Technology use via students with hearing impairment: Hear your voice and be heard

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Abstract

The study which aimed to develop the technology use process in reading and writing activities for students with hearing impairment using Wikis was designed as an action research. Participants were seven fifth grade students attending the Research and Education Center for Children with Hearing Impairment (ICEM) at Anadolu University in Eskisehir during the 2012–2013 academic year and their two teachers. Research data were obtained via course plans and evaluations, course observations, video recordings of the courses, reflective diaries related to the courses and semi-structured interviews with the teachers. No problems were encountered during the training given to teachers and researchers in integrity and in two consecutive sessions and presented the skills related to the activities. According to the teachers' views on the project; the teachers were satisfied with the project, the project increased the visibility of ICEM and it improved the technological efficiencies of both the students and the teachers and supported the development of students' vocabulary.

Keywords: Hearing impairment, technology use, Web 2.0, Wiki.

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1. Introduction

Internet is one of the fields of change and transformation in technologies. With the development of the Internet, several new technologies surfaced and these created new habits, new concepts and new lines of work. Internet, by providing new possibilities to the users and transforming itself in accordance with the demands of the users, continues providing new technologies. Web 2.0 and the new understanding it brought to the Internet is one of these new technologies. Users are no longer only a passive recipient of the content provided with Web 2.0 technologies but they could play an active role in creating this content. Thus, users could access the information they demand, while at the same time they could create their own by structuring this information. Wikis are among these Web 2.0 technologies that can provide these opportunities for the users. Wikis overcome the common problem in technology use in education, which is the time spent to learn how to use a new technology and the extensive amount of time spent to learn how to perform education and instruction using the new technology (Moursund & Bielefeldt, 1999), by providing an environment in which everyone who can use a word processor could create page content. Users could spend the time they would spend to learn how to use Wikis in learning how to use Wikis for their own purposes.

Mobile technologies, computers, educational software, games and technology-rich media could facilitate the learning of individuals with special educational needs (Altan, 2014; Girgin, Kurt & Odabasi, 2011; Kuzu, Odabasi & Girgin, 2011). Information and communication technologies, in addition to changing the academic experiences of children with special educational needs (Morrison, 2007), improve the educational output and life standards of these students (Blackhurst & Edyburn, 2000; Fisher & Frey, 2001). Although literature review displayed the possibilities of a strong educational environment as a result of the synergy between the Wikis and constructivist approach, it revealed no studies on the utilisation of such an efficient environment with groups with a disability. Disabled people due to the problems arising from their disabilities could not share equal opportunities with other individuals, while technological innovations could generate solutions for this inequality (Cagiltay, Cakiroglu, Cagiltay & Cakiroglu, 2001; Cankaya, 2013; Sahin, 2011). Thus, it was observed that the students who utilise mobile educational platform for people with special educational needs which includes skills such as social skills, language, mathematics, environmental awareness, gained experience on situations that they have never experienced before and that their interest and attention on learning were increased as a result (Fernandez-Lopez, Rodriguez-Fortiz, Rodriguez-Almendros & Martinez-Segura, 2013).

For students with hearing impairment exhibiting lower reading and writing skills (Stoner, Easterbrooks & Laughton, 2005), computer and Internet technologies rise to prominence as significant opportunities in supporting the reading and writing skills that especially the students with hearing impairment must gain in early ages and minimising the problems encountered during the learning process. While Karal and Cifci (2008) asserted that the use of material enriching the instruction such as animations was rewarding for the education of individuals with hearing impairment and it would also enrich the educational experience, Akcamete (2007) argued that the technologies used in the education of students with hearing impairment should be diversified. Consequently, information and communication technologies could help to deal with the problems that become evident in the form of lower learning performance (Liu & Hong, 2007) in students with hearing impairment vis-a-vis students with normal hearing. Thus, it could be stated that as the technical problems experienced in the educational environment have decreased due to the developing technology, improving the educational technology use in-class activities and diversifying the technology-supported materials would create an efficient and productive educational process and would avail significant benefits for students with hearing impairment.

Integration of materials that are appealing to more than one sense, implementation-oriented, dynamic, reusable and reclaimable, into the learning environment provides different experiences for the students with hearing impairment while supporting the development of their creativity and acquisition of new concepts. Today's technologies by rejecting the user as a passive recipient enable

the user with an active role in producing and editing the content. It is considered that the use of Wikis, one of the above-mentioned technologies, in the educational activities of students with hearing impairment would enrich the reading and writing experiences of these individuals. While the individuals with hearing impairment would express their experiences using their own words via Wikis, the editing capabilities of Wikis would contribute to the reading and writing activities. However, there are no studies on the use of Wikis in the education of students with hearing impairment in the literature. This study, which aimed to develop the technology use process in the reading and writing activities of students with hearing impairment via Wikis, is unique for its efforts in developing the technology use with the students with hearing impairment, for the inscription of the text by the students of the Research and Education Center for Children with Hearing Impairment (ICEM) during the process of education and instruction, for its innovative approach and for its use of Wikipedia with individuals with disabilities and for it is an interdisciplinary (information technologies-special education) study. Thus, the general aim of this study is to develop the technology use process in reading and writing activities for students with hearing impairment using Wikis. Within the context of that general purpose, the following questions were aimed to be answered:

Within the technology use implementation to be realised with the students with hearing impairment:

1. In the planning of the implementation process, how would the training of
   a. researchers,
   b. teachers and
   c. students
   should be implemented?

2. Within the reading and writing activities of the students,
   a. in developing materials and
   b. developing Wikipedia pages
      i. what are the problems they face and
      ii. the solutions to these problems?
3. What are the efficiencies of using the technology by the students at the end of Wikipedia implementation?
4. For the evaluation stage of the technology use implementation implemented; how are the opinions of
   a. teachers and
   b. students?

2. Methodology

2.1. Research model

This study aimed to create a model implementation that could be used to solve problems faced in the education of students with hearing impairment, designed as an action research to integrate the education and instruction of students with hearing impairment with technology, to evaluate the contributions of the technology and to support the skills of the students using the determined technologies. Action research is a process that entails the systematical data collection and analysis in determination of problems concerning the implementation process or in understanding and solving the problems already determined (Bogdan & Biklen, 2003; Yildirim & Simsek, 2011). Although there are several definitions about action research in the literature, they all agree on the purpose of this type of study as 'to change or develop the current situation in a classroom, program or the whole school' (Kuzu, 2005).

2.2. Participants

The research team that conducted the action research was formed by a total of eight researchers, out of which six were graduate students and one was a specialist in Computer and Instruction Technologies Education and one was a specialist in the field of education for hearing-impaired. Participants of the study were seven fifth grade students attending the Research and Education Center for Children with Hearing Impairment (ICEM) at Anadolu University in Eskisehir during the 2012–2013 academic year and their two teachers. One of the researcher teachers is the teacher of the class, at the same time, conducting group language courses and one-on-one studies at ICEM for 17 years. Another researcher, studying the development of reading and writing skills in children with hearing impairment for 19 years, conducted the planning of the content design and implementation for the Wikipedia Internet encyclopedia within the course of this study. Six graduate students worked one-on-one with the students with hearing impairment on the education process conducted with tablet computers under the supervision of teachers and the coordinator. Table 1 demonstrates the specifications and audiologic information of the participant students attending the fifth grade in the 2012–2013 academic year at ICEM.

Table 1. Student specifications and audiological information

Students	Chronological age (Months)	Degree of hearing loss (dBHL)	Hearing aid		Age of first hearing aid use (Months)	Cochlear implant age (Months)	Age of the start of education at ICEM (Months)
			Right	Left			
Doruk	157	112	CI	BTE	24	55	59
Sener	128	104	CI	BTE	24	42	42
Mahmut	127	111	CI	BTE	20	48	41
Mustafa	157	109	CI	BTE	24	85	112
Canan	128	108	BTE	CI	9	43	42
Mert	125	94	CI	BTE	19	60	39
Asena	155	110	CI	BTE	72	72	85

CI = cochlear implant; BTE = behind-the-ear hearing aid.

Five of the participating students were males and two were females. As could be observed in Table 1, six students had very severe and one had severe hearing loss. Chronological ages of the students varied between 13 years and 1 month and 10 years and 5 months. All of the students have cochlear implants in one ear and behind-the-ear hearing aids on the other. The age of the initial use of hearing aids, which is effective on the development of language skills of children with hearing impairment, varied between 9 and 72 months.

2.3. Data collection tools

In the process of content creation, the data of the study were obtained via interviews by participant students, classroom observations, course outlines and evaluations, documents obtained from the audiology clinic, examination of written products and their editing in one-on-one sessions, video recordings of the courses and by using reflective diaries for the courses. The data for the implementation process were collected via course plans and evaluations, course observations, video recordings of the courses, reflective diaries related to the courses and semi-structured interviews with the teachers.

2.4. The educational environment of the study

The study was conducted in the fifth-grade class at ICEM in Anadolu University. ICEM is a private educational institution that provides full-time day school for students with hearing impairment using Natural Auditory/Verbal Approach. At ICEM, hearing loss is diagnosed at early ages by the audiology clinic and children are equipped with hearing aids matching their hearing loss. Preschool education for children with hearing impairment starts at the age of three in ICEM and group classes and one-on-one studies are instructed by teachers, who graduated from the Program in Education of the Hearing Impaired, during the primary, middle and high school education. In group classes, the courses and the syllabus suggested by the Ministry of Education are implemented by observing the personal needs of the students and in one-on-one studies, chats, reading and writing studies are conducted to support the development of language skills. Development of the language and academic skills are continuously evaluated at ICEM and students with the equal language, communication and academic skills with peers with non-hearing-impairment are directed to the mainstreaming implementation and these students are provided with daily educational support facilities. The fifth grade at ICEM is divided into two sections of the 'big classroom' and the 'small classroom'. The big classroom is where the group studies are conducted and one-on-one studies are conducted in the small classroom. Two teachers are assigned in the grade, while one instructs the group studies in one classroom; the other conducts the one-on-one studies in the small classroom. In the big classroom, there is an area where the students participate in group courses; and desks where the students are engaged in activities right after the group sessions. In group instructions, students form a 'U' where they could see both the teacher and each other. In the small classroom where one-on-one studies are conducted, there are desks and chairs where the teacher could study with the student one-on-one. Both classrooms are sound insulated; and on the bulletin boards in classrooms, the activities for group sessions and one-on-one studies are demonstrated. These activities are initially displayed on classroom bulletin boards and then presented on the school bulletin boards. The environment where the students conducted the implementation process of this study using tablet computers was the student cafeteria at ICEM. Here, tables, where students could work with researchers and a whiteboard, were present. Furthermore, during the implementation period, a video camera was supplied to record the process.

2.5. Data collection process

Study data on the design process of Wikipedia content were collected between 19 November 2012 and 4 January 2013. Between the dates of 19th November and 20th December 2012, group activities were organised on content creation, followed by free writing activities for the students, and the written products obtained between 19 November 2012 and 4 January 2013 were reviewed in one-on-one sessions and edited by the students under teacher supervision. All events during the data collection period were recorded by a video camera to be later used in data analysis and reliability studies. Study data on the upload of Wiki content to the Wikipedia environment using tablet computers are collected between 12 April 2013 and 31 May 2013 and study data on teacher interviews are collected on 7 June 2013.

2.5.1. Content creation process

The class periods were 36–45 minutes long in group activities applied within the topic centred approach in social studies courses. In these courses, students were presented with information on ICEM content and in the next period, planning studies on the content that would be added to the existing content were conducted. Immediately after the group activities, every student was asked to write down the content discussed during the period. During the 20–35 minutes long free writing studies, students were asked to write down the information that they desired to be in the Wikipedia ICEM content and already discussed in the class on paper, and no help was provided during this process. After the students completed writing, they were asked to check their articles and edit their mistakes if necessary. After the written products were obtained, the teacher conducted one-on-one

editing sessions with each student. In every such session, the written products were reviewed by the teacher and the student together and edited in accordance with the phases of the implementation plan. Editing sessions with the students lasted 10–20 minutes in an average (Karasu, Akay & Girgin, 2013).

2.5.2. Implementation realised with the use of tablet computers

Within the scope of the course plans of the related week, students were instructed by a researcher. Students answered the questions asked, articulated new concepts during this process, where new concepts were written on the whiteboard and the students were made to read them to provide permanence for the concepts. Then, the students worked with their paired researchers one-on-one. During these studies, the concepts learned as a result of the weekly course plan were repeated with implementations, unclear points were questioned and the one-on-one sessions continued until every student displayed the week's achievements.

2.5.3. Validity and reliability process

In the study, during the content creation process, content validity was obtained by consulting expert opinion on the subjects and courses instructed and one-on-one editing studies. As part of the validity studies, data collection process and data analysis were monitored by a field expert who worked on the education, language development and reading and writing skills of students with hearing impairment for 33 years.

A researcher, who studied in the development and evaluation of the reading and writing skills of the students with hearing impairment for 19 years, conducted the implementation reliability studies on the acquisition and editing of written material in one-on-one environments and inter-evaluator reliability studies. The videos of all nine free writing sessions conducted to obtain the written material were watched and it was observed that no assistance was provided to students during the implementation of the writing of the written material. Among the 63 one-on-one editing sessions, 32% were watched. In the written material editing studies, implementation reliability on whether the implementations were handled the same way with all the students as planned and inter-evaluator reliability on the way mistakes were corrected in the writer material was discussed. Reliability studies resulted in 100% unanimous consensus.

The consistency of the transcripts of the audio recordings of the interview process was examined for the reliability of the data obtained from the interviews conducted with the teachers. For this purpose, 8–15-minute portions of audio recordings were listened to and compared with the transcripts for consistency. Then, data analysis transactions were conducted independently by two researchers and a field expert. Afterwards, the researchers and the field expert met to compare their studies and finalised the reliability study. In reliability studies, 96% consensus was reached. During the whole implementation process, researcher teachers and the coordinator evaluated the implementations weekly and in a sense acted as a validity committee.

3. Findings

Researcher and teacher training in the planning of the implementation process was conducted on 5 April 2013 and lasted for almost 2 hours. This training, given to teachers and researchers in integrity and in two consecutive sessions, presented the skills related to the activities that would be conducted with the students as divided into weekly targets. In this process realised with researchers and teachers, a high-level expert researcher in the use of tablets in education instructed about the use of tablets, followed by an instruction on the use of Wikipedia. No problems were encountered during the training and the paths to follow when conducting the implementations with the students with hearing impairment were discussed. During the implementation process realised with students, course outlines prepared by the project team and reviewed and finalised by the researchers and teachers working at ICEM were followed. During the first week of the implementation (12 April 2013), initially,

the team met with the children and students were paired. After the pairing, the pairs sat next to each other, where the researcher sat on the cochlear implant side of the student and then the instruction on tablet computers started. As per the plan for the first week, the concepts of 'tablet, touchscreen, volume control, main screen, status bar, icon, charge, screen lock' were instructed. During the first week, while a researcher presented the instructions, others worked one-on-one with the students. However, the implementation lasted longer than expected that way, there was no time left for experiments, students paid more attention to the researcher that they worked one-on-one and did not pay any attention to the instructor, thus the desired productivity was not acquired. A meeting of researchers was called at the end of the implementation process, where they shared their experiences and developed an action plan for the defective points of the process. Thus, it was decided that starting the next week, the instructor would summarise the subjects of the previous week and the new concepts would be instructed by the researchers, who would be working with the students one-on-one within the implementation process. This situation was narrated in researcher diaries as follows: *Since the previous implementation lasted longer than expected, we have changed our action plan and decided that researchers and students will study one-on-one in this week's implementation* (Murat), *We spent too much time with instruction last week and the tablets sitting in front of the children distracted the students, we have decided on personal education for this week* (Deniz).

In the implementation process realised on 26 April 2013, in parallel to the action plan and the course plan, the researchers instructed the paired students on the concepts of 'Internet browser, Safari, Internet address, address bar, Google, search engine and tab'. During the studies, ICEM teachers monitored the working groups continuously and assisted the students and researchers when they deemed necessary, supporting the instruction process. In this process, while the students worked one-on-one with the researches, too much noise occurred in the environment, thus the project group decided that the desired productivity was not acquired and a second action plan was developed. In that respect, the following week, sitting arrangements were changed and it was decided that one researcher would instruct using one single tablet computer and the students would commence to work one-on-one with the researchers only after the end of these instructions. This situation was reflected in researcher diaries as follows: *We were going to follow a different way of instruction than last week. Because there was a lot of noise last week* (Fikret), *We decided to do an implementation, which was a mixture of the two initial weeks. One of the researchers will instruct the students. Later on, researchers and students would go on to one-on-one for the implementation* (İlhan).

In the third week of the study (03 May 2013), the hearing-impaired students who were the participants of the study, were placed in U form around the researcher who would perform the instructions and the researcher instructed the concepts of 'sandbox, content, bold letters, italic letters, preview' as per the course outline. During the instruction process, the concepts were written on the whiteboard, letting the students repeat them. After the instructions, the students commenced to study one-on-one with their paired researchers. This process was observed to be more productive than the previous 2 weeks. Students expressed their experiences for the third week and the words they learned in their diaries as follows: *Teacher Sukran told about all the words and what do they stand for* (Mert), *I learned what sandbox means* (Asena).

The fourth week of the study conducted the same way since the previous week was productive and no loss of time was experienced. However, the researcher who was instructing the students was speaking too fast and was warned by the researchers from ICEM. Students expressed their experiences for the fourth week and the words they learned in their diaries as follows: *We created a story. We logged in* (Sener), *Teacher Deniz repeated the old words and told new words. We learned the words of login, username, password, copy and paste* (Canan).

In the fifth week of the study, the input of the content that students created in social studies course into Wikipedia was realised. In this process, the students could not recognise the situation that could arise when everyone tried to enter content for the same subject and wanted to save their content all at once. However, the researchers that they worked one-on-one with explained the situation and

asked the students to copy the content to their notepads before saving it and then instructed the students to copy the content from the notepad to Wikipedia and save it there in an orderly fashion. The implementation was finalised after all students saved their content to Wikipedia and ICEM Wikipedia page was created (http://tr.wikipedia.org/wiki/%C4%B0%C3%87EM). This was reflected in researcher diaries as follows: *When ICEM is searched in Wikipedia, the content comes up. We start to reap the fruits of the study* (Fikret), *Students got the payback of their correct and complete writings* (Arif), *After we saved the content, we checked if we did it right by searching ICEM. There it was!* (Ilhan)

During the sixth week of the study, in parallel to the course plan, the concepts of 'shooting mode, photograph mode, video mode' were instructed to the students and then the students shot photographs of different departments in ICEM under the supervision of the researchers they have paired with. The students enjoyed this implementation a lot since they were more active when compared to the previous weeks. Students reflected their experiences and the words they have learned in the sixth-week implementation in their diaries as follows:

We took the picture and we shot video. I shot a lot, I was so happy (Asena).

Me and Mert looked at the pictures on the iPad. Then, we were so happy (Mahmut).

…today we took pictures. Today's class was so much fun (Mert).

I took pictures, then shot videos (Mustafa).

In the seventh and the final week of the implementation, the process of the project was reviewed in the form of questions and answers with the students. In other words, the learned material was reinstructed. Finally, each student wrote everything that has been accomplished within the sphere of the project and their own feelings using the notepad implementation in the tablet computers under the supervision of researchers. While the students were writing these, researchers assisted the students whenever necessary preventing mistakes. Researchers assisted the writings that the students wrote using the notepad implementation to include the terms and the words that the ICEM experts and researchers determined to be used during the tablet training. Participant Canan's views on the implementation expressed by using the words she learned during the process are as follows:

I was so happy when the Wikipedia project started on 12 April. Teacher Sukran taught us many words. Teacher Sukran instructs us so well. Teacher Sukran taught us the word 'charge'. We checked the charge and my iPad had plenty of energy. We clicked on the Safari icon and wrote 'Bursa Zoo'. We looked at the pictures. I wrote Heidi and wild mountains' in the sandbox and we created a story. Computer teacher distributed us a manual. We took several pictures. We were so sorry that the Wikipedia project was over :(

Within the context of reading and writing activities for students with hearing impairment, in the processes of content creation, researchers working with the students developed the content for Wikipedia Internet Encyclopedia. For this purpose, nine courses were implemented within the context of social studies courses. During these courses, the students created the content. Content created was inspected by the instructor and the researcher at the end of each class and it was made sure that in written material, the students could organise their thoughts, could tell about them in a particular order, title their material according to the content, their writings include introduction, development and conclusion sections and they could use correct punctuation marks, such as full stop, comma and question mark. Students generally used proper syntax; however, in the use of suffixes and in spelling, they have made mistakes that required deletion of a vowel, syllable, suffix or the word itself, mistakes that needed replacement of vowels, syllables, suffix or words, mistakes that required re-editing and spelling mistakes. These mistakes were corrected by the teachers in one-on-one sessions. In one-on-one writing correction studies, first the students were allowed to correct their own mistakes, if they could not correct their mistakes, the mistakes were identified by the teachers, verbally corrected by the teachers, the correction was written on a separate piece of paper, respectively, if the students still could not correct their mistakes. Following the one-on-one editing studies conducted with the

students, the written material required from each student on the information shared in group sessions was obtained and the content creation process was completed. During this process, the students learned detailed information on their school, ICEM and had the opportunity to get to know their school better.

The problem faced during the implementation process was the inability of researchers to situate themselves always on the cochlear implant side of the students and changing their positions only after researchers working at ICEM warned them. Another problem was the fact that during the first 2 weeks of the study, due to the instruction method and the sitting arrangements, the interest of the students was concentrated on the tablet computers instead of the material instructed. Furthermore, certain problems arose when researchers used different concepts out of line with the course plan and sometimes instructed the students very rapidly, but these were resolved immediately after warnings by the surveillance team members.

At the end of the Wikipedia implementation, the efficiencies of the students to use technologies in reading and writing activities have improved. There were no problems faced during the implementation process on iPad use and content input of the students into Wikipedia, and this was an indicator that their technological proficiencies have increased. Concurrently, in the texts the students wrote in the notepads in their iPads, they have used technological concepts such as 'using iPad, Safari, Wikipedia, Internet address, sandbox, taking pictures' and this fact could be considered as the demonstration of the benefits of the many reading and writing activities implemented in Turkish courses. The increase observed in the technological efficiencies of the students was also reflected in teacher views when they wrote that the tablet use of the students improved significantly in weekly terms.

The views of the teachers on the evaluation stage of the implemented technology use implementation were grouped under six topics: whether the project has met the expectations, effects of the implementation, contribution of the project to ICEM, the problems encountered during the implementation, solutions for the problems encountered during the implementation process and similar project proposals. In the theme of the project meeting the expectations, the teachers argued that technological implementations could contribute to the improvement of reading and writing skills and the project helped promote ICEM. Similarly, the teachers stated that the effects of the implementation on the students were the increase in their vocabulary, obtaining skills to use a tool alone, while they argued that the effects of the project to the teachers were the facilities it provided for their learning when they had the opportunity to obtain information from experts without having to discover it themselves. Teachers addressed the issue of the contributions of the project to ICEM in its technological, recognition and infrastructural aspects and stated that they could search the Internet now, they could install to their iPads, there was no content to access about ICEM before the project, so the project contributed to the recognition of ICEM and finally, since the technological tools penetrated their educational environment, their utilisation has become common. In addition to these positive contributions, there were also certain problems, common to every implementation. Both teachers participated in the interview stated that their biggest problem was the lack of time due to their busy schedule. Teachers agreed on the solutions created for the problems encountered and stated that the whole project team was in continuous communication all the time and that helped by providing cooperation and collaboration. Thus, the problems that surfaced were resolved by mutual understanding and cooperation within the project team and efforts were spent to prevent the interruption of the project. This fact indicates the importance of the consensus among project members in project implementations. During the interviews conducted with participating teachers, they stated that the project was productive and satisfied with the results. At the same time, teachers believed that the implementation of the project in different disciplines with different populations would be beneficial.

The views of the students on the evaluation of the implemented technology use implementation were positive. These positive views were reflected in their writings in the notepad implementation in

their iPads and in the pictures they drew for the researchers and the notes they have made on these drawings. Students were happy about the implementation process, learned about new concepts and expressed sad emotions regarding the termination of the implementation process. In the process, their vocabulary has improved and technological efficiencies have developed. Students were excited about using a new technological tool in the learning process; they have learned new concepts about technology in addition to learning how to use this new gadget. It could be stated that they had a pleasant learning process as a result of the positive learning atmosphere created by their interaction with the project group. Thus, the participant students have embraced the implementation and have contributed actively in the implementation process.

4. Results and discussion

The study that aimed to improve the technology use process in the reading and writing activities for students with hearing impairment using Wikis was designed as an action research. No problems were encountered in the tablet education conducted by two practitioner teachers, two researchers and six doctorate candidates. It could be possible that, in addition to the fact that the educational process was conducted by a competent person and was able to provide answers to the questions posed by the participants, the literacy of the participants in using laptops, smartphones and similar technologies could have resulted in a problem-free process of education because the experience of the teachers, their approach, beliefs and attitudes affect their use of technology in education (Cagiltay et al., 2001). The most significant problem encountered during the implementation process was the inability of the researchers to always locate themselves on the cochlear implant side of the students with hearing impairment and changing their positions after the warning of the researchers from ICEM. A possible reason for that could be the lack of the previous opportunity for the researchers to work with students with hearing impairment one-on-one. Another problem was the instruction method during the first 2 weeks and the lack of students' concentration on the instructions due to the tablet computers. Their attention was concentrated on tablet computers. This could be due to the fact that they were presented with a new tool for the first time, different from the class material they were accustomed to. In fact, a new stimulus, an unusual situation could attract the attention onto itself. Furthermore, certain problems such as researchers diverting from the course plan and using different concepts, speaking very rapidly were encountered, but classroom teachers among the researchers made necessary warnings and these problems were resolved immediately. The reason for that could be the fact that researchers did not have the experience to instruct or work with students one-on-one although they have observed the education process for students with disabilities for a semester previously.

At the end of the Wikipedia implementation, students' efficiencies in using technology in reading and writing activities have improved. Thus, tablet computer use has the potential to improve note-taking skills of students with hearing impairment (Parton, 2006). It was possible that the introduction of a new and attractive tool into the learning environment of the students increased their motivation, created eagerness in learning; therefore, increasing the speed with which they have learned to use tablet computers, contributing in the increase of their technological efficiencies. According to the views of the teachers who worked one-on-one with the students with hearing impairment, the development of the students' use of tablets changed significantly on a weekly basis.

According to the teachers' views on the project; the teachers were satisfied with the project, the project increased the visibility of ICEM, which has not been heard of in digital media before and it improved the technological efficiencies of both the students and the teachers and supported the development of students' vocabulary. Furthermore, teachers were also satisfied with the fact that the infrastructure investment for the institution, thanks to the project, would benefit the future courses in the establishment. Teachers stated that the problems due to the lack of time and workload were resolved, thanks to the cooperation and meetings among the team.

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The study provided opportunities to use Wikis in the educational activities of students with disabilities and to enable these individuals to use their reading and writing skills in different contexts using technology and to express their thoughts using their own words via Wikipedia. The following suggestions were developed based on the study process and the findings of the study:

- Further qualitative and quantitative studies could be conducted to develop the technology use process in reading and writing activities of students with hearing impairment using different research designs than action research methodology.
- Different social media tools would be used for developing reading and writing skills of students with hearing impairment.
- Similar studies could be conducted with student groups with different disabilities.
- The efficiency of instructional implementations in the technology use process for students with hearing impairment could be further developed with different activities.

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REFERENCES

Altan, T. (2014). The many faces of TPACK/special education teacher education. Retrieved February 14, 2015, from http://www.spundge.com/item/187366/

Akcamete, G. (2007). Where we are in the education of children with hearing impairment? In *Proceedings of Disability'07 Exhibition and Social Activities Congress* (pp. 188–195). ıstanbul, Turkey: Harbiye Askeri Muze ve Kultur Sitesi.

Blackhurst, A. E. & Edyburn, D. L. (2000). A brief history of special education technology. *Special Education Technology Practice, 2*(1), 21–35.

Bogdan, R. C. & Biklen, S. K. (2003). *Qualitative research for education: An introduction to theories and methods* (4th ed.). New York, NY: Pearson.

Cagiltay, K., Cakiroglu, J., Cagiltay, N. & Cakiroglu, E. (2001). Teachers' perspectives about the use of computers in education. *Hacettepe University Journal of Education, 21*, 19–28.

Cankaya, S. (2013). *Development and evaluation of self-care and domestic skill teaching software for parents of individuals with intellectual disability* (Unpublished doctoral thesis). Anadolu University Graduate School of Educational Sciences, Eskisehir, Turkey.

Fernandez-Lopez, A., Rodriguez-Fortiz, M., Rodriguez-Almendros M. L. & Martinez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education, 61,* 77–90.

Fisher, D. & Frey, N. (2001). Access to the core curriculum: critical ingredients for success. *Remedial and Special Education, 22,* 148–157.

Girgin, U., Kurt, A. A. & Odabasi, F. (2011). Technology integration issues in a special education in Turkey. *Cypriot Journal of Educational Sciences, 6*(1), 13–21.

Kuzu, A. (2005). *A constructivist approach to online assisted instruction: an action research* (Unpublished doctoral thesis). Anadolu University Graduate School of Educational Sciences, Eskisehir, Turkey.

Kuzu, A., Odabasi, H. F. & Girgin, M. C. (2011). Use of mobile technologies to supoort students with hearing impairment: a case from Turkey. *Educational Technology Theory and Practice, 1*(2), 52–82.

Karal, H. & Ciftci, E. (2008, July 31). Benefits of computer-aided animation in the educational process of individuals with hearing impairment. Retrieved October 19, 2012, from ietc2008.home.anadolu.edu.tr/ietc2008/86.doc/86.doc

Kurt, A. A. & Goksun, D. O. (2016). Technology use via students with hearing impairment: Hear your voice and be heard. *Journal of Education and Special Education Technology*. *3*(1), 001-012.

Karasu, H. P., Akay, E. & Girgin, U. (November, 2013). *Content preparation process with students with hearing-impairment for internet encyclopedia Wikipedia.* Paper presented at the 23th National Special Education Congress, Bolu, Turkey.

Liu, C. & Hong, Y. (2007). Providing hearing-impaired students with learning care after classes through smart phones and the GPRS network. *British Journal of Educational Technology, 38*(4), 727–741.

Moursund, D. & Bielefeldt, T. (1999). A national survey on information technology in teacher education. Santa Monica, CA: Milken Exchange on Education Technology.

Morrison, K. (2007). Implementation of assistive computer technology: a model for school systems. *International Journal of Special Education, 22*(1), 83–95.

Parton, B. (2006). Snapshots of interactive multimedia at work across the curriculum in deaf education: implications for public address training. *Journal of Educational Multimedia & Hypermedia, 15*(2), 159–173.

Stoner, M. L., Easterbrooks, S. R. & Laughton, J. M. (2005). Handwritten and word-processed story retellings by school-aged students who are deaf. *Journal of Special Education Technology, 20*(3), 35–44.

Sahin, Y. L. (2011). *Development of a system to sustain seeing with sound for the education of visually impaired students* (Unpublished doctoral thesis). Anadolu University Graduate School of Educational Sciences, Eskisehir, Turkey.

Yildirim, A. & Simsek, H. (2011). *Qualitative research methods in the social sciences* (8th ed). Ankara, Turkey: Seckin Yayincilik.