USE OF MOBILE TECHNOLOGIES TO SUPPORT STUDENTS WITH HEARING IMPAIRMENT: A CASE FROM TURKEY

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Abstract

The students with hearing impairment are disadvantageous compared to the other students because of their disabilities in oral and verbal communication. With the help of the developing technology, this disadvantageous circumstance that they encounter can be balanced by organizing interactive learning environments appropriate to the hearing impaired students' needs, and this situation may help them to gain new learning experience. In this study, it is aimed to determine how the students with hearing impairment use the mobile technologies in their learning activities, daily lives and the communications between each other and the instructor. The study was designed as an action research and conducted with 12 students with hearing impairment who took the course named Fundamentals of Information Technology-I offered by Anadolu University School for the Handicapped in Fall 2007-2008. The course was aided with Personal Digital Assistants (PDAs) for 16 weeks within the scope of the research. On certain days of the week students completed online activities on the blog of the course, accessed course materials on the website, and once a week, attended four-hour face to face instruction. The study was funded by The Scientific and Technological Research Council of Turkey (TUBITAK; ID: 107K022). The current paper presents the findings of the aforementioned project with regard to the use of PDA by the students with hearing impairment.

Keywords: Mobile Technologies; PDA; students with hearing impairment; Turkey

MOBİL TEKNOLOJİLERİN İŞİTME ENGELLİ ÖĞRENCİLERİ DESTEKLEMEK AMACIYLA KULLANILMASI: TÜRKİYE'DEN BİR ÖRNEK

Özet

İşitme engelli öğrenciler, sözlü ve yazılı iletişimdeki yetersizliklerinden dolayı diğer öğrencilere göre dezavantajlı durumdadır. Gelişen teknolojinin sağladığı olanakların da

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yardımıyla işitme engelli öğrencilere uygun, etkileşimli öğrenme ortamları düzenlenerek onların bu dezavantajlı durumları dengelenebilir ve yeni öğrenme deneyimleri kazanmalarına yardımcı olunabilir. Bu araştırmada; işitme engelli öğrencilerin öğretim etkinliklerinde, birbirleriyle ve öğretim elemanıyla iletişimlerinde ve günlük yaşantılarında mobil teknolojileri nasıl kullandıklarının ortaya koyulması amaçlanmaktadır. Araştırma, eylem araştırması olarak desenlenmiş ve uygulaması 2007-2008 öğretim yılı güz döneminde Anadolu Üniversitesi Engelliler Entegre Yüksekokulu Uygulamalı Güzel Sanatlar Bölümü Grafik Sanatları Anasanat Dalı bünyesinde okutulan "BİL151 Temel Bilgi Teknolojileri-I" dersine devam eden 12 işitme engelli öğrenci ile gerçekleştirilmiştir. Araştırma kapsamındaki BİL151 Temel Bilgi Teknolojileri dersi, 16 hafta süresince PDA destekli olarak yürütülmüştür. Öğrenciler haftanın belirli günlerinde dersin blogunda verilen çevrimiçi etkinlikleri yerine getirmişler, dersin Web sitesindeki materyallere erişmişler; haftanın bir günü ise dört saat yüz yüze ders etkinliklerine katılmışlardır. Araştırma Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) tarafından desteklenmiştir (Proje No: 107K022). Bu makale söz konusu projenin işitme engelli öğrencilerin PDA kullanım durumlarını ortaya koyan bulgularını sunmaktadır.

Anahtar Kelimeler: Mobil Teknolojiler; PDA; İşitme Engelli Öğrenciler; Türkiye

Uzun Özet

İşitme engelli öğrenciler, sözlü ve yazılı iletişimdeki yetersizliklerinden dolayı diğer öğrencilere göre dezavantajlı durumdadırlar. Gelişen teknolojinin sağladığı olanakların da yardımıyla işitme engelli öğrencilere uygun, etkileşimli öğrenme ortamları düzenlenerek onların bu dezavantajlı durumları dengelenebilir ve yeni öğrenme deneyimleri kazanmalarına yardımcı olunabilir. Bu araştırmada; işitme engelli öğrencilerin öğretim etkinliklerinde, birbirleriyle ve öğretim elemanıyla iletişimlerinde ve günlük yaşantılarında mobil teknolojileri nasıl kullandıklarının ortaya koyulması amaçlanmıştır. Bu amaç doğrultusunda aşağıdaki sorulara yanıt aranmıştır:

İşitme engelli öğrenciler:
1. Öğretim etkinliklerinde,
2. Günlük yaşantılarında,
3. Birbirleriyle etkileşimlerinde ve
4. Öğretim elemanı ile etkileşimlerinde mobil teknolojileri nasıl kullanmaktadırlar?

Araştırma, eylem araştırması olarak desenlenmiş ve uygulaması 2007-2008 öğretim yılı güz döneminde Anadolu Üniversitesi Engelliler Entegre Yüksekokulu Uygulamalı Güzel Sanatlar Bölümü Grafik Sanatları Anasanat Dalı bünyesinde okutulan "BİL151 Temel Bilgi Teknolojileri-I" dersine devam eden 12 işitme engelli öğrenci ile gerçekleştirilmiştir. Araştırma kapsamındaki BİL151 Temel Bilgi Teknolojileri dersi, 16 hafta süresince PDA destekli olarak yürütülmüştür. Öğrenciler haftanın belirli günlerinde dersin blogunda verilen çevrimiçi etkinlikleri yerine getirmişler, dersin Web sitesindeki materyallere erişmişler; haftanın bir günü ise dört saat yüz yüze ders etkinliklerine katılmışlardır. Araştırma Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) tarafından desteklenmiştir (Proje No: 107K022). Bu makale söz konusu projenin işitme engelli öğrencilerin PDA kullanım durumlarını ortaya koyan bulgularını sunmaktadır.

Araştırmada tüm katılımcıların PDA destekli derse karşı olumlu tutum içinde oldukları ve PDA kullanımından büyük oranda memnun oldukları görülmüştür. Katılımcılar, PDA destekli bir dersin kendileri için hayatı kolaylaştırdığını, kendilerine zaman kazandırdığını, istedikleri her yerden ve her zaman İnternet'e erişim ve bilgi edinme olanağı sunduğunu ifade etmişlerdir. Yakuta ve Jumpei'nin (2001) işitme engelli öğrencilerle bir mobil teknoloji ürünü olan cep telefonu aracılığıyla gerçekleştirdikleri araştırmada katılımcıların aynı olanaklar nedeniyle mobil teknolojilere karşı olumlu tutum kazandıkları bulgusu ile örtüşmektedir. Etkileşimin türüne ve sıklığına bakılmaksızın, araştırmada katılımcıların PDA ile en çok gerçekleştirdikleri etkinlikler sohbet etme, mesajlaşma, bilgi edinme amacıyla araştırma yapma, fotoğraf çekme, video çekme, ödev hazırlama ve paylaşma, tartışmalara katılma, e-posta gönderme ve oyun oynama olarak sıralanabilir.

Araştırma kapsamında hazırlanan blog ortamında katılımcılara birbirleriyle ve öğretim elemanı ile etkileşimleri amacıyla blog ortamında tartışma ve sohbet olanağı sağlanmıştır. Katılımcılar her hafta farklı konularda ders ile ilgili, ayrıca sosyal etkileşim amaçlı açılan tartışmalara PDA'ları aracılığıyla katılmışlardır. Katılımcılar kendilerine verilen PDA'lar ve kendilerine sağlanan İnternet erişimi sayesinde birbirlerine ve öğretim elemanına e-posta gönderme-alma, SMS mesajı gönderme-alma ve MSN Messenger programları ile sohbet etme etkinliklerini gerçekleştirmişlerdir.

Katılımcıların blog üzerinden tartıştıkları konuları genellikle ilerideki meslek alanları ile ilişkilendirmeleri ve bu nedenle etkileşimlerini anlamlı bulmaları, hem PDA'lar aracılığıyla blog üzerinden birbirleriyle ve öğretim elemanı ile etkileşimlerini artırmış, hem de çevrimiçi öğrenme ortamlarında gerçekleşen öğrenme etkinliklerinin daha ilgi çekici ve verimli olmasına yol açmıştır. Araştırmada elde edilen bu bulgu, Johnson, Cathal ve Hall'un (2006) mobil teknolojileri kullanarak düzenledikleri öğrenme ortamında gerçekleştirdikleri araştırmadan elde ettikleri bulgu ile benzerlik göstermektedir.

Katılımcıların kendilerini daha rahat ifade edebildikleri, birbirleriyle ve öğretim elemanı ile ders dışı konularda da iletişime geçebildikleri blog ortamındaki kantin ve genel sohbet bölümlerinin açılması, öğrencileri PDA kullanmaya teşvik etmiş ve etkinliklere katılımlarını artırmıştır. Blogların katılımcılar arasındaki sosyal etkileşimi artırdığına ilişkin bu bulgu, Kuzu (2007) tarafından işitme engeli olmayan öğretmen adayları ile blog üzerinden gerçekleştirilen araştırmada elde edilen bulguyla uyuşmaktadır.

Blog kayıtlarından ve Web sitesinden elde edilen verilere göre katılımcıların büyük bölümü PDA'yı her gün kullanmıştır. Blog ortamında açılan tartışmalara katılma zorunluluğu, katılımcıların PDA kullanımlarını belirleyen en önemli gösterge olarak görülmüştür. Öğrencilerin tartışmalara katılmaya gösterdikleri ilgi, öğretim elemanının tartışmaya katılımı ile doğru orantılıdır. Öğretim elemanının blog tartışmalarına katılması, öğrencileri blog tartışmalarına katılma konusunda cesaretlendirmiş ve öğrencileri derse ve bloga katılmaya teşvik etmiştir. Öğretim elemanının blogdaki tartışma ortamına gönderdiği mesaj sayısı arttıkça, öğrencilerin katılımları ve gönderdikleri mesaj sayısının da arttığı gözlenmiştir. Ayrıca katılımcıların öğretim elemanıyla ders saati dışında da PDA aracılığıyla etkileşimlerinin devam etmesi öğrencilerin öğretim elemanından çekinmeden iletişim kurmalarına ve kendisine karşı yakınlık hissetmelerine yardımcı olduğu görülmüştür.

Katılımcıların gerek öğretim elemanı ile gerekse de diğer katılımcılar ile PDA'lar üzerinden istedikleri her an, her yerden ve gereksinim duydukları her konuda etkileşime geçebilmelerinin; gerek öğrenme açısından gelişmelerine gerekse de sosyalleşmelerine yardımcı olduğuna ilişkin araştırmadan elde edilen bulgu, Dawabi, Wessner ve Neuhold'un (2003), öğretim ortamında PDA kullanımının etkileşim ve işbirliğini zenginleştirebileceği bulgusu ile benzerlik göstermektedir. Aynı bulgu Liu, Tao, Ho, Liu ve Hsu'nun (2007), PDA'lar aracılığıyla işbirlikçi tartışma ortamlarının sağlanması sayesinde işitme engelli öğrencilerin soyut konuları daha kolay anladıkları ve anlamlandırdıkları bulgusu ile de örtüşmektedir.

Öğretim elemanının blog ortamındaki tartışmalara ve etkinliklere katılarak, gerektiği durumlarda ödevlerin nasıl yapılabileceği ile ilgili açıklamalarda bulunması ve etkinliklerle/ödevlerle ilgili katılımcılara örnekler vermesi; katılımcıları da etkinliklere katılma, blog ortamındaki tartışmalara mesaj gönderme konusunda cesaretlendirmiş ve motive etmiş, aynı zamanda katılımcıların yaptıkları ödevlerin beklenilen düzeyde olmasına yol açmıştır. Bu bulgu Liu ve Hung (2007)'un, öğretim elemanının işitme engelli öğrencilere mobil teknolojiler üzerinden hatırlatma stratejisini kullandığı anda öğrencilerin ödevlerini zamanında teslim etmelerinin arttığı ve yardım etme stratejisini kullandığı anda ise öğrencilerin kendilerine ödev olarak verilen problemlerin daha fazlasını çözebildikleri bulgusu ile uyuşmaktadır.

Toplumun önemli bir bölümünü oluşturan işitme engelli bireyler, her ne kadar işiten bireyler ile benzer bilişsel özelliklere sahip olsalar da, karşı karşıya oldukları engellerinden dolayı toplumdaki diğer kişilerle etkileşimleri sınırlı kalmaktadır. Özellikle okul çağındaki işitme engelli bireylerin gerek öğretim gerekse sosyal etkileşimleri göz önüne alınması gereken önemli bir sorun olarak karşımıza çıkmaktadır. Bilgi ve iletişim teknolojileri, özellikle zamandan ve yerden bağımsız İnternet erişimi sağlayan mobil teknolojiler işitme engelli bireylerin öğrenme ortamlarına entegre edilmesi bu soruna getirilebilecek çözümlerden biri olarak görülebilir. Bu araştırma bir mobil iletişim teknolojisi olan PDA'ların işitme engellilerin öğrenme ortamına entegre edilmesi aracılığıyla, onların gerek ders materyalleri, gerek birbirleri ile gerekse de öğretim elemanları ile etkileşimlerinin artırılmasına odaklanmıştır.

Introduction

Information and communication technologies play a significant role in constructivist learning environments in which active participation of individuals is ensured, learning approaches based on problem solution and cooperation are widely used, and learner-learner and learner-teacher interaction are indispensible. Thanks to the opportunities provided by computer and Internet, students gain rich learning experiences supported with multimedia elements in such environments. Especially Internet has recently become prominent as a technology with its ever increasing use in learning and research oriented activities through its capacity of access to information and worldwide communication. If supported with appropriate educational approaches, Internet as an environment that students can access when they need information and interact with other students and teachers out of the class, can be used as a device to increase the efficiency of classroom learning and social interaction among the participants (Kuzu, 2007). Technology can offer other devices that support learning and the number of such devices increases day by day. Mobile information and communication technologies which enable access to information independent from time and space are in this context one of the milestones of technology and learning concepts. Early applications of mobile technologies were mostly intended for learning specific subject fields however, with the advent of applications with activity purposes, mobile technologies became prominent in instructional settings, helping individuals learn the appropriate content in authentic environments (Naismith, Lonsdale, Vavoula, and Sharples, 2004) and as the most important communication device in attaining these learning. As happened with other technologies, mobile technologies need transitions to be carried out in the process of education. However the great diversity in today's pool of students means great diversity in the way we carry education (Hussey and Smith, 2010). Students with special needs, in the case of the study, the students with hearing impairment, are one group of concern for transitions in education.

The students with hearing impairment cannot diagnose sounds fully or partially. If this loss emerges at an earlier age of the children and hinders their ability to detect, differentiate and understand linguistic differences, the children may encounter the risk of native language acquisition imperfectly. Listening and speaking disability of the children causes not only the language acquisition but also their ability to learn new things both in formal and informal settings (Browne, 1996). As a result of this situation, children may face several difficulties in improving their academic skills (Tüfekçioğlu, 1992).

Early and proper diagnosis and the use of appropriate assistive technologies can help hearing impaired students for overcoming this disability, but these alone cannot solve the problem. Firstly, they should be assisted with proper hearing aids. Afterwards, by providing appropriate language experiences, the residual hearing abilities can be activated to develop their hearing and listening skills. At this stage, there is need for new approaches and methods that can be effective on these student's cognitive, social-emotional and academic success that develop differently from those of their peers. One of these new approaches is the use of mobile technologies which is thought to create new opportunities to develop relationships, understanding and intimacy within the communities of the students with hearing impairment (Power and Power, 2004). For this purpose, technology can be used to

support hearing impaired students with assistive tools to enrich their daily routines and learning skills.

Being a supportive and assistive technology, mobile technologies offer several opportunities both for learners and educators. Due to their independency of time and place, wireless communication features and portability, handheld devices can be used for instructional purposes as well as social interaction. They allow hearing impaired students to have a better verbal and written communication and learning experiences. According to Burgstahler (2003), the other benefits of implementing the mobile technologies for special students are listed as follows:

- maximize independence in academic and employment tasks,
- increase participation in classroom discussions,
- help students gain access to peers, mentors and role models,
- help them self-advocate,
- provide them with access to the full range of educational options,
- help them participate in different experiences not otherwise possible,
- provide them with the opportunity to succeed in workbased learning experiences,
- secure high levels of independent living,
- prepare them for transitions to college and careers,
- give them the opportunity to work side-by-side with peers,
- help them enter high-tech career fields,
- encourage them to participate in community and recreational activities.

Regarding all the benefits of using mobile technologies, the project team gave the priority to special education field which is thought to greatly benefit from mobile technology.

Purpose

With their mobility and structures that enable wireless communication, mobile technologies provide learners with access to information and communication independent from time and space at school and in their daily lives. However, there is need for research to analyze such environments in educational and social dimensions in order to effectively and productively conduct learning realized with mobile technologies. This study aims to help students with hearing impairment to use mobile information and communication technologies effectively and consciously, and equip them with learning environments and communication opportunities enriched with these technologies. Thus, the study addresses the following questions in accord with this purpose:

How do students with hearing impairment use mobile technologies (Personal Digital Assistant, in this case) in:

1. instructional activities,
2. their daily lives,
3. interaction with each other, and
4. interaction with the instructor?

Methods and Procedures

This study was based on the use of mobile technologies in the education of individuals with hearing impairment, and designed as an action research. Action research is a research process conducted to understand and develop the quality of education or actions in real school or class environments, and an inquiry type which is preplanned, preorganized and shared with concerning bodies (Johnson, 2002). The process in action research includes identifying the research problem, data collection, data analysis and interpretation, planning an action, implementing the action, and deciding on an alternative or new action. However, these processes do not show linear characteristic, but a continuous and spiral one.

Participants

The participants of the study were 12 hearing impaired students (8 females and 4 males) aged 17 to 22. They studied at Anadolu University School for the Handicapped, Department of Applied Fine Arts, and their major was Graphic Arts. They took "BIL 151-Fundamentals of Information Technology-I". The levels of hearing loss and the demographics of the participants obtained from the School's administration are given in Table 1. Participants' real names were changed for confidentiality, and code names were used instead.

Table 1. Personal information about the participants

Participant	Gender	Age	Hearing Loss		Origin	Duration of special education taken	
OİM	F	20	Right	: 112 dB	Congenital	17 years	Kindergarten: Special Education
			Left	: 108 dB			Primary : Special Education
							Secondary : Special Education
SG	F	21	Right	: 65 dB	Congenital	14 years	Kindergarten: ---
			Left	: 58 dB			Primary : Inclusion
							Secondary : Inclusion
ATÖ	M	19	Right	: ---	Congenital	18 years	Kindergarten: Special Education
			Left	: 102 dB			Primary : Special Education
							Secondary : Inclusion
CA	F	21	Right	: 110 dB	Congenital	17 years	Kindergarten: Special Education
			Left	: 110 dB			Primary : Special Education
							Secondary : Special Education
SS	F	22	Right	: 85 dB	Unknown	19 years	Kindergarten: Special Education
			Left	: 83 dB			Primary : Inclusion
							Secondary : Inclusion
MEÖ	M	20	Right	: ---	After		Kindergarten: Special Education
			Left	: 107 dB	Birth		Primary : Special Education
							Secondary : Special Education
MDK	F	20	Right	: 115 dB	Congenital	16 years	Kindergarten: Special Education
			Left	: 107 dB			Primary : Special Education
							Secondary : Special Education
GA	F	22	Right	: 90 dB	Unknown	19 years	Kindergarten: Inclusion
			Left	: 80 dB			Primary : Inclusion
							Secondary : Inclusion
BKK	M	24	Right	: 52 dB	After	20 years	Kindergarten: Inclusion
			Left	: 55 dB	Birth		Primary : Inclusion
							Secondary : Inclusion
EÇ	F	20	Right	: 107 dB	Congenital	18 years	Kindergarten: Special Education
			Left	: 107 dB			Primary : Special Education

Participant	Gender	Age	Hearing Loss		Origin	Duration of special education taken	
İHY	M	19	Right	: 95 dB	Congenital	16 years	Secondary : Special Education Kindergarten: Special Education Primary : Special Education
			Left	: 100 dB			
EÖ	F	20	Right	: 112 dB	Congenital	17 years	Secondary : Special Education Kindergarten: Special Education Primary : Special Education
			Left	: 110 dB			Secondary : Inclusion

The students participated in the study on a voluntary basis, and signed a consent form in the beginning of the term. All of them were computer literate. Table 2 shows the ICT use information of the participants.

Table 2. Participants' ICT use

Attributes of Participants	Frequency (f)		Percentage (%)
Owns a cell phone	Yes	: 12	100,0
	No	: ---	---
Owns a PDA	Yes	: 1	8,3
	No	: 11	91,7
Has Internet connection	Yes	: 8	66,7
	No	: 4	33,3
Uses Internet for communicating with friends	Yes	: 10	83,3
	No	: 1	8,3
	Missing	: 1	8,3
Uses Internet for communicating with teachers	Yes	: 5	41,7
	No	: 6	50,0
	Missing	: 1	8,3
ICT use for socializing with friends	Internet	: 6	41,7
	Cellular	: 6	50,0
	Other	: 1	8,3
Internet services used to communicate with friends	E-mail	: 1	9,1
	Chat	: 10	90,9
	Other	: ---	---
Internet services used to communicate with teachers	E-mail	: 6	54,5
	Chat	: 2	18,2
	Other	: 1	9,1
	Missing	: 2	18,2

Environment

School

The School for the Handicapped in which the research took place was established in 1993 in Anadolu University, Turkey. There are 150 students with hearing impairment enrolled at this school. Sign Language is not taught within the school; however, students are free to communicate through sign language.

There are currently four career choice departments in the school: Computers, Ceramic Arts, Graphic Arts, and Architectural Design. The aim of the school is to offer special education for the handicapped in vocational BA programs and thus enable them to become productive members of the community. These departments are equipped with the necessary technological aids to accommodate the educational needs of the students with hearing impairment.

Procedure

The research was conducted at Anadolu University School for the Handicapped, Department of Applied Fine Arts. "BIL 151 Fundamentals of Information Technology-I" course is a compulsory course which is allotted four hours a week (two for theory and two for practice). The following subjects are covered within the scope of the course: Basic computer concepts, hardware and software, Windows XP Operating System, Internet and Internet services, MS Word Operating Program, MS Excel Spreadsheet Program and MS Power Point Presentation Program.

The course aided with PDA was designed in three different environments as Web, blog and classroom, and carried out for 16 weeks including the exams. Among these environments, the lesson activities performed on the Web and blog were set in a way that is accessible to the participating students only through their PDAs. This hindered them to access the course pages from computers with Internet connection, and urged them to use their PDAs.

The Website involved the components of 'Courses', 'Canteen', 'Help', 'About' and 'Contact' pages. Class notes were provided on the "Courses" page. This page was updated weekly. Through a navigation system, the students could access previous weeks' class notes. Contents were organized as main headings for each week. Students could navigate between headings and home page. "Canteen" was designed to help students interact with their peers and the course instructor through using the blog technology. Through "Help" page, students could access instructions regarding the project along with the user manual of the PDA. Information regarding the project was provided on the "About" page. "Contact" page was designed to provide the contact information of the course instructor and technical staff.

In the blog environment designed in the scope of the research, the participants were provided with opportunities to discuss and chat with their peers and instructors. Participants attended various discussions on course subjects or for social interaction purposes through their PDAs every week.

The predetermined activities to be implemented during lesson weeks were determined in meetings held by the project coordinator, technical team of the project and the instructor who was going to conduct the lesson. They reviewed the actions through resorting to the opinions of experts in the education of the hearing impaired, the prepared lesson plans and activities were checked by the validity committee, and revised accordingly.

The activities related to the instructional use of PDAs, student-student interaction, student-instructor interaction and the use of PDAs in hearing impaired students' daily lives are mentioned below on a weekly basis.

1. Week - 2. Week - 3. Week

In the first three weeks, applied courses about the use of PDA were given to the students. The students were expected to get used to their PDAs.

4. Week

The instructional use of PDAs
- The instructor sent the list of newly learned words to the students' PDAs via Bluetooth.
- The students conducted an Internet search about the course contents and send the results to the instructor via PDA.
- The instructor transferred the PowerPoint presentation which was used in the course to the students' PDAs after the end of the course via the Bluetooth and Irda.

Student-Student Interaction
- The students introduced themselves in the discussion module of the course's blog.

Student-Instructor Interaction
- The instructor participated to the acquaintance activity.
- The students took their own photos with using the integrated camera of the PDA and sent them to the instructor as an e-mail via PDAs.
- The instructor took a photo with her PDA and published it in the acquaintance activity.
- The students wrote a meaningful text with using at least five new concepts (notions) they learned lately and sent as a e-mail via PDA.

The use of PDAs in Students' Daily Lives
- The students wrote the new words they learned in every lesson in their notebooks. And later, every student built her/his own index including these words and their meanings with using her/his PDA. In order to achieve this purpose, every student needed to decide what she/he might do after sharing her/his ideas with the other students. After that, every student needed to send her/his proposal to the instructor as an e-mail via PDA.

5. Week

The instructional use of PDAs
- The students took the course presentation from their PDAs via Bluetooth.
- The students conducted a search in Internet about the screen type they would prefer as graphic designers.

Student-Student Interaction

- The students shared their first experiences in computer field and the information they have about the computer technologies with the other students.

Student-Instructor Interaction
- The students took three photos of the computer hardware that they encountered in their daily lives and sent them to the instructor.

The use of PDAs in Students' Daily Lives
- The students found a Website related to their personal interests through their PDAs and sent the link of the Website as an e-mail to the other students and the instructor.
- The students wrote the addresses of two computer companies located in the center of Eskişehir with using their handwritings in the NOTES module and sent it to the instructor.
- The students wrote a meaningful text with using at least five new concepts (notions) they learned lately.

6. Week

The instructional use of PDAs
- The students downloaded the course presentation into their PDAs via Bluetooth in the last part of the face-to-face lesson.
- The students conducted an Internet search about the touch screen, and shared the information and the Websites they gathered the information in the course blog.
- The students gathered information about printer types from Internet searches, subject matter experts and other resources. And afterwards, they shared the information in the course blog with the other students such as the areas of use, the differences.

Student-Student Interaction
- The students sent the information they gathered about a printer which could be used for printing a photograph to their instructor and the other students via PDAs.
- The students shared their first experiences in computer field and the information they had about the computer technologies with the other students.

Student-Instructor Interaction
- The students sent the information they gathered about a printer which could be used for printing a photograph to their instructor and the other students via PDAs.
- The students took three photos of the computer hardware that they encountered in their daily lives and sent them to the instructor.

The use of PDAs in Students' Daily Lives

- The students found a Website related to their personal interests through their PDAs and sent the link of the Website as an e-mail to the other students and the instructor.
- The students wrote the addresses of two computer companies located in the center of Eskişehir with using their handwritings in the NOTES module and sent it to the instructor.
- The students wrote a meaningful text with using at least five new concepts they learned lately.

7. Week

The instructional use of PDAs
- The students downloaded the course presentation into their PDAs at the end of the course.
- The students conducted an Internet search about the intended use of RAM memory.
- The students conducted an Internet search about DVD types via their PDAs.

Student-Student Interaction
- The students discussed the question of "Which media do you prefer for carrying the data?" in the course blog.
- The students sent the information they gathered from the research on DVD types to a student named as BKK as an e-mail via their PDAs.

Student-Instructor Interaction
- The students built up and sent the list of the capacity-price-brand of the varied flash disks (USBs) to the instructor.

The use of PDAs in Students' Daily Lives
- The students inscribed the words learned in the sixth week lesson into the index in PDAs.
- The students wrote the words inscribed into the index and sent them to the instructor.
- The instructor presented a Website in which the students could download a game into their PDAs.
- The students downloaded, installed and played the game.
- The students wrote their opinions about the game they downloaded and sent them to the instructor.

8. Week

The instructional use of PDAs
- The students compared the computer and the PDA screen. Then, they had an discussion in the course blog about the differences and the similarities between these two screens, which one is easier to use and the reason of why it is easy to use.

Student-Student Interaction
- In the course blog, the students discussed the advantages and the disadvantages of adding more than one user in Windows XP.

9. Week

The instructional use of PDAs
- The indexing application.
- The students studied on the topic of how a program could be added into the taskbar from the course Website, and sent the summary of the topic to the instructor.

Student-Student Interaction
- The students discussed the question of "Why do we prefer using the shortcuts in Windows XP operating system?"
- The students sent the homework which was about adding a program into the taskbar to the student named as BKK.

Student-Instructor Interaction
- The students wrote a text about the topic of "Why do we prefer using the shortcuts in Windows XP Operating System?" and sent it to the instructor.

The use of PDAs in Students' Daily Lives
- The students discussed the possible advantages of customizing the start menu of the PDA for the use of PDAs.
- The students built up their academic schedule by using the "to do list" feature of the PDA.
- The instructor presented the link of a Website which the students could directly play the game through their PDAs.
- The students accessed the game through their PDAs and played.
- The students wrote their opinions about the game in the Chat section.

10. Week

The instructional use of PDAs
- The students examined the Internet Explorer in their PDAs and customized the settings appropriate to their PDAs.

Student-Student Interaction
- The students discussed the question of "How would you customize the accessibility options in Windows XP?" in the course blog.
- The students shared their ideas about the remarkable setting of Internet Explorer in their PDAs.
- The students discussed the midterm in the course blog.

Student-Instructor Interaction

- The students searched for the technical specifications of a computer such as CPU, hard disk capacity, display card and sent the information they found to the instructor and the student named as BKK as an e-mail via their PDAs.

The use of PDAs in Students' Daily Lives
- The students took a photo of a scene they liked in the campus by using their PDAs and set the photo as desktop wallpaper.
- The students wrote down all the steps during the taking a photo procedure and sent the text as an e-mail to the instructor and the student named as BKK via their PDAs.

11. Week

The instructional use of PDAs
- The students customized the settings of the Internet Explorer and explained the settings they used in the course blog.
- The students conducted an Internet search about IPs, and then they shared the summary information and the other resources in the course blog.

Student-Student Interaction
- The students conducted an Internet search about the Web browsers and shared the information and the resources they gathered in the course blog.

Student-Instructor Interaction
- The students sent the summary information they gathered about the varied Web browsers as an e-mail to the instructor and the student named as BKK.
- The students sent the summary information they gathered about IPs and the resources they used as an e-mail to the instructor and the student named as BKK.
- The students conducted an Internet search about what to pay attention when writing the links of the Website onto the address bar of the Internet Explorer.
- The students discussed the information they gathered about what to pay attention when writing the links of the Website onto the address bar of the Internet Explorer in the course blog.

The use of PDAs in Students' Daily Lives
- The students shared the most interesting experience they had since the beginning of the school term in using PDA in the Chat section of the course blog.

12. Week

Since this week was for the midterms, no activity was done.

13. Week

The instructional use of PDAs

- The students wrote and saved the final results found from the discussion in the course blog with using the MS Word in their PDAs.

Student-Student Interaction
- The students discussed the differences and the similarities between MS Word in PDA and MS Word in PC.

Student-Instructor Interaction
- The students sent the final report of the blog discussion to the instructor and the student named as BKK.

The use of PDAs in Students' Daily Lives
- The students searched some photos about New Year in Internet and downloaded them into their PDAs.
- The students sent the photos as an e-mail to the instructor and to the other students with adding New Year greetings on it in MS Word.

14. Week

The instructional use of PDAs
- The students built up a schema of the computer by using the organizational schema tool in MS Word.

Student-Instructor Interaction
- The students sent the schema built up to the instructor and the student named as BKK.

15. Week – 16. Week

The evaluation of the school term was conducted and no activity was done in these weeks.

A web-based program was used by the project team to work fruitfully, and to share the obtained data in a single environment. The project team prepared a manual for PDAs given to the students during the project to enable them to use these devices easily, solve problems on their own without a need for technical assistance. In the preparation phase of the manual, the original manual on the PDA website was resorted to. The project team translated necessary parts into Turkish, and tailored them according to the needs of students to ease the use of the device. Many pictures were added to the manual in order for the students know and use PDA easily.

A twelve-hour training program in four three-hour sessions was implemented with the students to enable them to use the PDAs better, as they would use the PDAs in classroom activities, extracurricular activities, and their social lives within the framework of the project.

Instruments

The action research process necessitates a systematic data collection in order to identify possible problems that can occur in a learning environment, and find solutions for these problems. The data obtained are expected to describe the environment sufficiently and thoroughly. In order to gather data, observations and semi-structured interviews frequently used in qualitative research methods were employed. Students' personal information forms, researcher's diaries, Web pages of the lesson, forum and e-mail messages, video recordings and questionnaires were the other data collection devices that constituted data triangulation, which is one of the important strategies used to attain accuracy and reliability in qualitative research (Creswell, 2005). The data collected for the current study consisted of semistructered interviews carried out in written form with the students.

Data Analysis

Content analysis was implemented while analyzing data, (Glesne, 2006; Grbich, 2007). Data were coded, themes were found, data were arranged in accordance with codes and themes, and findings were interpreted (Strauss and Corbin, 1990). The initial data coming from semi-structured interview was transferred by the project coordinator to interview forms. Data were analyzed by a researcher and an expert in the field independently. The common themes obtained were transformed into a coding key. A researcher and an independent expert in the field marked these themes on data sheets. Then, the reliability of the coding key was examined through the formula proposed by Miles and Huberman (1994, p.64) (i.e. reliability = number of agreements/total number of agreements + disagreements). The reliability coefficient of 0.94 was calculated for overall set of questions. As all inter-coder reliability coefficients for each question were above 0.70, the coding procedure was accepted as reliable.

Results

Findings

The findings of the study are given under the titles based on research purposes.

The Use of PDAs in Instructional Activities

The circumstances that participants used PDAs in instructional activities were evaluated in terms of:

a. interaction with course material,
b. access to course content and resources,
c. the most frequently used activities on the website of the course,
d. activities performed completely and correctly with PDA,
e. activities that students were happy to do with PDA,
f. activities that they found unnecessary to do with PDA,
g. activities perceived easy with PDA,
h. activities perceived difficult with PDA.

Moreover, students' views and requests with regard to PDA aided course were identified.

Each circumstance that students with hearing impairment used PDAs in instructional activities was explained below with examples from students' views.

Interaction with course material

PDA use with regard to participants' interaction with course material is explained in Table 3.

Table 3. Participants' interaction with course materials through PDAs

Themes	Frequency (f)
Material accessibility	6
Research opportunity	4
Use as an equipment	2
Homework preparation opportunity	1

All the participants stated that they easily accessed to course materials with PDAs. Thanks to uploading the electronic version of the course book on the Internet and downloading a copy of it to PDAs in an activity within the scope of the course, the participants were able to access the course material any time they wanted, that is, both online through the website of the course and offline through the memory card of their PDAs. In addition, they reported that they did research on the Internet within the scope of course subjects, so they accessed different materials about the subject.

The participants also stated that the use of electronical board in the classroom facilitated access to course material, so they could listen to the instructor instead of taking notes, and they downloaded the presentation of the course to their PDAs via Bluetooth at the end of the lesson. A participant (SG) reported the following opinion:

> "We can download what we learned during the lesson from the electronic board to PDAs in computer labs." [SG]

In addition, participants reported that PDAs saved them from pen-and-paper work. They perceived PDA as course equipment. Expressions of GA illustrate this:

> "I can use PDA with no need for paper. The instructor writes the course subjects on the board, and I download and read it again." [GA]

Access to course content and resources

The themes formed from the views of the participants with regard to PDAs' effects on access to course content and resources are given in Table 4.

Table 4. PDA's effect on access to course content and resources

Themes	Frequency (f)
Research opportunity	8
Saving time	2
Access independent from time	1
Classroom use	1

Participants indicated that they could access Internet and the course book, did research on the net to access extra resources, did library catalogue search about the subject, subscribed to related journals on the net, and prepared their assignments with PDAs:

> "If I didn't get the subject told by the instructor or if I want to understand the subject better, I can do research on the Internet in journals, books or library." [ATO]

> "If I want to subscribe to the books of the graphic and computer courses, I will do online shopping and buy the books." [IM]

Participants also stated that they could access course materials independently from time, and this saved time. A participant (CA) expressed that PDA use with electronic board in the classroom was beneficial for them and wanted other courses to be conducted the same way.

The most frequently used activities on the website of the course

When asked which material they most frequently used on the website of the course, the participants responded in terms of activities instead of materials. Therefore, the themes about the most frequently used activities were provided here (Table 5).

Table 5. PDA's effect on access to course content and resources

Themes	Frequency (f)
Discussion	4
Photograph taking/video recording	3
Research	2
Homework	1

Participants reported having participated in the forum activities on the website, chatted with their friends and exchanged information. They also added that the online research activity and the homework assigned were very beneficial for them. A participant affirmed that s/he used MS Word Program on the website of the course the most frequently and easily:

> "(…) if I am to write anything on the website of the course, I first write in Word, and when ready, copy and paste it on the website." [EC]

Another activity found beneficial by the participants is photograph or video shooting. The view of a student is given as an example below:

"We used the photograph and camera materials the most frequently on the website because taking photo or video recording makes us happy." [MDK]

Activities performed completely and correctly with PDA

The themes obtained from the views of participants with regard to which activities they performed completely and correctly with PDA are shown in Table 6.

Table 6. Participants' views with regard to activities performed completely and correctly

Themes	Frequency (f)
All the activities	5
MS Word activities	2
Assignments	2
Messaging/e-mail activities	2
Comments	1
Internet activities	1

Five participants believe that they did all the activities completely and correctly. As for other participants, they reported doing MS Word (Word Processor) activities, assignments, Internet activities, and commenting and messaging/e-mailing on the blogs completely and correctly. Below are examples views:

"We tried to complete all the duties. There may be missing parts but we did all the activities and assignments completely." [BKK]

"I believe having done the Word Program and Internet activities completely and correctly out of the activities performed with PDA within the scope of this course." [MEO]

"I believe having done Word assignments, messaging and e-mailing activities completely and correctly out of the activities performed with PDA within the scope of this course." [MDK]

Activities that students were happy to do with PDA

The themes obtained from the views of participants with regard to the activities they were happy to do with PDA are shown in Table 7.

Table 7. Activities liked

Themes	Frequency (f)
Internet access	6
Messaging	3
Taking photos	2
All the activities	2
Playing games	1
Doing homework on MS Word	1
Doing research	1
Watching videos	1

The participants reported their favorite activities as connecting to the Internet and surfing on the Internet with PDA. The reason for this was stated to be the mobility feature of PDAs and their capability to access Internet anytime they wanted thanks to this device:

"I have computer at home, but it is not mobile. PDAs are mobile; you can access Internet any time. This made me happy." [ATO]

Another activity the participants enjoyed the most was found out to be communicating with others through MSN Messenger, blog of the course or e-mail:

"Chatting on the blog made me happy." [EO]

"I can use PDA anywhere, and access Internet to communicate with my family and friends." [GA]

"Logging in msn through PDA, (…) it makes me really happy." [IM]

The participants expressed that they enjoyed performing all the activities on the website as exemplified below:

"I enjoyed all of them. The PCs we use in our daily lives and PDAs are similar, so the activities were similar." [CA]

The participants stated that taking photos, doing research on the Internet, writing on MS Word, playing games, and watching videos are other activities they were happy to perform.

Activities perceived unnecessary to do with PDA

The themes obtained from the views of participants with regard to activities found unnecessary are provided in Table 8.

Table 8. Activities perceived unnecessary

Themes	Frequency (f)
Map	6
None	2
Note book	1
Tool for downloading files	1
PowerPoint	1

Half of the participants found the map activity (finding way) unnecessary. In this activity, students download a city map of any country from the Internet with the GPS feature of their PDAs, and try to find their ways to a specific address. The maps of cities and countries are drawn by certain firms and sold for a fee; therefore, only the map of Eskisehir was bought and downloaded to the PDAs of students. Since the participants lived in Eskisehir and knew the city quite well, they thought they did not need to use a map, and this activity was useless. This situation is illustrated through the following view:

"There is GPS program. I don't use it. I know the map of Eskisehir. But if it were a different city, it would be necessary." [ATO]

The participants believed that this activity and GPS feature of PDAs would be very beneficial when they went abroad:

"I didn't use the map which was not necessary. If I were in other town, I would use it." [SG]

There were also some participants who felt that none of the activities done within the scope of the course was unnecessary. However, a participant (IHY) reported that s/he never used the download agent, so it was useless. Further, a participant (EC) reported that she found the "Notes" Program unnecessary, which is a note book software. S/he used MS Word program to take notes and it was easier to use compared to the other one. EO found the chatting activity useless since s/he talked to his/her friends face to face every time. In addition, MEO stated that s/he rarely used MS PowerPoint activity, so it was unnecessary.

Activities perceived easy with PDA

The themes obtained from the views of participants with regard to activities perceived easy are shown in Table 9.

Table 9. Activities perceived easy with PDA

Themes	Frequency (f)
MS Word activities	4
MS PowerPoint activities	4
Online research activities	2
Internet activities	1
Messaging activity	1
Notes	1
Discussions	1
Access to course material from the blog	1
All of them	1
None of them	1

The participants stated that they found MS Word and MS PowerPoint activities and assignments the easiest among the course requirements. Although MS Word and Ms PowerPoint were topics covered in the last weeks of the syllabus, the participants did many activities and assignments with MS Word program in their PDAs until they studied these topics. Furthermore, the instructor of the course shared the PowerPoint files he prepared for each lesson with the participants via Bluetooth after the classes. The same files could also be downloaded from the website of the course. MS Word and MS PowerPoint programs were the most widely used programs which are familiar to personal computer users, and studied under elective course option in secondary education. Therefore, it is quite natural that the participants felt confident in these two topics. Some of the views of the participants are given below:

"I think PowerPoint is easy in this course." [IHY]

"Word, PowerPoint, notes are easy to use." [ATO]

Moreover, the participants viewed activities such as connecting to Internet, surfing on the net, doing online research, chatting in the MSN Messenger, being involved in the blog discussions, and downloading course materials from the blog easy:

"The activities I find easy in this course are assignments, Word, PowerPoint, connecting to Internet, and chatting in msn." [MDK]

"I think doing research on the net was easy. Also, the discussion on the website was very entertaining." [EC]

"I do my assignments on the blog. I do assignments quickly when I enter the web page." [CA]

While a student (BKK) reported that all the activities were easy for him/her, a student (EO) reported that there was not any activity that s/he found easy.

Activities perceived difficult with PDA

The themes obtained from the views of participants with regard to activities they found difficult using PDA are provided in Table 10.

Table 10. Activities perceived difficult with PDA

Themes	Frequency (f)
None	7
MS PowerPoint activities	2
Checking weekly activities	1
Doing research	1
MS Word activities	1
Connecting to internet	1
Downloading files from internet	1

Seven out of twelve participants stated that they found none of the activities difficult within the scope of this course. One of the participants who reported that MS PowerPoint activity was difficult said that s/he did not know how to do a PowerPoint file with PDA. PDA shows the PowerPoint files, yet it does not provide an opportunity to prepare a PowerPoint file for its users. So, it was normal that the participant did not know how to form a PowerPoint file. We can assert that this situation stems from his/her not knowing this feature of the PDA. EC expressed his/her thoughts about the difficulty of PowerPoint activities as follows:

"Doing the assignments and activities on PowerPoint was difficult. Downloading something from Internet and using it in PDA was also difficult." [EC]

IHY stated that s/he found writing on MS Word difficult. It is obvious that she compared writing on MS Word program of PDA with that of computer. This can be seen in his/her following remarks:

"What I found difficult within the scope of this course was Word. Because writing on word program of PDA is difficult while it is easier on computer." [IHY]

Moreover, the participants reported that downloading files from Internet, using them on PDA, connecting to Internet, and checking the syllabus on the website of the course were difficult for them.

The use of mobile technology in daily lives

The themes obtained from participants' views with regard to the effects of PDAs on their daily lives are shown in Table 11.

Table 11. Effects of PDAs in participants' daily lives

Themes	Frequency (f)
Communication opportunity	6
Surfing on the net/research/assignment	5
Using as an equipment	2

It was found out that all the participants had positive opinions about the effects of PDAs on their daily lives. The participants reported that they generally kept in touch with their friends and instructors with PDAs, chatted with each other on MSN Messenger, shared information about their personal lives and the course subjects, and discussed their plans about what they would do in the future. Some responses are provided here:

"We share what we did during the day and what we studied in the lesson with friends and instructors." [SS]

"For the impact of it on our daily lives, I can say that we chat with friends, and share everything... We also share them with teachers." [MDK]

"I contact with my friend about where to meet. I can also go online for my assignments." [GA]

Participants also stated that they went online, surfed on the net, did research and assignments, and asked for help from their instructor about the subject. Example views are given below:

"I can say that it is very convenient in daily life. Because I can study anywhere at home instead of being stuck to the desktop in my room. Even, I can go online at a cafe with PDA. It feels good, and sometimes I can say hopefully we have this device.." [EC]

"When I don't understand the assignments or research topics, I ask to the teacher, and share with my friends." [ATO]

BKK and CA further stated that they carried most of the equipments they needed in their daily lives in one device thanks to PDA:

"Instead of carrying a lot of pieces such as notebook, just one device meets my all requirements." [BKK]

"We can use PDA easily because we can carry it everywhere easily. Everyone said I was luck to have it and I got pleased to hear it." [CA]

The use of mobile technology to interact with each other

The interaction of participants with their classmates with PDAs in the PDA aided course was investigated under two dimensions: interaction for curriculum subjects and interaction for extracurricular subjects. The themes obtained from participants' interactions for curriculum subjects are given in Table 12.

Table 12. PDA interactions with classmates for curriculum subjects

Themes	Frequency (f)
Sharing information	16
Communication	11
Contribution to learning	3

All participants had positive opinions about PDAs effects on their interactions with their classmates for curriculum subjects. All stated that they shared information with their classmates through PDAs. Sharing information particularly covers sharing homework assigned by the course instructor, discussing how to do homework, and helping each other:

"Communication is easy with it, we share how to do the assignments with friends." [MDK]

"We share lesson things, help each other, and correspond with PDA." [EO]

They also stated that they got the PowerPoint files of the course from their peers or instructor, and occasionally did it with the Bluetooth feature of PDA. Here, the views of two participants are worth mentioning:

"If I need for an assignment, I take the PowerPoint files from my friends or instructors." [IM]

"I send the subjects of the course to my friends via Bluetooth." [MEO]

Moreover, the participants stated that they discussed the topics of the lesson with their friends using the blog of the course and learned from each other:

"Sharing and discussing on a topic expands my knowledge. We discussed the topics we learned in the lessons, and I learned some information I didn't know before." [GA]

"When we didn't understand information or assignments, we shared and helped each other. Done like this, assignments and information become intelligible and easy. [ATO]

"Exchanging information with all the friends instantly is the easiest way for fast and effective learning. It is a method increasing and supporting success. [BKK]

The participants reported that they had the opportunity to get into contact with their friends and instructors on the course topics easily, thanks to PDAs.

The themes obtained from participants' interactions for extracurricular subjects with PDAs are given in Table 13.

Table 13. PDA interactions with classmates for extracurricular subjects

Themes	Frequency (f)
Communication	12
Exchange of information	4
Shooting photos/videos	1
Exchange of software	1

Except for a participant (IHY), all participants expressed their opinions on this topic. All reported that PDAs had positive effect on their interaction with their classmates for extracurricular activities. They stated that they communicated with each other through PDAs, talked about what they did on the weekend, planned what they were going to do, shared memories, and chatted. In addition, they reported that they shot photos and videos, and shared software with each other. Some views are presented below:

"We share what we did on the weekend, memories, we chat... etc." [MDK]

"We communicate about what we have done in our daily lives. We chat on what we have done." [GA]

"We use chatting tool and chat on msn with friends." [SS]

Participants Use of Mobile Technology in Their Interaction with Their Instructors

The themes obtained from the views of participants with regard to PDAs' effect on their interaction with the course instructor are given in Table 14.

Table 14. Participants use of mobile technology in their interaction with their instructors

Themes	Frequency (f)
Fulfill a learning need	6
Assignment/assignment check	3
Exam	2
Problems faced in PDAs	1

All participants stated that they got in touch with the instructor through PDAs to get information. It was clear that the most important reason for students to get in touch with the instructor was their wish to fulfill their learning needs:

"The instructor lectures. We can listen to the teacher in the classroom. If we don't understand something, we can ask the instructor and want help there. Then, we can understand." [IHY]

"The instructor helps me about the course, make explanations and give information." [EO]

Another reason for the participants' interaction with the instructor was to learn how to do an assignment or receiving feedback for their assignments:

"After sending my assignment to the instructor in e-mail, I can ask him/her if it is correct or erroneous. If I have a missing assignment,

I check it by sending e-mail to my instructor." [IM]

The participants also reported that they kept in touch with their instructor to get information about the exams:

"I can ask questions about exam." [SG]

"I keep in touch with the instructor to clarify the points I didn't understand in the lesson, or to ask about exam." [GA]

CA further stated that s/he got in touch with the instructor when s/he faced a problem in order to get help towards a solution:

"We solved the problems when there was on in PDA." [CA]

Discussion

This study revealed that all participants with hearing impairment had positive attitudes towards a PDA aided courses, and they were happy with using PDA. They reported that a PDA aided course made life easier, saved time, and provided opportunity to access Internet and information any time and place. The findings are parallel with that of Yakuta and Jumpei (2001) who found that children with hearing impairment had positive attitudes towards cell phone, a product of mobile technology for the same reasons. Regardless of the type and frequency of the activity, the activities the participants performed the most with PDA can be listed as chatting, messaging, doing research to get information, taking photos/videos, doing assignments, entering discussions, sending e-mails and playing games.

An important finding indicating the participants' positive attitudes towards PDAs was their perception of PDA as a course equipment. It was observed that this perception was a result of the fact that the course predominantly contained subjects on computer hardware and software, and the PDAs given to them had the operating systems and office softwares that were involved within the scope of the lesson. The PDAs used in this research study have MS Windows Mobile operating system, a mobile version of MS Windows operating system that the participants are familiar with in their desktops or laptops. Moreover, these PDAs include MS Word, MS Excel and MS PowerPoint softwares that the participants are familiar with. If the participants use an operating system they are not accustomed to (for example, PalmOS, Symbian, etc.), this could decrease the use of PDAs for learning and social interaction purposes to a great extent, as found out in the research study conducted by Odabaşı et al. (2009).

Thanks to PDAs' capability to access Internet, the participants could send and receive e-mail, send and receive short text messages, chat on MSN Messenger with each other and the course instructor.

Participants associated the discussion topics with their future profession, and found their interactions meaningful, which increased their interaction with their classmates and instructor on the blog through PDAs and made the online learning activities more appealing and productive. This finding of the study shows similarity with the finding of the research of Johnson, Cathal, and Hall (2006) which was conducted on a learning environment designed with mobile technologies.

Opening canteen and general chat sections on the blog enabled participants to express themselves more easily, to communicate with each other and the instructor about extracurricular subjects. This encouraged students to use PDA and increased their participation. This finding which shows that the blog increased social interaction among participants matches with that of Kuzu (2007) who conducted a research with pre-service teachers on a blog.

According to the data obtained from blog records and website, majority of the participants used PDA every day. The obligation to participate in the blog discussions was the most important determinant of PDA use. Students' interest to participate in discussions was directly related to the instructor's participation. The participation of the instructor on blog discussions encouraged students to join the blog discussions, and participate in the course and the blog. It was evident that the more messages the instructor sent to the discussion page, the more messages students sent. Furthermore, the continuous interaction of the participants with the instructor out of class hours via PDA helped them communicate with the instructor without hesitation. Participants could communicate with each other and the instructor via PDA about any topic any time and any place they wanted, and this helped their educational development and socialization. This was parallel with the finding of Dawabi, Wessner, and Neuhold (2003) which revealed that the use of PDA in learning environment could enrich interaction and cooperation. The same finding overlaps with that of Liu, Tao, Ho, Liu, and Hsu (2007) which showed that students understood and made sense of abstract subjects more easily with cooperative discussion environments offered through PDAs.

The instructor's participation in the blog discussions and activities, giving explanations about how to do the assignments when necessary, and offering examples about activities/assignments encouraged and motivated participants to join the activities, and send messages to blog discussions. This further helped the assignments to be at an expected level. This finding is parallel with the finding of Lui and Hong (2007) who revealed that when the instructor used the reminder strategy for the students with hearing impairment through the mobile technologies, students' level of submitting assignments on time increased, and when s/he used helping strategy, students could solve more problems than those that are assigned as homework to them.

Implications

Students with hearing impairment, who are an important part of our society, though sharing similar cognitive properties with the hearing ones, have limited interaction with the others in the society due to their impairments. Social interactions of students with hearing impairment at school age emerge as a problem which should be taken into consideration. Integrating ICTs, particularly the mobile technologies into the learning environments of individuals with hearing impairment can be one of the solutions for this problem. This research focused on increasing the interaction of the students with hearing impairment with the course materials, with each other and with their instructors through PDA.

This issue would be a concern for normal education as well. Twenty first century represents a widespread democracy, so it should open a way to larger applications for students with special needs. Globalization and democratization should affect educational systems positively; otherwise, it will be a total failure for emerging countries like Turkey. It is well known that an information gap separates industrialized nations from the poorer ones since building an information technology structure requires large investments in equipment, infrastructure, education, and training (Agboola and Lee, 2000). In the current world it is a must to better prepare future citizens of a global society with regard to technology literacies (Artiles and Bal, 2008), A society does not have a right to lose even one person. The researchers know that it is difficult to provide the technological devices such as PDAs to the

population of special education students in Turkey, but it is known that provision of technology devices at institutions is always a problem (Mull and Sitlington, 2003). Conscious of problems, yet eager to open new windows for special education students, the current study can be accepted as a trial and pioneer in this regard.

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