

*REFLECTIONS OF HEARING IMPAIRED STUDENTS ON DAILY
AND INSTRUCTIONAL PDA USE*

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Introduction

Rapidly increasing educational needs of the information society individuals make it necessary and commonplace to use information and communication technologies for instructional purposes. These technologies regulate, direct and shape individuals' social interactions, and help individuals participate in processes and activities which are relatively difficult to participate in (Englert, Margaret, & Young, 2004). Thus, information and communication technologies have become frequently used devices in modern instructional settings by both students and teachers not only because they provide plenty of interaction opportunities, but also they allow participants to access a plethora of information sources and instructional contents regardless of the time and place they are used.

Instructional use of information and communication technologies carries a peculiar importance as they also facilitate meeting the instructional needs of special students who cannot follow the requirements of normal educational processes. These individuals are different in comparison to their peers regarding their individual characteristics and educational proficiencies. Thus, implementing the same instructional methods and contents might not lead to ideal learning outcomes. In order to provide these individuals with a quality education along with chances to pursue an independent life, the instructional processes should be followed with a greater care (Eripek, 2002). The same motto is valid for both partially and completely hearing impaired children as well. Salubrious use of information and communication technologies for these special individuals might lead to better instructional outcomes and quality learning. Burgstahler (2003) lists the benefits of implementing these technologies for special students as follows. He maintains that using these technologies;

- Maximizes independence in academic and employment tasks,
- Increases participation in classroom discussions,
- Helps students gain access to peers, mentors and role models,
- Helps them self-advocate,
- Provides them with access to the full range of educational options,
- Helps them participate in different experiences not otherwise possible,
- Provides them with the opportunity to succeed in work-based learning experiences,
- Secures high levels of independent living,
- Prepares them for transitions to college and careers,
- Gives them the opportunity to work side-by-side with peers,
- Helps them enter high-tech career fields,
- Encourages them to participate in community and recreational activities.

In the present study, researchers considered above assumptions plausible and tried to investigate the instructional and daily use of PDA's by the students with hearing impairment. In this respect, the following parts focus on the education of students with hearing impairment in Turkey, investigate the instructional uses of mobile technologies, and questions the ways to integrate mobile technologies into hearing impaired students' daily lives and instructional experiences.

Education of the Hearing Impaired in Turkey

Even though the language development of hearing impaired students is different from that of their normal peers, they have only two educational options in Turkey. First, they can pursue an education in

special mainstream classrooms in normal schools with both hearing and hearing impaired peers. Second, they can go to special schools for the hearing impaired (Girgin, 1999). They can follow their education as either day students or boarding students in all levels of their education except for the pre-school education. When they graduate from the schools for the hearing impaired or from mainstream classrooms, they have the opportunity to enroll in vocational high schools for the hearing impaired or special mainstream classrooms of other vocational high schools without meeting an entrance requirement (MEB, 2006).

When hearing impaired students graduate from special vocational high schools or mainstreaming, they again have two options of higher education in Turkey. They can either enter the student selection exam (ÖSS) to enroll in a higher education institution according to their scores on the exam, or they can enroll in the Bachelor of Science or two-year degree programs of the School for the Handicapped at Anadolu University based on special ability tests. Anadolu University School for the Handicapped is the only institution in Turkey which provides hearing impaired students with a bachelor degree. In order to provide special students with an education which is appropriate for the type and degree of their impairment, several programs are simultaneously offered in the institution including graphic arts, ceramic arts, architectural drafting and computer operating training. (Girgin, 2006):

Use of Mobile Technologies for the Education of the Hearing Impaired

Aksan (1980) defines communication as the transmission of information, ideas, emotions and intentions from one place to another or from one person to another through primitive or mature indicators. In order to transfer a message through a person or place, it is necessary to transform the message to mutual codes or systematic symbols. Bloom and Lahey (1978) call this coding system *language*, and define it as a group of symbolic relations which are organized through a mutual consensus among individuals in order to sustain the fluency of the communication and describe the experiences in societies.

The basic function of the language is to sustain communication among individuals; however, it also has another crucial function which is to transfer the culture from individuals through individuals. Hearing impaired children with serious hearing problems have difficulty in developing their listening skills since they cannot receive acoustic stimuli appropriately. Some might be as efficient as intact children in speech because of both effective instruction and slight deficiencies in aural organs; however, others have serious speech problems stemming from deficiencies in grammar and phonetics. These individuals either develop insufficient speech skills or utter completely unintelligible patterns which are not accepted by the society (Abberton, Hazan, & Fourcin, 1990). However, diagnosing these students at an early age, exposing them to appropriate instructional settings and providing them with appropriate hearing devices have a considerably positive effect on their acquisition of the language (Clark, 1985; Wood, 1984).

Speaking and listening not only affects children's language acquisition positively, but also serve as basic means of learning both at school and outside the school (Browne, 1996). Tucker (1998) found out that children who did not have a trace of the hearing residual at the first audiologic tests might have better reception of acoustic signals, better differentiation, definition, and comprehension skills, and a better level of language acquisition if they are given proper hearing devices and exposed to appropriate education.

Hearing impaired children follow the same processes followed by their hearing peers during learning. However, because of their impairment, their language acquisition, reading comprehension, and written production are later realized in comparison to their intact peers (İçden, 2003). Thus, instructional settings prepared for the hearing impaired might be different from those of hearing children. Supporting the skills and knowledge instruction through visuals, accommodating instructional settings for the use of visuals, and sustaining peer interaction particularly carry importance. In addition, considering the importance of learning by experience on the sustainability of knowledge, it is utmost important to sustain active learning which is based on active participation of learners and application of theoretical information on real-life practices (Aile Eğitim Seti, [Family Education Set], 1997).

Technological developments facilitated the interaction of hearing impaired individuals with the world. These developments serve to hearing impaired children under two headings, namely, supportive technologies and instructional technologies (Akçamete, 2003). Electronic hearing devices, warning sets, specially-designed telephones, televisions and tele-text applications facilitate hearing impaired

individuals' interaction with the individuals surrounding them. On the other hand, mobile technologies can be considered as an indispensable alternative for hearing impaired individuals as they facilitate their interaction with the society, and meet their daily and instructional needs.

The term *mobile technologies* is used to indicate portable information-technology devices and technologies such as cellular phones, personal digital assistants, and GPRS (Çuhadar & Odabaşı, 2004). The rapid increase in individuals' need to access information whenever and wherever it is needed, made mobile technologies an important instructional device. With the developments in mobile technological devices, the rise of the term *mobile learning* occurs. Several definitions were provided in the literature regarding this new notion of m-learning. Quinn (2000) defines m-learning as e-learning through mobile computational devices. Fagerberg, Rekkedal and Russell (2002) define it as the use of mobile technologies in education. Georgiev, Georgieva and Smrikarov (2004) claim that m-learning is not a new concept which is different from existing e-learning or distance learning applications; rather it should be considered as a new form of these applications. One concept is common in all these definitions, that is, learning content is delivered to learners through wireless networks and mobile computational devices. When instructional endeavors realized through mobile technologies are examined, two types of applications seem to be the most commonplace (Çuhadar & Odabaşı, 2004):

1. Transmission of content to students through portable computers and wireless networks which allows realization of e-learning applications without depending on time and place,
2. Transmission of electronic course materials, sustaining collaboration and communication among students in traditional instructional settings.

Enriching instructional settings through mobile technologies provide both learners and teachers with important advantages. Sharples, Corlett, and Westmancott (2004) mention some of these advantages as follows. Mobile technologies;

- can be used whenever there is a need for learning,
- support individual learning,
- provide collaboration and communication everywhere,
- accommodate to individuals' particular knowledge and skill level,
- sustain uninterrupted access to information resources,
- accommodate to daily communication needs.

M-learning realized through the use of mobile information and communication technologies has some additional advantages (Smith and Kent, 2003). M-learning

- provides a motivational stimulus,
- offers ease of storage and portability,
- contributes to improved written work,
- makes it easier to produce written work,
- increases knowledge of computers,
- offers a range of useful functions,
- is readily available at all times.

Mobile information and communication technologies constitute the core of m-learning applications. Handheld computational devices known as personal digital assistants (PDA) are among the most popular of these technologies. These devices process through specially configured operating systems such as PalmOs, Symbian, and Windows. They have the capacity to run frequently used programs such as Ms Word, Excel, PowerPoint and Adobe Acrobat. It is easy to carry these devices everywhere since they are very small. They have touchpad screens or special pens to operate the device. They allow learners to access Internet and other mobile and non-mobile devices regardless of the place and time they are used, since they have the capacity to use the wireless networks.

Through instructional use of PDAs, students can reach electronic materials and online course contents outside the classroom, and enrich their communication with their teachers and peers. PDAs have two basic purposes in mobile learning (Power & Thomas, 2006):

- to provide sustained personal access to ICT, through which teachers might develop familiarity with relevant concepts and practices,
- to provide access to the projects and professional development materials.

Rios-Gutiérrez and Alba-Flores (2003) maintain that these handheld devices provide access to course contents and laboratory devices which made the learning process more dynamic and interactive. Wireless networks used by these devices support the instructional settings and learning through several ways:

- The interaction among learners and instructors is empowered particularly in large classrooms,
- Interaction outside the classroom is encouraged,
- Student can develop their own software through handheld devices,
- Data collection and archiving become easier,
- Evaluation and data collection become easier through the use of electronic exams and questionnaires,
- Collaborative and interactive learning environments are empowered through increased participation of students.

Purpose of the Study

The purpose of the study is to determine the ways to integrate mobile technology products into the instructional processes of hearing impaired individuals. Within this framework, following research questions will be addressed:

1. How do hearing impaired children use their PDAs for instruction and for daily purposes?
2. Which features of the PDAs attract the hearing impaired students most?
3. Which features of the PDAs are ignored by the hearing impaired students?

Importance of the Study

Investigating the ways to integrate mobile technology devices into the instructional processes of hearing impaired students facilitates designing rich learning environments for these individuals. Since using mobile technology devices require higher levels of technology literacy, the current study aims to design a mobile learning setting for undergraduate hearing impaired students. The only undergraduate institution in Turkey is the School for the Handicapped at Anadolu University where the current research has been conducted. The study is considered important for it constitutes a sample for future researches in Turkey.

Method

Data Collection Instrument

The current study seeks to determine the ways to integrate mobile technology devices into the instructional processes of hearing impaired individuals. In order to serve this purpose, semi-structured interview questions were developed first. Draft questions were examined by an expert panel, revised by experts and shaped according to their comments. Semi-structured interview questions can be listed as follows:

1. What did you do in your daily life and in your Art History Course through your PDA?
2. Do you think that your PDA has helped you in learning the contents of your Art History Course?
3. Which features of the PDA did you like most?
4. Which features of the PDA did you dislike most?

Procedure

At the beginning of the research process, researchers obtained five *Palm Tungsten W* PDAs along with their setup CDs. The PDAs had 16MB hard disk and a peculiar operating system called Palm OS. They could open MS Office documents along with PDF files. They had integrated wireless cellular modems. They could be used as cellular phones which included several features such as SMS, POP3, call waiting, speed dialing, and GSM 900/1800/1900.

Before the research procedures started, each participant was provided training about the technical specifications of the PDAs along with the ways to use the device effectively. Two sessions were administered each of which lasted 90 minutes. During the sessions, students were informed about several applications and were allowed to try those applications on their own as well. After the training sessions, students were given the PDAs, the setup CDs, and the standard user manual along with a special user manual prepared by the researchers. Students were asked to contact with the technical staff whenever they had a problem with the device. Sample pages of the special user manual are given in Figure 1. In the special user manual and during the training sessions, students were trained on how to

use the PDAs rather than on basic computer knowledge. That is because the standard information and communication technology courses already cover sufficient information on basic computer skills.



Figure 1. Sample pages from the special user manual of Palm Tungsten W

The special user manual included useful information regarding the PDAs each supported with relevant illustrations such as the specifications of devices, connecting the device to personal computers, turning on and using the Stylus, using the thumb-pad, using the phone, sending and receiving short messages, adjusting GPRS, e-mail adjustments, and surfing the web. In order for students to get used to the technical features of the devices, they were given three weeks. During this time, several meetings were organized where they could ask their questions regarding the use of their PDAs.

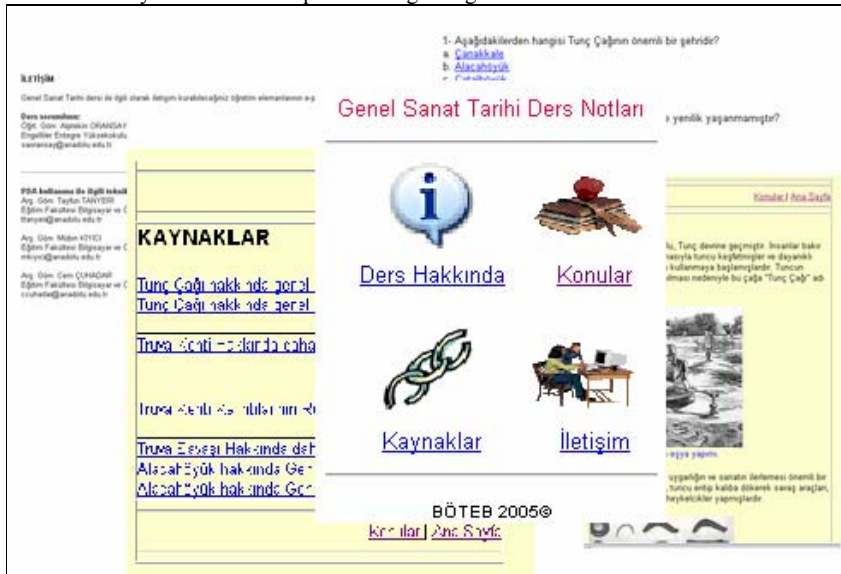


Figure 2. A screenshot from the website designed for PDAs

As the research topic, Anatolian Civilizations unit of the General Art History Course was selected which lasted three weeks. While the course instructor covered the relevant units during the allotted time, the research group supported the course content through a website where supplementary

materials, additional resources and a short exam were included. Participants were asked to use their PDAs within and outside the classroom during this time.

The website consisted of four basic elements. The first part provided the introduction, objectives and supplementary materials. The second part transmitted some subjects to students. Students were free to answer a test after each subject. The third part included several web resources. The last part was the contact section through which the technical staff and course instructor could be accessed. Students were informed that they could contact the course instructor and the technical staff whenever they had problems. During the research process, students contacted with the technical staff several times. Each problem was solved by the technical staff. Students mostly had problems in connecting to Internet, reading their e-mails, installing and uninstalling programs, and using Stylus.

Participants

Qualitative studies involve in-depth analysis of limited number of participants. Because of the work load of in-depth analysis, qualitative studies can only cope with a limited number of participants in comparison to quantitative studies dealing with a relatively larger amount of participants. The purpose in qualitative studies is to gather as much information as possible through using as many instruments as possible. Some qualitative studies include only one participant. The study is conducted with five hearing impaired undergraduate students from the School for the Handicapped at Anadolu University. Characteristics of the participants are provided below:

1st participant (SK): The first participant is a 22-year-old female. She completed her elementary degree at a school for the hearing impaired and her secondary degree at a vocational high school. She did not know how to use a computer when she started her bachelor degree. Her father has passed away and her mother is a housewife. Her hearing loss is 105 dBHL at the right ear and 107 dBHL at the left ear, that is, she has serious hearing loss. Her general point average (GPA) was 3.16 (out of 4) when she participated in the study.

2nd participant (BB): The second participant is a 21-year-old male. He completed both his elementary and secondary degrees at schools for the hearing impaired. He knew how to use a computer when he started his bachelor degree. His father is a faculty member at a university and his mother is a teacher. His hearing loss is 98 dBHL at the right ear and 95 dBHL at the left ear, that is, he has a serious hearing loss as well. His GPA was 3.61 when he participated in the study.

3rd participant (AS): The third participant is a 23-year-old male. He completed both his elementary and secondary degrees at schools for the hearing impaired. He knew how to use a computer when he started his bachelor degree. He reported that he learnt how to use a computer on his own. His father is a computer technician and his mother is a housewife. His hearing loss is 100 dBHL at the right ear and 90 dBHL at the left ear, that is, his hearing loss is serious. His GPA was 3.45 when he participated in the study.

4th participant (ME): The fourth participant is a 21-year-old female. She completed both her elementary and secondary degrees with normal hearing peers at mainstream classrooms. She knew how to use a computer when she started her bachelor degree. She reported that she learnt how to use a computer at a computer school. Her father is retired and her mother is a housewife. Her hearing loss is 92 dBHL at the right ear and 87 dBHL at the left ear, that is, her hearing loss is serious as well. Her GPA was 3.42 when she participated in the study.

5th participant (MO): The fifth participant is a 20-year-old female. She completed both her elementary and secondary degrees at schools for the hearing impaired. She knew how to use a computer when she started her bachelor degree. She reported that she learnt how to use a computer on her own. Her father is a teacher and her mother is a housewife. Her hearing loss is 107 dBHL at the right ear and 107 dBHL at the left ear, that is, her hearing loss is serious. Her GPA was 3.47 when she participated in the study.

Data Analysis and Interpretation

Content analysis was used in order to analyze the data. Content analysis is mostly used whenever the theoretical and conceptual framework is ambiguous. The first step is to code the data. The researcher categorizes the data into meaningful patterns and tries to find out what they conceptually means. Then, these codes are used to attain more meaningful themes. Data is reorganized in accordance with these

themes, which leads to a robust definition and interpretation of the dataset. Finally, findings are interpreted and results are put forward by the researcher (Yıldırım & Şimşek, 2005):

Validity and Reliability of the Data

Guba and Lincoln (1981) propose four criteria for evaluating qualitative findings and enhancing trustworthiness which are credibility, transferability, dependability and confirmability. In order to incorporate these criteria into the current research design, several strategies are adapted as suggested by Yıldırım and Şimşek (2005), such as extended interaction with the participants, in-depth data collection, triangulation, expert opinion, in-depth description and purposeful sampling.

Results

Findings and Interpretation

The data addressing the first research question, which interrogates whether participants used the PDAs in their daily lives and in their Art History Course, revealed that students neither used their PDAs for instructional purposes nor for daily use. Themes addressing the first research question are summarized in Table 1 below:

Table 1.

Reasons for not using PDAs for daily and instructional purposes

- | |
|--|
| <ul style="list-style-type: none"> • Internet connection problems • Insufficient time to get used to the PDAs • Preferring computers over PDAs • Fear of breaking PDAs |
|--|

Of participating students, SK and ME reported technical problems during Internet connection which prevented them from using their PDAs. Besides, they reported that they could not deal with the problems because they did not have enough technical knowledge. Moreover, they did not ask for the help of technical staff who are from another faculty, since they did not have enough time to deal with the problem. Their opinions are provided below:

The PDA could not connect to Internet. I could not go to the Faculty of Education within the week, because I did not have time. I was in trouble. Since it did not connect to Internet, I always had to go to the Internet café. (SK)

However, I could not use the PDA since there were problems with the Internet connection. I could not fix it or have someone fix it. (ME)

Another reason for not using PDAs for daily and instructional purposes is insufficient time to get used to the PDAs. Students mostly reported that they were unfamiliar with the PDA technology and they did not have enough time to deal with the device because of their assignments. Three students out of five reported this way:

I did not deal with that after the teacher assigned us to do so. Because I had a lot of assignments, thus I did not deal with that. (SK)

At the last days, I never used the PDA. It was hard to spare time for this device along with all those assignments. (ME)

I wanted to learn everything about the PDA, but since we did not have enough time, I did not do so. (MO)

Another reason explaining why students did not use or did not want to use the PDAs is a preference for personal computers over PDAs. Of participating students, BB, AS and MO reported that they did not like the PDAs and they got bored after a short span of use:

... I got bored. [...] However, I am not happy with the PDA. It is not necessary for me. (BB)

Sorry, but I did not use the PDA and got bored in a short span of time [...] I did not use the PDA a lot because it did not attract me, I did not like it. (AS)

I was not happy with that. (MO)

Of participating students, ME reported that the device did not attract her since the language of the device is English. Besides, she reported that since PDAs were not popular, she could not find answer to the technical problems. Thus, she preferred her personal computer over the PDA:

Besides, the palm PC was in English, very few people used it, thus it did not attract me. By few people, I mean, most people do not know about it. So, I cannot ask anybody about my problems. So, I did not use it very much. (ME)

AS reported that he did not see any difference between the PDA and his personal computer. He thought that both did the same stuff; however, he preferred the personal computer over the PDA. MO reported in a similar way while she was answering the fourth interview question:

There is no difference between the PDA and the computer. Computer has the e-mail, PDA has it as well. [...] Besides, computer is more beautiful than the PDA. (AS)

As I said, I did not like the PDA, since I did not or I could not use the PDA. Anyways, we always have to use computers because of assignments. Easy way is the short way, thus PDA did not help me at all. (MO)

Fear of breaking PDAs was another theme which was put forward as a reason for not using PDAs. PDAs are expensive devices. Students hesitate using these devices since the devices did not belong to them. AS and MO put it as follows:

I would like to learn how to use PDAs, but I could not completely learn because there might be a problem or an error. (AS)

I would like to search everything about the PDA but [...], I was afraid to break it. (MO)

Even though participants reported that they mostly abstained from using the PDAs, they stated that they used the PDAs for some daily and instructional purposes. Regarding the question which interrogates what types of daily and instructional activities they realized through PDAs, the following themes are summarized from the dataset:

Table 2.
Hearing Impaired Students' Preferences of PDA Use

| Types of Instructional PDA Use | Types of Daily PDA Use |
|--|--|
| <ul style="list-style-type: none"> • Sending and receiving e-mail • Note-taking • Interaction with the course material • Summarizing | <ul style="list-style-type: none"> • Surfing the web • Playing games • Telephone • SMS • Sending and receiving e-mail |

When Table 2 is examined, it is observed that one of the activities done by students is to send and receive e-mails. Of participating students, BB reports as follows:

I learnt how to send e-mails to the instructor, but it did not show whether it sent the message or not. I wondered. I immediately checked Internet on my personal computer. I had sent. I sent the message again. I was confused. (BB)

Above expression of BB reveals that since the student was not sure whether the message was received by his correspondent, he preferred to check the same procedure through the personal computer. This expression also shows that students do prefer personal computers over the PDAs.

Another theme regarding the instructional use of PDAs is note-taking which is illustrated through MO's answer below:

I saved important things and the things the teacher wrote on board to the 'notes' part of the PDA in the Art History Course. Then I transferred them to a paper at home. (MO)

In terms of the instructional use of PDAs, MO stated that she searched relevant supplementary materials for the course, accessed course materials, read and summarized them, and tried to send some materials to her instructor through the PDA. However, because of the technical problems, she then used her personal computer, summarized the course materials and send them to the instructor through the PC. Her opinions regarding this issue are provided below:

... I did research regarding the first assignment the teacher gave, I read it and summarized it through the PDA; however, I had problems in sending this material to the instructor. [...] However, I read the information regarding Art History in the 'Resources' section. I summarized the info and sent it to the instructor through my personal computer. (MO)

When the PDAs daily use is considered, it is observed that they are mostly used for accessing and surfing Internet. Some of the student responses are provided below:

*I checked the Internet the most. (BB)
I accessed Internet through the PDA. (BB)
When I use the PDA, I mostly surf the web. (AS)
In my daily life, I accessed the Net and looked at some pictures, but not so much. (MO)*

Another activity done through the PDAs outside the classroom is gaming. BB, AS and ME reported that they played games with the PDAs:

*I played games through the PDA. (BB)
When I used the PDA, I mostly accessed the Internet, read the messages and played games. (AS)
When I got bored, I played games. (ME)*

Since the PDAs could be used as cellular phones as well, students might have preferred to use them. However, the only student who mentioned this reason, MO said *I used the PDA since I do not have a cell phone*. This statement reveals that she used the PDA not because she liked using it, but she had to use it as she did not have a cell phone. She also mentioned that she did not like the cell phone of the PDA, but she used it to send short messages to her family:

... I send messages and called my family and friends (You were not happy with the PDA.) (MO)

ME mentioned that the cell phone of the PDA is much more complicated than normal cell phones, thus she preferred not to use this specification of the device:

The cell phone was somewhat complicated. I did the same thing more practically through my own cell phone. (ME)

Messaging is another way of using the PDAs for daily purposes. AS's response below can be given as an example of this:

When I used the PDA, I mostly accessed the Internet, read messages and played games. (AS)

ME reported that she did not have enough time to deal with the PDA because of her assignments; however, she used the device for e-mailing for a couple of times:

It was hard to deal with this device along with all our assignments. I could just send a couple of e-mails. (ME)

The research question addressing the most interesting features of PDAs revealed two themes which are given below:

Table 3.

Hearing Impaired Students' Most Favorite uses of the PDAs

- Gaming
- Sending and receiving short messages

Four out of five participants mentioned that they liked the game feature of the PDAs most. SK also mentioned that she liked sending short messages along with gaming. Some participant responses are provided below:

I liked the game feature.(BB)

I just liked sending short messages and playing games. (SK)

ME reported that the PDA was not technically attractive and interesting. She stated that she would prefer a more advanced and user friendly device than the PDA:

The PDA was not technically attractive to me. It did not attract me. I could have liked it, if it would have been a more advanced and user friendly device. (ME)

The final research question addressing the disliked features of the PDAs revealed six themes which are provided in Table 4 below:

Table 4.

Hearing Impaired Students' Least Favorites about the PDAs

- Connecting to the Internet
- Sending short messages
- Using the device as a cell phone
- Sending and receiving e-mails
- Watching, downloading and sending pictures
- The operating system

Some of the participant responses regarding the least favorites are provided below:

I did not like the Internet feature, sending and receiving messages through the phone, sending e-mails, picture feature and the operating system. (BB)

What I disliked most about the PDA is e-mailing, picture features and the operating system. (AS)

MO reported that she was not happy with the device, since it took too much time to access the Internet and turn on the cell phone of the device:

I certainly disliked the Internet and the cell phone features, because it takes too much time to turn these on, sometimes having problems in switching on. I did not like the other features anyway. (MO)

Conclusions and Suggestions for Further Research

Hearing impaired individuals constitute an important part of the society. They have the same cognitive abilities as hearing individuals; however, it is harder for them to interact with the society because of their impairment. Thus, it carries utmost importance to integrate information and communication technologies into instructional endeavors with the hearing impaired. Findings of the current study which focused on the ways to integrate information and communication technologies into lives of the hearing impaired students can be rephrased and interpreted as follows.

The PDAs used during the study involves an operating system (PALM OS) which is quite unfamiliar to the hearing impaired students. Different features provided by the operating system decrease the students' likelihood of using the PDAs for daily and instructional purposes. In order to facilitate the use of PDAs by students, it might be plausible to use PDAs which can operate through mobile versions of Windows students are more familiar with. In addition, students mentioned that they had several technical problems which prevented them from using the PDAs properly. Constant and on-time technical support along with practical information to help students solve the problems on their own

might be quite beneficial in this respect. Technical staff that is always available should be hired for such problems as well. Moreover, the time span to get used to the PDAs should be longer during which students will be able to learn to use the device comfortably.

Along with the technical support which should be provided to students in order to increase the productivity, it is crucial to conduct similar studies to integrate these devices into other courses. Such an attitude will help students get used to the devices better and use them effectively in several courses. Expanding the approach in the current study to other courses will also help students develop positive attitudes towards these devices.

In comparison to desktop computers, PDAs mostly have the ability to use the wireless networks; however, their specifications are generally more limited. Regarding the limited specifications of these devices, making use of their advantages to a higher extent, integrating quality visuals to course contents, and sustaining constructive communication and collaboration through the PDAs can motive hearing impaired students towards the course and the PDA use.

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