Mobile Technologies for Students with Hearing Disability (İBEM)

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Mobile technologies offer several opportunities both for learners and educators. These handheld devices sustain independence from time and place, and serve as useful devices during e-learning practices through the use of wireless connection protocols. Mobile technologies can be used for instructional purposes as well as social interaction. They can also allow hearing impaired individuals to have better communication and learning experiences. The focus of the current paper is a research study entitled 'Mobile Technologies for Students with Hearing Disability (IBEM)' which has been supported by The Scientific and Technological Research Council of Turkey (TUBITAK). Within the framework of the project, mobile technologies are implemented with hearing impaired students to ameliorate their instructional and societal interaction experiences. The study also tries to pinpoint the difficulties faced in practice. Course materials, assignments and drills are all delivered through handheld computers. The study is designed as an action research. In order to collect data, observation and semi structured interviews along with some other qualitative data collection techniques were used. To ensure the validity of the data and to realize data triangulation, personal information forms about students, researchers' diaries, course web pages, forum and e-mail messages, video records and exam results are used.

INTRODUCTION

Hearing impairment can be defined as full or partial loss of the ability to diagnose sounds, which can be caused by several biological and environmental factors. If this loss is serious at the first two years of a child's life to an extent that obstructs detecting, differentiating and understanding linguistic differences, the child faces with the risk of acquiring the native language imperfectly. Listening and speaking do not only affect children's language acquisition, but also their ability to learn new things both in formal and informal settings (Browne, 1996). Thus, children with hearing impairment are quite likely to confront with several difficulties in improving their academic skills (Tüfekçioğlu, 1992).

Communication involves the exchange of information, opinions and emotions. Effective communication among individuals is mostly realized through the verbal language, which consists of a set of organized symbolic relations people agreed on. Hearing impaired individuals have problems in getting used to this agreement. In our daily lives, speaking is almost the synonym of language. Even though this argument is theoretically wrong, speaking is the fastest and most effective way of delivering ideas and sustaining interpersonal communication. However, verbal language or speaking is not the only means of interpersonal communication. Gestures, mimics, and body language can also help us convey the meaning. Even though our interlocutors do not speak, we can understand whether they are responding in a positive or negative manner through interpreting their head and hand movements. For instance, Abbe Charles Michel De l'Epee (1712-1789) observed a basic system of signs already being used by the deaf people in Paris, incorporated these already used signs into an organized and formal sign system, and created the first sign language for children with hearing impairment. His system then became the basis for American Sign Language and influenced several other sign languages. Even though such alternatives have been created, speaking is still the most effective version of communication since it is faster, more flexible and variant than other means of communication. In addition, checking whether the message is correctly delivered is more immediate and easier, which lessens the amount of misunderstandings.

In our daily lives, along with our communication experiences realized through face-to-face verbal interaction, we sometimes need to interact with information and individuals at a distance. We generally use communication tools like telephones, fax machines, and e-mails. Technological advancements helped hearing impaired individuals in this respect. For instance, there are programs that can transform speech sounds into letters and transfer these letters to interlocutors immediately. Thus, hearing impaired individuals who cannot use ordinary telephones can interact with their addressees effectively. Mobile phones constitute another communication means for hearing impaired individuals as these tools became quite commonplace, and they provide users with practical short messaging services. In order to use all these unique communication devices, which might be quite useful particularly for hearing impaired children, it is necessary to be proficient in other verbal communication means that are reading and writing. In this respect, there is a need for new methods and approaches

to address hearing impaired children's academic, cognitive, social and emotional development levels all of which might happen to be somewhat different and underdeveloped than those of their intact peers. Mobile learning practices might be a new and effective way to address hearing impaired students' special needs.

Several definitions are mentioned in the literature regarding 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 notion different from existing e-learning or distance learning applications. They maintain that mobile learning can be considered as a new form of existing e-learning and distance learning practices. One component seems to be common in all definitions, that is, learning content is delivered to learners through wireless networks and mobile devices. Sharples, Corlett and Westmancott (2004) refer to general requirements for technologies to support contextual life-long learning, cite the Sharples (2000) study, and list some advantages that can also be used to define m-learning practices. They are:

- highly portable, that is, they are available wherever the user needs,
- individual, that is, adapting to learners' abilities and learning styles, and designed to support personal learning,
- unobtrusive, that is, the learner can retrieve knowledge without the technology hindering the situation,
- available anywhere to enable communication with peers and teachers,
- adaptable to the context of learning and learners' knowledge,
- useful, that is, they are suited to everyday communication needs,
- easy to use by individuals without previous technology experience.

The current study aims to help hearing impaired students to use mobile information and communication technologies effectively and consciously, and provide them with enriched instructional and communication experiences. Within this framework, an instructional process will be designed, developed, implemented and evaluated in order to ameliorate instructional practices of hearing impaired children.

THE PROCESS OF THE IBEM PROJECT

The Scientific and Technological Research Council of Turkey (TUBITAK) provided the project team with a budget of 170.000 TL (136.000 US dollars). The list of equipments along with their purposes within the project is provided below:

- 2 personal computers, which helped the research team to design and develop instructional materials (e.g. graphics, web pages, instructional contents), and to store research data,
- 20 personal digital assistants (PDA) for participant hearing impaired students in order for them to carry their class notes, access web pages, interact with their peers and the course instructor (Some of the PDAs are being used by the research team to develop course contents compatible with the devices),
- a digital camera, which helped the research team to record classroom interactions throughout the year,
- a voice recorder to keep record of semi-structured interviews conducted with participants,
- a digital board, which can transform the teachers' notes into the electronic format, and transfer this information to students PDAs through wireless connection,

In order to sustain that the research process is realized in a systematic way and research team works in a planned manner, the process is organized within six steps. These steps and their definitions are provided below:

1. Design of instructional materials: The project team worked in two groups. Researchers experienced in terms of instructional design and hearing impaired education worked in the instructional design team. Materials designed by the instructional designers were sent to the technical design team, who developed the content in a way that is compatible with participants' PDAs and accessible through wireless connection protocols.
2. Evaluation of instructional materials: Materials produced in the previous step were evaluated in terms of their instructional and technical features. Instructional evaluation involved

determining whether the materials were appropriate for hearing impaired students. Technical evaluation involved whether the materials were compatible with the display resolutions of PDAs, and whether they were downloaded easily to PDAs.

3. Preparation of user manuals for mobile communication tools: In order for students to use PDAs easily, a unique user manual for students was developed through adjusting the contents of the standard user manuals.
4. Delivering mobile communication tools to students and technical preparation: PDAs were delivered to students a while before the instruction began so that students got used to these devices and began to use them for daily purposes.
5. Project implementation: The course which was supported with the materials peculiar to the context was offered.
6. Data collection and analysis: Collection of data to address the aims of the project was realized and transferred to electronic environment. The data analysis process still continues.

Preparation of PDA User Manual

The project team prepared a user manual for PDAs and delivered the manuals to students at the beginning of the semester in order for students to use these devices easily and solve their problems without a need for technical staff. While preparing the user manual, the standard user manual published on the producer website was resorted. The manual involved detailed and user-friendly information regarding the hardware of the tool along with information regarding the software installed to PDAs.
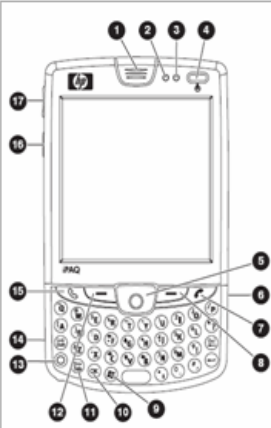
E-POSTA AYARLARININ YAPILMASI

GPRS bağlantısı ve diğer kablosuz ağ teknolojilerinin yardımı ile kullanıcılar HP IPAQ 6915 ile zaman ve yerden bağımsız bir biçimde e-posta gönderip alabilmektedirler. Ekran üzerinde bulunan Messaging programına girilmesi gerekmektedir.

Programa giriş yapıldıktan sonra sol üst köşede bulunan Inbox kısmında Outlook E-mail seçilir ve burada daha önceden ayarlı bir e-posta hesabınız varsa gelen maillerinizi görebilirsiniz.

Daha önceden kurulmuş bir e-posta ayarı yapılmamış ise Menu tıklanır ve Tools bölümünden New Account tıklanarak yeni bir e-posta hesabının kurulumu yapılabilir. E-posta hesabının POP3 ya da IMAP desteği veren e-posta hesapları için yapılabilir. Burada örnek olması bakımından @anadolu.edu.tr adresinin alınmış olan bir e-posta adresinin kurulumu anlatılacaktır.

Messaging programının çalışması ile Menu, Tools ve New Account tıklanmasıyla karşımıza yandaki ekran çıkacaktır. Burada programın bizden mail adresimizi tam olarak girmemizi istemektedir. Enter e-mail adres yazan bölüme mail adresimizi tam olarak mkiyici@anadolu.edu.tr olarak yazar ve Next tıklarız.

e-posta adresi girildikten (1 nolu ekran) ve Next tıklandıktan sonra HP IPAQ 6915 sunucudan gerekli bilgileri otomatik olarak almayı denemektedir (2 nolu ekran). Ancak Anadolu Üniversitesi e-posta sunucusu bu bilgileri otomatik sağlayamadığı için bilgilerimizi

Training Students about PDAs

In order for students to use PDAs during classroom activities, outside the classroom, in their interactions with peers and teachers, and in their social lives effectively, a-twelve hour training was organized. In the first session of the training, students were informed about the project briefly. Then, they were informed about the ways to use PDAs along with the hardware of the device. After students were orientated about the hardware and software, they were also asked to define every single unit of the device. In the second session of the training, students were informed about using PDAs for basic interpersonal communication. Thus, the facilities of cell phone and SMS were explained. In the third session, students were informed about how to connect Internet, wireless internet connection, and GPRS connection, which makes use of the GSM lines. In the last session, students were informed about how to operate the programs already installed to the tool. In addition, programs that can be used for daily practices were explained. Installing new programs and uninstalling existing programs were explained and the training was finalized.

Course Implementation

The implementation of the project was realized in the Fall semester of 2007 during the course entitled 'Fundamentals of Information Technology – I' at the Graphic Arts Program at the Department of Applied Fine Arts at Anadolu University School for the Handicapped. The course was realized in three different contexts which were Web, blogs and classroom. Activities realized through web and blogs were developed by the technical team to ensure that course materials can only be accessed through PDAs. The implementation of the course was realized by the project team based on the lesson plans prepared by the course instructor, slides addressing the contents, and class notes. Previously determined activities were evaluated in a meeting involving at least a researcher and the course instructor, made compatible with the project implementation procedures, and offered to students.

Classroom Context

Activities requiring face-to-face instruction were realized in the computer laboratory of Anadolu University School for the Handicapped. The laboratory had 13 computers each connected to Internet and each other through a local area network. The main computer was supported with a video projector which was used by the course instructor. In addition, a digital board is located in the classroom along with a whiteboard in case the digital one breaks down.

Course Web Pages

As the resolution display of the PDAs was quite low (240x240 pixels), the website of the course along with contents of other pages were prepared by the technical team accordingly. In addition, as the PDAs were compatible with the mobile version of Internet Explorer, HTML tags supported by this version were used. Since it was not possible to open several web pages simultaneously, the website

menu was prepared as a single frame. Thus, students were able to see the menu on every page they visited. The website prepared for the project involved the components of 'Courses', 'Canteen', 'Help', 'About' and 'Contact'.

Courses:
Class notes are provided on this page, which was updated every week. A navigation system helps students to access previous weeks' class notes as well. Contents are organized under main headings for each week. Students can access any heading and return back to the list of headings through clicking the 🏠 button.
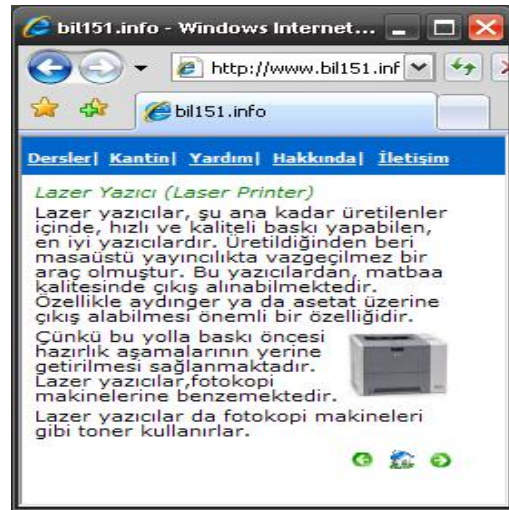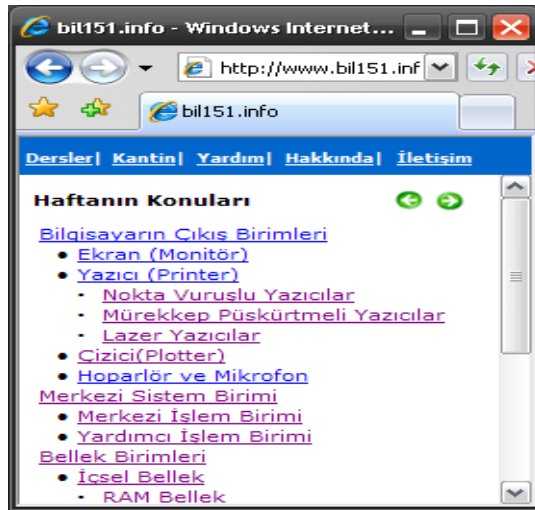
Canteen:
This page is designed to help students interact with their peers and the course instructor through using the blog technology.
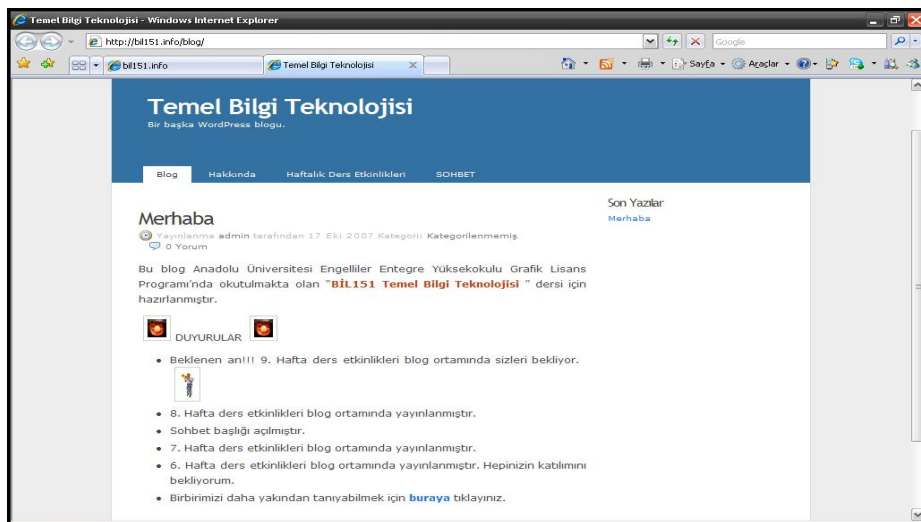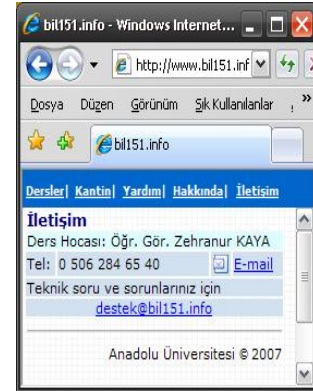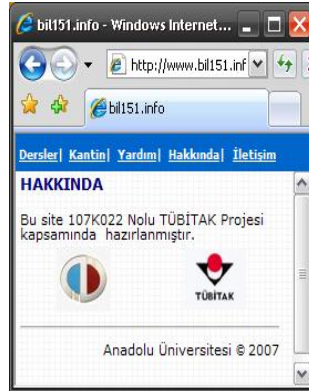

A Screenshot of the Canteen

Help:
Through this page, students can access instructions regarding the project along with the user manual of the PDA.

About:
Information regarding the project is provided on this page.

Contact:
Contact information of the course instructor and technical staff are provided on this page.

After the website was tested in the intranet of the institution, a domain name was rented (www.bil151.info) and made ready for use before the semester started.

METHODS

The project was designed as an action research. Action research can be described as a systematic collaborative investigation realized to improve the quality of actions within classrooms (Johnson, 2002). Action research requires systematic data collection and analysis to understand and solve an existing problem or a problem appeared during the implementation of a research (Yıldırım & Şimşek, 2005). The process is realized through determining the research problem, collection data, analyzing and interpreting data, planning action, implementing action, and deciding on alternative actions (Mills, 2003).

The current research makes use of several qualitative data collection techniques particularly observations and semi-structured interviews. In addition, students' personal information forms, course web pages, forum and e-mail messages, video recordings, and exam results constituted other sources of qualitative data to describe the context in detail and to sustain data triangulation, which is an important strategy to sustain data credibility (Creswell, 2005). The context of the implementation should be described clearly and in detail which is an important aspect of action research. In this respect, data collection tools are explained below:

Expert Panel

In order to evaluate problems confronted in terms of theoretical framework and implementation of the project, an expert committee was formed consisting of scholars experienced in instructional design, hearing impaired education and qualitative research methods. The committee also provided potential solutions to implementation problems. A committee meeting was organized every week whose written reports were collected within a committee decisions file, and implemented throughout the project.

Personal Information Forms

The study tries to emphasize a learner-centered approach. A personal information form was generated and administered to participants to investigate learner profiles. The form included questions addressing some background information about the participants such as their genders, whether they had a personal computer, and frequency of Internet use.

Researcher Diaries

Researcher diaries constitute an important data source in qualitative studies. Every project member involved in the action learning process has kept a diary in which they have recorded their reflections, action plans, record of actions that were taken, observations on the effects of actions and impressions about the implementation.

Semi-structured Interviews

Semi-structured interviews are frequently used in qualitative research methods. They had a small set of questions to direct the participant towards the scope of the project, but they also allowed participants to raise relevant items they liked within the general topic. Interviews also helped

researchers to confirm the data, elaborate on findings, and describe findings in detail as indicated by Yıldırım and Şimşek (2005).

Blog Records
In addition to face-to-face interaction within the classroom, blogs provided learners with a new opportunity to interact. Each week, a discussion topic was determined and students were asked to discuss on these. The data addressing asynchronous interaction patterns were collected through blog records.

Video Records
Observation is another frequently used method in qualitative studies. Note-taking during observation might be a data recording option; however it has several limitations as notes do not sufficiently reflect every single physical and social data. Video records made it possible to elaborate on the details of the physical and social context and allowed researchers to examine the context again and again (Yıldırım & Şimşek, 2005). Two IP cameras were located in the laboratory in order not to loose any data. In addition, a member of the research team used an extra camera to record the courses.

Midterms and the Final Exam
Students were administered two midterms and a final exam. The average of short quizzes administered during the courses as pre-tests and post-tests was the total score of the first midterm.

Reflections
Students' reflections about the use of PDA for instructional purposes, about the problems they experienced, and similar things were sought for during the implementation process.

CONCLUSION
The study was designed as a two-year project. The implementation process was completed in accordance with the steps to be followed in any action research endeavor. The research team is now analyzing semi-structured interviews, voice recordings, video recordings, and student reflections which were collected throughout the implementation process.

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