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Developing Technology Supported Instructional Activities in a Class of Middle School Students with Intellectual Disability *

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Abstract

The purpose of this study is to create a class supported by advanced technological tools (e.g. tablet computer, interactive boards) in a special education middle school for students with intellectual disability; conduct technology-based instructional activities; determine the problems likely to emerge in this process and solve these problems; and improve students' competencies in the Science and Technology course. This study, which is an action research, was conducted in three stages: "Determining the Situation", "Implementation"; and "Monitoring". This paper presents the implementation and monitoring stages of the study. The research participants are 11 sixth grade students with mild intellectual disability receiving education at an official special education middle school, their parents, two classroom teachers of the intellectually-disabled, validity committee members, dissertation supervision committee members, and the researcher. The research data were obtained from video-recordings, field notes, the researcher's diary, daily lesson plans, validity committee meeting decisions, decisions taken in the reflection and planning meetings with the teachers, semi-structured interviews, artifacts, criterion-referenced test, check-lists, and official documents. The data obtained during and at the end of the research process were subjected to content analysis via Nvivo 10.

The findings indicated that identifying student needs in the integration process, providing and developing electronic contents according to these needs, and planning instruction activities by taking these needs into consideration are important. In addition, the research provided very detailed data concerning the problems likely to be encountered in the integration of technology into a natural teaching environment. It was stressed that the problems encountered during the use of technology in instruction activities may lead to new behavioral problems, and teachers have to take measures against these situations. The integration of technology

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into the Science and Technology course curriculum improved the students' academic performance. It also contributed to the teachers. The findings were discussed in the light of other studies in the literature, and recommendations were put forward for practice and further studies.

Introduction

With the recent advancement in technology, it is aimed to make every student technology literate and access the information they need. Hence, it is planned to increase student achievement by improving knowledge, instruction activities, and dynamic classroom activities. Although individuals with intellectual disability have the same needs as typically developing individuals, they need the diversification and adaptation of instruction activities. At this point, technology minimizes the limitations of students with intellectual disability and enriches their learning by offering them a multiple perspective regarding concepts and real-life problems and providing visualization (Anderson & Anderson, 2005; Colomo-Palacios, Paniagua-Martin, Garcia-Crespo, & Ruiz-Mezcua, 2010).

It is seen that there are great number of terms that explain use of technology in education of students with intellectual disabilities. Terms; assistive technology, instructional technology, assistive learning technology, information and communication technology, computer assisted instructional can be seen often in the literature (Liu, Wu and Chen, 2013; Spooner, Knight, Browder, Jimenez and DiBiase, 2011). Technology, although it is expressed with different terms, the main goal is to contribute education of students with intellectual disability using benefits of digital technologies. In this study authors prefer to use the term "technology" to describe the high technology (digital) to prevent term complexity.

It is reported that the use of technology in instruction activities for students with intellectual disability increases students' motivation and interest in lessons and improves their basic thinking and learning skills through visual and sound effects (Hasselbring and Williams-Glaser, 2000). Additionally, technology makes teaching more effective as students receive consistent and instant feedback (Smith, Spooner and Wood, 2013). Technology also allows individualization, supports unique learning styles and skills, provides individuals who have difficulty in expressing themselves with alternative ways of expressing themselves and sharing what they know, allows doing consistent research as much as desired, and so on (Green, 2011, p. 7; Whitby, Leininger, and Grillo, 2012). Although it is known that technology is so effective for individuals with intellectual disability, there are only a limited number of studies on the integration of technology into instruction activities (Courduff, Szapkiw and Wendt, 2016; Edyburn, 2010; Ertmer and Ottenbreit-Leftwich, 2010; Mishra and Koehler, 2006).

Edyburn (1998) defines the integration of technology into curriculum as associating the contents and technological tools that provide learning and teaching with instructional goals and states that the technologies to be used in teaching must be used in a focused, purposeful, and manageable way that improves student performance. In Edyburn's (1998) Model of the Technology Integration Process, which is stated to be a developmental model, the phases required for the integration of software (i.e. multimedia applications) into the curriculum are described in detail in four main phases: (a) selection of technologies, (b) acquisition of technologies, (c) implementation of technologies, and (d) integration of technologies. Edyburn (1998) states that students' competences, the subject covered, and the type of technology do not affect this model process and that the model offers teachers a route map for the integration of software into the curriculum.

King-Sears and Evmenova (2007) say that educators can use technology to improve the effectiveness of instruction, but effective instruction requires integrating instructional technology and assistive technology into well-designed meaningful activities. King-Sears and Evmenova (2007), list the steps to be followed in the integration of technology into the curriculum as follows:

- Determining student needs and acquisitions,
- Evaluating technology choices and deciding on what can be used,
- Diversifying activities to integrate technology into instruction activities,
- Implementation and monitoring of its effect on students.

In Turkey, teachers and students perceive technology as a separate activity or end-of-lesson reward rather than using it as a teaching tool in daily instruction activities in educational environments. It is reported that the way teachers use software and hardware is more important than the availability of technological hardware and software in a classroom. In other words, difference occurs in the effectiveness of instruction as a result of not only technology but also the way teachers use and adapt technology (Colomo-Palacios et al., 2010; Wang, Ke, & Wu, 2012).

A great deal of studies show that technology is effective in education of students with disability (Doenyas, Şimdi, Özcan, Çataltepe, & Birkan, 2014; Fitzgerald & Koury 2008, Kim, Cho Blair, & Lim, 2014; Sheriff & Boon, 2014; Mechling, 2007; Ramdoss et al., 2012; Yücesoy-Özkan, Öncül, & Kaya, 2013). It is stated that there is a need for research in relation to the use of the proven technologies in instructional activities and the program.

Very limited number of studies have been carried out on the use of technology in special education schools in Turkey. In their study aimed at determining the problems encountered in the integration of technology into a special education school attended by hearing-impaired individuals, Girgin, Kurt and Odabaşı (2011) conducted an open-ended survey to 11 teachers working at that school. 55% of the teachers stated that many of the problems encountered in the integration process of technology are about the method of integrating information and communication technologies rather than infrastructure problems. The authors reported that technology integration does not necessarily mean that the school has internet connection and computers and teachers have basic skills of using technology, rather the integration process involves more important details. They highlighted the importance of the curriculum and teaching methods in technology integration.

Sola-Özgüç and Cavkaytar (2014) conducted a case study to describe the use of instructional technology by special education teachers in a special education school attended by students with intellectual disability. The data obtained from the semi-structured interviews conducted with the teachers, the observations made in the classrooms, and the researcher's diary indicated that instructional technology for students with intellectual disability is very limited, which has a negative effect on students and teachers.

Although rapid development in technology has increased the use of technology in educational environments, instruction activities in special education schools do not involve technology-supported instruction activities due to reasons such as lack of technological hardware and content and limitedness of teachers' skills of using technology. They observed that when the teachers had a chance to obtain technological tools, they conducted course activities without providing technology integration (Sola-Özgüç & Cavkaytar, 2014).

Though studies conducted in other countries indicate what needs to be done in planning technology integration and the obstacles encountered in the implementation of technology integration models, they do not give much space to the basic stages of the integration process (Edyburn, 1998, 2001; Haines & Sanche, 2000). Based on the recommendations put forward in the studies conducted in Turkey and other countries, the present study aimed to integrate advanced technologies into curriculum in a special education school attended by students with intellectual disability, examine the stages of the technology integration process in detail, and develop technology-supported instruction activities. Interviews with teachers graduating from the department of classroom teaching of the intellectually-disabled indicated that teachers need instructional technology more in science and social studies education (Güleç Aslan et al., 2012). In his research examining the studies dealing with the teaching of academic skills with technology support, Martin (2006) found out that the studies were mostly related to reading, writing, and mathematics and there was a need for research about the use of technology in science and social studies education. The present study was conducted within the scope of the Science and Technology course as it contains knowledge that will be more useful in the daily lives of students with intellectual disability and this knowledge is not taught in the daily life and outside the instruction activities. In this regard, this study sought to create a classroom supported by advanced technological tools (e.g. tablet computers, interactive boards) in a special education middle school for students with intellectual disability; integrate technology into a unit of the Science and Technology curriculum; develop multimedia applications and carry out technology-supported instruction activities; determine the problems likely to emerge in this process and solve these problems; and improve students' learning and competencies in the Science and Technology course. To this end, an attempt was made to answer the below-mentioned research questions:

1. How technology was used into the Science and Technology course of the class 6-A?

- **1.1** What kind of a process was followed while developing the Individualized Education Program (IEP)?
- **1.2** How was technology integrated into IEP?
- **1.3** How were the supplied technologies configured and put in the class?
- **1.4** How were the instruction activities carried out?
- **1.5** How were the situations encountered during the use of technology improved?

2. What are the effects of the use of technology in the Science and Technology course instruction activities on students and teachers?

3. What is the situation like in the Science and Technology course four months after the implementation in terms of;

- **3.1** Students?
- **3.2** Teachers?

Method

Methodology of Research

This is an action research aiming to integrate technology into the Science and Technology curriculum of middle school students with intellectual disability for improving instruction activities and to monitor the integration process. Qualitative and quantitative data collection tools were employed. Action research refers to the process of determining an existing problem, taking actions to solve it, and establishing a continuous connection between the action developed as a solution and the reflection considered as its result (Avcı, 2013; Mills, 2003). In their school observations made before the present study, the authors found out that technology use was very limited at the school. The first author works as the advisor of six fourth-grade students from the university where she works within the scope of the "Teaching Practice" course at the school included in the study. She observed the fourth grade students at that school within the scope of internship two days a week. During the observations, she had a chance to observe the possibilities of the school, the structure of the classes, and the diversity of teaching tools. In the interviews conducted with the teachers, they stated that they had material problems in the lessons and the school provided very limited opportunities for the use of technological tools though they wanted to use them. In this regard, it was aimed to carry out the present study in an attempt to answer the question of how technologies can be used in the lessons so that instruction activities can be improved. This research was conducted in three stages; (a) determining the situation before the implementation, (b) implementation, and (c) monitoring process. This paper presents the implementation and monitoring process stages. The process of determining the situation was published in another scientific journal as a research. The implementation process was planned based on the 1,133-minute observation data obtained from the process of determining the situation.

Setting

The study was carried out in the class 6-A of a special education middle school located in Sakarya. This class was included in the study because its teachers for the following academic period had been defined whereas there was a possibility of change in the teachers of other classes, and the teachers of the class that would be 6-A in the following year were voluntary to take part in the study. The classroom is located on the second floor of the two-floor school.

Participants

The research participants are two teachers of the class 6-A, 11 students diagnosed with mild intellectual disability, the students' parents, the researcher, and validity and dissertation supervision committee members.

(a) Teachers: Both of the teachers are female. They graduated from the department of "Education of the Intellectually-Disabled" of a state university. Teacher Nalan is 27 years old and has a professional experience of four years. Teacher Firdevs is 30 years old and has a professional experience of ten years. The teachers shared the Science and Technology lessons that were two course hours on two days of the week and conducted the instruction activities in accordance with the lesson plans and directions prepared by the researcher.

(b) Students: The classroom includes 11 students with mild intellectual disability. Although it was stated that all of the students had mild intellectual disability, they fell under three different levels in terms of academic skills. The first level includes the students named Sacide, Tufan, Sema, and Doğuş receiving three to five-year inclusive education in a general education classroom. The second level includes three students named Selin, Öykü, and Zehra graduating from a special education elementary school and a student named Zehra K. that had graduated from a general education elementary school and been enrolled in that school in the year the research was carried out. The third level includes three students named Ali, Aykut, and Mert graduating from a special education elementary school and showing lower academic skills performance than their friends in the other group. The students in the classroom were diverse in terms of educational background and having or not having advanced technologies. Table 1,

which includes the students' descriptive characteristics, presents these details as well. As it was thought that the data related to all the students included in the study would cover too much space, it was decided to select two focus students from each level (i.e. a total of six focus students) and monitor the developments of these students (the eighth validity committee meeting minutes dated 04.02.2014; non-structured interview with classroom teachers, 11.02.2014; and the diary, p. 53). Based on this decision, the following six focus students were selected: Sacide and Sema from the first level (high level) group; Selin and Zehra Y. from the second level (medium level) group; and Aykut and Mert from the third level (low level) group. While the quantitative results obtained concerning the students' success in the Science and Technology course are presented over the focus students, other findings are presented over all the students.

(c) Parents: The mothers of nine students and the father of one student were contacted when necessary. The parents of a student were not contacted in the beginning. As that student was placed in the child home in the research process, the special education teacher working at that institution was contacted in the implementation stage of the study. The mothers' ages vary between 31 and 53. Their average age is 42. While eight of the mothers graduated from an elementary school, one mother graduated from a middle school. The father is 47 years old and graduated from a high school. The parents were included in the study mostly for information purposes. In addition, they were requested to support their children at home when they were given homework about the Science and Technology course activities in the implementation stage (Diary, p. 61).

(d) Researcher: The first author participated in the study as the researcher. She has been working as an instructor at the department of special education of a state university for 10 years. She received undergraduate education in the fields of education of computer and instructional technologies and education of the intellectually-disabled. She received the Action Research course in her doctoral program. She has conducted studies in which qualitative research methods have been used. She fulfilled some tasks in ensuring the integration of advanced technologies into the program as a participant observer in the stage of implementation. These tasks included determining advanced technologies, placing them in the classroom, integrating technology into the curriculum, planning lesson activities and sharing them with teachers, keeping a diary about the observations and progresses made in the implementation process, preparing action plans against the existing problems, taking audio-recordings and video-recordings, and analyzing the data during the process. In the monitoring stage, the researcher made observations about the implementation of the lessons as a non-participant observer after technology integration had been completed.

(e) Validity Committee: A "Validity Committee" was formed to guide the researcher about the action plans to be developed by her by discussing the situations based on the data obtained in the implementation process. The committee consisted of two faculty members specialized in the field of special education and one faculty member specialized in the field of science education.

(f) Dissertation Supervision Committee: As this study was conducted as a doctoral dissertation, a Dissertation Supervision Committee was formed to supervise the steps followed by the researcher in the research process, the data collected by her, and the analysis of the collected data and to put forward recommendations. This committee consisted of three faculty members (two faculty members specialized in education of the intellectually-disabled and one faculty member specialized in education of computer and instructional technologies).

Data Collection

The research data were obtained through observations, semi-structured interviews, document analysis, the researcher's diary, check-lists, criterion-referenced test (CRT), daily assessments, artifacts, validity committee meeting minutes, dissertation supervision committee meeting minutes, and reflection and planning meeting reports.

(a) Observation: The primary data of the present study were collected via observations. All the Science and Technology lessons conducted in the process of integration of advanced technologies into the Science and Technology course were observed. The observation data were video-recorded. The observations were video-recorded for 2029 minutes. In the monitoring stage, the researcher observed the situation in the classroom as a non-participant observer. The observations were video-recorded for 141 minutes in this stage.

(b) Semi-structured Interviews: At the end of the implementation, semi-structured interviews were carried out to determine the teachers', parents', and students' views. 10 students participated in the interviews as one student was transferred to another school during the implementation. 9 parents participated in the interviews because one student lived at a child home and one student was transferred to another school. An interview was conducted with the teacher of the student living at the child home. Two classroom teachers participated in the interviews. All the interviews were audio-recorded. A sound-recording of 315 minutes was obtained in the end.

(c) Researcher's Diary: A researcher's diary functions as a schedule for the researcher and is a record that provides information about the stages of the research and involves the researcher's comments based on the data sources such as observations and interviews used in a study (Mills, 2003; Ünlüer, 2011). In this research process, the researcher kept a diary of 136 pages, 70 of which were kept in the stage of determining the situation.

(d) Documents: To have detailed information about the students, the student files were examined by gaining permission from the administration. The researcher examined the educational evaluation reports given by the Counseling and Research Center (CRC), parent interview forms, and school case analysis forms in which some students' behavioral problems had been recorded, all of which were included in the student fields.

(e) Check-Lists: The check-list developed by the researcher to identify the students' prior knowledge of the unit into which technology would be integrated was administered to 11 students for 15 to 30 minutes, and the data were recorded.

Another check-list used in the study was the reinforcer list that was developed by the researcher to determine effective reinforcers in instruction activities.

(f) Criterion Referenced Test (CRT): A CRT was developed for the "Let's Know the Matter" unit covered in order to make a detailed evaluation of the effects of the conducted instruction activities on the students. CRT was administered to the focus students before and after the implementation. While the CRT administration before the implementation took 22 to 43 minutes, the CRT administration after the implementation took 34 to 50 minutes. After the implementation, CRT was administered to only four focus students as one of the students had been transferred to another school and another student had dropped out because of family-related reasons.

(g) Daily Lesson Plans: Twenty-four different daily lesson plans were prepared for two course hours by the researcher and teachers. These plans included the instructional goals, the tools used, the way lessons would be taught, and assessment of whether the target skills had been acquired by the students. The data obtained from the assessment activity carried out by two teachers at the end of the lessons were entered in the assessment tables in the daily lesson plans and delivered to the researcher. These data helped the researcher make decisions such as proceeding to the next subject or repeating the same subject in the reflection and planning

meetings conducted with the teachers. Also, they provided information about the student' development during a term.

(h) ***Artifacts:*** A WhatsApp group titled "Borinli" was formed to facilitate the communication with the teachers in the research process. Photos were also shared in the group. 15 photos and 27 text data were obtained through the sharing on that medium. The records of the exercises done by the students were taken in the form of software reports on the webpage "www.ozelegitimakademisi.com".

(i) ***Validity and Dissertation Supervision Committee Meetings:*** Eleven validity committee meetings and two dissertation supervision committee meetings were conducted in the implementation stage of the study. The topics brought forward and the decisions made during the meetings were audio-recorded. The transcriptions of the audio-recordings were reported by the researcher in the form of meeting minutes. 587-minute audio-recording was reported during the research.

(j) ***Reflection and Planning Meetings:*** Throughout the implementation, the researcher and two teachers of the classroom came together at the end of lessons in order to scrutinize the lessons and plan the next lesson. In those meetings, they watched the video-recordings and discussed student performances and instruction activities. A total of 19 reflection and planning meetings were carried out. The topics brought forward and the decisions made during the meetings were audio-recorded. 572-minute audio-recording was reported by the researcher during the research.

Data Analysis

In action research, data are analyzed both during and at the end of the process (Creswell, 2014, p. 261; Glesne, 2013, p. 261; Mertler, 2006, p. 124). In the present study, the data were analyzed in two stages: analyses during the process and analyses after the collection of the data.

(a) ***The Analyses Made During the Process:*** (a) During the research, reflection and planning meetings in which the video-recordings taken during the lesson were watched were made at the end of the lessons. Those meetings were audio-recorded. The audio-records were reported immediately after the meeting. (b) The lessons were summarized; their macro-analyses were made; and the points to be discussed in the validity committee meetings were determined at the end of each lesson (two course hours). (c) The obtained data were handled in the validity committee meetings held every week or every 15 days. Those meetings were audio-recorded, and the audio-records were reported at the end of the meetings. Those decisions led the way for the action plans to be implemented in the subsequent week. (d) The students' daily assessments were entered in the performance sections, thereby obtaining program-based evaluation data. (e) In that process, the researcher wrote the situations she encountered during the observations and in the research environment in her diary.

(b) ***The Analyses Made After the Collection of the Data:*** After all the data were obtained, an intensive analysis process was launched. First, representative video-recordings were determined for the analysis of the video-recordings. While determining the video-recordings, particular attention was paid to taking those records from the early weeks and the late weeks of the implementation in order to clearly show the developments in the process. Another criterion was taking video-recordings from the second course hours of the lessons as technology was mostly used in the second course hours. In this regard, six course hours were determined for detailed analysis. Semi-structured interviews and the determined video-recordings were transcribed.

As the research question "How technology was used into the Science and Technology course of the class 6-A?" dealt with a process, this question was responded based on artifacts such as diaries, reflection and planning meetings as well as the summary documents of the video-recordings. The research question "What are the effects of the use of technology in the Science and Technology course instruction activities on (a) students and (b) teachers?" was responded through inductive analysis via Nvivo 10. The situation concerning the monitoring stage, on the other hand, was descried by using the video-recordings and the researcher's diary.

Validity and Reliability

Qualitative data collection tools are predominantly used in action research. Based on the validity and reliability principles suggested for qualitative research, the following measures were taken in the present study (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005; Güler, Halıcıoğlu, & Taşğın, 2013, p. 333; Merriam, 2013, p. 206; Uzuner, 2005, p. 8): (a) The Science and Technology lessons were observed from March 1 to June 13, 2014 and from 22 to 23 October 2014 and documented by field notes and video-recordings. (b) A three-person validity committee and a dissertation supervision committee were formed for them to guide the researcher and supervise the process. Also, expert opinions were frequently taken to check the transcriptions of the audio-recordings and video-recordings and ensure the reliability of the coding. (c) Ten different data collections techniques were employed in the study. Data triangulation was made based on the obtained data, and the consistency of the data was ensured. (d) All the steps of the research were described in detail. (e) The researcher periodically held validity committee meetings and conducted reflection meetings with the teachers about the classroom activities at the end of each lesson in order to ensure the objectivity of the data. (f) The research was verbally presented in a national congress and presented as a poster in an international congress and examined by experts independent of the research. (g) As this research was supported by Anadolu University Scientific Research Projects Unit, the development reports given once every six months were evaluated by the commission, and the data were examined by the independent experts.

Research Ethic

In this research, ethics were taken into consideration in terms of (a) administration of the study to the participants, (b) collection of the data, and (c) the researcher's responsibility to public (Güler et al., 2013). In the beginning, research permission was gained from the governorship of the province where the research was carried out. In addition, Ethics Committee Approval was taken from Anadolu University for the research. The committee approved that the research would have no ethically negative effect. The participating classroom teachers, students, and their parents were informed about the research. They are mentioned with their code names rather than their real names in this paper.

Audio-recordings and video-recordings were taken in the data collection stage, and the obtained data were documented. As the purpose of the action research was to solve the problems encountered, no data were excluded from analysis. On the contrary, the fact that the obtained data manifested different situations enriched the research. An attempt was made to contribute to filling in the gap between practice and theory by seeking solutions to the problems encountered in the real educational environments. While the reports were being reported, the positive and negative aspects of the process were expressed for future studies, and recommendations were put forward in regard to the solution of negative situations.

Research Process

1. Integration of Advanced Technologies into the Curriculum

The phases to be followed for technology integration in the present study were carried out taking into account the studies conducted by Edyburn (1998) and King-Sears and Evmenova (2007). The technology integration into curriculum process implemented in this study was themed as follows: (a) development of IEP, (b) integration of technology into IEP (c) configuration of technologies and placing them in the class. In addition, the problems encountered during the process and the solutions generated for them are given under the title of situations encountered during the integration.

1.1. Developing an individualized education program (IEP)

Before the implementation, the researcher examined the IEP of the students in the spring semester and determined that the IEP prepared as a one-year plan did not include the goals concerning the "Granular Structure of Matter" unit, which is covered in the sixth grade curriculum and has to be taught. The authors decided that the effect of technology could be seen in this unit more clearly as no instruction activity had been organized for students on the subjects of that unit and the unit contained abstract concepts (Diary, p. 25). On the other hand, the researcher decided to teach the "Let's Know the

Matter" unit, which is included in the 4th grade curriculum, as the "Granular Structure of Matter" unit of the Science and Technology course covered in the 6th grade included higher level skills than the students' levels. To integrate technology into instruction activities, she prepared an IEP for the students in the first place. She also developed and administered a separate criterion-referenced test for six focus students in order to identify the students' prior knowledge of the "Let's Know the Matter" unit and set goals appropriate for their levels before technology integration.

1.2. Integration of technology into IEP

This stage involved planning what kind of tools should be used in instruction activities to accomplish the goals set and procuring such tools. In this regard, both hardware and multimedia applications that could be used in instruction activities were searched. They were procured after the ways they would be used in the instruction activities were determined.

1.2.1. Determining and procuring the hardware

As the purpose was to ensure the use of advanced technologies in the classroom, it was planned to provide every student with a tablet computer and earphones and put an interactive board and printer in the class. The research was supported by Anadolu University Scientific Research Projects Unit. Considering the research budget, it was considered more appropriate to use tablet computers with Android operating systems as they had a wider range and economical. Also, as the students with intellectual disability had limitations in their fine motor skills, the use of large-screen tablet computers was deemed suitable. Based on these criteria, it was decided to procure tablet computers with a screen size of 9.7 '' for the research. Wall-mounted 65'' interactive board was procured as an in interactive board. A printer was chosen regarding printing out many pages, scanning, and photocopying features. However, some problems were experienced in the procurement of advanced technologies in the research process. While the interactive board and tablet computers had to be supplied by March 2014, they were supplied only on 9 May 2014. In that process (from 1 March to 9 May 2014), the researcher used twelve 7 '' tablet computers run by Android operating system with the support of the university where she worked, the projector of the school where the study was conducted, and her own Asus laptop to carry out the instruction activities. As of 9 May 2014, the aforementioned advanced technologies provided by Anadolu University Scientific Research Projects Unit were used.

1.2.2. Determining and procuring multimedia applications

In the process of determining and procuring multimedia applications (electronic course contents), multimedia applications were obtained in three ways: (a) using the existing multimedia applications without making any adjustment on them, (b) using the existing multimedia applications by adjusting them, and (c) developing and using new multimedia applications. The process of developing multimedia applications started just after the determination of content and continued until the end of the implementation. Figure 1 presents the process of integration of multimedia applications into IEP.

As it was seen that the existing multimedia applications and those multimedia applications that were planned to be used after necessary adjustments were made on them were inadequate, it was decided to plan new multimedia applications. To this end, a web-based software that can be run on all the devices (e.g. desktop computer, laptop computer, tablet computer, phone) via HTML5 (Hypertext Markup Language), CSS3 (Cascading Style Sheets), and Javascript, has a responsive design, and can be accessed via "www.destechetkinlik.com" was developed. The software was designed as a dynamic structure that can be used not only in the Science and Technology course but also other academic courses. Additionally, as there was limited electronic content about the properties of matter, two to six-minute short videos were shot on the properties of matter (e.g. soft-hard, transparent-nontransparent, rough-smooth).

1.3. Configuration of technologies and placing them in the class

This stage involved configuring the advanced technologies to be used in the instruction activities, placing them in the class, and teaching how to use them. First, an e-mail address was received on behalf of the class. An account was opened on Google play store with that e-mail address. The applications were downloaded on the tablet computers by using this account. The interactive board was installed and set by the company officials. The printer was matched with the interactive board by the classroom teachers (Diary, p. 119). After the tools were placed in the classroom, how to use them was taught. The printer, laptop computer, and projector were used by the teachers and the researcher. They were not actively used by the students. Therefore, how to use them was not taught. The use of tablet computers was considered to be important for the independent study of the students. Thus, the researcher taught how to use tablet computers to the students for four course hours.

Results

The results are addressed under three categories: (1) C***onducting instruction*** (2) the effects of technology-supported instruction activities, and (3) determining the situation in the class after the implementation.

1. Conducting Instruction

The implementation stage of the technology integration process involved 48 course-hour instruction activities. During those instruction activities, the following topics covered in the "Let's Know the Matter" unit were taught: (a) there are numberless matters in our environment, (b) the change of matter, (c) the states of matter, and (d) the change of matter through heat. During the course activities, the teachers employed the direct instruction method. At the end of two course hours, the researcher and the teachers made a reflection and planning meeting. In that meeting, they assessed the instruction process on that day, decided whether they would proceed to the next topic in the following lesson, and determined which applications and software they would use in the following lesson. The researcher transformed these decisions into daily plan format by arranging them based on the content and method to be used and shared them with the teachers one day before the lesson. After she received the teachers' recommendations for the plan and rearranged it, she finalized it for it to be used in the lesson. One of the validity committee members stated that lessons should be conducted within a certain order; lesson routines should be formed; and transitions from activity to activity should be planned (11th validity committee meeting decisions, 14.03.2014). In line with these recommendations, the researcher formed lesson routines. Although the topics and the technological tools used differed from time to time, lesson routines were generally formed as follows:

- Taking students' attention to the subject
- Reminding the rules of using tablets
- Recalling the previous subjects
- Short lectures using real object examples (5 to 10 min)
- Addressing questions to the students using real object examples
- Playing videos that are associated with the subject (either on individual tablets or on the board)
- Addressing questions to the students regarding the video
- Doing exercises about the subject over either the web-based content or the PowerPoint presentation
- Brief summary of the subject
- Daily assessment activities on the tablets

1.1. Situations encountered during the integration of technology into curriculumprocess.

The situations encountered in the implementation stage of the integration process can be collected under two titles (a) building a positive classroom climate (b) points to be taken into consideration during the instruction activities.

1.1.1. Building positive classroom climate

Before the technologies put in the classroom were used in the instruction activities, sessions were held to teach how to use tablet computers to the students. The biggest problem the researcher and the teachers encountered during the teaching of how to use tablet computers was that the students did not give back the tablet computers at the end of the lesson and opened other applications during the course activities. So, in the 10th validity committee meeting, it was decided to establish rules of using tablet computers and teach these rules to the students first. A symbol reinforcer table was formed to reinforce those students obeying the rules. In this way, the effective use of tablet computers in the instruction activities was ensured. Apart from that, it was observed that the students pressed the buttons of the projector in those lessons when there was a need to use it and they continued that behavior despite the teachers' warnings. To prevent that, it was decided in the 11th validity committee meeting to introduce the devices put in the classroom to the students though they would not use them actively and satisfy their curiosity and to express them that pressing the buttons in unnecessary situations might damage them. Then the researcher implemented that decision. Additionally, the researcher assigned tasks to the students in the installation and use of electronic tools. Thanks to those solution suggestions, the students stopped displaying the above-mentioned improper behaviors during the instruction activities. Teacher Firdevs expressed her comments on this issue as follows:

> "*…The tasks you assigned to Aykut. When should we work? When should we listen? When should we keep quiet? These kinds of things. The tasks you gave motivated them a lot … Maybe, if we had displayed a different attitude by telling him things like 'no, don't sit, don't touch, or you will damage it', he could not have been so interested and active*" (Interview with Teacher Firdevs, 26.06.2014).

1.1.2. The points to be taken into consideration in the technology-supported instruction activities

It was seen that there were certain points to be taken into consideration during the use of advanced technologies in the instruction activities of students with intellectual disability in terms of (a) the videos used in the instruction activities, (b) the battery lives and storage of tablet computers (c) the features of technological tools, and (d) teachers' having techno-pedagogical knowledge and skills.

Watching short videos about the subject, which was a routine of the instruction activities, turned out to be a situation on which an action plan should be developed. It was observed that some students just forwarded the videos and acted as if they had been watching them while some others got bored and watched their friends during the video activities they engaged in on their tablet computers for three to six minutes after the subject was taught. In the fifth reflection and planning meeting on 27.03.2014, the teachers stated that the student got bored during the six-minute videos. Thus, the researcher reduced the durations of the created videos to 90-120 seconds. In addition, she prepared different scenarios based on the usage areas of matters rather than providing a direct information presentation in the video content. The above-mentioned problems were not observed again after those arrangements were made.

Another situation experienced during the instruction activities was short battery lives. That not only caused some students to follow the activities from behind but also gave rise to such problem behaviors among the students as miff and shouting as they could not use their tablet computers. To overcome this problem, the researcher requested the student with a tablet computer out of battery to continue the activity together with his/her peer next to him/her. In addition, the researcher checked the battery levels of the tablet computers before the lesson to minimize this problem. Moreover, how to check the battery level was taught to the students. It was tried to overcome the problem by charging the tablet computers with low battery at break time.

Another problem was the storage of the tablet computers. They were stored by the researcher in the research process. That indicates that teachers may encounter storage problems in educational environments. This may cause a hesitation among teachers in case they may be broken or taken unauthorized . The following comments of Teacher Firdevs confirm this: "*It would be good if there was a locked cupboard. In this way, the security of all the tools would be ensured, and they would be kept under the control of the teacher. Then there would be no problem after the teacher went away*" (Interview with Teacher Firdevs, 26.06.2014).

Besides the battery life problem, the tablet computers had problems in sensing finger movements and connecting to the network. These problems were experienced in both tablet computers used. In addition, sometimes, the tablet computers froze and the students could not perform the activity (the video-recordings of the lessons dated 18.04.2014, 22.04.2014, and 03.06.2014). Especially students with intellectual disability can have limited clicking skills due to their limited fine motor skills. It was observed that the students had difficulty in drag and drop activities as the screen sensor was not sensitive and so they asked the teacher or the researcher for help. Hence, if tablet computers that have a faster processor, a larger memory, and a sensitive touch screen are chosen, activities can be more productive. Furthermore, as mentioned before, it was planned to procure large screen (9.7 '') tablet computers by considering the students' limited fine motor skills. As the tablet computers were supplied late, instruction activities were conducted with small screen (7 '') tablet computers for two months because of the reasons beyond the researcher's control. Large screen tablet computers were used in the instruction activities in the last month of the research. No difference was observed between the uses of small screen and large screen tablet computers by the students. All in all, it can be said that the technical characteristics of tablet computers are more important for students than their screen sizes.

Another point to be taken into consideration in the use of advanced technologies in instruction activities is teachers' technology use skill levels. In the present study, the researcher ensured the use of advanced technologies in the course activities, searched and adapted electronic contents, developed new electronic contents, constructed hardware, and eliminated technical problems. Considering that these actions have to be taken by teachers in educational environments, it can be said that teachers' technology use skills should be examined based on the technological pedagogical content knowledge model. In the light of the findings obtained in this research process, the skills that teachers need to have in the fields of technology, content, and pedagogy in order to perform the above-mentioned actions can be listed as follows:

Technological knowledge

- Using MS Word (creating a table, writing a text)
- Preparing a presentation on PowerPoint
- Using tablet computer
- Using a video editing program (e.g. Movie Maker, Adobe Premier pro)
- Using a picture editing program (e.g. Paint, Photoscape)
- Using an Internet browser

Content knowledge

- Knowing the Science and Technology course concepts to be taught
- Being capable of framing the subject content to be taught by considering the relationships between the subjects included in the Science and Technology curriculum and the order of the subjects
- Associating the situations encountered in the daily life with the concepts learned in the Science and Technology course

Pedagogical knowledge

- Determining student needs and developing IEP
- Determining the instruction method to be used and developing IEP in accordance with it
- Discovering students' strengths
- Managing problem behaviors (building positive classroom climate)
- Interpreting students' development by making daily assessments
- Developing and administering a CRT to measure students' performances

The technological pedagogical knowledge, which is the intersection point of these skills, was observed in this research process as follows:

- Determining students' needs concerning the "Let's Know the Matter" unit covered in the Science and Technology course via CRT offered on the tablet computer
- Using hardware and software in line with the steps of direct instruction method in teaching the concepts of the "Let's Know the Matter" unit taught in the Science and Technology course
- Preparing the daily assessments of the "Let's Know the Matter" unit covered in the Science and Technology course on PowerPoint according to student levels (marking the right among four pictures, marking the right among three pictures) and administering them on the students' personal tablet computers.

Besides the above-mentioned techno-pedagogical education competence, teachers should also have practical technology use skills. For example, it is quite difficult for students with intellectual disability to write the address of the website related to the activity on the address bar, and students with intellectual disability have difficulty in this matter (Borg, Lantz, & Gulliksen, 2014; Wehmeyer, Tasse, Davies, & Stock, 2012). To overcome this problem, the connection addresses of the activities were sent to the mailbox of the class account available on the tablet computer of every student, and then the students were asked to click on the connection in the last e-mail in the mailbox. In this way, an important problem for the students was solved.

2. The Effects of the Use of Technology in Science and Technology Course

2.1. The effects of the use of technology on student

The results showed that technology supported instruction activities have positive effects on (a) students' achievement and (b) students' behaviors.

2.1.1. The effects of the use of technology on student achievement

The data obtained from observations, semi-structured interviews with parents and students, reflection and planning meetings with teachers, and daily assessments indicate that there is improvement in academic achievement of all the students. In addition to these data collection tools, CRT (Criterion Referenced Test) was administered to the focus students before and after the experiment. The researcher administered CRT about the subject to be covered to six focus students whom he identified prior to the implementation. The test was administered to four students after the experiment. Graphic 1 shows the data regarding the students' performances before and after the implementation.

Performances of focus students showed that their rates of achievement were 98%, 83%, 70%, and 56% respectively for Sema, Selin, Zehra, and Aykut. Though these data show an improvement in students' achievement, Aykut and Zehra displayed lower performances compared to daily assessments. Selecting the correct option out of four images in daily assessment was later changed to selecting the correct option out of three images during the implementation process since Aykut had difficulty in the unit that was being instructed. On the other hand, the questions in CRT were prepared according to selecting the correct option out of four questions. The reason why Aykut's achievement rate in CRT was lower than daily performance might be this difference in the criteria. Zehra K. displayed a better performance in daily assessments compared to CRT assessment administered at the end of the implementation. In an interview conducted with Teacher Firdevs following CRT assessment, she stated: "*Considering the daily assessment, for instance Zehra K. was able to do it. But now, she made serious mistakes*

and carelessness" which confirms this result. Zehra K. did not go to school in the last weeks of the term. Her father took her to the school for a day for assessment. It is believed that this absence led to low performance.

In addition to student performances in assessment tools, improvements were observed by teachers and parents. For example, Teacher Nalan explained students' transference of what they learnt into their daily lives (i.e. their generalization of the knowledge): "*they adapted it to other courses. That is, they definitely recalled and mentioned the things they had learnt before while, for example, watching a film.*"

Teacher Firdevs commented on students' learning about recycling as follows: "*Majority of students asked where they should throw the pieces of paper whenever they went to dustbins. That means they comprehended the logic. They threw the pieces of paper into the bin. When one of them threw into a wrong place, they warned the person.*"

Most of the mothers stated that students transferred what they learnt to daily life in the semi-structured interviews. For instance, Sema's mother Mrs. Zeliha stated: "*For instance, when there is butter on the table, she says "Mom, this melts and becomes liquid when it remains like this*"". This indicates that students can use the information they got from the class in their daily lives. All in all, it is possible to say that students were successful in the "Let's Know the Matter" unit, instructed for the first time, through technology supported instruction activities. In addition, it was seen that they used the knowledge they obtained in daily life functionally.

2.1.2. The effect on student behaviors

Technology supported instruction activities of the study made positive contributions to students' (a) peer interaction and collaboration, (b) taking responsibility, and (c) class participation as well as improvements in academic skills.

Peer Interaction and Collaboration: It was observed that the interaction and collaboration among the peers increased in the class thanks to the use of technology. In the class dated as 18.04.2014, three students ran out of batteries while studying with destechetkinlik program on their tablets. Students could not charge their tablets on their desks since there was not sockets on the desks. Therefore, these students were asked to make destechetkinlik exercises with their friends sitting next to them. Thus, six students worked in collaboration in groups of two. The researcher conveyed her opinions regarding this situation in her diary as follows:

> *"…Therefore, we asked the students who ran out of battery to work with their friends sitting next to them. Here, Doğuş-Zehra K., Aykut-Öykü, and Ali-Mert studied together. The group that surprised me most was Öykü-Aykut. Aykut studied really well with Öykü. Öykü offered nice opportunities to him. Students are really active while studying on the tablet computers. They ask, and do …"* (Diary, p.100).

Teachers also observed that the interaction and collaboration between students increased. They expressed this observation in the interviews. For instance, Teacher Nalan stated: "*It was beneficial for them as well. For instance, they helped each other while using. Friends with much better skills helped others with low capacity or those who never used technology before. Their assistance improved.*"

On this issue, Teacher Firdevs made the below statement: "*I do not know, but they really support each other. When one of them fails, another intervenes and tries to help. Sometimes they learn the things which they could not learn through us from their peers.*" In addition, it was frequently observed that whenever they had a problem with their tablets, they asked their friends sitting next to them for help or they informed the researcher or the teacher of this situation (e.g. the video recordings of the classes dated 03.04.2014, 22.04.2014, and 03.06.2014).

Taking responsibility: Many opportunities emerged during this study that required students to take responsibility. This was not the primary target of the study. The use of technological tools in the class created opportunities that allow students to take responsibility. First of all, students washed their

hands after eating chips and biscuits before turning their tablet computers on. They also paid attention to not to have foods or beverages near them while using their tablet computers. This can be an example of their responsibility to protect their tablet computers. In addition to using their tablet computers with care, they asked for cleaning water and handkerchief from the researcher when they realized their tablet computers were dirty. This also shows that they pay attention towards the responsibility of the cleanliness of a tool that belong to them. The expression of Teacher Nalan and Firdevs in semi-structured interviews confirm this finding. Teacher Firdevs conveyed her views regarding the responsible behaviors of students as follows:

> "*Well, the responsibility is their protection of their materials. They undertook a substantial responsibility to protect them… For instance, about guarding. They undertook responsibility really well. They spent effort to do it. All of them strived to protect the materials with heart and soul. They did not even ask why they would stay there instead of playing outside during the break. Entrusting the materials to them encouraged them more"* (Interview with Teacher Firdevs, 26.06.2014).

Teacher Nalan commented on the relevant situation in semi-structured interview with the following words: "*He was responsible. It was his tablet. He was using it. He was protecting it. He was wiping and cleaning it. He was maintaining and delivering it. That is, these were a kind of responsibility"* (Interview with Teacher Nalan, 26.06.2014).

*Participation in Lessons***:** It is possible to say that students' participation in class increased as another contribution of technology. It is possible to see the differences between the observation data obtained prior to implementation and the observation data during the implementation. It was observed that participation in lessons included not only correctly responding the questions asked by the teacher but also; raising hands to respond the question regardless of the correctness or incorrectness of the responses, commenting on the question that was addressed and telling an anecdote from his life regarding the matter, telling what he sees in the pictures in the PowerPoint presentation shown on the board, **b**eing eager to participate in an activity, which indicates that there is more willingness and effort to carry out the activities in the class. As the committee members watched the video recordings in the validity committee meeting, they stated that student participation increased (The 15th validity committee meeting, 25.04.2014). The teachers also stated in the reflection and planning meeting that student participation increased (11th reflection and planning meeting, 18.04.2014). Teacher Nalan stated that student participation is at a very good level. Teacher Firdevs stated that Zehra Y. and Mert raised hands as well which was something they did not do in previous classes. (11th Reflection and planning meeting, 18.04.2014).

It was seen that the activities conducted with the projector and the interactive board increased student motivation. Students raised hands to go to the board even if they already had done previously. The researcher conveyed her interpretation of student participation in the class dated as 18th of April 2014: *"What drew my attention most today is that students were raising hands with great eagerness. They were even cross with the teacher when she did not give them turns. In addition, I have never seen Öykü raising hands on her own accord. She did the activities with happiness*" (Diary, p.99, 18.04.2013). During the 16th validity committee meeting, committee members stated that Mert showed very low participation prior to the implementation swaying from one side to the other by himself. His partipaion increased during the implementation, which was a good improvement (16th Validity committee meeting, 23.05.2014).

2.2. The effects of the use of technology on teachers

It was seen that technology supported instruction activities (a) made contributions to teachers, (b) increased collaboration between teaches, and (c) teachers' expectations of their students changed.

2.2.1. The Contributions to the teachers

It was seen that the study provided the teachers with new knowledge. In addition, the teachers' motivations increased thanks to technology since it attributed a different dimension to the activities. The data obtained through semi-structured interviews from the teachers support this result. For instance, Teacher Firdevs made the following statement:

> "*Indeed, it relieved us from the monotony. Unfortunately, we do not have much of a technology here. We are always limited. That is why we are trying to do things that draw the attention of children like manual things. This really has been very good for us. We are also freed from monotony. Actually, if you had not been here and somebody had given the instruments to us and said 'Here is an interactive board, take it and use it for your classes', we would not have done much… It was really fun for us. I did not get bored and neither did students. It was quite an experience for us. We learnt. To tell you the truth, it has been a good year for me. I have always said that we have learnt much from you.*" (Interview with Teacher Firdevs, 26.06.2014)

The explanation above expressed the contribution of the research process to the them. Teacher Nalan expressed the contributions of the study as follows:

> "*The study had definitely positive effect. We were out of our routine. I wish this implementation took place in other classes as well. I mean constantly because you can find anything, various activities since they are technological. For instance, it is not possible to bring over everything to the class visually. Different activities, different things… They wonder what will happen that day. It was fun for us as well. In addition, it was not something I had known before or researched before. I also learnt something new"* (Interview with Teacher Nalan, 26.06.2014)

2.2.2. Collaboration between the teachers

It was seen that teachers' roles became more active with the arrival of technology to the class. During the stage of determining the situation it was seen that the teacher who was not lecturing at the time was quietly listening the instruction and participate in the activities when needed while this later changed for the second teacher to be more active as well. At the beginning of the implementation, collaboration between teachers was more obvious in terms of tablet computer use and assessment activity whereas in the following classes the second teacher contributed to lecturing. Committee members stated in the 14th validity committee meeting that both teachers were active and complement one another. They interpreted this situation with the following expression "*There are two teachers but it is as if there is one"* (14th Validity committee meeting, 11.04.2014). The researcher conveyed collaboration between teachers additionally in her diary: "*In addition, the second teacher was as active as the lecturing teacher today. This is what Teacher Atilla stated: technology brought the collaboration."* (Diary, p.82, 18.03.2014). In the following days, she added another observation regarding this issue in her diary "*Today Teacher Nalan actively participated in the class as well. I think collaboration between teachers is gradually increasing. This is a very good improvement"*, and commented on the improvement of the collaboration between teachers (Diary, p.89, 01.04.2014).

Teacher Firdevs also stated that both teachers were active during the implementation. She made the below statement regarding collaboration:

> "*Well, while we were lecturing in the first semester, generally one of us was more active during the class. One of us was more passive. However, with the experiment, both of us started to be more active. This is because children needed our help while using the tablets… I felt that both of us were more active this term because after the lecturing, we acted together*" (Interview with Teacher Firdevs, 26.06.2014).

As indicated by Teacher Firdevs, not only the second teacher, who was passive in detecting the situations, but also the lecturing teacher became more active. It is believed that this situation stems from teachers' sparing a short period of time for lectures and diversification of the instruction with various activities to make students acquire the concepts.

2.2.3. The Change in the Teachers' Expectations for Their Students

It was seen prior to the implementation that teachers had concerns about the implementation. Though the unit "Let's Know the Matter" is included in fourth grade curriculum, teachers thought that students would not acquire these abstract concepts thoroughly. In addition, they hesitated about whether the students would be successful in using the technological tools. The researcher conveyed her opinions regarding this situation as follows:

> "*At the end, we made reflection and planning meeting with the teachers. I asked the teachers to express their impressions and criticisms. They were a bit hesitant. It was as if they were questioning "Where did we come? The subject of matter cannot be instructed." Teachers seemed to have no belief. This increased my efforts with perseverance. Yes, matter-object is an abstract subject. But I believe that following subjects will be more fun and efficient.*" (Diary, p.78, 11.03.2014).

Teacher Firdevs' comments in the interview support this interpretation. Teacher Firdevs expressed her opinions regarding how the experiment changed her ideas as follows:

> "*Well, actually I had doubts regarding some of my students. I thought they would not be able to work with the software by themselves, without me. I would not imagine that they would do it and make progress without hesitation. It was as if there was monitoring all the time. I felt that they would not be able to manage without us. Honestly, I did not expect much from their being independent. I questioned to what extent they would manage. Then we allowed them to use the technology by themselves in late phases. I thought they would need help to complete the activities and to decide which ones need to be dragged and which ones need to be clicked on. One advances through the next buttons and when the activity finishes, s/he needs to return to the main page. I thought they would need help to do these. But actually, how can I say? They started to do all of these quickly and correctly.*"

Teacher Nalan expressed that they did not have any problems with the content with the arrival of technology in the second term; however, she had doubts whether the children would learn the specified subject or not. Teacher Nalan conveyed her opinions regarding the issue as follows:

> "*We were having more difficulty in the first term. This was because we were not able to find activities for our subjects. We experienced difficulty in what we could bring to the class. However, when the subject became matter, we could find appropriate videos, songs, anything even if it was abstract. It was not so difficult because it was technological. But it was abstract, and we thought children could not learn. … Yes, we experienced this hesitation.*" (Interview with Teacher Nalan, 26.06.2014)

Teacher Firdevs sincerely stated the following: "*If you did not start such an implementation, and we took this subject, we might not focus on the subject much because it is so complicated that we would not believe that children would learn it.*" This explanation shows that there is much change in teachers' expectation. Briefly, it was seen that teachers thought students would not manage to learn this subject prior to the implementation upon assessing the subject and the employed tools. It was obvious that they discovered the students' potentials by observing what students could do following the implementation.

2.3. Unexpected contributions of the research process

The effect of the research process on students and teachers were analyzed in accordance with the purposes. It was seen as a result of the content analysis that the study yielded unexpected contributions as well. Unexpected contributions; (a) make parents get to know their children better in terms of the knowledge and skills they could acquire (the study led the parents to know their children better) and (b) make parents to learn new things through their children (the study enabled parents' to acquire new knowledge).

2.3.1. Parents get to know their children better

Parents expressed that students conveyed the things they learnt during the study to their parents at home, and made experiments to practice the things they learnt. Parents also stated that they discussed with their siblings or cousins, and exchanged information about certain subjects. (Diary, p.121, 123, 131, Interviews conducted with Selin's, Tufan's, Doğuş's, Öykü's, Mert's, and Sema's mothers, 02.06.2014-05.06.2014). Selin's mother Mrs. Sare stated that Selin taught what she had learnt to the people around her in addition to practicing them: "*She teaches it to the children living in the same street with us. She teaches to small children. The girl next to us is the daughter of Selin's uncle. Selin tells them that she puts it in the evening and takes it back as ice. … She also tells it becomes water again. She practices it all the time.*" In this sense, it was seen that parents' views regarding their children's academic achievement improved positively.

2.3.2. Parents' acquisitions of new information

Another one of the unexpected contributions of the study is parents' acquisitions of new information. Parents' meetings and one-to-one interviews with mothers indicated that parents acquired new information in two dimensions thanks to this study. For the first situation, the parents stated that they learnt the phenomena they frequently encountered whose reasons they do not know via their children's explanations. For the second situation, the parents stated that they were not aware of the fact that these concepts need to be taught to their children. They realized that their children need to be taught the subject that will help them to explore their milieu. Sema's mother Mrs. Zeliha also confirms acquisitions of new information with the following explanation: "*In fact, we learn with Sema because we do not know them. I even tell them to her father sometimes. But I tell you, if they asked me why the wheel does not slide, I would not think of telling the answer*".

3. The Situation in the Class After the Implementation Ended

The school ended due to summer break after completion of the implementation. It was decided that the situation in the class would be decribed in the fall term of the next academic year four months after the implementation. Teachers' designs of Science and Technology course with advanced technologies as well as students' performances during the Science and Technology course were observed. In this sense, four classes were video recorded during Science and Technology course in 22.10.2014 and 23.10.2014. At the end of the observations, it was seen that the knowledge students acquired from the unit Let's Know the Matter was permanent. It was seen in the interviews made with the teachers during the breaks or following the classes that they were also astonished because of students' performances. The researcher conveyed her opinions regarding this situation in her diary as follows: "*When you give clues to children, they remember most of them. They watch the videos. They remember them as well. Even Teacher Firdevs was surprised. She said "How come they know!". These were really good.*" (Diary, p.136).

Since teachers did not make assessment following the classes, permanency data regarding Let's Know the Matter unit were not determined quantitatively, but obtained via observations. The teachers used interactive board during the activities. However, it was seen that teachers did not develop new electronic contents, but used the ones prepared by the researcher. In addition, it was seen that teachers did not use tablet computers in four classes.

All in all, it is possible to say that technology supported instruction activities made contributions to students with intellectual disability academic skills in terms of permanency. In addition, it was observed that the teachers experienced limitations in technology integration into the curriculum.

Discussion

This study was carried out to integrate technology into the Science and Technology curriculum of a special education middle school; develop instruction activities with advanced technologies; solve the problems emerging in this process; and improve students' learning and competencies in the Science and Technology course. In this regard, the findings were discussed under two titles: (a) integration of advanced technologies into the curriculum, (b) the effects of technology-supported instruction activities.

Integration of Advanced Technologies into the Curriculum

The main finding of this research is that technology should be integrated into curriculum so that effective technology-supported classroom activities can be developed. It is evident that planning which features of the supplied hardware or multimedia applications will be used, with which students they will be used, and how they will be used in the course activity and including them in IEP is an important stage of the integration process. The studies dealing with technology integration in the field of special education (Edyburn, 1998, 2001; Israel, Marino, Delisio, & Serianni, 2014; King-Sears & Evmenova, 2007; McKnight, & Davies, 2012; Zabala, 1995) also stress that determining students' needs is an important stage. In this regard, the finding obtained in the present study is consistent with the literature. In the process of integration of technology into the curriculum, the stages of Edyburn's (1998) Model of Technology Integration Process were followed. It was observed in the present study that some of these stages were not fulfilled and some stages needed extra steps. The steps of locating, reviewing, and deciding multimedia, which are under the selection stage (i.e. the first stage) of Edyburn's (1998) Model of the Technology Integration Process, were not fulfilled completely in the present study. Because of the limitedness of the contents appropriate for the subject covered and the target group, the existing contents were adapted, and new contents were created. Hence, it can be said that Edyburn's (1998) process of technology integration cannot be implemented exactly in Turkey as contents are not developed for individuals with intellectual disability. Aksal and Gazi (2015) conducted a study for determining the integration of information and computer technologies into special education schools in developing countries and stated that digital contents are very limited in the field of special education and this is a very important problem encountered in technology integration.

Another point to be taken into consideration in use of technology is students' levels of experience in using technological tools. The students' experience in using technological tools was determined before the instruction activities. It was determined that except for one student in the class, all the students used a tablet computer, laptop computer, or desktop computer. It was observed that as the student not having any experience in using technological tools had higher academic skills than the other students in the class, she made up the difference in technology use between herself and other students in a short time. However, extra sessions for teaching tablet use may have to be held for students who have low academic performance and are inexperienced in using technology in other classes. Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros and Martínez-Segura (2013), report that teaching sessions for tablet use may be organized for students to be able to use tablet computers in instruction activities. In their study dealing with the use of a tablet application in a classroom, Campigotto, McEwen and Demmans Epp (2013) did not include teaching session for tablet use in their research process as the participating students were already experienced in tablet use. In summary, determining students' skills of using tablet computer before tablet computer use is started in instruction activities is important for instruction activities to be conducted smoothly and effectively.

It was observed that the students displayed problem behaviors in using tablet computers as an instructional technology in the early weeks. It is thought that this resulted from the fact that the students considered tablet computers as an entertainment technology rather than an instructional technology. Birinci (2013) reports that many students have low motivation to use mobile tools for educational purposes. Campigotto et al. (2013) state that students use tablet computers more for playing games than for learning purposes and teachers have difficulty in managing this. Likewise, Wong, Chin, Tan, Liu, and Gong (2010) state that it is difficult to make students acknowledge that mobile technologies are tools that support study. Similarly, Chiang and Jacobs (2010) say that one of the difficulties of technology use in the classroom is classroom management. Another observation during the implementation was that the students' curiosity was aroused by the fact that the tools not used and experienced by them before the present study were put in the classroom and used for carrying out different activities. Therefore, every technology brought to the classroom was introduced to the students along with their functions though they did not require their individual use. Apart from that, improper behaviors of the students who touched the new technologies unnecessarily and turned this into a behavior problem were ignored. The students were reinforced when they intervened in the technological tools timely and properly (e.g. helping to install the projector before the lesson) and attention was paid to their proper behaviors. These interventions are consistent with the suggestions for preventing problem behaviors provided by Alberto and Troutman (2013), Scheurmann and Hall (2012, p. 177), and Vuran (2013). Based on the findings of the studies in the literature and the findings of the present study, it can be said that factors about classroom management should be taken into consideration while advanced technologies are being included in instruction activities.

Another point to be taken into consideration in the course activities is the readiness of technological tools to be used smoothly without hindering the lesson. Although the battery levels of the tablet computers were checked by the researcher throughout the implementation, they ran out of battery and some did not start by any means during the course activities. In such cases, some students displayed problem behaviors such as getting cross and shouting as they could not use their tablet computers. It was seen that while the use of technology in instruction activities has a positive effect on students' motivations, the inconveniences experienced may cause them to have behavioral problems. In their study dealing with the use of iOS application in a classroom where students with special needs studied, Campigotto et al. (2013) stated that technology integration may lead to new behavioral problems in classrooms and cause new classroom management problems. Based on this finding, it can be said that teachers should prepare back up plans for course activities within the scope of their lesson plans in case such problems occur.

Another important finding of the present study concerning the situations encountered in the integration process was about the duration of the videos to be prepared for intellectually disabled students. Some students had behavioral problems especially when the videos they individually watched on their tablet computers exceeded three minutes. In some other cases, the students did not listen to the video and did not make use of the instructive feature of the video though they did not display any behavioral problem. Evmenova and Behrmann (2014) support this finding as well. In their study in which they employed video contents in teaching academic skills to adult students with intellectual disabilities, Evmenova and Behrmann (2014) stated that video duration is an important factor to be considered.

This study sought to develop advanced technologies-supported instruction activities in a special education middle school not having any advanced technological tools, solve the problems emerging in this process, and improve students' competencies in the Science and Technology course. This study did not aim to improve the teachers' technology use competencies and integration skills. However, as indicated in the literature, it was seen that teacher competencies are an important factor in every stage of this process. The integration process, which starts with the determination of student needs, involves a lot of phases. In addition, pedagogical knowledge including developing IEP, determining the teaching method, and shaping the content based on this method was seen to be highly

important in this process. As the literature puts it, being able to use technology does not necessarily lead to a healthy technology integration (Edyburn, 1998; Fitzgerald & Koury, 2008; Girgin et al., 2011; Kabakçı-Yurdakul & Odabaşı, 2013; King-Sears & Evmenova, 2007; Liu et al., 2013; Marino, Sameshima, & Beecher, 2009; Smith & Okolo, 2010; Tournaki & Lyublinskaya, 2015; United Nations Educational Scientific and Cultural Organization, 2006, p.115). Some other important details to be considered in technology integration process are developing contents that will contribute to students' learning, putting effective technological tools in the classroom, and making these tools a routine part of instruction activities. This finding is consistent with Reel's (2009) statement that integration is completed when technology becomes an unnoticeable part of teaching and assessment.

The Effects of the Use of Technology in the Science and Technology Course Instruction Activities

Both qualitative and quantitative data collected throughout the study indicated that the students made progress in relation to the "Let's know the matter" unit covered in the Science and Technology course. This result is consistent with other studies in the literature pointing to the fact that technology has an effect on the academic skills of students with intellectual disability (Campigotto et al., 2013; Fitzgerald & Koury, 2008; Liu et al., 2013; Sheriff & Boon, 2014).

The research findings indicated that the students properly used the new knowledge they acquired in their daily lives. In other words, the students' knowledge moved from the acquisition dimension to the permanence and generalization dimension. The parents stated that their children applied the knowledge they acquired at school in their houses and transferred such knowledge to the people around them. This finding can be explained by Anderson and Anderson's (2005) and Colomo-Palacios et al.'s (2010) statement that technology enriches individuals' learning as it offers multiple perspectives concerning abstract concepts and real-life problems and visualizes them. This finding of the present study is also consistent with Smith et al.'s (2013) finding implying that technology makes instruction more effective by providing effective and instant feedback.

The students' technology use contributed not only to their academic skills but also to their behaviors. While interaction among the students was very low before the implementation, collaboration and interaction among them increased thanks to technology-supported activities. Some student behaviors observed included asking their friends about a problem on the tablet computer, trying to solve the problems of their friends sitting next to them with their tablet computers, and asking the researcher to help their friends when they could not solve the problem on the tablet computer. This finding is consistent with the finding indicating that mobile technology use in the classroom improves interaction among peers, which is reported by Campigotto et al. (2013), McKnight and Davies (2012), Keengwe (2013), and Naismith, Lonsdale, Vavoula, & Sharples (2004). In addition, technology use in course activities increased sharing among the students and enabled them to discover different activities on the tablet computer together. This increased the students' motivations and durations of being interested in the course activities. This finding is consistent with the findings of those studies which report that technology increases students' motivations and durations of being interested in the course activities (Campigotto et al., 2013; McKnight & Davies, 2012; Kim et al., 2014; Neely, Rispoli, Camargo, Davis, & Boles, 2013; Whitby et al., 2012).

The implementation in the present study contributed to the teachers as well. Both teachers stated in the post-implementation interviews that even though they had the skills of using advanced technologies, they could not have known how to use the interactive board and tablet computers in course activities without the researcher's guidance and thus they could not have used them as effectively as they did in the activities. It is evident that one of the most important factors influential on technology integration is not teachers' having skills of using technology, but having skills of integrating technology into the curriculum. The studies dealing with the Technological Pedagogical Content Knowledge Model in the literature support this finding (Kabakçı-Yurdakul and Odabaşı, 2013; King-Sears & Evmenova, 2007; Lavin, Korte, & Davies, 2010; Marino et al., 2009; Smith & Okolo, 2010; Tournaki & Lyublinskaya, 2015).

During the observations the researcher made in the monitoring stage for describing the existing situation without intervening in, she observed that the teachers did not use technology in a planned way as in the implementation stage, did not include all the technological tools available in the classroom in the instruction activities, and did not make any assessment at the end of the instruction. This confirms that teachers have low knowledge and skill of technology integration.

Conclusion and Recommendations

This study was carried out to integrate technology into the Science and Technology curriculum of a special education middle school classroom; develop instruction activities with advanced technologies; solve the problems emerging in this process; and improve students' performances in the Science and Technology course. Technology integration into curriculum process was explained in stages. Findings show that technology based instruction improve students' Science and Technology course performance. Besides, it was observed that students transferred what they learnt to daily life. It was determined that technology supported instruction activities of the study made positive contributions to students' behavior. The study improve peer interaction and collaboration, (b) build taking responsibility, and (c) enhance class participation as well as improvements in academic skills.

Also, it was seen that there are some situations that should be considered during technology based instruction activities. These are; the videos used in the instruction activities, (b) the battery lives and storage of tablet computers, (c) the features of technological tools, and (d) teachers' having techno-pedagogical knowledge and skills. It was seen that technology based instruction increased teachers' motivation, enhanced collaboration between teachers, and teachers' expectations towards their students changed positively. In addition, it was observed that the study made parents get to know their children better in terms of the knowledge and skills they could acquire (the study led the parents to know their children better) and (b) made parents to learn new things through their children.

Lastly, after the implementation ended, it was determined that students maintained the information they learnt during the study. However, it was observed that technology based instructional activities were not prepared by teachers as planned and effective manner by the researcher as before.

Based on the findings obtained in the research process, certain recommendations may be put forward for practice and research. Recommendations for practice; (1) special education schools should have lockers to keep the devices and accessories safe if they decide to use mobile technologies, (2) as batteries die out during the activities and prevent students from completing the activities, sockets may be placed near the desks of students or a charging station may be placed at a corner of the classroom, (3) inter-peer cooperation may be improved by making a student with low technological competence sit next to a student with high technological competence while carrying out technology-supported instruction activities, (4) teachers should possess certain competencies during the technology integration process. The "Instruction Technologies and Material Design" course is given to pre-service teachers at the departments of the Education of the Intellectually-Disabled. The course content may be extended to include technology integration into the curriculum and examination of the contents that can be used on interactive boards, computers, tablets, and so on. (5) Mentorship practices may be provided by experts or teachers that are experienced in special education and informatics to support teachers in pedagogical and technological terms during the technology integration process.

Recommendations for future studies; (1) The effects of technology-supported instruction activities on students can be scrutinized in various academic courses such as reading-writing, mathematics, life sciences, and social sciences, (2) the behavioral problems aroused by the use of technology in classrooms may be investigated; research may be conducted to create a positive classroom climate; and teachers may be equipped with intervention approaches in this matter during undergraduate education, (3) the students were allowed to use the tablets for only instruction activities in the present study. Another study may examine practices which allow students to use the tablets at their homes and to do their assignments through them and involve parent-teacher collaboration, (4) Future studies may also examine the improvement of the technology-integration competencies of the teachers for students with intellectual disability based on the technological pedagogical content knowledge approach.

References

Alberto P. A., & Troutman A. C. (2013). *Applied behavior analysis for teachers* (9th ed) Englewood Cliffs, NJ: Prentice Hall.

Aksal, F. A., & Gazi, Z. A. (2015). Examination on ICT integration into special education schools for developing countries. *TOJET: The Turkish Online Journal of Educational Technology*, *14*(3), 70-72.

Anderson, K. M., & Anderson, C. L. (2005). Integrating technology in standart-based instruction. In D. Edyburn, K. Higgins, & R. Boone (Eds.), *Handbook of special education technology research and practice* (pp. 521-544). Whitefish Bay, WI:Knowledge by Design.

Avcı, E. (2013). *The integration of digital technologies into fine arts education in the context of digital art: An action research* (Unpublished doctoral dissertation). Anadolu University, Graduate School of Educational Sciences, Eskişehir.

Birinci, G. (2013). Teknopedagojik ortamda çoklu ortam araçları. In I. Kabakçı-Yurdakul (Ed.). *Teknopedagojik eğitime dayalı öğretim teknolojileri ve materyal tasarımı* (pp. 215-238). Ankara: Anı Yayıncılık.

Borg, J., Lantz, A., & Gulliksen, J. (2014). Accessibility to electronic communicaton for people with cognitive disabilities: A systematic search and review of empirical evidence. *Universal Access in the Information Society, 351*, 1-16.

Brantlinger, E., Jimenez, R., Klingner, J., Pugach, M., & Richardson, V. (2005). Qualitative studies in special education. *Exceptioanl Children*, *71*(2), 195.207.

Campigotto, R.I., McEwen, R., & Demmans Epp, C. (2013). Especially social: Exploring the use of an iOS application in special needs classrooms. *Computers & Educatio*n, *60*, 74-86.

Chiang, H. Y., & Jacobs, K. (2010). Perceptions of a computer-based instruction system in special education: High school teachers and students views. *Journal of Prevention Assessment & Rehabilitation, 37*(4), 349-359.

Colomo-Palacios, R., Paniagua-Martin, F., Garcia-Crespo, A., & Ruiz-Mezcua, B. (2010). Technology enhanced learning for people with intellectual disabilities and cerebral paralysis: The MAS platform. *Research in Developmental Disabilities*, *34*, 3618-3628.

Courduff, J., Szapkiw, A., & Wendt, J. L. (2016). Grounded in what works exemplary practice in special education teachers' technology integration. *Journal of Special Education Technology*, *31*(1) 26-38.

Creswell, J. W. (2014). *Educational Research: Planning, Conducting, and Evaluating Quanitative and Qualitative Research*. Upper saddle river, New Jersey: Pearson Education, Inc.

Doenyas, C. Şimdi, E., Özcan, E. Ç., Çataltepe, Z., & Birkan, B. (2014). Autism and tablet computers in Turkey: Teaching picture sequencing skills via a web-based iPad application. *International Journal of Child-Computer Interaction, 2*(1), 60-71.

Edyburn, D. L. (1998). A map of the technology integration process. *Closing the Gap*, *16*(6), 1, 6, 40.

Edyburn, D. L. (2001). Models, theories and frameworks: contributions to understanding special education technology. *Special Education Technology Practice*, *4*(2), 16-24.

Edyburn, D. (2010). Understanding the quality of the science supporting the special education technology evidence base. *Journal of Special Education Technology, 25*, 63-68.

Ertmer, P., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, culture, and beliefs intersect. *Journal of Research on Technology in Education*, *42*, 255-284.

Evmenova, A. S., & Behrmann, M. M. (2014). Enabling access and enhancing comprehension of video content for postsecondary students with intellectual disability. *Education and Training in Autism and Developmental Disabilities*, *49*(1), 45-59.

Fernández-López, A., Rodríguez-Fórtiz, M. J., Rodríguez-Almendros, M. L., & Martínez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education*, *61*, 77-90.

Fitzgerald, G., & Koury, K. (2008). Research on computer-mediated instruction for students with high incidence disabilities. *Journal of Educational Computing Research, 38*(2), 201-233.

Glesne, C. (2013). *Introduction to qualitative research* (A. Ersoy & P. Yalçınoğlu, Trans.) Ankara: Anı Publishing.

Girgin, Ü., Kurt, A. A., & Odabaşı, H. F. (2011). Technology integration issues in a special education school in Turkey Cypriot. *Journal of Educational Sciences, 1*, 13-1.

Green, J. L. (2011). *The ultimate guide to assistive technology in special education: Resources for education, intervention, and rehabilitation*. Prufrock Press: Waco, TX.

Güleç Aslan, Y., Özbey, F., Bilgiç, E., Çetinkaya, Ç., Sola Özgüç, C., Fidan, A., & Cihan, H. (2012). *Perceptions of qualifications of special education teachers*. (Project Number: 2012-06-12- 002). Sakarya: Sakarya University Scientific Research Project.

Güler, A., Halıcıoğlu, M.B., & Taşğın, S. (2013). *Qualitative Research Methods in Social Science.* Ankara: Seçkin Publishing.

Haines, L., & Sanche, B. (2000). Assessment models and software support for assistive technology teams. *Diagnostiqu*e, *25*(4), 291-305.

Hasselbring, T. S., & Williams-Glaser, C. H. (2000). Use of computer technology to help students with special needs. *The Future of Children and Computer Technology*, *10*(2), 102-122.

Israel, M., Marino, M., Delisio, L., & Serianni, B. (2014). Supporting content learning through technology for k-12 students with disabilities. Retrieved from http://ceedar.education.ufl.edu/wp-content/uploads/2014/09/IC-10_FINAL_09- 10-14.pdf.

Kabakçı-Yurdakul, I., & Odabaşı, H. F. (2013). Technopedagogical education model. In I. Kabakçı-Yurdakul (Ed.). *Designing Material and Instructional Technologies Based on Technopedagogical Education* (pp. 41-67). Ankara: Anı Publishing.

Keengwe, J. (2013). *Pedagogical Applications and Social Effects of Mobile Technology Integration.* Hershey: IGI Global.

Kim, M., Cho Blair, K. S., & Lim, K. (2014). Using tablet assisted Social StoriesTM to improve classroom behavior for adolescents with intellectual disabilities. *Research in Developmental Disabilities*, *35*, 2241-2251.

King-Sears, M. E., & Evmenova, A. S. (2007). Premises, principles, and processes for integrating technology into instruction. *Teaching Exceptional Children*, *40*(1), 6-14.

Lavin, A., Korte, L., & Davies, T. (2010). The impact of classroom technology on student behavior. *Journal of Technology Research, 2*, 1-13.

Liu, G. Z., Wu, N. W., & Chen, Y. W. (2013). Identifying emerging trends for implementing learning technology in special education: A state-of-the-art review of selected articles published in 2008-2012. *Research in Developmental Disabilities*, *34*, 3618-3628

Marino, M. T., Sameshima, P., & Beecher, C. C. (2009). Integrating TPACK in preservice teacher education: Frameworks for promoting inclusive educational practice. *Contemporary Issues in Technology and Teacher Education*, *9*(2), 186- 207.

Martin, S. S. (2006). Special education, technology, and teacher education. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.113.1310&rep=rep1&type=pdf

McKnight, L., & Davies, C. (2012*). Current perspectives on assistive learning technologies: 2012 review of research and challenges within the field*. Oxford: University of Oxford.

Mechling, L. C. (2007) Assistive technology as a self-management tool for prompting students with intellectual disabilities to initiate and complete daily tasks: A literature review. *Education and Training in Developmental Disabilities, 42*(3), 252-269.

Merriam, S. B. (2013). *Qualitative research. A guide to desing and implementatin* (S. Turan, trans.). Ankara: Nobel Publishing.

Mertler, C. A. (2006). *Action Research. Teachers as Researchers in the Classroom*. Thousand Oaks, California: Sage Publications.

Mills, G. E. (2003). Action Research: *A Guide for the Teacher Researcher* (2nd ed.). Upper Saddle River: Merrill Prentice Hall.

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*, 1017-1054.

Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2004). *Literature Review in Mobile Technologies and Learning.* UK: University of Birmingham.

Neely, L., Rispoli, M., Camargo, S., Davis, P. H., & Boles, H. S. M. (2013). The effect of instructional use of an iPad on challenging behavior and academic engagement for two students with autism. *Research in Autism Spectrum Disorders, 7*, 509-516.

Ramdoss, S., Lang R., Fragale, C., Britt, C., O'Reilly, M., Sigafoos, J.,... Lancioni, G. E. (2012). Use of computer-based interventions to promote daily living skills in individuals with intellectual disabilities: A systematic review. *Journal of Developmental and Physical Disabilities, 24*, 197-215.

Reel, T. (2009). Enhancement of integration of technology into the curriculum. *Ontario Action Researcher*, *10*(2), 1-19.

Scheurmann, B. K., & Hall, J. A. (2012). *Positive behavioral support for the classroom.* (2nd ed). Boston: Pearson Education Inc.

Sheriff, K. A., & Boon, R. T. (2014). Effects of computer-based graphic organizers to solve one-step word problems for middle school students with mild intellectual disability: A preliminary study. *Research in Developmental Disabilities, 35*, 1828-1837.

Smith, S. J., & Okolo, C. (2010). Response to intervention and evidence-based practices: Where does technology fit? *Learning Disability Quarterly*, *33*, 257-272.

Smith, R. S., Spooner, F., & Wood, C. L. (2013). Using embedded computer-assisted explicit instruction to teach science to students with autism spectrum disorders. *Research in Autism Spectrum Disorders, 7*, 433-443.

Sola-Özgüç, C., & Cavkaytar A. (2014). Teacher use of instructional technology in a special education school for students with ıntellectual disabilities: A case study. *Turkish Online Journal of Qualitative Inquiry, 5*(1), 51 - 65.

Spooner, F., Knight, V., Browder, D., Jimenez, B., & DiBiase, W. (2011). Evaluating evidence-based practice in teaching science content to studenets with severe developmental disabilities. *Researh & Practice for Persons with Severe Disabilities, 36*(1), 62-75.

Tournaki, N., & Lyublinskaya, I. (2015). TPACK for teaching mathematics and science and differentiation of instruction: Case study with pre-service special educators. Proceedings of *Society for Information Technology & Teacher Education International Conference*, 3004-3011.

United Nations Educational Scientific and Cultural Organization. (2006). ICTS in education for people with special needs: Specialized training course. Retrieved from http://iite.unesco.org/pics/publications/en/files/3214644.pdf.

Uzuner, Y. (2005). Action research with samples in special education. *Ankara University Faculty of Educational Sciences Journal of Special Education, 6(2), 1-12.*

Ünlüer, S. (2011). *Examining the process of information and communication technologies integration at the school for the handicapped* (Unpublished doctoral dissertation). Anadolu University, Graduate School of Educational Sciences, Eskişehir.

Vuran, S. (2013). Davranış problemleri ile baş etme. [Coping with behavior problems]. In H. İ. Diken (Ed.), *İlköğretimde kaynaştırma* [*Incluison at primary school*] içinde (pp. 260-287). Ankara: Pegem Akademi

Wang, C., Ke, Y., & Wu, J. (2012). Collaborative action Research on technology integration for sicence learning. *Journal of Science Education and Technology, 21*, 125-132.

Wehmeyer, M. L.,Tasse, M. J., Davies, D. K., & Stock, S. (2012). The role of technology use by a person with intellectual or developmental disabilities as a family support. *Rivista di studi familiari, 16*(2), 90-99.

Whitby, P. J. S., Leininger, M. L., & Grillo, K. (2012). Tips for using interactive Whiteboards to increase participation of students with disahilities. *Teaching Exceptional Children, 44*(6), 50-57.

Wong, L., Chin, C., Tan, C., Liu, M., & Gong, C. (2010). Students' meaning making in a mobile assisted Chinese idiom learning environment. In *9th international conference of the learning sciences* (Vol. 1) (pp. 349-356). Chicago, Illinois: International Society of the Learning Sciences.

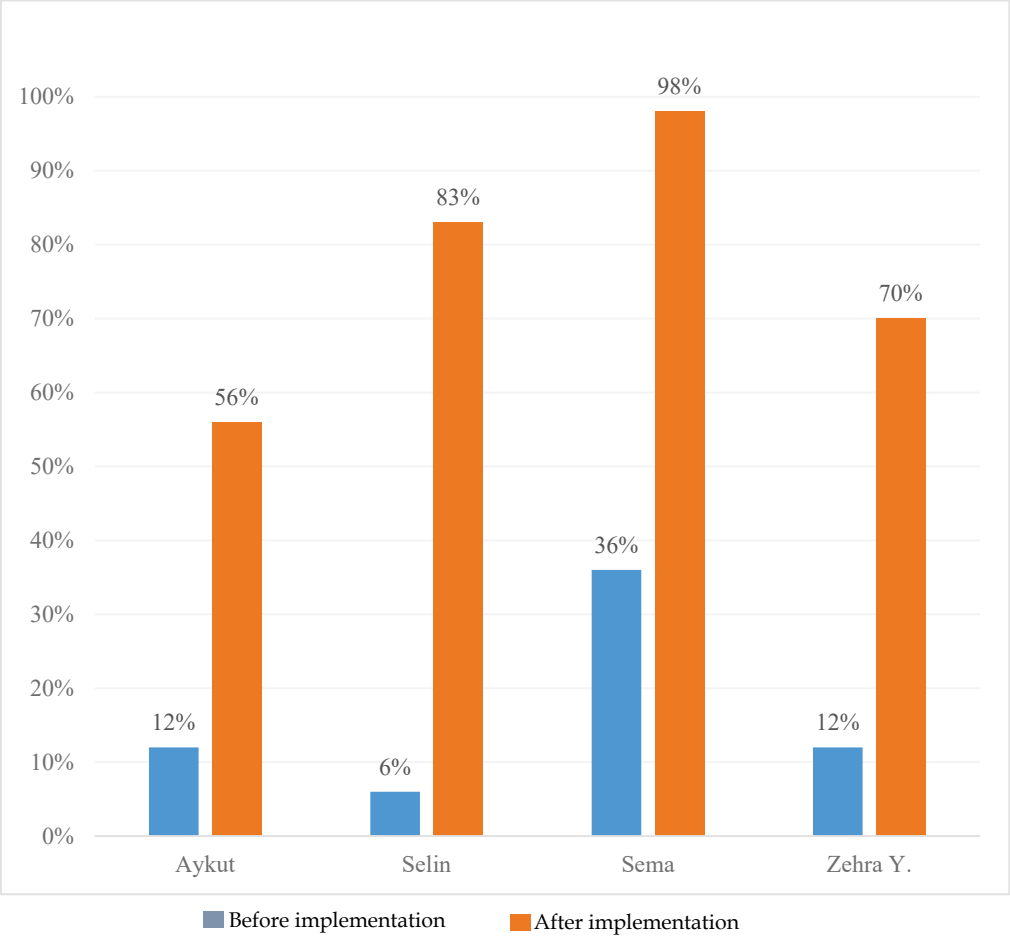
Yücesoy-Özkan, Ş., Öncül, N., & Kaya, Ö. (2013). The effects of computer-based instruction on teaching emergency telephone numbers to students with intellectual disability. *Education and Training in Autism and Developmental Disabilities, 48*(2), 201-218.

Zabala, J. S. (1995). *The SETT Framework: Critical Areas to Consider When Making Informed Assistive Technology Decision*. Houston, TX: Region IV -Education Service.

Appendices

Table 1. Demographic Information of Participant Students

Student Name	Date of Birth	Previous School of Student	How Long Students Have Been in This School	Advanced Technology Opportunities Students Have at Their Homes		
				Computer	Tablet	Internet
Sacide	2001	General education class	1 month	-	-	✓
Tufan	2001	General education class	1 month	✓	-	✓
Sema	2001	General education class	3 years 1 month	-	-	-
Doğuş	2001	General education class	1 year 1 month	✓	-	✓
Zehra K.	2002	General education class	1 month	✓	-	-
Selin	2001	General education class	2 years 1 month	-	✓	✓
Aykut	2001	Special education primary school	5 years 1 month	-	-	-
Öykü	2001	Special education primary school	5 years 1 month	✓	-	✓
Zehra Y.	1999	Special education primary school	5 years 1 month	✓	-	✓
Ali	1999	Special education primary school	5 years 1 month	✓	✓	✓
Mert	2001	Special education primary school	5 years 1 month	✓	-	✓



Graphic 1. Students' Performances Before and After Implementation

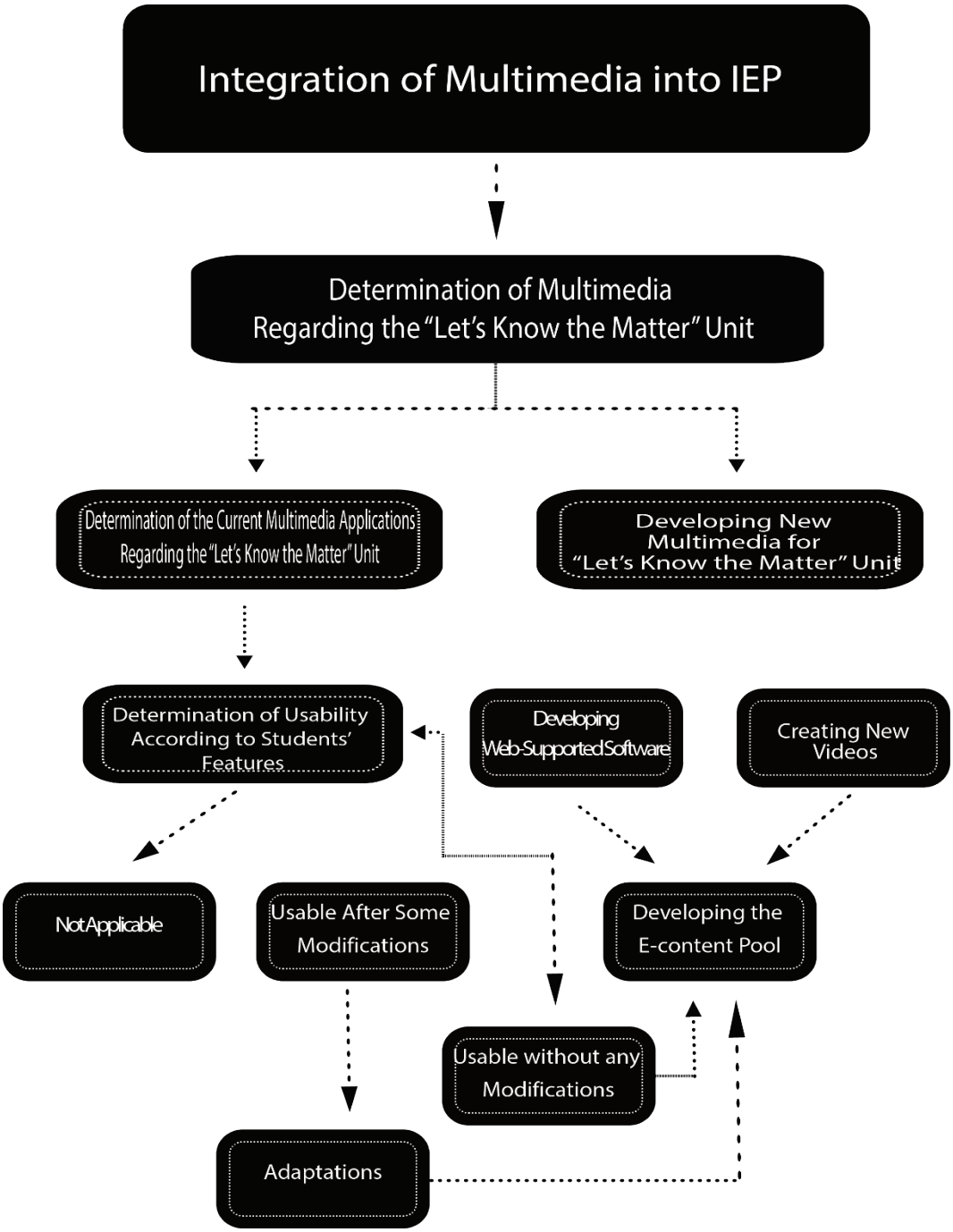


Figure 1. Integration Process of Multimedia Applications into IEP