000).

Internet addiction is dealing with underlying psychological mechanism like problematic relationships, existential or identity crises, anxiety, academic difficulties or work problems. Online activities help the person avoid disturbing thoughts and negative feelings. Many research findings show that young users are more at-risk subjects for internet addiction than adults. Internet use is the highest in the 16–24 age groups, and early exposure to the internet increases the risk of problematic internet use (Kandell, 1998; Öztürk, Odabasıoglu, Eraslan, Genç, & Kalyoncu, 2007). It is the critical time of social and emotional development. When problematic internet use rises, academic self-efficacy declines. Drinking, dissatisfaction with family, and experience of recent stressful event are potential risk factors leading young people to internet addiction (Lam, Peng, Mai, & Jing, 2009; Odacı, 2011). Certain factors such as use habits, newsgroup, e-mail services, game playing, chatting, and demographics are predictors of internet dependence.

Some studies suggest that there are several differences between boys and girls in terms of the risk of internet addiction. Female adolescents typically use online networking for enhancing communication and sharing information via instant messaging, chatting, and visiting personal websites. However, male adolescents mainly use online networking for playing online games. Internet addiction appears to have male preponderance (Hyun, Han, Lee, Kang, Chung & Renshaw, 2015; Siomos et al., 2008). Tutgun, Deniz, & Moon (2011), compared the problematic internet use of Turkish university students with South Korean university students. Turkish university students reported that they spend more time for chatting and meeting with new people than South Korean counterparts. The fact that male students in Turkey tend to use internet at problematic levels more in comparison with females may be the result of the excessive times they spent in internet with the purposes of chatting and meeting with new people. Ceyhan's (2011) findings revealed that Turkish university students' levels of problematic internet use differed significantly with respect to their basic internet use purposes. The results showed, in terms of the basic internet use purpose, that the problematic internet use levels of university students who " use the internet for entertainment purposes" and of those who " use the internet to establish social relationships with unfamiliar people" were significantly higher than that of those who "use internet to obtain information". He claimed that the use of internet for entertainment and social interaction constitutes an important risk factor for the emergence of the problematic internet use symptoms.

Many researchers reported that both internet usage time and the internet hourly usage , indeed, are important signs of problematic internet usage (Ferraro et al.,2007). They found that people spending a high amount of time online (11 hours and above per week) obtain higher internet addiction scores.

In addition, their results put forth that nightly chatters are more at risk than daily chatters for developing internet addiction disorder. They say nightly users are more at-risk subject for developing an internet addiction disorder, diminishing their individual living quality and disabling their time control.

Internet is an immensely important technological, social and communication tool, and it is changing our daily lives. Predictably, it should be associated with different kinds of human responses which are positive as well as negative ones. Beard (2005) comments that mental health professionals need to be aware of the growing problem, commonly called "internet addiction," and the role that we can take in addressing problematic internet use and abuse. Difficulties with this new technology should be examined in a proactive manner instead of waiting for the crisis to occur and then "picking up the pieces." Introducing new technology and simultaneously using psychology to counteract negative effects may lessen the onset of difficulties and the development of crises. The effective strategies for preventing internet addiction of young population are related to the risk focused approach, which requires the recognition of the factors concerning addiction. The risk focused approach to internet addiction needs the identification of factors to develop appropriate preventive interventions for persons at the risk of internet addiction.

In view of the explanations made above and the earlier literature concerning internet use, this aimed to examine the relationships between problematic internet use, and some demographic features of online experiences of Turkish university students. Thus, the development of preventive interventions can be specified.

METHOD

Participants

A cross sectional descriptive study was conducted to examine the factors associated with problematic internet use. In the framework of this research, the problematic internet use term was preferred for any kinds of pathological or addictive online activities. The sample included 200 (37 %) male and 342 (63 %) female in total 542 undergraduate students. The mean age of the sample was 20.79 ± 1.73 with a range from 18 to 26 years. The socio-demographic features and online experiences of the students are shown in Table 1.

The data collection materials were distributed to the participants while they were in attendance of required course. The participants completed the questionnaires after the researchers had explained the purpose of the study. The consent of the participants was taken and their confidentiality was assured. All students were also ensured that they were free to refuse if they did not want to answer the questions.

Measures

The Sociodemographic Information Form: The basic information form was used to collect demographic information relating gender, age, having their own computer, the age of their first personal computer, the age of onset of connecting to internet, the frequency of computer use, the amount of hours spent, the time of the day they mostly use internet, and the reason for using internet.

Online Cognition Scale (OCS): The OCS is a 36-item questionnaire that measures problematic internet use. It was developed by Davis and adopted to the Turkish population by Ozcan and Buzlu (Davis, Flett, & Besser, 2002; Ozcan & Buzlu, 2005). This scale evaluates the problematic internet use and particularly focuses on cognitions rather than behaviors. It is also adapted from related measures of procrastination, depression, impulsivity and pathological gambling. The respondents rate agreeableness on a seven-points Likert scale. The OCS comprises four subscales: loneliness/depression, diminished impulse control, social comfort, and distraction. Additionally, the

OCS can be scored as the total measure of problematic internet use. As the scores of the scale rise, the problematic internet use behaviors increase (Davis et al., 2002).

In the current study, a high internal consistency was found, as a total measure of problematic internet use (α=0.97) and for each of the four subscales: social comfort (α= 0.93), loneliness/depression (α= 89), diminished impulse control (α= 0.88), and distraction (α= 0.86).

Procedures
The questionnaires were administered to the participants by lecturers while they were attending their compulsory course. The lecturers informed the participants about the questionnaires and gave the necessary directions.

Analysis
The relationship between the scores of OCS sub scales and frequency of internet use were investigated by computing the Pearson correlational analysis. The difference between means of OCS subscales according to gender was compared through t-test. The difference of OCS and subscales and subjective evaluation of academic performance, and weekly internet use hours were tested by computing one-way Anova. Chi –square was conducted to determine the relationships between the reasons of internet use and gender. SPSS 16.0 statistical software program was used for statistical analysis.

FINDINGS

The results of Socio-demographic Information Form and the Online Cognitive Scale are presented in Table 1. As a reminder, the proportion of females (63%) is higher than that of males (37%), the number of female participants were higher than males.

Of the whole sample, 71.8% reported that they had their own computer. Among these users, 38.9% stated they had used computer firstly at the ages of 5-15 years, whereas 32.5% had used it firstly at the age of 16-24. The results indicated that 74.6% of the students connecting to Internet firstly 5-15 years. The frequency of connecting to internet was 40.4% for occasionally, 39.9 for daily and 11.6% for every other day. Students were connecting to internet most often at the evening (62.4%). The reported hours of internet use at most were 0 to 9 per week.

Table 1: Socio-Demographic Features and Online Experiences of the Students

Variables (n=542)	**n**	**%**
Gender		
Female	342	63
Male	200	37
Academic performance		
Good	216	39,9
Average	287	53
Poor	32	5,9
missing	7	1,2
Having own computer		
Yes	389	71.8
No	151	27,8
missing	2	0,3
The age of first having a computer		
5-15	211	38,9
16-24	176	32,5
Not Stated	155	28,6

The age of onset of connecting to internet		
5-15	404	74.6
16-24	84	15,5
25 +	1	0,2
Not Stated	52	9,7
Frequency of computer use		
Never	6	0,1
Rarely	34	6,3
Occasionally	219	40,4
Every other day	63	11,6
Daily	216	39,9
Not stated	4	0,7
Weekly hours online		
0-9 hours	331	61,1
10-19 hours	95	17,5
20-29 hours	54	10
30-39 hours	23	4,2
40 and +hours	29	5,4
Not stated	10	1,8
The time of the day the most often use		
At morning	28	5,2
At noon	53	9,8
At evening	338	62,4
At night	37	6,8
Not stated	86	15,8
Reasons for internet use		
Connecting Facebook	107	19,7
Searching academic studies	104	19,2
Communicating with friends	47	8,7
Watching video or film	29	5,4
Connecting E-mail	26	4,8
Reading newspapers	21	3,9
Playing games	12	2,2
Using Twitter	3	0,6
Other	3	0,6
Not stated	190	35,1

The reasons of internet use were generally for social contact (communicating with friends, connecting Facebook and e-mail, and using twitter) and for searching academic studies. But a large part of the students (35.1%) did not report their reason of internet use. As a result of the bivariate analysis, a positive correlational coefficient was found between the frequency of internet use and the scores of total Online Cognition Scale and subscales ($r=.112$, 0.10; $p<.01$). It indicated that students who used internet frequently had higher OCS scores.

An independent sample t-test was conducted to determine the difference between the means of social comfort, loneliness/depression, diminish impulse control and distraction subscales of OCS and total scores of OCS according to gender. The results indicated that male students have significantly higher level of social comfort, loneliness/depression, diminish impulse control / distraction and problematic internet use than female students ($t=-3.78$, $p<0.0001$; $t=-3.31$, $p<0.001$; $t=-3.43$, $p<0.001$; $t=-3.15$, $p<0.02$; $t=-3.68$, $p<0.0001$; respectively).

In addition, the reasons of internet use were investigated according to gender. The female and male participants differed significantly on internet usage reasons (χ^2=20.365, p=0.000). The female students use internet for connecting friends with Facebook (54.6%), searching for academic studies (33.5%), watching video or films (7.3%), reading newspapers (3.7%), and playing games (.9%), whereas the male participants use internet for connecting with friends (49.2%), searching for academic studies (23.1%), reading newspaper (10.0%), playing games (10%), and watching video or films (7.7%).

The analysis revealed that there was a difference between the subjective evaluation of academic performance, and the total scores of OCS and subscales. The students who had evaluated their academic performance as poor ($\bar{x}$=35.81) use internet mostly for social contact in comparison with those who evaluated academic performance as good ($\bar{x}$=26.43). On the other hand, the average academic performance, as subjectively stated by the students, OCS subtest scores on loneliness/depression ($\bar{x}$=14.44), diminish impulse control ($\bar{x}$=25.27), distraction ($\bar{x}$=20.26), and problematic internet use ($\bar{x}$=92.51) higher than good academic performance ($\bar{x}$=11.35, $\bar{x}$=20.70, $\bar{x}$=17.11, $\bar{x}$=75.59; respectively).

In the analysis, the students who use internet less than 10 hours were evaluated as low risk group, the students whose internet use hours range from 10 to 29 hours were evaluated as average risk group, the students who use internet more than 30 hours were evaluated as high risk group. The results showed that there was a significant difference between weekly internet use hours and the total scores of OCS and except social comfort subscales (F=2.692, p=.069; F=4.932, p=.008; F=6.038, p=.003; F=5.674, p=.004; F=4.961, p=.007; respectively). The low risk group's mean score ($\bar{x}$=12.16), was lower than the average risk group's mean score ($\bar{x}$=14.47) with respect to loneliness/depression subscales. On the other hand, the low risk group's mean score ($\bar{x}$=21.76) was lower than high risk group mean scores ($\bar{x}$=27.57) in diminish impulse control. The low risk group's mean score ($\bar{x}$=17.77; $\bar{x}$=80.31) was lower than the average mean ($\bar{x}$=20.30; $\bar{x}$=91.68), and the high risk group's mean score ($\bar{x}$=21.96; $\bar{x}$=99.51) in both the distraction subscales and total score of online cognition scale.

DISCUSSION AND CONCLUSION

Discussion

This study primarily focused on exploring the internet usage behaviour and some demographic features of Turkish University students. Our results indicated that most of the students have begun to use the internet at an early age. Earlier exposure to the internet is a risk factor for students to have internet addiction (Ni et al., 2009). In addition, adolescents who use internet every day or more than 20 hours per week are at higher risk of internet addiction(Ko, Yen, Yen, Lin, & Yang, 2007).

The results revealed that the frequency of connecting to internet was occasionally (40.4%) and daily (39.9%) and the majority of the students use internet frequently. But, again it is seen that most of the students (61.1%) use internet average 0-9 hours per week. It can be interpreted that these students net-surfing activities are not addictive. On the other hand, of the whole sample, 9.6 % reported that they use internet 30 hours and over. It is important to highlight that even these students are using the internet only an average of 4.5 hours per day. If the students using internet for 40 hours and over are taken as risk group, they would be online an average of 5.7 hours per day. Although, there are some responsibilities like attending the courses, doing homework or project, other daily social activities and basic physical needs (sleep, eating, primary care) for the students, 5.7 hours and over are excessive time consumption spent in front of internet.

Furthermore, the students were connecting to internet most often at evening. Similar to this result, Ceyhan (2008) stated that connecting to internet most often at night is the predictor of the level of problematic internet use of the students. Night is long and free time, there is less responsibilities than daily activities. Students use a computer to spend the time instead of devoting to sleep at night or

having face to face relations with friends or relatives. Therefore, students who are online at night may use internet more problematically.

As the students' online activities increase, their success level will decrease. Therefore, the amount of being online a week and academic performance are taken together for evaluation. The results stated that average and high risk group has more problematic internet use than low risk group. Consistently with this finding, according to subjective evaluation of academic success, the average academic performance group experience high loneliness and depression, low impulse control, low level of attention and more problematic internet use. In contrast to high academic success group, low academic performance group uses internet as a tool of social comfort. The results were somewhat consistent with those of Morahan-Martin & Schumacher (2000) study of college students. Academic self-efficacy and academic procrastination can act as the predictors of problematic internet use among university students. This means that as problematic internet use rises, academic self-efficacy declines (Odacı, 2011).

When we look at the gender difference, the male students' internet use is more problematic than the female ones. Additionally, males who connected internet experienced more social comfort, loneliness, depression, low level of impulse control, distraction and total score of problematic internet use than females. According to the OCS results, males use internet to get social comfort. In parallel with this, it was found that the reason of internet use of male students was to get social contact, female students have the same reason for using internet and they also use internet for this purpose more than male ones. The rate of social contact is changing, but the order of reasons of internet use does not change. In this study, the OCS results and reasons for internet use were taken together, it can be stated that both gender reported the same reasons for internet use: connecting Facebook and e-mail, and using twitter. Social media can provide benefits to users by satisfying their personal, functional and social needs. Males and females are using social media for different reasons to satisfy their needs. For example, females tend to use social media more to communicate with friends while males may use social media for the product purchases and attain information, do sports and play game (Lim, Lim, & Heindrichs, 2014; Yeh, Ko, Wu, & Cheng, 2008).The other possible reasons may be when lack of social support, students have a higher tendency to explore online. There was another significant finding about the reason of internet use according to gender. Males use internet to play games more than females. Generally, playing games is a male interest. Therefore, males may be more prone to pathological use because they are more likely to use applications for internet games (Morahan-Martin et al., 2000). Also, males use the internet for downloading activities more frequently for longer duration than females (Teo, & Lim, 2000). Moreover, different studies suggest that the excessive use of social networks and the internet are related to propensity for depression, being less assertive, the impoverishment of social relationships, decreased academic performance (Vilca & Vallejos, 2015). As a reason of connecting to internet, males and females reported to make academic studies. But females use internet to search academic studies more than males. This finding can be related with academic performance. Females who use internet for academic studies (to scan resources for project or any academic knowledge acquisition) would have high academic performance.

Conclusion

In the light of results, this study suggests that problematic internet usage is not rare among Turkish university students. In addition, some psychological features like loneliness/depression, diminish impulse control, distraction and social comfort differentiate problematic internet user from others. In addition, some gender differences are obvious for problematic usage. Both genders internet usage aims are similar but males are more tend to internet use problematic than females. Poor academic achievement, evening internet usage and weekly hours of being online were important factors about problematic internet use. Identifying the protective and risk factors for problematic internet use in order to develop some preventive strategies has significant implications for young students' mental health. The internet use problem among university students should be intervened as early as

possible. Preventive efforts should be made to increase problem solving skills and providing alternative ways of socialization rather than internet use for the students.

But, there are some limitations in this study such as cross-sectional design, reliance on self-report measures and sample size. But the present study is the first step for a comprehensive research study about problematic internet use among the university students.

BIODATA AND CONTACT ADDRESS OF AUTHOR

Dr. Canan GÜRSEL is a lecturer in the Faculty of Education at Gazi University. She got her Bachelor degree from the Department of Psychology in the Middle East Technical University (METU) in 1985.

She started to work in the Department of Forensic Psychology at the Forensic Medicine Institude of Ankara University as a research assistant in 1986. She completed her MA degree at Ankara University at the Department of Psychological Services in Education in 1988. She got her Ph.D. from the Department of Forensic Psychology from the Forensic Medicine Institude in 1997. In the same year she started to work as a psychologist in the Department of Child and Adolescent Psychiatry of Medical School of Ankara University. Since 2005, she has been the member of the department of Philosophy Group Teaching in the Education Faculty of Gazi University. She studied on Internet and cell phone addiction, child abuse and neglect, juvenile delinquency and special learning disability.

Canan Gürsel PhD, Lecturer, Gazi University
Gazi Faculty of Education, Social Sciences and Turkish
Education Department, Philosophy Group Teaching
Ankara- TURKEY.
E . Mail: canangursel@gazi.edu.tr

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ANALYSIS OF MATHEMATICS TEACHER CANDIDATES' CONCEPTUAL KNOWLEDGE RELATED TO SEQUENCES

Assoc. Prof. Dr. Abdullah Çağrı BİBER
Kastamonu University, Educational Faculty
Kastamonu- TURKEY

Assoc. Prof. Dr. Abdulkadir TUNA
Kastamonu University, Educational Faculty
Kastamonu- TURKEY

Abstract
The purpose of this study is to examine the conceptual knowledge of mathematics teacher candidates about the sequence concept. This research is a case study in which qualitative methods are adopted. The first phase of the study was conducted with a total of 45 teacher candidates taking the course of Analysis III. In this stage, the "Sequence Knowledge Test" consisting of four open-ended questions developed by the researchers was used as a data collection tool to examine the concepts of the teacher candidates about the sequence concept. In the second stage of the research, individual interviews were made with 8 teacher candidates selected from the sample in order to conduct an in-depth study on conceptual knowledge about the subject of the sequence. Content analysis was used to analyze the obtained data. As a result of the analysis of the data, important shortcomings were found in the concept knowledge of the teacher candidates.

Keywords: Mathematics education, conceptual knowledge, sequences.

INTRODUCTION

Concepts are the way in which objects or events that can be related to each other are separated into mental groups or categories. Concepts are at the center of ideas and some theoreticians think of concepts as "the smallest building blocks or units of thought" (Ormrod, 2006). The importance of concepts in the mathematics education process is well known. Hiebert and Carpenter (1992) likened the formation process of conceptual knowledge to a network structure and emphasized that conceptual knowledge can also be formed by this network structure. The formation of conceptual knowledge can be achieved through the internalization and association of mathematical knowledge (Hiebert & Lefevre, 1986). The level of conceptual knowledge is the level of knowing the concept of the student (Rittle-Johnson ve Koedinger, 2002; Star, 2002). According to Fennema and Franke (1992), a mathematics teacher with conceptual knowledge is able to understand the underlying concepts of operations, demonstrates the ability to perceive the relationships within concepts and is capable of establishing some relations between mathematical concepts and real life applications of concepts.

In our daily lives, making events, ideas, and objects into a sequence is the process of putting them in a logical sequence. In mathematics a sequence is the process of putting more mathematical concepts (polynomial, matrix, function etc.), especially "numbers". This process occurs in the form of indexing, such as the first term, the second term, ... Mathematically this process is looked at as a function and functions defined from the set of positive integers Z^+, to set of real integers R are called " sequence" (Argun, Arıkan, Bulut and Halıcıoğlu, 2014). The sequence is one of the most important building blocks of mathematical analysis. As can be seen from the above description, besides having the concept of the sequence, the concept of series is built on sequence, and the concept of integral is built on the concept of series. Because the sequence are special functions (Balcı, 2008), it is very important that the subject is understood especially by the students of the analysis course. The sequences is an invaluable opportunity for students with learning disabilities about their functions and

features. "If the sequence is a special function, what is the function? Does the sequence provide the conditions for functioning? What does convergence and limit in the sequence mean? Why is the limit only for $n \to \infty$ in the sequence defined? Are the known $\varepsilon - \delta$-techniques for limits in functions used in sequence? If so, how? What is the accumulation point? Why do not we talk about continuity in the sequence?" such questions provide important opportunities for teaching in the classroom to reinvestigate and reinforce knowledge of mathematical analysis. Moreover, the sequence is a rare subject that is prone to a real life based teaching model, which can be explained with everyday examples in analysis lessons. Also the working logic of computer programming (Basic, Logo, etc.) and some programs (Microsoft-Excel, Access, etc.) overlap with the sequences; therefore sequences are a very suitable subject for computer-aided instruction. Taken all this into consideration, it is seen how important and indispensable the "sequences" is, especially for high school and university level mathematics learners. Mathematics teachers sometimes say that learners have a significant learning difficulty about the concept of sequences. Despite this, however, there are no studies in the literature that examine students' learning difficulties and conceptual knowledge related to the sequences. Only in some studies it is seen that the sequences and series are in the upper order in the order of the subjects which are perceived as difficult by the students (Durmuş, 2004; Gurbuz, Toprak, Yapıcı and Doğan, 2011; Tatar, Okur and Tuna, 2008; Tuna and Kacar, 2005; Kutluca and Baki, 2009). In addition to these, Doruk and Kaplan (2013) examined the proof evaluation skills of elementary mathematics teacher candidates on the concept of convergence of sequences and Çiltaş and Işık (2012) examined the mental models of primary and secondary mathematics teachers' sequences and series. In other studies, concept difficulties related to sequence and series convergence were investigated (Akgün and Duru, 2007; Alcock and Simpson, 2004 ve 2005). Therefore, there is no example of a study in which conceptual information about sequence is examined and there is no example how the concept of sequence is perceived by math learners. Considering this lack of field literature and mathematical significance of sequence, this study aims to examine the conceptual knowledge of teacher candidate about sequence and so this study is thought to contribute significantly to the field literature. For this purpose, in this study, probing answers were searched as "how do the teacher candidates describe the sequence?"

METHOD

Model of study

This study aimed at examining the conceptual knowledge of mathematics teacher candidates about sequence is a case study in which qualitative methods are adopted. In the case study, an in-depth study is conducted focusing on an event, a case, an individual, or groups (Fraenkel & Wallen, 2000; Yildirim and Simsek, 2005).

Sample

Two different sampling methods were used in the selection of participants in the study. The study was first carried out with a total of 45 teacher candidates who were studying in the 3rd grade of Mathematics Teaching at a university in the north of Turkey in the fall semester of 2016-2017 academic year and who took the course of Analysis-III in the sequences-series topics. In this sampling selection a simple random sampling method has been adopted (Gay, Mills, & Airasian, 2006). As they have already taken the Analysis I and Analysis II courses (second grade), it is assumed that the participants have the necessary background knowledge on the sequences topic. In the selection of the participants in the second sample, the sampling method was adopted from the purposeful sampling methods (Patton, 2002). At this stage, individual interviews were conducted with 8 teacher candidates who gave incorrect answers to the items included in the data collection tool among the participants. In this way, it is aimed to conduct an in-depth examination of the conceptual knowledge of teacher candidates.

Data collection tool

In this study, the "Sequence Knowledge Test" consisting of four open-ended questions developed by researchers was used as a data collection tool to examine conceptual knowledge about the sequence

concept of teacher candidates. The suitability of the questions in the prepared data collection tool for the purpose of measurement and how much it represents the area to be measured, is determined according to the "expert opinion" (Karasar, 1995). Open-ended questions allow students to freely express their thoughts about the research topic, allow scientific ideas and concept knowledge of the students to be released (Bauner and Schoon, 1993). In addition, interviews were held with pupils who provided certain criteria among the teacher candidates who participated in the study in order to conduct an in-depth examination of conceptual knowledge on the subject of the sequences.

Analysis of Data

Content analysis was used to analyze the data obtained in the study. According to Patton (2002), content analysis allows a framing of the collected data, provides the concretization of this frame by coding and categorization. The answers given by the teacher candidates participating in the study to the items in the sequence knowledge test were examined in three categories; correct, incorrect and empty. The data were independently coded and analyzed by two researchers who were experts in mathematics education. The percentage of agreement between the researchers' coding according to the reliability study was 85% (Miles and Huberman, 1994). The incompatible items were re-examined and a consensus was reached. Descriptive statistical techniques (percentage / frequency) were used in the analysis of the data obtained from the relevant test. And the data obtained from the interviews carried out with the teacher candidates were interpreted by the phenomenological method. This method is particularly used in studies where learning differences and the causes of these differences are being investigated (Marton, 1994). Phenomenographic method focuses not on individual but on differences in how individuals understand concepts, how they understand and interpret them (Marton and Booth, 1997).

RESULTS

In this section, the questions in the " sequences knowledge test" included analysis findings of the answers given by prospective teachers and interviews with candidates who gave different answers. Some of the answers that are required due to the pattern of the research are presented as an example. The answers that the candidates gave to the questions in the Sequences Knowledge Test were categorized as "right", "wrong" and "empty" and the findings were evaluated according to the order of the questions.

The answers given to the items in the test to see how teacher candidates identify the sequences are analyzed in this section, and the findings are given in Table 1 and Table 2.

Table 1: Analysis of the Responses to the First two Items

Criteria	Questions		
	1(Definition)	1(Sample)	2
	f (%)	f (%)	f (%)
Right	23 (51)	16 (36)	14 (31)
Wrong	19 (42)	18 (40)	28 (62)
Empty	3 (7)	11 (24)	3 (7)

The answers to the item "What is the sequence? In short, describe and give a sample of the sequences from daily life.", which is the first part of the test used in the research, were analyzed in two parts. According to this, only 51% (n = 23) of the candidates gave the right, 19% (n = 42) gave the wrong definitions to the part of the item related to the definition of sequence and 3% (n = 7) left it empty. For the second part of the item, the proportion of those who could give suitable daily samples was reduced to 36% (n = 16), the rate of giving wrong samples was 40% (n = 18) and the nulls were 24% (n = 11). This indicates that candidates can not make the exact definition of the

sequence in their minds and it shows that candidates can not give proper examples of daily life related to the sequence concept, which is a sorting process, and can not practice theoretical knowledge. For example, some examples of incorrect answers given by students in this question are given in Figure 1.

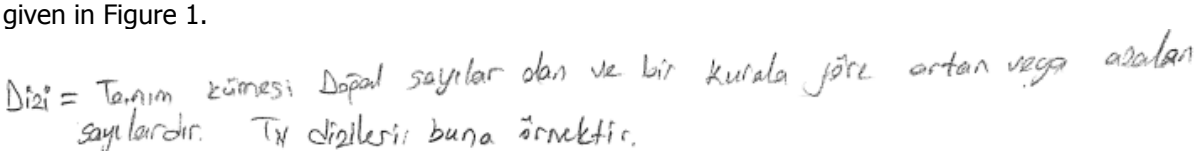

Figure 1-a: "Sequences: Numbers defined in the set of natural numbers and increasing or decreasing according to a rule. TV-sequences can be an example."

The interview made with the candidate teacher who answered in Figure 1-a is given below.
Researcher: Could you explain why you answer this question like that?
Teacher candidate: TV-series is also increasing, just like the sequences defined in mathematics.
Researcher: You said in the description that you gave "definition set of numbers with natural numbers". What does it mean?
Teacher candidate: I think the "numbers" expression is the element of a function's image set.
Researcher: Should a sequence be necessarily increasing or decreasing?
Teacher candidate: Actually you are right. There were also constant sequences, they are neither increasing nor decreasing, are they?

Here, the teachers candidate argue that the sequences must be increasing or decreasing. Therefore, it can be said that the candidate has formed the concept of sequences with such a relation in mind. However, he hesitates when he is told something different, indicating that he can not be sure of the conceptual knowledge he has about the sequences.

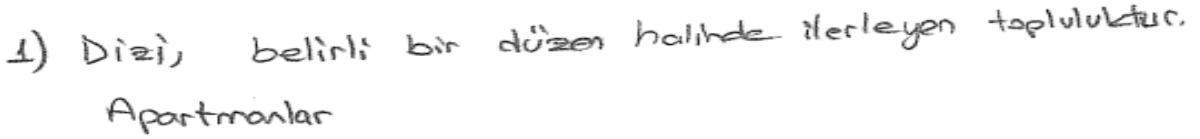

Figure 1b:"The sequence is a community that moves in a certain order. For example, apartments."

The interview with the student who answers in Figure 1-b is given below.
Researcher: Could you explain why you answer this question like that?
Teacher candidate: In the sequences there is always an order, a certain rule. That's why I answered that.
Researcher: Do we call everything "sequence" that has the rule?
Teacher candidate: The general term in the sequence is a rule.
Researcher: What is the rule in apartment buildings?
Teacher candidate: Each apartment has a number and these numbers go up?

It is seen that this teacher candidate is also associated with an increase in the sequence concept. Some features of the sequences (increasing, decreasing, constant) seem to lead to the definition of the concept.

When the answers to the second ranked item in the test "Draw a graph of the sequence $f(n) = n^2 - 4$ " are examined, it was seen that only 31% (n = 14) of participants did correctly, 62% (n = 28) misdrawled and 7% did not draw. When the false answers given to this question were examined, it was seen that almost all of the participants had drawn a graph of a function defined in the R-real numbers.

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Figure 2a: The interview with the student who answered the question in Figure 2-a is given below.

Researcher: What do you think about drawing the graph here? Can you briefly tell me?
Teacher candidate: $f(n)=n^2-4$ this is a parabola equation, the wings up and focus point is $(0,-4)$.
Researcher: What is the sequence? Could you give me a mathematical definition?
Teacher candidate: The sequences are functions whose definition set is positive integers.
Researcher: Is not there a mistake in your drawing according to your description?
Teacher candidate: Of course! There will not be a left side in the chart, right?

In the case of the above interview, it is understood that the teacher candidate sees the sequence as a function whose definition set is a set of real numbers. Moreover, despite the fact that the researcher draws attention to the fault, the fact that the candidate still can not answer correctly shows that the candidate does not correctly understand the concept of sequence in his mind.

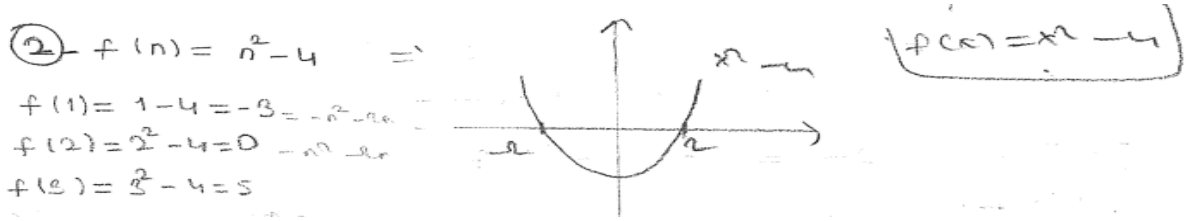


Figure 2b: The interview with the student who answers in Figure 2-b is given below.

Researcher: What do you think about drawing the graph here? Can you briefly tell me?
Teacher Candidate: I found the X-axis cut points, i thought of it as a parabola and i drew it.
Researcher: On the left side you find the values of function 1, 2 and 3, why did you do it?
Teacher Candidate: Because the sequence are defined in positive integers.
Researcher: Why do not you just mark these points in the coordinate system when you draw drawing?
Teacher Candidate: Because these points would not be enough for the parabola image.

Again, in this example, although the candidate has correctly given the mathematical definition of the sequence concept, it appears that it does not take this definition into consideration.

Table 2: Analysis Of The Answers To The Third And Fourth Questions

Criteria	Questions		
	3 (Arithmetic sequence)	3 (Geometrical sequence)	4
	f (%)	f (%)	f (%)
Right	19 (42)	19(42)	0 (0)
Wrong	15 (33)	16 (35)	43 (96)
Empty	11 (24)	10 (22)	2 (4)

The answers to the third item "Give some examples for arithmetic and geometric sequence from daily life" are analyzed in two parts. According to this, for arithmetic sequence examples only 42% of the

candidates (n = 19) were right, 33% (n = 15) gave the wrong samples and 11% (n = 24) left the item empty. For the second part of the item, the rate of giving geometric sequential daily life samples is again 42% (n = 19), while the false sample is 35% (n = 16) and the nulls are 22% (n = 10).

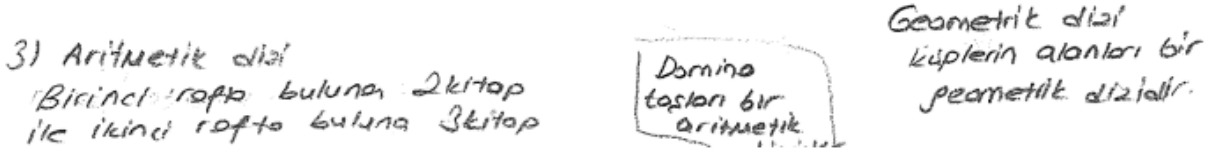


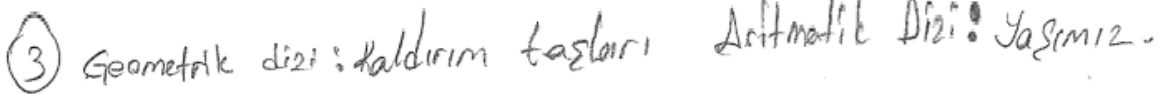
Figure 3a:"Arithmetic sequence: 2 books for the first shelf, 3 books for the second shelf and so on, domino stones form an arithmetic sequence.

Geometric sequence: The cubic field is a geometric sequence "

The interview with the student who answers in Figure 3-a is given below.

Researcher: Could you explain the example you gave for the arithmetic sequences?
Teacher Candidate: I wanted to give an example of books on the shelf for arithmetic sequences. 2 for the first shelf, 3 for the second shelf, and so on. Also in the dominoes, the numbers increase one by one.
Researcher: Could you explain the example you gave for the geometric sequences?
Teacher candidate: We saw in the lessons, nested cubes. These are geometric sequences.
Researcher: Where do the nested cubes form the geometric sequences?
Candidate Teacher: The areas of the cubes placed inside form the geometric sequence.

As you can see in the example above, the candidate is constantly associating the arithmetic sequences with an increase and it is also noteworthy that the examples given in increase especially one by one. Looking at the example given for the geometric sequence, it is understood that the candidate is not sure of the geometric sequence knowledge.



Figüre 3b: "Geometric sequence: Pavement Stones Arithmetic sequence: Our age"

The interview with the student who answered as in Figure 3-b is given below.

Researcher: Could you explain the example you gave for the geometric sequence?
Candidate Teacher: Pavement stones have geometric shapes.
Researcher: Could you explain the example you gave for the arithmetic sequence?
Teacher candidate: In the case of age, only numbers are used.
Researcher: Do we use geometric sequence in the case of geometry?
Teacher candidate: Yes, because we need to do geometric calculations.

This example clearly demonstrates that the conceptual knowledge of mathematics learners should be examined. Here it appears that the candidate has identified concepts with their names. It is understood that the candidate sees the arithmetic sequence as a sequence where arithmetic operations can be performed, and the geometric sequence as a sequence containing the geometric order.

None of the answers to the last item in the form of "Find the general term of a sequence $(a_n) = \{1, 1/2, 1/3, 1/4, 1/5, ...\}$ " can not be judged correctly, almost all 96% (n=43) of the answers are wrong. The rate of those who leave this item is 4% (n = 2).

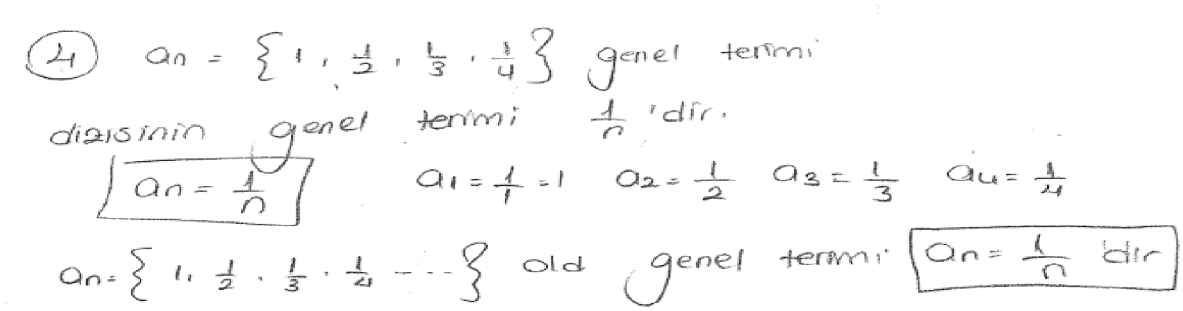


Figure 4a: The interview with the student who answered as in Figure 4-a is given below.

Researcher: From the first four terms, you have come to the general term. Can not the fifth term be based on a different rule?
Teacher Candidate: How would it be? It probably will not be different, i suppose the fifth term would be 1/5, I guess.

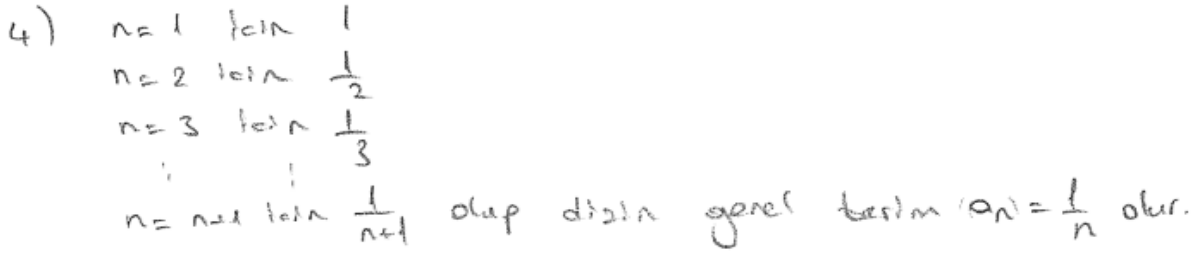


Figure 4b: The interview with the student who answers as in Figure 4-b is given below.

Researcher: From the first four terms, you have come to the general term. Can not the fifth term be based on a different rule?
Teacher Candidate: Could it be? I do not think so, but in such questions the first few terms are given and there is a general term. There is the same thing here.

As can be seen in the two examples given above, candidates think that the general term of the sequence can be found by knowing several terms of the sequence.

CONCLUSION AND DISCUSSION

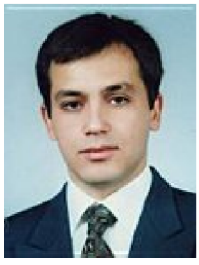
In this study, the conceptual knowledge of teacher candidates about the sequence was examined. According to the findings of the research, it is possible to reach the following conclusions about the concept knowledge of the candidates on the sequence;
Candidates were able to give a mathematical description of the concept of the sequence (51%), but it was found that candidates were given difficulty (36%) to give daily examples of the sequence. It is seen that the majority of the teacher candidates who give the wrong conceptual definition, are associated the sequence with an increase or decrease. It can be said that this association is dominant in the examples given by teacher candidates about the sequence. Similar conclusions about the difficulties involved in the transfer of mathematical knowledge into daily life are evident in the work of Koirala and Bowman (2003), Guberman (2004) and Moschkovich (2007). The fact that the percentage of correctly drawn participants in the test is low (31%) gives important ideas about candidates' knowledge about the concept of the sequence. Candidates see the sequence as a continuous function defined in the set of real numbers and make their drawings accordingly. The drawings are usually meant to include a set of definitions $R^- \cup \{0\}$, and graphics are often curves, not dot clusters. This suggests that candidates do not bring the sequence definition into their minds. In fact, it has been shown in many studies that students generally have difficulties in graphical drawing (Capraro, Kulm and Caproro, 2005, Shah and Hoeffner, 2002, Uyanik, 2007).

It has been seen that the teacher candidates generally regard the arithmetic sequence as consecutive number sequences, because in the examples it has been determined that the difference between successive terms is often one. It can be said that candidates often give examples of pattern samples for arithmetic sequences or sums of sequences, because of their misperception about the concept of arithmetic sequence.

When looking at the examples given for geometric sequences, it is seen that the samples often overlap with the sequences of samples solved in the courses such as "finding the way from the given height to the left of the dropped ball" or "finding the sum of the geometrical properties of the shapes that are nested and that are getting smaller or bigger in a certain rate ". Apart from these, the lack of different examples about geometric sequences shows that the teacher candidates have difficulty in transferring the information they have seen in the course to daily life. Studies show that teachers do not have a connection between the mathematical topics in university education and the topics they teach in their schools (Wu, 1999). Again, Soylu and Soylu (2006), in the study of students' problem solving processes, concluded that students could not apply the mathematical concepts or definitions they learned in the course. According to Galbraith and Stillman (1998), while secondary school students know mathematical formulas by heart, they do not understand the concepts, so they have difficulty using their knowledge to solve real-life problems. With the studies mentioned here, it is seen that these research results emphasize similar points. For this reason, one of the priorities of the instructors who teach mathematics teacher candidates in the education faculties should be to create environments that will enable the teacher candidates to understand the nature and basic characteristics of mathematical concepts. Moreover, it is striking that most of the samples given by the candidates are geometric shapes. This indicates that the candidates have attached meaning to the concepts by associating them with only their names.

It is quite striking that no candidate can respond correctly to the last item in the information test, " Find the general term for the $(a_n)=\{1,1/2,1/3,1/4,1/5,...\}$ " However, the general term of only a few terms known sequences, can not be determined. Here, the first five terms of both of the $(1/n)$ and $((n-1)(n-2)(n-3)(n-4)(n-5)+1/n)$ sequences are this form $\{1,1/2,1/3,1/4,1/5\}$. However, these are two different sequences, also there are other examples for sequences that have this first five terms (Balcı, 1996). However, the sixth terms of these two sequences are $1/6$ and $721/6$, respectively. This is an important aspect of sequences, but none of the candidates have unfortunately paid attention to it. It is understood that the candidates here are only trying to find the general term by focusing on the rule. Parallel to this situation, according to Sevimli (2009), argues that rule-based learning is more dominant in the analysis courses, and account-based approaches are adopted.

BIODATA AND CONTACT ADDRESSES OF AUTHORS



Abdullah Çağrı BİBER is an Assoc Professor Dr. at Kastamonu University, Educatonal Faculty Mathematics Education, Turkey. He received Ph.D İn Mathematics Education from Gazi University. His study areas mathematical teaching and leraning, Mathematis Education and Concept Misconceptions.

Assoc. Prof. Dr. Abdullah Çağrı BİBER
Kastamonu University, Educational Faculty
Kastamonu- TURKEY
E. Mail: acbiber@kastamonu.edu.tr

Abdulkadir TUNA is an Assoc Professor Dr. at Kastamonu University, Educatonal Faculty Mathematics Education, Turkey. He received Ph.D İn Mathematics Education from Gazi University. His study areas Mathematical Thinking and Leraning, Mathematis Education and 5E Learning Model.

Assoc. Prof. Dr. Abdulkadir TUNA
Kastamonu University, Educational Faculty
Kastamonu- TURKEY
E. Mail: atuna@kastamonu.edu.tr

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