



**DETERMINING THE DIFFICULTIES THAT VISSUALY DISABLED STUDENTS
FACE IN SCIENCE LEARNING¹**

Cihat DEMİR* - Diyar ÖZTÜRK**

Abstract

Insufficient or no use of the sense of sight undoubtedly affects learning activities negatively. Although visually impaired students are subject to special education, it is thought that there are still some difficulties in front of their learning. The aim of this study is to reveal the difficulties faced by visually impaired 8th grade students in learning Science. In the study, the special case method was applied by adhering to the qualitative research traditions. The study group consists of 10 8th grade students of Ali İhsan Arslan Visually Impaired Secondary School in Diyarbakır province in the 2022-2023 academic year. The data of the study were collected with a structured interview form prepared by the researcher. According to the findings of the study, visually impaired students stated that they had difficulty in subjects involving visual shapes in Science classes, and they also complained about the lack of laboratories. More space should be given to teaching materials and activities designed taking into account the individual needs of visually impaired individuals.

Keywords: Visually impaired students, 8th Grade, Science teaching.

Görme Engelli Öğrencilerin Fen Bilgisi Öğrenmelerinde Karşılaştıkları Zorlukların Belirlenmesi

Öz

Görme duyusunun yeterince veya hiç kullanılmaması hiç şüphesiz öğrenme aktivitelerini de olumsuz etkilemektedir. Görme yetersizliği olan öğrenciler her ne kadar özel eğitime tabi olsalar da yine de öğrenmelerinin önünde bazı zorluklar olduğu düşünülmektedir. Bu çalışmanın amacı görme engelli 8. Sınıf öğrencilerinin fen öğrenmelerinde karşılaştıkları zorlukları ortaya koymaktır. Çalışmada nitel araştırma geleneklerine bağlı kalınarak özel durum yöntemi uygulanmıştır. Çalışma grubunu 2022-2023 eğitim yılında Diyarbakır ili Ali İhsan ARSLAN görme engelliler ortaokulu 8. sınıfında öğrenim gören 10 öğrenci oluşturmaktadır. Çalışmanın verileri araştırmacı tarafından hazırlanan yapılandırılmış görüşme formu ile toplanmıştır. Çalışmadan elde edilen bulgulara göre görme engelli öğrenciler fen derslerinde en çok görsel şekil içeren konularda zorlandıklarını belirtmişler ayrıca laboratuvar eksikliğinden şikayetçi olmuşlardır. Görme engelli bireylerin bireysel ihtiyaçları göz önünde bulundurularak tasarlanan öğretim materyal ve etkinliklerine daha fazla yer verilmelidir.

Anahtar Kelimeler: Görme engelli öğrenciler, 8. Sınıf, Fen öğretimi.

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* Doç. Dr., Dicle Üniversitesi, Matematik ve Fen Bilimleri Bölümü, Fen Bilgisi Ana Bilim Dalı, doctorchihatdemir@gmail.com, <https://orcid.org/0000-0003-0800-5116>

** Öğretmen, Millî Eğitim Bakanlığı, diyarozturk_21@hotmail.com, <https://orcid.org/0000-0002-3417-1030>

1. Giriş

Disability can be defined as a limitation or inability to perform an activity due to body functions (World Human Organizations [WHO], 2012). Disabled people are divided into five groups: 1- mentally disabled 2-hearing and speech disabled 3-visually disabled 4-orthopedically disabled and 5-chronically disabled (Arslan et al., 2014). Since the subject of this article is visually impaired people, as stated above, it is necessary to specify what is meant by visually impaired. Accordingly, individuals who have complete or partial vision loss or impairment in one or both eyes, those who use eye prosthesis, and those who have color blindness and night blindness are called visually impaired (Atıcı, 2007). It has been reported that there are more than 100 million disabled people in the world (WHO, 2012).

From a sociological perspective, a disabled individual is an individual whose accessibility is greatly limited not because of pathological problems, but as a result of social pressures (Çarkçı, 2011). It is known that visually impaired people also experience some difficulties in their school lives. A delay may be observed in the conceptual development and cognitive abilities of these individuals, and they may be less successful, especially in skills that require abstract thinking (Kızar, 2012). Although it is aimed to integrate visually impaired people, who have limitations in their ability to move independently, into normal classes, the opportunities to closely care for them remain very limited in our country where there is such a competition (Özgür, 2004). As a matter of fact, a study revealed that teachers' awareness of visually impaired students was low (Öztürk, 2003).

Although every sensory organ seems to be of great importance for learning, the eye is considered the most important sensory organ in terms of providing very rich information (Ataman, 2003) and it is estimated that 80-85% of the information obtained while learning is acquired through vision (Ataman, 2012; Cavkaytar & Diken, 2012; Özkan, 2013; Taymaz, 1997).

1.1. Related Literature

There are limited studies on providing support with educational materials to visually impaired people. Bülbül (2013) conducted materials that visually impaired individuals can use in their graphic studies, and Okçu and Sözbilir (2016) conducted an activity-based research in the field of Science and technology. In the studies of Zorluoğlu and Sözbilir (2017), it was tried to determine the learning-supporting needs of students with visual impairments in order to make their course learning more effective. According to the findings, the needs that support the learning of visually impaired students were determined as "education-training environment needs", "education-training needs" and "evaluation-oriented needs". The study conducted by Bülbül (2016) is about the Physics education of a visually impaired individual in the field of Science. According to the findings of the research, the factors that make a visually impaired student a physicist are; Self-awareness, focus on success, flexibility and accessibility of the learning environment.

When looking at the international literature, it was determined that the problems related to the learning and teaching aspects of these situations may be negatively affected if the teaching process is carried out (Sleezer et al., 2014; Visscher-Voerman & Gustafson 2004).

1.2. Importance, Purpose and Research Questions

In order to understand the functioning of the world we live in, we need to learn Science, especially Science. This is the same for both students without disabilities and those with disabilities. When the literature is examined, it is seen that while there are sufficient studies on the Science learning of students without disabilities, there are not enough studies on the Science learning of students with disabilities. Considering the skills that Science courses provide to students, it is thought that visually impaired students should have the skills offered by the Science course at least as much as

normally sighted students. For this reason, this study was conducted to reveal the difficulties visually impaired students face in learning Science courses.

It is assumed that this study will shed light on future studies on the learning of disabled students. The aim of this study is to reveal the difficulties visually impaired 8th grade students face in learning Science. For this purpose, answers were sought to the following questions.

- 1- What kind of difficulties do you experience in learning Science lessons?
- 2- What kind of Science education do you think should be?
- 3- What kind of technologies do you use in science lessons?
- 4- What kind of deficiencies do you experience in Science teaching practices?

2. Method

This heading includes the research method and design, study group, data collection and analysis, validity and reliability of the research, ethics of the research and the role of the researchers.

2.1. Method and Design of the Research

The research was conducted in accordance with qualitative research traditions. Qualitative research adds depth and a philosophical dimension to scientific research (Altıparmak and Nakipoğlu, 2005). Qualitative research methods are increasingly used in research on social phenomena (Patton, 2002). The quality of qualitative variables can only be explained by dividing them into certain categories (Bahar, Nartgün, Durmuş, Bıçak, 2012). Special case study, one of the qualitative research methods, was used in the research. The special case method is a method that helps researchers obtain information by examining the event in depth in the environment in which it occurred in a short time (Çepni, 2007; Yin, 2002).

2.2. Study Group

The study group of the research consists of 10 students studying in the 8th grade of Ali İhsan Arslan Secondary School for the Visually Impaired in Diyarbakır in the 2022-2023 academic year. The study group was formed using the purposeful sampling method. Purposeful sampling allows the in-depth study of situations that are thought to have rich information (Büyüköztürk et al., 2009).

Table 1. *Study group*

Participant Code	Gender	Vision Status
P1	Male	Low vision
P2	Male	Low vision
P3	Male	Low vision
P4	Female	Low vision
P5	Male	Blind
P6	Female	Blind
P7	Female	Low vision
P8	Female	Low vision
P9	Male	Blind
P10	Male	Low vision

2.3 Data Collection and Analysis

As a data collection tool in the study, a structured interview form consisting of 4 questions was used to determine the difficulties visually impaired students face in learning Science. The structured interview technique appears to be a more suitable technique in educational Science research due to its certain level of standardization and flexibility. After the data collection tool was prepared, expert (with 3 dr. faculty member working in Dicle University, Ziya Gökalp Faculty of Education, Department of Science) opinions were received and necessary corrections were made taking into account the expert evaluations. In addition, while evaluating the data collection tool, it was evaluated by different practitioners to ensure the reliability of the tools. An expert teacher with a master's degree in Science administered the study questions another time and reached similar results.

The interviews used as data collection tools in the research were analyzed with the content analysis approach, and the difficulties students encountered in learning Science were divided into some codes and categories (Yıldırım & Şimşek, 2011).

2.4. Validity and Reliability of the Research

To ensure the validity and reliability of the research, credibility studies recommended by Guba and Lincoln (1982) were conducted. In order to increase the credibility of the research, expert opinions were consulted while preparing the interview form and during the data analysis process. In addition, the research was conducted impartially, regardless of personal opinions.

2.5. Role of Researchers

The first researcher works as an academician in the department of Science at the University. While he is working on how to teach Science to prospective teachers more efficiently, he thinks it would be appropriate to carry out various studies in the field (in national education schools). For this purpose, he decided to conduct this study.

The second researcher has a master's degree in Science, and on the other hand, he worked as a teacher in different educational institutions affiliated with the Ministry of National Education for 11 years and served as a school assistant principal for nearly 4 years. The researcher also served as the assistant principal at a school for the visually impaired and observed the problems related to the visually impaired and decided to investigate the issue from the students' perspective in order to overcome the problems encountered by visually impaired students in learning Science.

3. Findings and Interpretation

This section contains the analysis results of the interviews conducted with the students, depending on the purpose of the research. The findings are presented in parallel with the research questions.

Table 2. Responses of visually impaired students to the question "What kind of difficulties do you experience in learning Science?"

	f	%
Visually Shaped Topics	7	70
Lack of Question Bank and Resource Books	3	30
Questions with Graphs and Tables	1	10
Inability to Test	1	10
Lack of Smart Boards	1	10
Not being able to read the texts	2	20

Note: The reason why the total frequency value is more than the f number is because a student expressed more than one opinion.

When the answers given to the question about what kind of difficulties were experienced in learning Science course are examined in Table 1; It was observed that 70% (7) experienced difficulties most in visual matters. Those who stated that there are no question banks and reference books are 30% (3), those who say that the texts cannot be read are 20% (2), and those who state difficulties such as questions with graphics and tables, the inability to conduct experiments and the absence of smart boards are 10% (1). Some students expressed this situation as follows;

“If we could see the visual shapes related to the subjects like other students, we would learn better.” **Participant 3**

“Thanks to our teachers, they explain it, but I have difficulty learning visual subjects.”
Participant 1

Table 3. Responses of visually impaired students to the question "What kind of Science education do you think should be?"

	f	%
Having Concrete Materials	3	30
Using Raised Marks	1	10
Books written with Braille Alphabet	1	10
Good Attitudes and Behaviors of Teachers	1	10
Laboratory Applications and Teaching Lessons by Doing and Experiencing	4	40
Use of Technological Tools	3	30
Exemption from Figured and Visual Questions in Exams	2	20
Preparing Exams for the Visually Impaired	2	20

In Table 3, the question asked to the participants about how Science teaching should be; students mostly want 4 (40%) laboratory applications and lessons to be taught by doing and experiencing. The number of those who want concrete materials and technological tools to be used in lessons is 3 (30%).

In addition, 20% (2) of the participants want to be exempt from formal and visual questions in the exams and to prepare the exams for the visually impaired. 10% (1) of the participants demand that teachers have good attitudes and behaviors, that books written in braille alphabet are available in classrooms and that braille signs are used. Some striking statements from the participants are as follows:

“It would be better if our topics were related to real life” **Participant 2, 3, 8**

“I think it is more accurate to use information that we may encounter in daily life”
Participant 10

Table 4. Responses of visually impaired students to the question "What kind of technologies do you use in Science lessons?"

	f	%
I Use a Smartphone	6	60
Computer and Tablet	7	70
Voice Programmed Devices	2	20

As seen in Table 4, when visually impaired students are asked what types of technologies are used in Science lessons; It was observed that 7 (70%) used computers and tablets the most, 6 (60%) said they used a smartphone, and 20% of the participants used voice-programmed devices. Some striking statements from the participants are as follows:

“Too much technology may be harmful, but thanks to the tablet, I can understand the subjects I have difficulty with” **Participant 9**

“I can learn many subjects thanks to the phone, and I can easily explain my problems with voice command” **Participant 10**

Table 5. Responses of visually impaired students to the question "What kind of deficiencies do you experience in Science Teaching Practices?"

	f	%
Lack of Laboratory	8	80
Lack of Test Materials Suitable for Visually Impaired People	7	70
Lack of Tangible Materials to Touch	5	50

When Table 5 is examined, it is seen that 8 (80%) of the visually impaired students complain about the lack of laboratories in Science Teaching Practices, 7 (70%) say that experiment materials suitable for the visually impaired are missing, and 5 (50%) say that there are no concrete materials to touch. It appears to be. Some striking statements from the participants are as follows:

“The experiments carried out in the laboratory are really useful, it would be better to increase the number of experiments” **Participant 1, 8, 9** (Remarkable statements were received from the participants.)

4. Conclusion, Discussion and Recommendations

When the answers to the question about what kind of difficulties were experienced in learning Science course were examined; It was observed that 70% (7) experienced difficulties most in visual matters. It is seen that 30% (3) state that there are no question banks and reference books, 20% (2) say that the texts cannot be read, and 10% (1) state that there are difficulties such as Questions with Graphics and Tables, Inability to Perform Experiments and Lack of Smart Boards. Kandaş and Demir (2018) reached similar findings in their study, and it was determined that visually impaired students had problems finding resources while preparing for the exams, and also had difficulty in reading and writing the exam questions, and therefore they wanted to be exempt from courses where the use of vision was at the forefront. When looking at the literature; Some studies involving the development of auxiliary materials and adaptations of various tools and equipment for a teaching process in which visually impaired students are more effective have revealed that students learn more effectively (Gupta & Singh, 1998; Poon & Ovadia, 2008; Supalo et al., 2009).

To the question asked about how Science teaching should be; Students mostly want 4 (40%) laboratory applications and lessons to be taught by doing and experiencing. The number of those who want concrete materials and technological tools to be used in lessons is 3 (30%). The most appropriate education and training to be offered to individuals with visual impairments is to benefit from the abilities of sensory organs other than their impairment. In this way, individuals' learning will be provided through different sensory organs, minimizing the deficiencies in learning caused by vision. Model designs of objects that are large enough to be understood by touching them with the hand (Enç, 2005) or objects that are too large to be understood by hand can be easily understood by the sense of touch and can give individuals information about their realities. For this reason, tactile materials

should be emphasized in individuals with visual impairment. In addition, 20% (2) of the participants want to be exempt from illustrated and visual questions in the exams and to prepare the exams for the visually impaired. 10% (1) of the participants demand that teachers have good attitudes and behaviors, that books written in braille alphabet are available in classrooms and that braille signs are used. The Braille (braille) writing system is seen as a learning tool that makes visually impaired individuals independent in education, daily life and business life, as it enables visually impaired individuals to access standard printed materials, referred to as ink printing (Amato, 2002). Braille text allows visually impaired individuals to access information independently (Şafak, 2017).

When visually impaired students are asked what types of technologies are used in Science lessons; It was observed that 7 (70%) used computers and tablets the most, 6 (60%) said they used a smartphone, and 20% of the participants used voice-programmed devices. It has been observed that visually impaired students mostly complain about the lack of laboratories in Science Teaching Practices, and the students who participated in the study also stated that experiment materials suitable for visually impaired people are missing and that there are no concrete materials to touch. When the literature is examined, various studies that support our study and can contribute to the Science learning of visually impaired students stand out. In the study conducted by Mayo (2004), the use of text and figures was used to determine visually impaired students' perceptions and mental pictures of abstract concepts in Science education, and positive results were obtained. In another study, activities that could use sensory organs other than vision were performed during the lecture (Cooperman, 1980). Similarly, Kumar et al. (2001) mentioned in their study that different teaching strategies should be used to adapt visually impaired students to Science classes. In addition, in many studies, materials developed for the visually impaired have been evaluated from various perspectives and the elements that should be taken into consideration in the material development process in this field have been revealed (Buultjens et al., 1999; Bülbül, 2013; Bülbül et al., 2012). In a study conducted on learning chemistry, Tombaugh (1981) thinks that in order to best educate visually impaired people in chemistry and other physical and natural Sciences related to it, students should first be informed about the problems they may encounter and their needs. After the necessary information was given, the benefit of using an auxiliary tool for students to work independently in chemistry laboratories was mentioned. Cole and Slavin (2013) developed auxiliary tools so that visually impaired people can easily use equipment in physics laboratories. Similarly, in his study, Weems (1977) talked about the Science laboratory program created to facilitate the adaptation of blind and partially sighted students to the Science classroom and to ensure their full participation in Science activities, and the materials developed during the implementation of this program, and concluded that these materials were useful for visually impaired students they have reached.

There are many studies in the literature regarding the education of visually impaired people. When the literature is examined, it is seen that academic studies on the education of visually impaired people are mostly concentrated in the fields of medicine, rehabilitation and social services. However, special education studies, especially in the field of Science education, are not yet at a level where the needs can be met (Ünlü et al., 2010).

Suggestions

- In Science teaching for visually impaired individuals, it is recommended to enrich the learning environment in a way that appeals to other senses other than vision.
- The number of audio resource books that visually impaired students can benefit from is very limited, the number of Science audio resource books should be increased.

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