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Learning probability of 4th grade science curriculum learning outcomes among visually impaired students

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ABSTRACT

In this study, it is aimed to evaluating of learning probability of 4th grade science course curriculum learning outcomes by visually impaired students. Therefore, ability to gain learning outcomes has been examined. In addition to, in case of gaining of learning outcomes, "how to gain?" question was investigated. Document analysis method was used for this analysis. 46 learning outcomes were analyzed through descriptive analysis. As a result of analyzing, the confidence coefficients were found to be (.72) greater than .70. From these findings, low vision students could gain 80.4% and partially gain 19.6% of learning outcomes; blind students could gain 58.7% and partly gain 26.1% and not gain 15.2% of learning outcomes. It is thought that great majority of learning outcomes can be gained by visually impaired students. Visually impaired students can gain to curriculum learning outcomes, however it is necessary to use promoters for these students during teaching.

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1. INTRODUCTION

The education need constitutes a major part of human life. Education is essentially the process of making change intentionally through the individuals' own experience in the behavior of individual. However, curriculum is needed for the systematic advancement of education. Curriculum is a program within the educational program that attaches importance to ability and implementation [1]. Knowing what to do with the learning outcome is significant for the program to gain functionality [2]. Learning outcomes are knowledge, ability, attitude values aimed to be taught to the students during the education process [3]. The main purpose is that the students get the knowledge on their own when learning outcome is gained. By this means, student will realize scientific process skills that are the aim of science education as well. For this reason, teaching in science curricula has a special significance in teaching process [4].

Science is interdisciplinary positive science including science branches such as physics, chemistry, biology, geology, astronomy and environmental education. Sciences enable us to understand the environment in which the individual lives, to solve the problems encountering and to use the concepts learning in their daily life [5]. The teaching of science is carried out within the scope of Science Education Curriculum [6] in Turkey. In this context, also it is aimed to provide the students with basic information about science, to make use of the scientific process skills related to science, to realize the interaction among the individual, the environment and society, to develop entrepreneurship skills related to science, interest and curiosity about events happening in nature and nearby and attitudes have been adopted.

Learning science are applied in sciences curriculum without distinguishing individual differences. However, individual differences ought to be at the forefront to become curriculum more efficient in order to get basic skills and to make education better quality [6]. Nevertheless, when teaching programs are designed, as stated they are prepared without considering individual differences in Turkey. For this reason, the updating

of the curriculum according to the needs of the age of students, the renewal by taking into consideration of the student characteristics or the application of the necessary arrangements will provide important contributions to the increase of the quality of education; and therefore the education of the student applying the learned knowledge [7].

It is impossible for teachers to apply the curriculums prepared without considering the inadequacies to the students with inadequacy [8]. For this reason, education done without considering individual differences will not reach us the desired result and target [6]. In the related researches in the literature, it is stated frequently that the curricula are designed without considering individual differences [3, 9-12]. The presentation of science cource with visual content, its dependence on application and the abundance of abstract concepts make it difficult for visually impaired students to gain the learning outcomes [9]. Thus, equality in opportunity should be granted and it is necessary to ensure that visually impaired students do not to get behind their peers.

Students not having visual impairments learn difficult concepts of abstract science and mathematics [8, 12]. This situation starts from the inability of students to imagine abstract concepts in their minds. When it is thought that 85% of the information is obtained with vision, it is becoming more difficult for visually impaired students to learn science concepts containing abstract concepts [8]. Visually impaired population in Turkey constitutes a substantial audience with 6% of the population of Turkey [13]. Considering these aknowledgements, it is necessary to provide equality of opportunity for visually impaired individuals and to make necessary arrangements in education for this. As visually impaired students are having problems joining the educational process. In addition to these, students participating in the training process may encounter other problems in the process. For this reason, visually impaired students fall behind from their peers [11, 14, 15]. It is stated that the visually impaired students have a lower success than the students who don't have visually impaired but the reason of this failure is due to the lack of expectation and as a result of the braille alphabet [16], without using aprporiate teaching program and teaching methods [17].

In terms of education, visually impaired students are basically divided into two areas: blindness and low vision. According to educational definition those who need Braille alphabet (tactile alphabet) or the use of auditory materials are referred as educational blind [18]. The effective usage of the sensory organs is crucial in gaining learning outcomes for low vision and blind individuals. Morever, teachers should entegrate various materials and methods to transfer learning outcomes [16]. Therefore, Braille, documents written with a bigger type size, tape recorders, computer, tablet, magnifier, three dimensional modelling should be applied for science teaching for visually impaired students [9, 19].

Effective science education is achieved through the correct learning of knowledge, skills, concepts and learning outcomes related to science [20-22]. To learn the concepts of science by the visually impaired students and to acquire the learning outcomes, using embossed letters, large paper documents, sound recorders, computers, tablets, magnifiers, three dimensional are necessary [19]. Examining the literature, peer relations of visually handicapped students with visual impairments, study of difficulties encountered by visually handicapped individuals in social life [23], studies on adolescents affected by visual impairment show that structured group education has an impact on knowledge levels and behaviors in the targeted areas [24]. In another study, it is found that the depression levels and the self concept features are similar to each other and the level of anxiety is higher [25-27], a total blind student museum education study [28], education of visually impaired students on mathematics education [3, 17, 29], music education for students with visual impairments [30], learning styles of visually impaired students [31], concept development in visually impaired students [32] developed and implemented a written document recognition and vocalization system for visually impaired individuals [33], that guided exploration model on students affected by visual impairment had a positive effect on success compared to traditional learning model [9, 10, 15, 34, 35], teaching the concept mapping and summarizing skills of students with low vision through peer tutoring [36] and material design in concept teaching for blind students [11, 12, 15, 37-40]. In the field of literacy, there were no studies other than [3]'s study on the achievement of the learning outcomes in the curriculum by visually impaired students. It is aimed to evaluate the possibility of the fourth class learning outcomes of the science lessons by the visually impaired students in the study due to lack of studies on the learning outcomes of the science curriculum in the field and the study of the science course in the 4th grade. It has been investigated how blind and visually impaired students, who are responsible for the same acquisitions as well as their peers in the study, will get acquisition or not. The usefulness of the program will be assessed by calculating the likelihood of gaining 4th grade learning outcomes in the science curriculum for visually impaired students. This study is very important because it shows how visually impaired students could gain learning outcomes and in this regard the learning outcomes of curriculum programs will show how appropriate the students are to individual differences.

2. RESEARCH METHOD

This study is conducted with document analysis method. Document analysis defines as a systematic procedure for reviewing or evaluating either printed or electronic documents or materials [41]. As any of qualitative methods, document analysis can be used as a complementary or an independent research method [41, 42]. In this study, it isinvestigated whether the visually impaired students are capable of gaining the 4th class learning outcomes (46 learning outcomes) published in the Science Teaching Curriculum in 2017, and with which supporters the students could gain them.

The learning outcomes analysis table was evaluated by 3 researchers. One of them was a chemistry educator for students with visual impairment. The other two researchers are science teachers and graduate students. For this reason, it is examined and evaluated whether the students with visual impairment will be able to gain the 4th grade learning outcomes of science lessons and which learning outcomes can be won with the supporters.

As a data collection tool, researchers have created a benefit analysis chart that can assess whether learning outcomes gain for blind and under-seen students, how they can gain if they gain, and what sponsors they need. This table for evaluations was used by each researcher.

To ensure reliability, the analysis was carried out in three steps. In the first step, the ability of the students with visual disabilities to gain by choosing two units in each unit was evaluated by the researchers. After, whether the learning outcome is learned is evaluated. The researchers presented their thoughts on which dimension to gain and which support they could get, and the dimension to which consensus was given. In cases where the consensus is not available, each researcher has set the dimension to which they have agreed; express their opinions. In the second step, the learning outcomes were analyzed by each researcher. At the last step, the analysis of the researchers has been controlled to combine the individual structured analyzes. Analyzes provided in a consensus, have been accepted. In analyzes where no consensus was reached, the researchers were either discussed either agreed upon, or the classification was accepted with a majority vote. The confidence coefficient (29) of the study was calculated (.72) by determining the consensus and disagreements during the control.

In the study, descriptive analysis method was used because analysis of learning outcomes used code-category and theme pre-designed by researchers. Descriptive analysis is applied in cases which descriptive descriptions are made according to some themes determined by the researcher [43-45]. The analysis of the learning outcomes are as follows: "4.3.2.1. It teaches the magnet and discovers that it has poles." even if the teacher tells the learning outcomes, it is thought that the student with low vision is able to learn without supporting this learning outcome. For this reason, low vision students have been examined in the learning-categorization category and in the learning code without support. The blind student is thought to acquire the learning outcome by bringing the magnet or three-dimensional material into the center and explaining and supporting the student. For this reason, the blind student has also been placed in the category of gain-learning outcomes and descriptive narrative tactile model codes. “4.4.2.1. It measures and compares the masses and volumes of different materials.” It is thought that low-vision and blind students will need supporters for this learning outcome to be realized and taught. For this reason, underemployed students are thought to get acquisition by using a magnifier in the category of gaining, in the context of teacher-peer assistance, using descriptive narrative. Throught the blind students, this learning outcome is placed in the category where it is directed towards practice andcomparison, and can be partially won by using peer-teacher assistance and descriptive narrative. “4.5.3.1. Question the causes of light pollution.” It is considered that these students will not be able to learn exactly whether the acquisition is given to the student by the teacher or if various supporters are used. For this reason, the learning outcome has been studied in the learning code, partly in the gaining category and without support. It is predicted that the blind student cannot gain this learning outcome as a result of not being able to learn the light concept because of life and vision failure. For this reason, this learning outcome has been examined in the code of blind students cannot gain. “4.8.1.3. Design and present the product.” it is thought that when the acquisition is explained by the descriptive narrative of the underemployed learner, he or she can design and present the product with the help of the teacher and his friends. For this reason, the learning outcome is placed in the gaining category and in the teacher assistance-descriptive narrative-peer help codes. It is thought that the blind student will not be able to gain this learning outcome because the student can not do drawing and design with the aid of the teacher or with the descriptive narrative of the teacher. For this reason, blind students have been examined in the code of non-gain.

3. RESULTS AND DISCUSSION

There were 46 students in the 4th grade Science Education Program have been examined. The supporters of the visually impaired students have been examined by considering the criteria for which they

can gain. The distribution of the likelihood that the gains can be gained by the low vision and blind students are given in Table 1.

Table 1. Distribution of learning outcomes according to the prospects of low vision and blind students

	Low Vision			Blind		
	Gains	Partially Gain	Can't Gain	Gains	Partially Gain	Can't Gain
Number of Learning Outcomes	37	9	0	27	12	7
Percent (%)	80.4	19.6	0	58.7	26.1	15.2
Number of Total Acquisition		46			46	

It is thought that low vision students can get 80.4% of the learning outcomes and partially get 19.6%. There are no learning outcomes that can not be learned by students with low vision. It is thought that blind students will be able to get 58.7%, partly get 26.1% and get 15.2% (Table 1). The status to gain learning outcomes with supportive factor and without supportive factor of the students with low vision are shown in the Table 2.

Table 2. Investigation of the learning outcomes that are thought to be gained by students with low vision by supportive factor

	Gains with supporter	Gains without supporter
Number of Learning Outcomes	18	28
Percent (%)	39.1	60.9

The learning outcomes that blind students are not expected to gained, are usually experiment design, materials that can be distinguished by visual sense, lighting tools and light and light pollution learning outcomes. The learning outcomes that blind students can not achieve are; "4.4.4.2. Designs the experiment that the materials can change with the effect of heat.", "4.4.5.1. They classify the substances they use frequently in their daily life as pure substances and mixtures and explain the differences between them.", "4.5.1.2. Designs for lighting vehicles that can be used in the future.", "4.5.3.1. Questions about the causes of light pollution.", "4.5.3.2. Explain the negative effects of light pollution on the observation of natural life and celestial bodies.", "4.5.3.3. Produces solutions to reduce light pollution.", "4.8.1.3. Design and deliver the product." concluded from the results that 60.9% of the 46 learning outcomes could be gained by students with low vision without a need of support, while %39.1 could gain with the supportive (Table 2).

The status to gain learning outcomes with supportive factor and without supportive factor of the blind students are shown in the Table 3. Blind students are thought to be able to get 41% of the 39 learning outcomes while they cannot gain %59 of it without supporter (Table 3).

Table 3. Investigation of the learning outcomes that are thought to be gained by blind students with supportive factor

	Gains with supporter	Gains without supporter
Number of Learning Outcomes	16	23
Percent (%)	41	59

It can be seen that under-sighted students can get acquisition without achivement 60.9% (28 learning outcomes) of the 46 achivement they can get acquisiton. Teacher assistance is ranked first with 19% (f: 8) according to the supportive rate used in the acquisitions that are thought to be possible using the facilitator. Then, in descending order: 16.7% (f: 7) computer and tablet, 16.7% (f: 7) descriptive narrative, 14.3% (f: 4) peer help, 7.1% (f: 3) three-dimensional model and 4.8% (f: 2) intelligent board supporters (Figure 1). Distribution of learning outcomes according to supporters for low vision students are given in Figure 1.

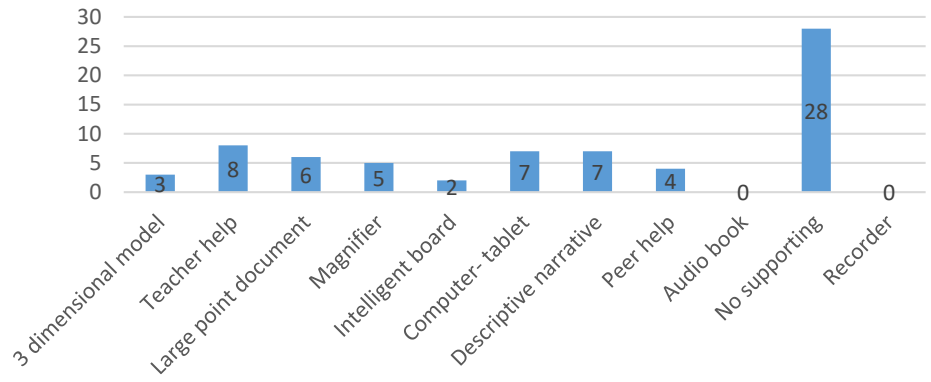

Figure 1. Distribution of learning outcomes according to supporters for low vision students

Blind students are thought to be able to gain 59% (23 learning outcomes) of the 39 achivements they thought they could gain without support. According to the supportive ratio used in the acquisitions using the supporter, supporters use the descriptive narrative with 26.8% (f: 11), 14.6% (f: 6) and the three-dimensional model with 12.2% (f: 5) and the computer-tablet is in third place, 9.8% (f: 4), and the relief and audio book is in fourth place (Figure 2). Distribution of learning outcomes according to supporters for blind students is given in Figure 2.

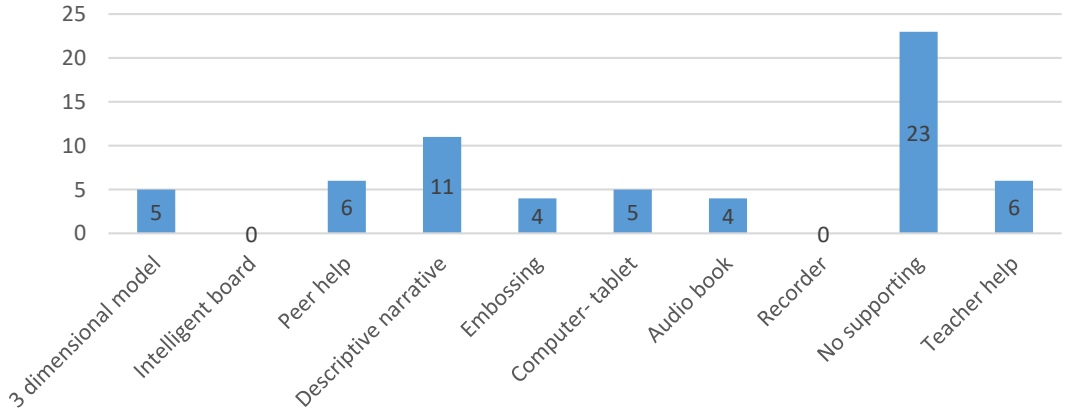

Figure 2. Distribution of learning outcomes according to supporters for blind students

Distribution of the learning outcomes most needed by the students with low vision is indicated at Table 4. Accordance with table there are "4.1.2.1 interpretation of difference between the earth's rotation and wandering movements", "4.1.2.2. The movements of the world reveal by the eventual consequences." and "4.4.2.1. Compare the masses and volumes of different materials by measuring them." It seems they will need them: 4.1.2.1. Three-dimensional model, large paper document, computer-tablet and descriptive narrative; 4.1.2.2. Three-dimensional model, intelligent board, computer-tablet and descriptive narrative; 4.4.2.1. It is determined that they will be able to gain more with the aid of teacher, magnifier, peer help and descriptive narration.

Table 4. The learning outcomes that low vision students need the most supports

Acquisitions	Supporters Used			
4.1.2.1.	3 dimensional model	Large point document	Computer-tablet	Descriptive narrative
4.1.2.2.	3 dimensional model	Intelligent board	Computer-tablet	Descriptive narrative
4.4.2.1.	Teacher help	Magnifier	Descriptive narrative	Peer help

"Distribution of the Blind Students' Needs and Supports" is given in the Table 5: "4.1.1.2. Associate rocks with mines and discuss the importance of rocks as raw materials" and "4.2.1.3. It discusses the importance of freshness and nourishment of foods for a healthy life based on research data." It is thought that they will need supporters for their learning outcome; 4.1.1.2. Descriptive narrative, relief, computer-tablet and audio book; 4.2.1.3. In the acquisition, it is predicted that they will be able to earn with the aid of peer, relief, computer-tablet and audio book. The benefits that low vision students and blind students most need for supporters are those including high-level cognitive process skills.

Table 5. Distribution of the blind students' needs and supports

Acquisitions	Supporters Used			
4.1.1.2.	Descriptive narrative	Embossing	Computer-tablet	Audio book
4.2.1.3.	Peer help	Embossing	Computer-tablet	Audio book

The 4th grade science sciences curriculum consists of 8 units and 46 acquisitions. The curricula are prepared taking into consideration the individual differences. When examining the learning outcomes, it was revealed that visually impaired students may have some difficulties in gaining the learning outcomes. It has been achieved that low vision students will gain 80.4% of all the learning outcomes and the blind students will be able to gain 58.7% of all the learning outcomes. In order to make more meaningful interpretations, it was determined that if the findings were evaluated according to the sub-dimensions: 39.1% of the students with low vision (18 learning outcomes) and 41% of the students with blind students (16 learning outcomes) were needed. This shows that both students with blindness and underemployment can not gain a large majority of learning outcomes without the use of supporting material. For visually impaired individuals, support is needed in order for the learning to take place. A teacher trying to apply the curriculum directly will not be able to gain student achievement if there are no supporting materials. In order to achieve equal opportunities, adaptations should be made to curricula for visually impaired students. The inclusion of supporters identified in the analysis for visually impaired students into the learning outcomes of the Science Curriculum Program will be active for both teachers and these students.

It is believed that supporters used in the analysis and written in the literature can make it easier for the visually impaired students to gain their learning outcomes and enable the active participation of the students in the lectures. The use of tactile and auditory weighted materials during the teaching of blind students and the use of course materials such as large paper documents in the teaching of underemployed students make learning effective. In experiments involving especially science, mathematics and computer-assisted teaching contribute to visually-impaired students.

It is emphasized the importance of supporters in education by emphasizing that the use of materials that are appropriate for the curriculum in the science classroom will make learning more permanent and effective. In the scope of the study, it is necessary to blend the teaching materials with the supporting materials according to the results that the underemployed students can gain 39.1% of the learning outcomes and the blind students the 41% of the learning outcomes, and even if no differences in practice and equal opportunities in process, the conclusion has to be given. It is determined that blind students can not gain 7 of their learning outcomes. Given the learning outcomes that can not be earned, these are usually gains that include concepts such as making experiments, designing experiments, activities that can be used for vision, lighting devices, light and light pollution. It is thought that these learning outcomes can not be earned due to the inadequacy of life in visually impaired students. Because visually impaired individuals have little knowledge of the shapes, colors, and movements of some creatures before they are examined with their hands. However, the students are limited in their ability to perceive even the touches of objects with certain conditions and concepts. For this purpose, the inadequacies should be taken into consideration when preparing the outcomes for the program, or the programs should include flexible outcomes for students with inadequacy.

In the study, it has been determined that students will need more than one supporter in gaining the learning outcome because some of the learning outcomes include "high level cognitive process skills such as" asking the student to explain the concept at the end of the research" , "making student comparisons" and "explaining the differences" are determined. This leads to the idea that underemployed and blind students will not be able to earn learning outcomes without supporters and will have difficulty in learning the concepts of the subject. In addition, the need for a greater sense of sight in acquiring the learning outcomes necessitates the use of supporters during instruction. It has been determined that the learning outcomes are made up of high-level cognitive process skills and that more blind students are needed with more supporters, such as reliefs, computer-tablets and audio books, to facilitate research. Teachers' assistance, computer-

tablets, descriptive narration and large-scale documents are needed for low-level students to acquire high-level cognitive process skills.

As a result, when low vision and blind students need support materials, it is determined that low vision students can achieve 39.1% of learning outcomes and blind students can 41% with the supporters. As the learning outcomes needed for the supporter consist of learning outcomes that include abstract and high level cognitive process skills, it was determined that blind students with low vision and blind students could achieve success with the supportive materials of their inadequacies. In addition, it was determined that low vision and blind students would need supportive materials for similar rates of attainment. Supportive materials need by low vision and blind students have been examined, it was found out that teacher aid and descriptive narrative are the most important factors. However, it was determined that descriptive narrative should be used more in order to achieve success for the blind students. When the overall learning outcomes of 4th grade curriculum have been examined, it is considered that all of the students with low vision can achieve full learning outcomes, but the blind students can achieve only 39 of the learning outcomes, but seven of them cannot even if they are used supportive materials. It has been determined that these seven learning outcomes cannot be achieved because they are abstract concepts that cannot be embodied or those that require active use of the student's vision. When the 4th grade Science Education Program is evaluated in general, it is found out that the individual differences of visually impaired students are not taken into consideration in the preparation of the curriculum.

4. CONCLUSION

It is seen that blind and visually impaired students are classified within themselves and there are individual differences even among these students. Accordingly, the preparation of the curriculum considering individual differences will make learning more effective and productive. Likewise, the teaching environment should be tailored to the needs of the students. The topics to be explained in the lessons can be supported with more tactile materials, and the materials must be designed accordingly. Large pointed documents for under-sighted students, use of magnifier; using blueprints, audiobooks, etc. for blind students will make learning easier.

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