International Journal of Contemporary Educational Research (IJCER)

www.ijcer.net

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Gulistan Yalcin[1], Tugba Kamali Arslantas[1]
[1]Aksaray University

To cite this article:

Yalcin, G. & Kamali Arslantas, T. (2020). Mentoring Inservice Teachers to Support their Inclusive Science Teaching Practices for Students with Visual Impairment *International Journal of Contemporary Educational Research,* *7*(2), 112-131. DOI: https://doi.org/10.33200/ijcer.741436

IJCER International Journal of Contemporary Educational Research
Volume 7, Number 2, December 2020, 112-131 ISSN: 2148-3868

Mentoring Inservice Teachers to Support their Inclusive Science Teaching Practices for Students with Visual Impairment

Gulistan Yalcin[1*], Tugba Kamali Arslantas[1]
[1]Aksaray University

Abstract

The Accessible Science for Students with Visual Impairment (ASVI) mentoring program aimed at developing innovative teaching methods for teaching science effectively to third-grade and fourth-grade students with visual impairment (VI). In order to achieve this, the program aimed to guide classroom or science teachers to develop or adapt instructional materials based on the objectives of the science class and also the needs of students with VI. The study was conducted during 2019-2020 at Aksaray University, in Turkey, with the participation of 10 faculty members (as the mentors) and 23 inservice teachers (as the mentees). The main purpose of the study was to investigate the inservice teachers‟ perceptions (as mentees) about the faculty members‟ mentoring roles, and to understand the mentors‟ self-perceptions. This research was designed as a qualitative case study. The study‟s findings revealed that mentors as the focus of the current study, they had the opportunity to implement procedures based on effective mentoring, and were thereby able to help the inservice teachers develop professionally in their preparations. Mentoring was highlighted as a means of overcoming some of the problems that the inservice teachers‟ faced in their educating of students with special needs.

Keywords: Inclusive education, Visually impaired, Mentoring, Inservice teacher education

Introduction

Whilst the basis for inclusion practices was enacted in the United States of America in 1975 under Public Law (PL) 94-142, inclusion practices in Turkey were initiated much later, in 1997, with Delegated Legislation No. 573 (Batu & Kırcaali-İftar, 2005). Fairchild and Henson (1993) defined inclusion practice as keeping students with special needs together with their typically developing peers as much as possible, and providing an educational environment which best meets their needs with minimal limitations. This practice has been defined in the Turkish Special Education Services Regulation (Milli Eğitim Bakanlığı [Ministry of National Education], 2018) as maintaining interaction between students with special needs and their typically developing peers at the same level, and providing the necessary support in order to ensure that they receive education alongside their peers.

According to the 2018-2019 statistical data from the Turkish Ministry of National Education (Milli Eğitim Bakanlığı [Turkish Ministry of National Education], 2020), there are 1,260 inclusion students in formal preschool education, 115,556 inclusion students in primary education, and 130,624 inclusion students in secondary education throughout Turkey. Although the exact number of students with visual impairment (VI) in inclusive classrooms is unknown, the number of students included in inclusion practices in Turkey has increased. The biggest reason for this increase is that most schools dedicated to VI have ceased to offer the accommodation services previously offered in the past. Although the educational rights of students with VI is protected by law in most countries, Turkey included, those rights are unlikely to be upheld fully due to several reasons. It has been similarly reported in the literature that many obstacles exist for students with VI attending classrooms based on inclusion practices (Bardin & Lewis, 2008; Gray, 2009; Metatla, 2017; Morelle, 2016; Morelle & Tabane, 2019; Okonkwo, Fajonyomi, Omotosho Esere, & Olawuyi, 2017; Ramrathan & Mzimela, 2016). Some of these obstacles are a lack of educational services support aimed at classroom teachers, their access to educational materials with Braille or large-font text, and limited access to specialized equipment and assistive technological tools. Also, teachers working with students with VI are not equipped with

* Corresponding Author: *Tugba Kamali Arslantas, tugbakamaliarslantas@gmail.com*

adequate knowledge or skills in the education of students with VI (Porter & Lacey, 2008; Smith, Kelley, Maushak, Griffin-Shirley, & Lan, 2009).

Background

Students with VI face numerous academic challenges in accessing the required information in their educational courses due to high levels of visual content, mostly in science and mathematics courses when compared to their sighted peers. There are three main reasons for the academic challenges that students with VI experience. First, visual signs do not convey meaning to students with VI, mostly because they do not have preformed mental images with which to refer back to like their sighted peers (Jones, Minogue, Oppewal, Cook, & Broadwell, 2006). In addition, students with VI are less ready for science-based courses (Darrah, 2013; Kolitsky, 2014), and therefore experience certain difficulties in these classes. Second, two-dimensional images of three-dimensional concepts may prove difficult for students with VI to interpret (Bogner, Wentworth, Ristvey, Yanow, & Wiens, 2006). Third, information provided within a single diagram may require various tactile graphics and verbal descriptions in order to be understood by students with VI (Bogner, Hurd, Wentworth, Ristvey, & Arens, 2011). Therefore, the use of assistive technologies, actual physical objects and real-time talking about real experiences is of vital importance for the students with VI in science-based courses (Aykut & Özmen-Güzel, 2010; Hasper et al., 2015; Rule, Stefanich, Boody, & Peiffer, 2011).

In order to deal with the challenges that students with VI face in science education, there are certain critical issues that should be provided for such as individualized instruction, accessibility, material adoption, and the use of assistive technologies. Students with VI may require individualized learning strategies (Kamali Arslantas, Yildirim, & Altunay Arslantekin, 2019; Koenig & Holbrook, 2000; Lohmeier, 2009) that enable them to discover through the use of their other senses as well as their remaining vision, if any, and proper educational materials developed according to their needs (Altunay Arslantekin, 2012; Yalcin & Altunay Arslantekin, 2019). It is therefore necessary to meet the needs of students with VI in their learning activities in order to ensure that they face similar conditions to their sighted peers. To this end, Expanded Core Curriculum, as developed by Hatlen in 1996 and adopted as a popular approach in the education of students with VI, meets the needs of students with VI in both their academic and daily life. The curriculum focuses on teaching compensatory skills to students with VI so as to enable them to become involved in each phase of their education (Lohmeier, 2009; Sapp & Hatlen, 2010), and thereby enjoy equal educational opportunities with their sighted peers.

Science courses should be accessible to all students, whether disabled or able-bodied (Atika, Ediyanto, & Kawai, 2018; Ediyanto, Atika, Hayashida, & Kawai, 2017). Additionally, science courses are expected to prepare students to enter further or higher education, business life, and also for social life (Mundilarto, 2002). However, experts have stated that students with VI do not succeed in science courses to the same level as their sighted peers (Yalcin, 2020). In order to be successful in science courses, students with VI require certain arrangements to their educational environment, as well as particular materials made available within inclusion classrooms and other school environments according to their individual needs (Altunay Arslantekin, 2012; Rule, 2011; Toenders, de Putter-Smits, Sanders, & den Brok, 2017). Şahin and Yorek (2009) conducted interviews with science teachers in order to learn about their experiences with students with VI, with some teachers having stated that students with VI need more time throughout the learning process than their sighted peers, and that they need adaptation of certain materials such as tactile learning materials. In his study Rule (2011), prepared tactile materials in order to teach earth and space concepts and conducted instructions with those materials. He figured out that these tactile materials are effective in learning of students with VI. Similarly, Toenders et al., (2017) stated that adapting physics materials based on the needs of students with VI, it is possible to ensure students with VI can access and understand physics concepts.

Students with VI may require materials that have been prepared in different formats for science classes (Jones & Broadwell, 2008), such as a Braille barometer, Braille thermometer, Braille-labelled laboratory equipment, a human anatomical model, three-dimensional (3D) materials, 3D models of cells and DNA, and a tactile anatomy atlas in their science classes (Aslan, 2016). Although many of these materials are supplied from the Directorate General of the State Supply Office in Turkey, it is known that teachers have limited access to them. For this reason, many teachers are expected to adapt their normal teaching materials that they use with their sighted students according to the needs of students with VI (Yalcin, 2020).

With the improvements seen in technology, it has become more possible to create the required methodological and pedagogical conditions for students with VI. Technology usage has been introduced with the Expanded Core Curriculum, and the use of assistive technology has been shown to be highly effective with VI students in accessing information and in the pursuit of an independent daily life (Altunay Arslantekin, 2012; Yalcin & Altunay Arslantekin, 2019). Studies in the literature support the effectiveness of assistive technology application in teaching science and mathematics since it ensures the active participation of students with VI in classes (da Mota Silveira & Martini, 2017; Koehler, Wild, & Tikkun, 2018; Ludi, Canter, Ellis, & Shrestha, 2012; Lunney, 1995; Nees & Berry, 2013; Negrete, Lisboa, Peña, Dib, & Vargas, 2020; Supalo, Humphrey, Mallouk, Wohlers, & Carlsen, 2016). Supalo et al. (2016) reported that students with VI can effectively participate in technology-supported science laboratories. Similarly, Koehler et al. (2018) used 3D printed models in their science class for students with VI, and indicated that adaptations in the curriculum can be effective means for teaching students with VI. However, the use of assistive technology in the education of students with VI requires comprehensive teacher training. As Abner and Lahm (2002) pointed out, classroom teachers can struggle in using assistive technologies effectively since many are unprepared and are in need of training. However, in a study conducted by Moreland (2015), the findings showed that teachers who were specifically trained in assistive technology usage have more positive attitudes toward technology usage in the classroom.

Full attendance of students with VI in science-based classes depends on adaptations having been applied to the curriculum and teaching strategies, assistive technology usage in class, materials having been developed according to needs of the students with VI, and cooperation between experts in the field and science or classroom teachers (Yalcin, 2020). The literature has shown that students with VI can learn science subjects to the same level as their sighted peers if certain changes are applied to the teaching and classroom materials (Betts & Cross, 2010; Fraser & Maguvhe, 2008; Kızılaslan, Zorluoğlu, & Sözbilir, 2020; Şahin & Yorek, 2009; Urquhart, 2012).

One of the most important elements in inclusion practices are the teachers themselves. It is expected that teachers should possess adequate knowledge about the learning characteristics of the inclusion student in the classroom, and to be able to organize their teaching methods in line with their students‟ needs. However, it is also known that classroom and science teachers have limited information and skills regarding the education of students with VI. Therefore, the literature has emphasized that, for an effective inclusion practice, supportive educational services should be provided by experts in the form of training these teachers (Fraser & Maguvhe, 2008; Koehler & Wild, 2019; Rosenblum, Ristvey, & Hospitál, 2019). Koehler and Wild (2019) defined the content of support offered by experts to classroom teachers in six steps in order to better support students with VI in their science-based classes. These steps are to guide classroom teachers on how to ensure student participation in the classroom, to adapt materials and provide the necessary support according to the students‟ needs, to ensure that students can readily access the course, and to provide the necessary prerequisite skills to students prior to them having to learn the science, to guide the teacher on how best to evaluate students with VI, and being a model for the classroom teacher by teaching in small groups. In the study by Rule et al. (2011), the results of the education program given to secondary school teachers on attitudes towards students with VI in science and mathematics classes and material adaptations were examined. The findings revealed that when materials (tactile, auditory) were prepared based on students‟ needs, students with VI were as successful in lessons as their sighted peers; whilst teachers who acquired the necessary knowledge and skills through working with students with VI found themselves ready to work with these students.

Mentoring as part of inservice teacher education is one of the strategies that can be applied in order to support teachers‟ skills in learning to teach (Wang, 2002). Notably, the literature states that mentoring contributes to teachers‟ professional and personal growth (Ambrosetti & Dekkers, 2010; Hudson, 2004; Mena, Hennissen, & Loughran 2017). In the current study, mentoring was implemented as an intervention in order to contribute to the teachers‟ inclusive science teaching practices.

Mentoring

In the literature, mentoring has been similarly defined by several researchers. Van Dijk (2008) defined mentoring as the process of transferring essential job-related skills, attitudes, and behaviors from one person to another. Godshalk and Sosik (2003) and Luecke (2004) defined mentorship as a relationship in which a more skilled and experienced person helps to inform and guide a less knowledgeable and less skilled person. Accordingly, the purpose of mentoring is that a mentee interprets the knowledge and experiences transferred from a mentor to contribute to their own self-development (Klasen & Clutterbuck, 2002). In the current form, mentoring is a non-hierarchical process in which both mentor and mentee can benefit (Ambrosetti & Dekkers, 2010) since both parties can learn from the process and experience personal gain (Forde & O‟Brien, 2011; Hudson, 2013).

There are two important elements within the mentoring process, that of the “mentor” and the “mentee.” A “mentor” is someone with a greater level of experience, whose role it is to guide, support, and nurture a less experienced person, who is their “mentee” (Truter, 2008). Certain qualities that a mentor should possess have been previously defined by researchers in the literature (Janse van Rensburg & Roodt, 2005; Meyer & Fourie, 2004; Truter, 2008), including being reliable, honest, acting with integrity within a group, having emotional intelligence and the ability to understand others, possessing strong social skills, and is both patient and understanding. In addition, mentors are expected to possess skills on the specific subject/s that they are providing mentoring for (Meyer & Fourie, 2004; Truter, 2008). Some of these skills are: (a) Having adequate knowledge and experience in the field being mentored; (b) Interested in self-development; (c) Willing to share their own experiences; (d) Having the capability to ask questions in a proper and correct manner; (e) Being a good listener; (f) Being able to help their mentee to manage the knowledge that they gain, and (g) Being an effective role-model so as to help their mentee gain the relevant skills.

The mentee is another important element of the mentoring process, and is defined as a person who is in receipt of mentoring from a mentor. Meyer and Fourie (2004) defined a mentee as a person who is responsible for their own self-development, whilst aware of the importance of learning from others. In the literature, researchers have underlined certain qualities that a mentee should possess in order to benefit from the mentoring process, with Clutterbuck (2005) listing them as good communication skills, being open to new information and experiences, having a sense of trust, willing to communicate with their mentor, being committed to learning, being responsible to both their fellow group members and their mentor, and being open to criticism.

There are certain factors that make for an effective mentoring process, apart from the qualities of both the mentor and mentee/s, including determining the criteria of how mentors and mentees are selected (Conolly & Blunt, 2006; Meyer & Fourie, 2004), describing the goals and desired outcomes expected to be realized during the mentoring process (Conolly & Blunt, 2006), clearly sharing the content and activities related to the mentoring process with the mentees (Meyer & Fourie, 2004), and organizing the setting where process take place. Similarly, the literature revealed that shared decision-making processes (Gabriel & Kaufield, 2008; Kopcha, 2010; Roth & Tobin, 2002), forming equal relationships (Wilkinson et al., 2014), defining mutual expectations and goals (Baran, 2016; Barker, 2006), practicing together as a form of sharing responsibility (Baran, 2016), feedback-oriented communication (Baran, 2016), and being adaptive to mentees‟ needs (Rajuan, Beijaard, & Verloop, 2010; van Ginkel, Oolbekkink, Meijer, & Verloop, 2016) are all critical elements to the success of mentoring programs. These criteria ensure that both mentee and mentor grow together personally (Baran, 2016; Huizing, 2012; Simpson et al., 2007), professionally (Hudson, 2004, 2013; Lopez-Real & Kwan, 2005; Lumpkin, 2011; Mena et al., 2017; Zachary, 2009), and pedagogically (Baran, 2016; Hudson, 2004). In the study of Baran (2016), it was stated that mentoring programs contribute to the professional growth of mentors by affording them the opportunity to build professional friendships and to improve their communication skills.

As a system, inclusive education has become pervasive, adding additional responsibilities for teachers independent of their specific domain. Professional development of inservice teachers is necessary considering the requirements of special education (SE). In this regard, mentoring has been attributed to being an effective means for inservice teachers to gain the necessary skills for conducting effective education (Hairon et al., 2019; Hobson, Ashby, Malderez, & Tomlinson, 2009; Ingersoll & Strong, 2011; Mathur, Gehrke, & Kim, 2013; S´anchez-García, Marcos, GuanLin, & Escribano, 2013), which also includes the practices of inclusive education (Falvey, Coots, Bishop, & Grenot-Scheyer, 1989; Hobbs & Westling, 2010; Rudiyati, 2014).According to the literature, mentoring practices in SE are found to be effective with teachers (Akçamete, Aslan, & Dinçer, 2010; Boyer & Lee, 2001; Heirdsfield, Walker, Walsh, & Wilss, 2008; Patton et al., 2005; White & Mason, 2006), students (Pleiss & Feldhusen, 1995), as well as for other stakeholders (Moon & Callahan, 2001; Ota & Austin, 2013). In a mentoring study conducted by Rudiyati (2014) with teachers of students with VI, it was shown that mentoring can be effective in increasing teachers‟ inclusive skills.

The Purpose of the Study

The current study attempts to overcome the problems that students with VI face in science classes, and the challenges that inservice teachers are required to confront in serving to inclusive students, by improving the inclusive teaching practices of inservice teachers. For this purpose, an Accessible Science Project for Students with Visual Impairment (ASVI) mentoring program was conducted. The main purpose of the program was to develop innovative teaching methods for the effective teaching of science to third-grade and fourth-grade students with VI.

In order to achieve this, the ASVI program aimed to guide classroom and science teachers do develop or adapt instructional materials based on the objectives of science classes and the needs of students with VI. Despite the project targeting students with VI, the adopted materials can be applied to students with different types and levels of disability. Thus, the program has the potential to contribute to teachers in preparing materials for students with a variety of disabilities, which in turn affects their inclusive teaching practices. The focus of the current study was generally on the mentors, since the literature emphasizes that many aspects of the mentoring process impacts on the mentors rather than the mentees, which is based on mentors‟ self-reflections of their own practices (Lopez-Real & Kwan, 2005; Simpson, Hastings, & Hill, 2007).

Method

The main purpose of the current study was to explore inservice teachers‟ perceptions, as mentees, about faculty members‟ mentoring roles, and also to understand the mentors‟ self-perceptions. The study was designed as an exploratory case study that guided an in-depth analysis of both the mentors‟ and mentees‟ perceptions of an Accessible Science for Students with Visual Impairment (ASVI) mentoring program. In the context of an exploratory case study, the purpose is to extend understanding of a complex social phenomena in real-life contexts (Ogawa & Malen, 1991). Exploratory case studies are qualitative in nature. Baxter and Jack (2008) indicated that qualitative case study methodology provides tools for researchers to learn about complex phenomena within their specific context. The case in the current study focused on the hands-on material design for a science course designed specifically for VI students, with teachers from different schools participating in the study. Implementing an exploratory case study approach enabled a detailed investigation of the mentoring process through a multiple-case mentor-mentee context (Yıldırım & Şimşek, 2011).

The following research questions have driven the current study:

(1) What are the mentors‟ perceptions of the ASVI mentoring program?
(2) What are the mentees‟ perceptions of their mentors in terms of fulfilment of their mentoring roles?

Participants

The participant group of the current study was comprised of both mentors and mentees.

The first group of participants in the current study were the mentors, who were either faculty members of Special Education (n = 8) or Science Education (n = 2) departments at Aksaray University, Turkey. Sampling method was implemented in two steps. First, the mentors were recruited based on purposeful sampling, then, based on the convenience sampling method, mentors who were available to participate were recruited. The two faculty members from the Science Education department were Professors. Three of the faculty members from the Special Education department were Assistant Professors, while the remaining five faculty members were Research Assistants studying for doctoral degrees in SE at various universities in Turkey. The mentors‟ role was twofold; to mentor inservice teachers in the development and adaptation of science education instructional materials for students with VI, and also to guide their mentees in the construction of knowledge on how to educate students with VI. Also, the mentors introduced assistive technologies to their mentees for use within the project, including the use of Braille printers, 3D printers, 3D pens, and a tactile-copying machine.

The second group of participants were inservice classroom and science teachers working in primary education. At the outset of the study, an announcement was undertaken through the Aksaray Provincial Directorate of National Education to all schools in the Aksaray province. The announcement included information about the project, its procedures, and that the project was looking to recruit volunteer participants for the 1-year research project. Mentees were recruited based on the purposeful sampling method. Based on the selection criteria, teachers who had one or more inclusive students in their class or in their school (i.e., not specifically in their own class) were welcomed to apply to join the project in order to increase their inclusive teaching skills. Considering the increasing inclusive practices in Turkey, there is a high possibility of teachers having an inclusive student in their class in the future. A total of 23 teachers (10 science education and 13 classroom teachers) attended all stages of the project.

The matching of mentors and mentees was applied on a random basis, with five groups formed consisting of two mentors and four or five mentees.

Accessible Science for Students with Visual Impairment (ASVI)

The current study was conducted as part of the "Accessible Science for Students with Visual Impairment" (ASVI) project, which was supported by the Sabancı Grant Foundation 2019 Program for a period of 1 year. The project was conducted at the Aksaray University, in Turkey, with cooperation of the Aksaray Provincial Directorate of National Education.

The current study focused on the ASVI mentoring program which was conducted in two stages, and with four panels and six workshops, however, the current study specifically focuses on the workshops. Four panels were conducted with the teachers at the beginning of the program, during which information about the workshops was provided, the needs and individual characteristics of students with VI were discussed, and the project"s details were clarified. The workshops were then conducted following on from the panels. During the workshops, five groups of inservice teachers developed materials under the guidance of two mentors. The output of the workshops was a set of 22 science education materials that had been developed and adapted based on the individual needs of VI students.

Workshops

The workshops were conducted during November 2019 and January 2020, and over a total of 6 days Each workshop started at 8:30 in the morning and lasted until the groups had completed their assigned materials. For groups who could not complete their materials during one day, they continued working with the same material the next day. The critical issue during the material development was consideration of the needs of students with visual impairment, and what kind of modifications they needed in order to access these materials.

Prior to the workshops, the mentors examined the science textbooks and prepared an objective list where students with VI required specific materials. Then, before each workshop, the mentors assigned objectives for each of the groups, with each group responsible for developing different sets of materials. All the required equipment necessary for developing the materials were prepared in advance of each workshop by the mentors, and distributed to the tables where each group would work. All of the workshops were conducted at the university"s premises. Depending on the process, some groups were assigned more than one objective and were responsible for the development of more than one material. According to the difficulty associated with creating the materials, some groups continued with the same activity over two days of their workshops. Table 1 presents information about the dates and objectives of the each workshop, whilst Figure 1 presents a visual of one of the materials that was prepared.

Table 1. Workshop dates and objectives for material development

Date	Objective	Group
November 18, 2019	Compares areas covered by land and water on earth"s surface on the model.	Group 1
November 18, 2019	Understands the world is made up of layers.	Group 1
November 18, 2019	Prepares a model of the earth.	Group 2
November 18, 2019	Discovers the forces of push and pull.	Group 3
November 18, 2019	Presents observational results of the lifecycle of a plant.	Group 4
November 18, 2019	Explains the basic functions of sense organs.	Group 5
November 20, 2019	Prepares a model of the earth.	Group 2 (continued with same material)
November 20, 2019	Explains what should be done to protect sense organ health.	Group 1
November 20, 2019	Hardness/softness, flexibility, brittleness, color, odor, taste, roughness, and smoothness.	Group 3
November 20, 2019	Conducts experiments to understand magnets.	Group 4
November 20, 2019	Conducts experiments to understand push and pull forces.	Group 5
November 22, 2019	Hardness/softness, flexibility, brittleness, color, odor, taste, roughness, and smoothness.	Group 3 (continued with same material)
November 22, 2019	Conducts experiments to understand push and pull forces.	Group 4 (continued with same material)
November 22, 2019	Conducts experiments to understand push and pull forces.	Group 5 (continued with same material)

Date	Objective	Group
November 22, 2019	Recognizes the elements that constitute a simple electrical circuit and their functions.	Group 1
November 22, 2019	Discovers how light is necessary for vision.	Group 2
January 13, 2020	Conducts experiments to understand push and pull forces.	Group 5 (continued with same material)
January 13, 2020	Classifies sound sources as natural or artificial.	Groups 1 & 2 (two different materials)
January 13, 2020	Relates rocks with minerals and discusses the importance of rocks as raw materials.	Group 3
January 13, 2020	Discusses types of rock and minerals found in Turkey (e.g., gold, boron, marble, lignite, copper, hard coal, silver).	Group 4
January 14, 2020	Classifies sound sources as natural or artificial.	Groups 1 & 2 (two different materials) (continued with same material)
January 14, 2020	Discusses types of rock and minerals found in Turkey (e.g., gold, boron, marble, lignite, copper, hard coal, silver).	Group 4 (continued with same material)
January 14, 2020	Explains the formation of fossils.	Group 3
January 14, 2020	Constructs a working electrical circuit.	Group 5
January 14, 2020	Explains the formation of fossils.	Group 3 (continued with same material)
January 15, 2020	Explains the relationship between sound intensity and distance.	Group 1
January 15, 2020	Discovers that that every sound has a source, and that sounds spread in all directions.	Group 4
January 15, 2020	Using the sense of hearing, makes inferences about the approach and distance of a sound source and its location.	Group 5

Figure 1. A visual of Earth model

Each workshop included three modes of mentoring as "discussion," "material development," and "feedback and reflection." At the beginning of the workshops, discussions were held with regards to the objectives and the potential materials that could be developed based on the characteristics of the target group. Each group undertook a brainstorming activity and then decided on the specific features of the materials they would develop prior to commencing the material development process. The groups each worked collaboratively throughout the process. After completion of each item of instructional material, feedback and reflection sessions were then conducted. The mentors visited each of their groups and provided them with feedback, and discussed the materials that they had developed.

Data Sources

Three data sources were used in the current study, with focus group interview schedules for teachers, semi-structured interview schedules for mentors, and observation forms completed by the mentors.

Focus Group Interview Schedules: At the end of the study, five focus group interviews were conducted with the teachers in order to gather their insights about the mentors. Each focus group interview lasted between 45 and 60 minutes. The focus group interviews were conducted by the current study"s researchers, who each possessed prior experience with qualitative studies. The focus group interview guidelines included questions about the participants" general perceptions related to the project, their perceptions about their mentors; specifically, what they thought about their mentors" contribution to the project, their mentoring strategies, and how the mentors affected the effectiveness of the workshops.

Semi-structured interview schedules for mentors: Also, at the end of the study two of the researchers conducted interviews with the faculty members in order to understand their mentoring experiences from a mentors" perspective. Interviews lasted around 30 minutes with each mentor. Interview guidelines included questions about their general perceptions related to the project, what they gained from the mentoring process, and in what specific factors they contributed to their mentees.

Observation Forms: The current study included prolonged observation of the mentees during their workshops. Holistic description of the events was undertaken by two researchers, who completed observation forms and also took field notes during the collaborative activities.

Data Analysis

For the qualitative data of the study, thematic analysis was performed in order to describe the phenomenon. Thematic analysis is a flexible qualitative data analysis technique that provides a rich and detailed presentation of the collected data (Braun & Clarke, 2006). First, the interview recordings were transcribed into written form. For data analysis, the step-by-step approach as proposed by Nowell, Norris, White, and Moules (2017) was applied. As the first step, the researchers familiarized themselves with the data (Braun & Clarke, 2006) through "careful reading and re-reading of the data" (Rice & Ezzy, 1999, p. 258). Next, the researchers separately generated initial codes for the data. During their coding, the researchers identified the significant elements of the data and attached labels to index them in relation to themes (King, 2004). The data were organized based on the interview questions, and each of the respondents" answers were categorized based on their consistencies and differences. During the third step, the researchers looked for themes in the data, and then sorted and collated the coded data (Braun & Clarke, 2006) according to a data-driven inductive approach in order to generate the themes (Boyatzis, 1998). During the fourth step, the researchers reviewed the themes so as to explore whether or not they appeared to form a coherent pattern. The researchers then met to examine the themes and subthemes, and worked towards reaching a consensus. For example, some of the themes that had little support were changed. During the fifth step, the themes were defined and named by the researchers, having met to discuss the themes in detail. The themes were the organized repeatedly until consensus was reached. Finally, the researchers wrote the findings of the data. These six steps were implemented for both types of data collected; interviews and observation forms.

Trustworthiness

In order to strengthen the research design, the researcher took issues of the study"s trustworthiness (Lincoln & Guba, 1985) into consideration during both the data collection and analysis process. In order to ensure credibility triangulation, prolonged field engagement and peer debriefing were employed. Data triangulation was achieved through having multiple data sources, with interviews and observation used together to validate the results through comparison of the observational data with the interviews. Investigator triangulation was also performed in order to minimize potential researcher bias. For that purpose, both researchers conducted the data collection process. Additionally, the qualitative data were analyzed independently by two researchers and the findings then compared. Prolonged field engagement is another credibility strategy concerning the investment of adequate time within a research site in order to learn the culture, testing for possible misinformation, and for the establishment of trust (Lincoln & Guba, 1985). The researchers in the current study conducted repeated observations and held in-depth interviews; staying for a prolonged period of time at the research site. Peer debriefing was also ensured since the two researchers worked separately at the beginning and then jointly examined the themes until a consensus was reached.

In order to ensure dependability (which is termed as reliability in quantitative studies), both audit trail and intercoder agreement (Silverman, 2000) were applied. Audit trail in the current study was achieved by recording and documenting the whole process in order that an external observer could trace the research on a step-by-step basis. Intercoder agreement or intercoder reliability is a strategy that requires different coders to analyze transcribed data (Creswell, 2008; Miles & Huberman, 1994). The current study did not aim for an exact match in the coding, but for consistency among the codes and categories. For that purpose, both of the researchers worked throughout the data analysis phase.

Results

The findings of the study are presented under subheadings of "Mentors" perceptions" and "Mentees" perceptions" according to the relevant themes.

1) Mentors' Perceptions

During the interview, the mentors were asked to explain their perceptions related to the mentoring program. First, all of the mentors indicated that the program was able to reach and achieve its aims and in line with the goals, and that the mentees achieved the necessary gains in the design and adaptation of instructional materials aimed at inclusive students. In addition, the mentors strongly emphasized that besides designing and adapting materials, the mentees" awareness about disabled students increased. Digital assistive technologies used for students with VI were introduced to the teachers during the process and they were informed about these technologies. Regarding this issue, one the mentors stated that:

> *The most important outcome of the program was the materials themselves since these materials can be used for all students with different disabilities, even with those without a disability. [Mentor 1]*

The mentors viewpoints regarding the mentoring program were clustered around two main themes. First, they expressed their perceptions of their own personal gains, and then explained their perceptions related to the mentoring procedure. Table 2 represents the mentors" perceptions during the process.

Table 2. Mentors" Perceptions

Themes	Sub-themes	Categories
Personal Perceptions		
	Improved Professional Practice	Sharing knowledge and vision, Gaining new academic perspectives
	Effective Collaborative Work	Collaboration, Shared decision-making, Practicing together and reflection
	Building Collegiality	Different profession, Working for a common goal, Relevance of the topic
Procedurel Perceptions		
	Identifying Mutual Expectations	-
	Discussion	-
	Material Development	-
	Feedback and Reflection	-

Personal Perceptions

The first issue mentioned by the mentors was with regards to their personal perceptions toward the mentoring program. They evaluated it as an invaluable opportunity to learn new things and as a means to improving themselves. Having the opportunity to work with teachers and colleagues from two different discipline areas promoted positive outcomes of the study. The mentors reported that it was a reciprocal process in which both sides of the relationship had learned. The mentors" perceived benefits of the mentoring experience in various practices as "improved professional practice," "effective collaborative work," and "building collegiality."

Improved Professional Practice. The mentors perceived the greatest benefit of the mentoring exercise to be the opportunity to improve their professional practice in terms of sharing their knowledge, gaining new academic perspectives, and improving themselves with regards to project management issues. They indicated that they had the chance to share their knowledge and vision related to inclusive education practices with classroom teachers. As the mentors were mostly new to their academic career, they first considered the opportunity to work with teachers as the actual practitioners, and from whom they learned new things and then shared these ideas with each other. As they significantly emphasized, their experience with the teachers also contributed to them considering to undertake more academic studies in the future. Similarly, conducting the mentoring program as two mentors together provided opportunities to develop abilities to strengthen their capacities professionally, since the mentors were from different academic disciplines. One of the mentors indicated that:

> *Specifically working with the teachers helped to gain new insights, especially about the studies I had conducted in the field. Since the teachers, as actual practitioners, explained the problems they faced related to special education issues, we had the chance to learn more about the actual problems they faced, which in turn helped me to think about future academic studies with the target group. [Mentor 2]*

Effective Collaborative Work. This professional improvement in turn enhanced their ability to nurture collaborative working skills. The mentoring relationship included the factors of collaboration, shared decision-making, practicing together, and also of reflection, which together promoted effective collaborative working. These common shared experiences promoted their effectiveness as a team. Working for a common and important goal was a key motivating factor for the mentors, which in turn increased their keenness to work and collaborate effectively.

Building Collegiality. The other category mentioned was about building collegiality, as during the process the mentors conducted the workshops partnered alongside a second mentor. This was the first such experience for eight of the mentors in the study, which provided them with an invaluable experience. The mentors from different disciplines reflected their knowledge effectively during the mentoring program. A collegial relationship was effectively fostered which was related to the relevance of the study"s goals. They indicated that the mentoring program was conducted based on a real need, which increased their motivation as they were working for a common goal. This level of keenness and effectiveness is exemplified in the following quote:

> *As a team, we established collegiality since we believed in the necessity of the program's focus. There was a real solidarity between the mentors, and also between the mentors and mentees. Thus, we created a network of support, and learned a great deal from each other. [Mentor 6]*

To summarize, these positive experiences promoted corresponding changes in the mentors" self-perception of their own personal development and understanding of their value within the workplace.

Procedural Perceptions

The second theme of the mentors" perceptions related to procedural issues. As the mentors evaluated the mentoring program as being a successful and productive process, they mainly related this success to the structure of the mentoring program itself. Thus, their answers to the interview questions were categorized according to the procedural steps as they evaluated the mentoring program based on these stages.

Identifying mutual expectations. Prior to the workshops, the mentors held discussions with their mentees during the panels. These discussions primarily concerned the topics of SE and the problems faced by and needs of students with VI. During these panels, the mentors and mentees also discussed potential solutions that could be enhanced for the education of students with VI. This ensured that both sides" expectations related to the outcomes of the workshops were defined, which corresponded to the main theme of the project being that the process should be personally relevant to both parties. The participants raised similar ideas related to the mentoring program, as well as how to conduct the process, which also ensured active participation of the mentors.

> *From the beginning of the material development process, discussing problems related to the education of the VI as well as potential solutions helped to increase the sense of belonging of us all. In this way, we had the chance to work towards a common goal that was relevant to real-life experience. As I observed, we all worked with a high level of motivation in order to successfully reach our determined goals. [Mentor 2]*

Discussion. Before each workshop, the groups discussed the objectives that had been assigned to them, and then brainstormed about what could be designed and how it should be designed in order to teach that specific subject to students with VI. These discussion sessions ensured that both the mentees and their mentors took part in the research together, which helped promote the establishment of a co-equal working relationship. Also, these discussions held prior to the actual practical material development provided the teachers with an opportunity to learn how to think and what to think while considering the individual differences of students with VI and their individualized needs for the learning of a new subject. Thus, the teachers learned to think of ways to produce better outcomes for their students. Conducting effective discussions with the involvement of all the participants was also found to be essential to the effectiveness of the process.

> *During the discussion sessions, the teachers' awareness of students with VI and their specific needs increased. The teachers held discussions in groups and spent effort to find solutions for an effective material development. These discussions contributed to both their personal development and to the material development process. [Mentor 4]*

Material Development. The mentors strongly emphasized that the hands-on material development process was conducted very effectively, having brainstormed every step as a team, and reached common ideas within the group. The mentors attributed the success of the material development process to the relevance of the study, and to its applicability to a real-life application based on real experiences. The applicability of acquired knowledge and practices was articulated.

Feedback and Reflection. After each material development process had concluded, each mentor pair visited all of their groups and provided process feedback at the group level. Process feedback included task-related behaviors and focused on the convenience of the materials to students with VI. Additionally, during this session, the mentees were required to reflect on their opinions as related to the feedback and what they had learned following the materials development process.

2) Mentees' Perceptions

During the interviews, the mentees were asked to evaluate their perceptions in terms of their mentors. As the mentees highlighted, the mentors, as faculty members, had a powerful role in influencing and shaping the inclusive teaching practices of inservice teachers. Similarly, the mentees stated that the mentoring program provided an opportunity for their professional renewal, and helped to advance their knowledge with regards to inclusive teaching practices. Thus, the mentees found the mentorship experience to be beneficial in increasing their knowledge related to the education of students with VI. Moreover, they added that they might require ongoing support during their actual teaching practices in the field. The mentees" perceptions clustered around four themes; namely "endorsing the setting up of co-equal relationships," "adapting the mentoring program to the mentees" needs and suggestions," "being tech-savvy," and "being proactive." Table 3 presents an overview of the mentees" perceptions.

Table 3. Mentees‟ Perceptions

Themes	Sub-themes
Endorsing the setting up of co-equal relationships	Mutual respect, Trust, Equal balance of power
Adapting the mentoring program to the mentees‟ needs and suggestions	Construction of practical knowledge, Workshop days and duration
Being tech-savvy	Effective assistive technology use, Creating assistive technology awareness and familiarity
Being proactive	Highly focusing on the big picture of inclusive education, Foreseeing possible problems

Endorsing the setting up of co-equal relationships

The most strongly emphasized issue by the mentees was the mentors‟ effectiveness in promoting the establishment of a co-equal relationship with their mentees, which was characterized by mutual respect, trust and equal balance of power. The mentees, as teachers, indicated that at first they were biased against the university faculty members, having had concerns that the mentors would try to direct them and manage the whole process based on their own preferences. However, all of the focus groups stated that the mentors were very effective in managing the process with respect and trust, and were able to promote a co-equal relationship with the teachers they were mentoring. The mentees stated that they felt that they were treated as equals with the mentors, which ensured their keenness to join in throughout the program. The mentors both began with and maintained an equality-centered paradigm in which all parties established a partnership which nurtured a reciprocal relationship. This equal balance of power ensured the development of a true partnership. On this, one of the groups stated that:

> *The way the mentors valued the teachers and the way they looked into the eyes of the teachers was so nice. It is the mentors who brought us to this point, through their warm behavior and cordiality. To be honest, if the mentors had not worked with us as equals, we would have stepped back. The mentors' efforts during the process motivated us; otherwise, we would have thought that we had got out of school voluntarily to spend time on the project, but question why the mentors were not working with us. However, the mentors worked equally and enthusiastically with us. [Focus Group 3]*

Similarly, a member of the same group also mentioned that:

> *When I came here, there was a very warm environment and everyone's opinions were taken as equal. My opinion towards academics has changed in a positive way, I can really say that. Before, I was very prejudiced against academicians, but here the mentors valued all of us. [Focus Group 3]*

Adapting the mentoring program to the mentees' needs and suggestions

Adapting the mentoring program was the second-most mentioned theme regarding the mentors. The mentees indicated that the mentors‟ being adaptive to their needs ensured an effective mentoring process. Especially, the mentors were reported as being able to adapt the process concerning the construction of practical knowledge in materials development for students with VI. They shaped the process depending on the mentees‟ needs and perceptions. When the mentees had different ideas, the mentors tried to implement them. The second issue mentioned was about adopting the workshop schedule and duration based on the convenience of the mentees. Each time when they were planning the process, the views and opinions of the mentees were given due consideration. Thus, aligning the mentoring program with the expectations and opinions of the mentees ensured the mentees desire to be active participants in the mentoring program, and thereby to exhibit a positive attitude with the mentors.

Being tech-savvy

The mentees also reflected their perceptions regarding assistive technology usage during the study. They indicated that the mentors were technologically competent, or “tech-savvy,” and were able to effectively integrate assistive technologies during the materials development process, which provided additional insights for the mentees. As the mentees strongly emphasized, building technology awareness and familiarity during the hands-on material development process proved to be an invaluable experience. Thus, the mentees admired the mentors‟ tech-savviness which contributed to the mentees reconsidering their own teaching practices so as to produce better outcomes for students with VI in their classes, as exemplified in the following quote:

> *We really appreciate the technological assistance provided by the mentors. We had the chance to become familiar with a variety of technologies, and noticed how practical they were. For example, the Braille writer was really easy to use. Even though we did not know about the existence of such kinds of technology beforehand, we noticed how easy it was to use. The 3D pens we learned can be used in classes to make the learning environment more attractive and motivating. The mentors were really keen on being portrayed as tech-savvy and modern instructors. [Focus Group 1]*

Being proactive

The proactivity of the mentors was also articulated by the mentees as one of the things they admired about the mentors. The mentees stated that the mentors were highly focused on the bigger picture throughout the program of delivering inclusive education, which increased their proactivity in foreseeing the problems that we might encounter. This issue positively affected the efficiency of the mentoring process.

Discussion and Implications

The current study aimed to contribute to the literature on inclusive education by conducting an Accessible Science for Students with Visual Impairment (ASVI) mentoring program, highlighting both the self-perceptions of mentors and of the procedure itself; as well as the mentees‟ perceptions related to their mentors. The study‟s findings suggest that such kinds of mentoring studies that promote partnerships between universities and central education authorities should be conducted more, which in turn could result in positive outcomes for both faculty members and teachers alike. As is frequently noted in the literature, effective mentoring studies within an inservice context (Mathur et al., 2013; S´anchez-García et al., 2013) should ensure that both mentors and mentees learn together (Haggarty, 1995; Halai, 2006; Hobson et al., 2009) since the tendency is to aim for a sense of communal development (Forde & O‟Brien, 2011).

The findings of the current study focused more on the “mentors,” presenting the participants‟ perspectives related to the mentors and their mentoring aspects. The mentors first reflected on their personal gains, indicating that the mentoring program was personally rewarding (Huizing, 2012; Simpson et al., 2007) since such positive gains would benefit them throughout their academic careers. The mentors reported that mentoring was perceived as beneficial in terms of professional practice, collaborative working, and in the building of collegiality.

Immersing faculty members with inservice teachers within the ASVI program helped the faculty members to improve their professional practices in terms of sharing knowledge and their vision related to inclusive education, as well as gaining new academic perspectives. These current findings contribute to the literature, which also shows that mentoring has been widely recognized as an important aspect of gaining in professional practice for mentors (Hagger & McIntyre, 2006; Hudson, 2013; Lopez-Real & Kwan, 2005; Zachary, 2009). One critical output of the current study relates to the mentors‟ experience in sharing knowledge and vision reciprocally with teachers. Prior to the study, the faculty members had no experience of personal reflection from working with teachers as part of a long-term project. This was also found to have been discussed in the literature, since mentoring affords significant opportunities for the sharing of experiences, perspectives, and enthusiasm about various themes based on expertise (St-Jean & Audet, 2009). During this sharing process, the mentors benefitted from the experiences of their mentees and by learning more about the problems that they faced in the classroom. The faculty members also had the chance to gain new perspectives, which might help shape their future academic studies. However, this finding might be considered as specific to the current study, since the mentors were mostly new to their academic careers and therefore more open to new perspectives. Similarly, some studies in the literature highlighted certain benefits of mentoring for mentors in terms of advancing their pedagogical knowledge (Hudson, 2013), which can be associated with the current study‟s results.

The other positive gain for the mentors was improving their effective collaborative working skills. The study‟s findings showed that improving the effective collaborative working skills within a mentoring program especially conducted between faculty members and teachers requires shared decision-making and joint practicing. Research studies have indicated that shared decision-making processes (Baran, 2016; Gabriel & Kaufield, 2008; Kopcha, 2010; Roth &Tobin, 2002) and practicing together as a form of sharing responsibility (Baran, 2016) are critical to the success of mentoring programs, and which is also an indicator of effective collaborative working. The current study‟s findings also support that effective collaborative working increases the motivation of both stakeholder parties due to working towards a common and relevant goal.

The findings also showed the power of such a mentoring program in building collegiality. As the mentors hailed from various academic departments, they were afforded the opportunity to develop ideas from different perspectives throughout the study. In addition to brainstorming with the teachers, the mentees also discussed and brainstormed as a group of academicians, which enlarged their academic vision and facilitated the establishment of a trust-based collegiality. This finding is also in line with the literature, emphasizing that mentors can benefit from mentoring programs in gaining new perspectives (Simpson et al., 2007), whilst at the same time improving the working relationships with their colleagues (Baran, 2016; Davies, Brady, Rodger, & Wall, 1999). In addition, the current study‟s findings suggest that building a collegial relationship ensured a meaningful growth was experienced by both mentors and mentees during the study.

The second issue that the mentors mainly discussed related to the workshop procedures and the steps that were implemented. The findings implicated that understanding the issues related to inclusive education and being able to implement effective inclusive practices requires activities to be conducted based on practice, feedback, and reflection. However, before conducting these steps, identifying mutual expectations based on effective discussion is key (Baran, 2016), and which positively affects the overall procedure, especially in ensuring the active participation of the mentees. As emphasized in the literature, when the expectations are mutually agreed upfront, the mentees‟ personal commitment increases (Barker, 2006), and this also indicates that the mentors will likely conduct the process based on mutual respect (Huskins et al., 2011). Thus, identifying and aligning mutual expectations with regards to the mentoring process can be considered as an essential element of effective mentoring (Baran, 2016; Rajuan, Beijaard, & Verloop, 2010).

Another element critical to the improvement of inclusive education practices requires inservice teachers to experience hands-on materials development in order to better understand the needs of the target group and thereby to aim to meet those needs. The findings support that hands-on material development is sine qua non for the professional development of effective inclusive practices by inservice teachers. The current research also revealed that ending the process with feedback and reflection can lead to increased communication between groups, as well as the satisfaction and motivation of the mentees. All of these procedural steps affected the overall quality of the mentoring program. Other mentoring studies conducted on inclusive education practices also suggest that such studies involve collaboration among different stakeholders, which contributes to teachers more effectively solving problems associated with inclusive education (Falvey, et al., 1989).

The current study also examined the perceptions of the mentees related to their mentors, which were found to be positive. The first topic was endorsing the setting-up of co-equal relationships, which was closely related to the aforementioned factor of there being shared decision-making and practicing together. Parallel to this, the study showed that the mentees found that being treated equally was considered to be a positive example of their interaction with the mentors. These findings imply that the establishment of equal relationships opened the way for mutual respect, trust, and an equal balance of power. This also corroborates with the literature, which emphasizes the significance of the equal relationship (Driscoll, Parkes, Tilley-Lubbs, Brill, & Bannister, 2009; Wilkinson et al., 2014), since mentoring is a bidirectional undertaking in its current form.

The second item that the mentees significantly commented on related to their mentors‟ being adaptive to their (the mentees‟) needs and suggestions. The mentees saw this as valuable since it motivated them to both continue with the process, and also to volunteer more within their group. As indicated in the literature, adapting materials based on the mentees‟ needs was considered to be a precondition for effective mentoring (Rajuan et al., 2010; van Ginkel et al.,2016).

Additionally, the mentees favored two important aspects related to the mentors in the current study, which were their mentors being both tech-savvy and proactive. These items were specific to the current study and to the context, and which thereby positively affected the mentees‟ perspectives and the overall effectiveness of the process.

Conclusion and Suggestions

Mentoring, as a bidirectional undertaking, is a form of concurring with the best practices of inclusive education. With the mentors as the focus of the current study, they had the opportunity to implement procedures based on effective mentoring, and were thereby able to help the inservice teachers develop professionally in their preparations. Mentoring was highlighted as a means of overcoming some of the problems that the inservice teachers‟ faced in their educating of students with special needs.

Since the current study was a long-term research and required full involvement of its participants, only 23 teachers joined the study through to the end of the workshops. For this reason, it is suggested that these types of mentoring studies, aimed at the improvement of inclusive practices, could be conducted with a greater number of participants. Similarly, experimental studies could be conducted to compare different mentoring strategies. Moreover, the current study was limited to the development and adaption of science education materials for third-year and fourth-year VI students. In the future, studies that focus on the upper grades and also different disciplines could be conducted. Thus, inclusive practices will benefit further through a process of continuous improvement and thereby become more pervasive and seen less as being exclusive, distinctive, or uncommon. Another limitation of the current study was that the mentors did not observe the mentees‟ actual classroom practices. Conducting a mentoring study that included an element of coaching would provide a more sound and comprehensive interpretation of the teachers‟ understanding of inclusive education practices.

Acknowledgements or Notes

This research was supported by the Sabancı Grant Foundation 2019 Program.

References

Abner, G. H., & Lahm, E. A. (2002). Implementation of assistive technology with students who are visually impaired: Teachers‟ readiness. *Journal of Visual Impairment & Blindness*, *96*(2), 98-105.

Akçamete, G., Aslan, B., & Dinçer, Ç. (2010, May). *Uygulama öğretmenlerinin mentörlük becerilerinin değerlendirilmesi* [Evaluation of practice teachers' mentoring skills]. Paper presented at the Uluslararası Öğretmen Yetiştirme Politikaları ve Sorunları Sempozyumu II. Hacettepe University, Ankara, Turkey.

Altunay Arslantekin, B. (2012). Engel türüne göre materyal uyarlama, hazırlama ve kullanımı [add translation here]. In A. Ataman (Ed.), *Temel eğitim öğretmenleri için kaynaştırma uygulamaları ve özel eğitim* [Inclusive education practices for classroom teachers and special education] (pp. xx-xx). Ankara, Turkey: Vize.

Ambrosetti, A., & Dekkers, J. (2010). The Interconnectedness of the Roles of Mentors and Mentees in Preservice Teacher Education Mentoring Relationships. *Australian Journal of Teacher Education, 35(*6), 42-55. http://dx.doi.org/10.14221/ajte.2010v35n6.3

Aslan, C. (2016). Görme engelliler için yardımcı teknolojiler [Assistive technology for visually impaired]. In S. Çakmak (Ed.), *Özel eğitim ve yardımcı teknolojiler* [Special education and assistive technologies] (pp. 56-92). Ankara, Turkey: Vize.

Atika, I. N., Ediyanto, E., & Kawai, N. (2018). Improving Deaf and Hard of Hearing Students‟ Achievements Using STS Approach: A Literature Review. *International Journal of Pedagogy and Teacher Education*, *2*, 3-19.

Aykut, Ç., & Özmen-Güzel, R. (2010). Hayat bilgisi ve sosyal bilgiler öğretimi [Life studies and social studies teaching]. In İ. H. Diken (Ed.), *İlköğretimde kaynaştırma* [Inclusive education practices in primary school] (pp. 480-515). Ankara, Turkey: Pegem Akademi.

Baran, E. (2016). Examining the Benefits of a Faculty Technology Mentoring Program on Graduate Students‟ Professional Development. *Journal of Digital Learning in Teacher Education, 32*(3), 95-104. https://doi.org/10.1080/21532974.2016.1169958

Bardin, J. A., & Lewis, S. (2008). A survey of the academic engagement of students with visual impairments in general education classes. *Journal of Visual Impairment & Blindness*, *102*(8), 472-483.

Barker, E. R. (2006). Mentoring – a complex relationship. *Journal of the American Academy of Nurse Practitioners, 18*(2), 56-61.

Batu, S., & Kırcaali-İftar, G. (2005). *Kaynastirma* [Inclusion]. Ankara, Turkey: KOK.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544-559.

Betts, L. R., & Cross, A. (2010). Reflections on supporting a visually impaired student complete a biological psychology module. *Psychology Teaching Review*, *16*(1), 58-60.

Bogner, D., Hurd, D., Wentworth, B., Ristvey J., & Arens, S A. (2011). *Visualizing science with adapted curriculum enhancements*. *ACE Resource Manual*. McREL. Available online at https://sites.google.com/site/mcrelace/.

Bogner, D., Wentworth, B. L., Ristvey, J., Yanow, G., & Wiens, R. (2006). Our place in the spongy universe. *The Science Teacher*, *73*(3), 38-43.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development.* Sage

Boyer, L., & Lee, C. (2001). Converting challenges to success: supporting a new teacher of students with autism. *Journal of Special Education, 35*(2), 75-83.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oaClutterbuck, D. (2005). Mentoring and the legal profession: Developing professionals for real. *Development and Learning in Organizations, 19*(1), 10-12.

Conolly, J., & Blunt, R. J. S. (2006). Perceptions of mentoring: Expectations of a key resource for higher education. *South African Journal of Higher Education*, *20*(2), 195-208.

Creswell, J. W. (2008). *Educational research planning, conducting and evaluating quantitative and qualitative research.* Prentice Hall.

da Mota Silveira, H., & Martini, L. C. (2017). How the New Approaches on Cloud Computer Vision can Contribute to Growth of Assistive Technologies to Visually Impaired in the Following Years. *Journal of Information Systems Engineering & Management*, *2*(2), Article 9.

Darrah, M. A. (2013). Computer haptics: A new way of increasing access and understanding of math and science for students who are blind and visually impaired. *Journal of Blindness Innovation and Research*, *3*(2), 3-47.

Davies, M. A., Brady, M., Rodger, E., & Wall, P. (1999). Mentors and school-based partnership: ingredients for professional growth. *Action in Teacher Education, 21*(1), 85-96.

Driscoll, L. G., Parkes, K. A., Tilley-Lubbs, G. A., Brill, J. M., & Bannister, V. R. (2009). Navigating the lonely sea: Peer mentoring and collaboration among aspiring women scholars. *Mentoring and Tutoring: Partnership in Learning, 17*(1)*,* 5-21.

Ediyanto, E., Atika, I., Hayashida, M., & Kawai, N. (2017). A Literature Study of Science Process Skill toward Deaf and Hard of Hearing Students. In *1st Annual International Conference on Mathematics, Science, and Education (ICoMSE 2017)* (pp. 190-195). Atlantis Press. https://dx.doi.org/10.2991/icomse-17.2018.23

Fairchild, T. N., & Henson, F. O. (1993). *Engelli Çocuklarda Kaynaştırma Eğitimi* [Inclusive Education in Children with Disabilities] (S. Ünlü Trans./Ed.). Eskişehir, Turkey: Anadolu University.

Falvey, M., Coots, J., Bishop, K., & Grenot-Scheyer, M. (1989). Educational and curricular adaptations. In S. Stainback, W. Stainback, & M. Forest (Eds.), *Educating all students in the mainstream of regular education* (pp. 143-1158). Baltimore: Brookes.

Forde, C. & OʽBrien, J. (2011). Taking continuing teacher education forward. In C. Forde, & J. OʽBrien (Eds.), *Coaching and mentoring: Developing teachers and leaders* (pp. 82-90). Edinburgh, United Kingdom: Dunedin Academic.

Fraser, W. J., & Maguvhe, M. O. (2008). Teaching life sciences to blind and visually impaired learners. *Journal of Biological Education*, *42*(2), 84-89.

Gabriel, M. A., & Kaufield, K. J. (2008). Reciprocal mentorship: An effective support for online instructors. *Mentoring and Tutoring: Partnership in Learning, 16*(3), 311-327.

Godshalk, V. M., & Sosik, J. J. (2003). Aiming for career success: The role of learning goal orientation in mentoring relationships. *Journal of Vocational Behavior*, *63*(3), 417-437.

Gray, C. (2009). A qualitatively different experience: Mainstreaming pupils with a visual impairment in Northern Ireland. *European Journal of Special Needs Education*, *24*(2), 169-182.

Haggarty, L. (1995). The use of content analysis to explore conversations between school teacher mentors and student teachers. *British Educational Research Journal, 21*(2), 183-197.

Hagger, H., & McIntyre, D. (2006). *Learning teaching from teachers: Realising the potential of school-based teacher education*. Maidenhead, United Kingdom: Open University.

Hairon, S., Loh, S. H., Lim, S. P., Govindani, S. N., Tan, J. K. T., & Tay, E. C. J. (2019). Structured mentoring: Principles for effective mentoring. *Educational Research for Policy and Practice.* Advance online publication. https://doi.org/10.1007/s10671-019-09251-8

Halai, A. (2006). Mentoring in-service teachers: issues of role diversity. *Teaching and Teacher Education, 22*(6), 700-710.

Hasper, E., Windhorst, R. A., Hedgpeth, T., Van Tuyl, L., Gonzales, A., Martinez, B.,...Baluch, D. P. (2015). Methods for creating and evaluating 3D tactile images to teach STEM courses to the visually impaired. *Journal of College Science Teaching, 44*(6), 92-99.

Hatlen, P. (1996). The core curriculum for blind and visually impaired students, including those with additional disabilities. *RE:view Online, 28*(1), 25-32.

Heirdsfield, A. M., Walker, S., Walsh, K., & Wilss, L. (2008). Peer mentoring for first-year teacher education students: The mentors‟ experience. *Mentoring & Tutoring: Partnership in Learning*, *16*(2), 109-124.

Hobbs, T., & Westling, D. L. (2002). Mentoring for inclusion: A model class for special and general educators. *Teacher Educator, 37*(3), 186-201.

Hobson, A. J., Ashby, P., Malderez, A., & Tomlinson, P. D. (2009). Mentoring beginning teachers: What we know and what we don‟t. *Teaching and Teacher Education*, *25*(1), 207-216.

Hudson, P. (2004). Specific mentoring: a theory and model for developing primary science teaching practices. *European Journal of Teacher Education, 27*(2), 139-146. https://doi.org/10.1080/0261976042000223015

Hudson, P. (2013). Mentoring as professional development: „growth for both‟ mentor and mentee. *Professional Development in Education, 39*(5), 771-783. https://doi.org/10.1080/19415257.2012.749415

Huizing, R. L. (2012). Mentoring together: A literature review of group mentoring. *Mentoring and Tutoring: Partnership in Learning, 20*(1), 27-55

Huskins, W. C., Silet, K., Weber-Main, A. M., Begg, M. D., Fowler, V. G., Hamilton, J. & Fleming, M. (2011). Identifying and Aligning Expectations in a Mentoring Relationship. *Clinical and Translational Science Journal, 4*(6), 439-447.

Ingersoll, R. M., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: A critical review of the research. *Review of Educational Research*, *81*(2), 201-233.

Janse Van Rensburg, K., & Roodt, G. (2005). The perceptions of employment equity and black economic empowerment as predictors of union commitment. *South Africa Journal of Industrial Psychology*, *31*(1), 55-64.

Jones, M. G., & Broadwell, B. (2008). Visualization without vision: students with visual. In J. K. Gilbert, M. Reiner, & M. Nakhleh (Eds.), *Visualization: Theory and practice in science education* (pp. 283-294). Dordrecht, Germany: Springer.

Jones, M. G., Minogue, J., Oppewal, T., Cook, M. P., & Broadwell, B. (2006). Visualizing without vision at the microscale: Students with visual impairments explore cells with touch. *Journal of Science Education and Technology, 15*(5-6), 345-351.

Kamali Arslantas, T., Yıldırım, S., & Altunay Arslantekin, B. (2019). Educational affordances of a specific web-based assistive technology for students with visual impairment. *Interactive Learning Environments* (Advance online publication). https://doi.org/10.1080/10494820.2019.1619587.

Kızılaslan, A., Zorluoğlu, S. L., & Sözbilir, M. (2020). A hands-on classroom activity to teach science concepts for students with visual impairment. *Science Activities, 56*(4), 130-138.

King, N. (2004). *Using templates in the thematic analysis of text. In* C. Cassell & G. Symon (Eds.), Essential guide to qualitative methods in organizational research (pp. 257–270). Sage

Klasen, N., & Clutterbuck, D. (2002). *Implementing Mentoring Schemes: A Practical Guide*. Oxford, United Kingdom: Elsevier.

Koehler, K. E., & Wild, T. A. (2019). Students with Visual Impairments Access and Participation in the Science Curriculum: Views of Teachers of Students with Visual Impairments. *Journal of Science Education for Students with Disabilities*, *22*(1), 8

Koehler, K. E., Wild, T. A., & Tikkun, S. (2018). Implications of 3-D Printing for Teaching Geoscience Concepts to Students with Visual Impairments. *Journal of Science Education for Students with Disabilities, 21*(1), 49-81.

Koenig, A. J., & Holbrook, M. C. (2000). *Foundations of education, Volume II: Instructional strategies for teaching children and youths with visual impairments*. Sewickley, PA: AFB Press.

Kolitsky, M. A. (2014). Reshaping teaching and learning with 3D printing technologies. *e-mentor*, *56*(4), 84-94.

Kopcha, T. (2010). A systems-based approach to technology integration using mentoring and communities of practice. *Educational Technology Research and Development, 58*(2), 175-190

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE Publications.

Lohmeier, K. L. (2009). Aligning state standards and the expanded core curriculum: Balancing the impact of the No Child Left Behind Act. *Journal of Visual Impairment & Blindness*, *103*(1), 44-47.

Lopez-Real, F., & Kwan, T. (2005). Mentors‟ perceptions of their own professional development during mentoring. *Journal of Education for Teaching, 31*(1), 15-24.

Ludi, S., Canter, A., Ellis, L., & Shrestha, A. (2012). Requirements gathering for assistive technology that includes low vision and sighted users. In *2012 First International Workshop on Usability and Accessibility Focused Requirements Engineering (UsARE)* (pp. 25-31). IEEE.

Luecke, R. (2004). *Coaching and Mentoring: How to Develop Top Talent and Achieve Stronger Performance*. Boston, MA: Harvard Business Press.

Lumpkin, A. (2011). A Model for Mentoring University Faculty. *The Educational Forum, 75* (4), 357-368

Lunney, D. (1995). Assistive technology in the science laboratory: A talking laboratory work station for visually impaired science students. *Information Technology and Disabilities*, *2*(1).

Mathur, S. R., Gehrke, R., & Kim, S. H. (2013). Impact of a teacher mentorship program on mentors‟ and mentees‟ perceptions of classroom practices and the mentoring experience. *Assessment for Effective Intervention, 38*(3), 154-162. https://doi.org/10.1177/1534508412457873

Mena, J., Hennissen, P., & Loughran, J. (2017). Developing pre-service teachers‟ professional knowledge of teaching: The influence of mentoring. *Teaching & Teacher Education, 66*, 47-59. https://doi.org/10.1016/j.tate.2017.03.024

Metatla, O. (2017, July). Uncovering challenges and opportunities of including children with visual impairments in mainstream schools. In *Proceedings of the 31st British Computer Society Human Computer Interaction Conference* (Article 102). Swindon, United Kingdom: British Computer Society.

Meyer, M., & Fourie, L. (2004). *Mentoring and coaching: tools and techniques for implementation*. Johannesburg, South Africa: Knowres.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks, CA: Sage.

Milli Eğitim Bakanlığı. (2018). *Özel Eğitim Hizmetleri Yönetmeliği* [Special Education Services Regulation]. Resmî Gazete 07.07.2018 Sayılı 30471. Ankara, Turkey: Milli Eğitim Bakanlığı. Retrieved from https://orgm.meb.gov.tr/meb_iys_dosyalar/2018_07/09101900_ozel_egitim_hizmetleri_yonetmeligi_07072018.pdf.

Milli Eğitim Bakanlığı. (2020). *Millî eğitim istatistikleri örgün eğitim 2018-2019* [National education statistics formal education]. Resmi İstatistik Programı. Ankara, Turkey: Milli Eğitim Bakanlığı. Retrieved from https://sgb.meb.gov.tr/meb_iys_dosyalar/2018_09/06123056_meb_istatistikleri_orgun_egitim_2017_2018.pdf.

Moon, T. R., & Callahan, C. M. (2001). Curricular modifications, family outreach, and a mentoring program: Impacts on achievement and gifted identification in high-risk primary students. *Journal for the Education of the Gifted*, *24*(4), 305-321.

Moreland, L. M. (2015). *Science for Visually Impaired Students and Accessible Technology* (Doctoral dissertation). Marshall University, Charleston, WV. Retrieved from http://mds.marshall.edu/cgi/viewcontent.cgi?article=1983&context=etd

Morelle, M. (2016). *Challenges experienced by learners with visual impairment in two mainstream primary schools in Klerksdorp, Dr. Kenneth Kaunda District*. (Doctoral dissertation). University of South Africa.

Morelle, M., & Tabane, R. (2019). Challenges experienced by learners with visual impairments in South African township mainstream primary schools. *South African Journal of Education*, *39*(3), Article 1615.

Mundilarto, M. (2002). Posisi dan peranan strategis pengajaran IPA (Fisika) di SLTP [Position and Strategic Role of Teaching Natural Sciences (Physics) at SLTP]. *Cakrawala Pendidikan, Jurnal Ilmiah Pendidikan, 2002*(3), 339-356.

Nees, M. A., & Berry, L. F. (2013). Audio assistive technology and accommodations for students with visual impairments: Potentials and problems for delivering curricula and educational assessments. *Performance Enhancement & Health*, *2*(3), 101-109.

Negrete, O., Lisboa, A., Peña, F. J., Dib, C. O., & Vargas, P. (2020). Teaching labs for blind students: equipment to measure the thermal expansion coefficient of a metal. *European Journal of Physics, 41*(3), 035704.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*(1) https://doi.org/10.1177/1609406917733847

Ogawa, R. T., & Malen, B. (1991). Towards rigor in reviews of multivocal literatures: Applying the exploratory case study method. *Review of Educational Research, 61*(3), 265-286.

Okonkwo, H. C., Fajonyomi, M. G., Omotosho, J. A., Esere, M. O., & Olawuyi, B. O. (2017). Challenges, counselling needs, and coping strategies of students with visual impairment in regular secondary schools in Nigeria. *Human and Social Studies*, *6*(1), 111-137.

Ota, C. L., & Austin, A. M. B. (2013). Training and mentoring: Family child care providers" use of linguistic inputs in conversations with children. *Early Childhood Research Quarterly*, *28*(4), 972-983.

Patton, K., Griffin, L. L., Sheehy, D., Arnold, R., Gallo, A. M., Richardson, K.,...James, A. (2005). Navigating the mentoring process in a research-based teacher development project: A situated learning perspective. *Journal of Teaching in Physical Education, 24,* 302-325.

Pleiss, M. K., & Feldhusen, J. F. (1995). Mentors, role models, and heroes in the lives of gifted children. *Educational Psychologist*, *30*(3), 159-169.

Porter, J., & Lacey, P. (2008). Safeguarding the needs of children with a visual impairment in non-VI special schools. *British Journal of Visual Impairment*, *26*(1), 50-62.

Rajuan, M., Beijaard, D., & Verloop, N. (2010). The match and mismatch between expectations of student teachers and cooperating teachers: Exploring different opportunities for learning to teach in the mentor relationship. *Research Papers in Education, 25*(2)*,* 201-223.

Ramrathan, L., & Mzimela, J. (2016). Teaching reading in a multi-grade class: Teachers" adaptive skills and teacher agency in teaching across grade R and grade 1. *South African Journal of Childhood Education*, *6*(2), Article 448.

Rice, P. L., & Ezzy, D. (1999). *Qualitative research methods: A health focus* (Vol. 720). Victoria, Australia: Oxford University.

Rosenblum, L. P., Ristvey, J., & Hospitál, L. (2019). Supporting Elementary School Students with Visual Impairments in Science Classes. *Journal of Visual Impairment & Blindness, 113*(1), 81-88.

Roth, W.-M., & Tobin, K. (2002). *At the elbows of another: Learning to teach through co-teaching.* New York, NY: Lang.

Rudiyati, S. (2014). Improving Skills of Candidate Teachers of Children with Visual Impairment as Sighted Guide. *Dewantara, 2*(1), 24-33.

Rule, A. C. (2011). Tactile Earth and space science materials for students with visual impairments: Contours, craters, asteroids, and features of Mars. *Journal of Geoscience Education, 59*(4), 205-218.

Rule, A. C., Stefanich, G. P., Boody, R. M., & Peiffer, B. (2011). Impact of adaptive materials on teachers and their students with visual impairments in secondary science and mathematics classes. International *Journal of Science Education, 33*(6), 865-887.

Şahin, M., & Yorek, N. (2009). Teaching Science to Visually Impaired Students: A Small-Scale Qualitative Study. *Online Submission*, *6*(4), 19-26.

S´anchez-García, A. B., Marcos, J. J. M., GuanLin, H., & Escribano, J. P. (2013). Teacher development and ICT: The effectiveness of a training program for in-service school teachers. *Procedia-Social and Behavioral Sciences,* 92, 529-534. https://doi.org/10.1016/j.sbspro.2013.08.713

Sapp, W., & Hatlen, P. (2010). The expanded core curriculum: Where we have been, where we are going, and how we can get there. *Journal of Visual Impairment & Blindness*, *104*(6), 338-348.

Silverman, D. (2000). *Doing qualitative research: A practical handbook*. Thousand Oaks, CA: Sage.Simpson, T., Hastings, W., & Hill, B. (2007). „I knew that she was watching me": the professional benefits of mentoring. *Teachers & Teaching, 13*(5), 481-498.

Smith, D. W., Kelley, P., Maushak, N. J., Griffin-Shirley, N., & Lan, W. Y. (2009). Assistive technology competencies for teachers of students with visual impairments. *Journal of Visual Impairment & Blindness*, *103*(8), 457-469.

St-Jean, E., & Audet, J. (2009). Factors leading to satisfaction in a mentoring scheme for novice entrepreneurs. *International Journal of Evidence Based Coaching and Mentoring, 7*(1), 148-161.

Supalo, C. A., Humphrey, J. R., Mallouk, T. E., Wohlers, H. D., & Carlsen, W. S. (2016). Examining the use of adaptive technologies to increase the hands-on participation of students with blindness or low vision in secondary-school chemistry and physics. *Chemistry toenderEducation Research and Practice, 17*(4), 1174-1189.

Toenders, F. G., de Putter-Smits, L. G., Sanders, W. T., & den Brok, P. (2017). Improving physics teaching materials on sound for visually impaired students in high school. *Physics Education, 52(*5).

Truter, I. (2008). Responsibilities of a leader as mentor and coach:: management. *South African Pharmaceutical Journal*, *75*(5), 58-61.

Urquhart, V. (2012). How One Teacher, Two Students with Visual Impairments, and a Three-Year R&D Project Could Change How All Students Learn Science. *Journal of the American Academy of Special Education Professionals, 2012*(Spring-Summer), 185-196.

van Dijk, H. G. (2008). The talent management approach to human resource management: attracting and retaining the right people. *Journal of Public Administration*, *43*(SI 1), 385-395.

van Ginkel, G., Oolbekkink, H., Meijer, P. C., & Verloop, N. (2016). Adapting mentoring to individual differences in novice teacher learning: the mentor"s viewpoint. *Teachers and Teaching: Theory and Practice, 22*(2), 198-218.

Wang, J. (2002). Contexts of mentoring and opportunities for learning to teach: A comparative study of mentoring practice. *Teaching and Teacher Education, 17(*1), 51–73. https://doi.org/10.1016/S0742-051X(00)00038-X

White, M., & Mason, C. Y. (2006). Components of a successful mentoring program for beginning special education teachers: Perspectives from new teachers and mentors. *Teacher Education and Special Education*, *29*(3), 191-201.

Wilkinson, C., Pennington, T. R., Whiting, E., Newberry, M., & Feinauer, E. (2014). Triad relationships and member satisfaction with paired placement of student teachers. *Australian Journal of Teacher Education, 39*(8), 162-184.

Yalcin, G. (2020). Görme yetersizliği olan öğrencilere yönelik ortam, materyal ve program/öğretimsel düzenlemeler [Setting, materials and program / educational arrangements for students with visual impairments]. In P. Piştav Akmeşe & B. Altunay (Eds.), *İşitme ve görme yetersizliği olan çocuklar ve eğitimleri* [Children with hearing and vision impairments and their education] (pp. 271-293). Ankara, Turkey: Nobel.

Yalcin, G., & Altunay Arslantekin, B. (2019). Görme yetersizliği olan öğrenciler için genişletilmiş çekirdek müfredat ve dinleme becerileri [Extended core curriculum and listening skills for visually impaired students]. *Aksaray Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 3*(2), 298-323.

Yıldırım, A., & Şimşek, H. (2011). *Sosyal bilimlerde araştırma yöntemleri* [Research methods in social sciences]. Ankara, Turkey: Seçkin Yayınları.

Zachary, L. (2009). Examining and expanding mentoring practice. *Adult Learning, 20*(1-2), 43-45.