Educational Researcher Journal
ISSN: 3064-500x (e)
2025, Vol. 2 No. 01, page 74-87
https://edurj.com/index.php/edurj

OPEN ACCESS

Exploration of Science Learning Strategies for Blind Students at the Sejahtera State Elementary School in Bogor City

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ABSTRACT

The education or teaching needed by children with special needs or blindness is different from normal children. As should get more attention, special education and teaching. Because they have the same educational nature and religious potential as normal students. This study aims to 1) Find out what learning strategies can be applied to involve blind students in science learning. 2) Find out what challenges are faced in science learning for blind students. The research method used is qualitative phenomenology, with data collection techniques including interviews, observations, and documentation. Data were analyzed with thematic data analysis. To test the validity of the data using member check. The results of this study indicate that one of the important learning strategies is learning media, the media is in the form of audiovisual and 3-dimensional objects that can be touched by blind students, while the challenges faced in science learning for blind students are the lack of facilities and infrastructure in the form of learning media. The conclusions of this study are: 1) Science learning strategies for blind students are school policies, learning outside the classroom, then teacher abilities, and student mobility orientation. 2) The challenges faced in science learning for blind students are challenges in the classroom, characteristics of blind students, cognitive abilities, and facilities and infrastructure.

ARTICLE INFO

Keywords:
Learning Strategy; Science Learning; Blind Students

Article History:
Received: 22 Jan 2025
Revised: 01 Feb 2025
Accepted: 15 Feb 2025
Published: 16 March 2025

How to Cite in APA Style:
Qisthi, A., Yektyastuti, R., Hamami, F., & Erlangga, S. Y. (2025). Exploration of Science Learning Strategies for Blind Students at the Sejahtera State Elementary School in Bogor City. *Educational Researcher Journal*, *2*(1), 74–87. https://doi.org/10.71288/educationalresearcherjournal.v2i1.28

Introduction

Science education emphasizes providing direct experience to develop competencies so that students are able to explore and understand the natural environment scientifically. Science lessons are important to be mastered by every student in the 21st century today (Yektyastuti et al., 2019), because science lessons can hone the ability to understand and solve science problems with thinking skills (Rivera, 2015). According to the West Java Education Office (Disdik Jabar), data on students with special needs in West Java shows that there are 26,000 students currently studying. Children with special needs include

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https://doi.org/10.71288/educationalresearcherjournal.v2i1.28

children with intellectual disabilities, emotional disabilities, hearing and speech impairments, physical disabilities, multiple disabilities, learning disabilities, hyperactivity, and one of them is blind. According to the Ministry of Education and Culture, there are 688 blind students. Blind children include children who have limitations in their sense of sight that cannot function properly, but blind children can still use other senses that still function, including touch, hearing, smell, and others. Therefore, blind children must be able to use other senses properly in order to be able to follow learning in class to develop their abilities, even though they have visual impairments. According to Piaget, even for blind students, when their development is translated into cognitive development, blind students are about four years behind at the sensorimotor level and two years behind at the intuitive stage. Special training is needed for both motor and mental skills for blind students to compete with sighted students and find out what to do to maintain balance. In implementing learning strategies for blind students, modifications must be made so that their senses function and can receive/understand the messages and materials delivered (Hermanto & Asep, 2021). Especially in science learning, science learning has the characteristic of the need for visual learning (Garraway-Lashley, 2019).

Of course, the education or teaching needed by children with special needs or blindness is different from normal children. As should get more attention, special education and teaching. Because in essence they have the same educational nature and religious potential as normal students (Lina et al., 2023).

Based on the results of observations carried out on January 8, 2024 at the Sejahtera State Elementary School in Bogor City, researchers witnessed that at the Sejahtera State Elementary School in Bogor City, blind students consisted of 6 students, the student data consisted of:

No	Class Level	Classification of Blind People		Number of Students
		Low Vision	Blind	
1	I	1	1	2
2	II	1	1	2
3	IV	1	1	2

The learning process at SDLB Negeri Sejahtera Kota Bogor is carried out simultaneously in one classroom and there are no barriers between class levels. In the special class for the blind, there are 3 teachers where when learning begins, these three teachers are only limited by a small distance from table to table. So the researcher saw that the learning process was less effective and there were several students who had difficulty focusing on the learning given by the teacher (Qisthi et al., 2024). Therefore, to deepen understanding and obtain better information, this study explores science learning strategies for blind students, in the study an in-depth analysis was carried out on how science learning strategies for blind students and what the challenges are.

Method

This type of research uses qualitative research with phenomenological methods. Phenomenological theory states that motives are the same motives that underlie a person's actions that are reluctant to be called motives. As a result, to understand individual human behavior, one must consider the themes or ideas that underlie the behavior in question. We can see the meaning of the action according to the original motive that undoubtedly underlies the actions carried out individually with the motives that underlie an action or because of the purpose (Steeva Yeaty Lidya Tumangkeng & Maramis, 2022).

Results

The results of the study were found to explain in detail various themes identified from the results of interviews and observations carried out by informants related to the exploration of science learning strategies for blind students at SDLB Negeri Sejahtera Kota Bogor as contained in the research focus below.

Learning strategies that can be applied to involve blind students in science learning

Figure 1. Results of data analysis of science learning strategies that can be applied to involve blind students.

Learning strategy is an educator's effort to motivate students to do activities and achieve learning goals. Of course, determining a learning strategy is very important in a learning process because the learning strategy will greatly affect the results or achievements of learning. Science learning strategies for blind students are certainly different from sighted students. Some learning strategies that can be applied to involve blind students in science learning are:

a. School policy

School policy is also one of the science learning strategies for blind students, because the abilities of blind students are different from regular students, the school makes policies to adjust to the abilities of its students. This is in accordance with the results of an interview with Mr. Daden as a Blind Class Teacher (GKT) who said that: "It goes back to each school, the state provides a curriculum only as a reference, it goes back to each school because the ones who understand best are the teachers and the school at the school itself" (CHW.GKT) School policies are made as a result of teacher meetings because teachers and the school are the ones who understand best how their students' abilities are. One of the policies that schools make is adjusting or modifying the curriculum, the curriculum from the ministry is only a reference for its implementation, it is still adjusted to the students' abilities. There are several school policies to help involve blind students in science learning that have been set at SDLB Negeri Sejahtera Kota Bogor, namely:

1) Curriculum adjustment

The curriculum used is generally still in accordance with the ministry's policy, but for SDLB it is adjusted to the students' abilities, so the difference is seen from the students' abilities because teachers cannot force their students. This is in accordance with the results of interviews with blind class teachers and blind assistant teachers who said that: "Actually, the curriculum refers to the child's abilities, if the child's abilities at this time this curriculum terlalu tinggi karna kemampuan anaknya memang di bawah rata-rata jadi saya mencari kurikulum yang bisa disederhanakan ya di internet." (CHW.GKT)

The results of the interviews conducted by the researcher are that because the curriculum currently used is too high for the abilities of blind students, the curriculum is modified to suit the students' abilities.

2) Learning outside the classroom

Due to the lack of learning media that can support the science learning process, the strategy used by teachers at SDLB Negeri Sejahtera Kota Bogor is to invite blind students to learn outside the classroom such as behind the school to use plants as learning media, or invite blind students to the museum to use the media in the museum that can be used as supporting media, especially in science learning. This is in accordance with the results of the interview with the teacher of the blind class who said that: "Yes, that's it, so explaining it must be done by visiting the school, so for example, we don't have teaching aids about measuring tools in science learning such as measuring cups or thermometers because we don't have them, so I invite students to go to class to visit places that have such tools, for example to the laboratory or the national library, yesterday I took a blind class to the national library in Jakarta by train and then got off the station we walked to the library, so the point is to introduce science teaching aids that are not available at school" (CHW.GKT)

From the results of the interview above, it can be seen that learning outside the classroom is very helpful for the learning process, especially in science learning because of the lack of media, students can still use the media in the surrounding environment or during class visits.

b. Teacher ability

The ability of teachers at SDLB greatly influences the process and learning outcomes in the classroom, especially for the blind because students depend on how the teacher teaches in the classroom. When researchers conducted interviews with blind class teachers, they said that the teacher's ability to determine strategies and methods must be varied and creative, not monotonous because the teacher's enthusiasm will affect the students' enthusiasm in learning, in addition, good teacher abilities can affect students' communication skills. This is in accordance with the results of an interview with a blind class teacher who said that: "When determining strategies and methods, they must be varied, not monotonous lectures, questions and answers, so I like to intersperse with assignments, discussion methods must be varied, if they are not varied, monotonous lectures, questions and answers, children will get bored" (CHW.GKT)

Furthermore, the teacher's ability to create a pleasant learning atmosphere will motivate students in the learning process as stated by a blind class teacher during the interview: "What is clear is that when teaching, teachers must show the teacher's enthusiasm in teaching because the teacher's enthusiasm in teaching can determine children to be enthusiastic about learning because they are motivated by the teacher's enthusiasm for learning, from the teacher's voice it influences if his voice is loud and firm it will affect the child's communication, so if for example there is a child who is not communicative, the teacher must reprimand them, well that is one of the efforts to build smooth communication" (CHW.GKT)

c. Student mobility orientation

In the science learning strategy for blind students, student mobility orientation is also one of the important things because orientation and mobility skills can help someone to move in their current environment and greatly support independence in the environment later. This is in accordance with the results of an interview with a blind class teacher who said that: "Yes, every Wednesday I teach them about mobility orientation, this orientation and mobility does not only teach them how to walk, but also how they are guided by sighted people, right?" how should a sighted person guide a blind child, so if the sighted person doesn't know, they should be told how to hold it because not all sighted people can guide a blind child properly, then how when they go up or down stairs. Then the mobility orientation every Wednesday is not only learning about how to walk but also learning to determine the compass where west and east are when they are in a place they don't know, so they are given efforts on how to determine it "(CHW.GKT)

From the results of the interview above, it can be seen that this orientation and mobility learning for students is very important for blind students to implement because mobility orientation is very useful for blind students to know and get to know their

surroundings such as where they are and how to know where students should go when students are in an environment they don't know.

Challenges faced in science learning for blind students

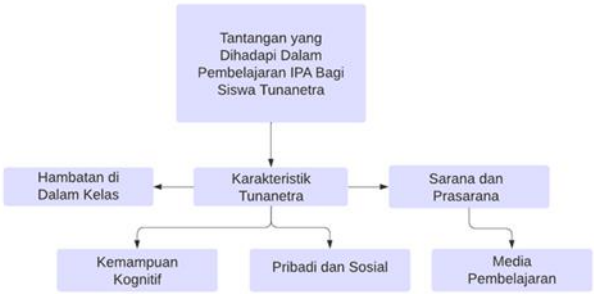

Figure 2. Results of Data Analysis of Challenges Faced in Science Learning for Blind Students

Science learning must be concrete and clear, therefore science learning for blind students is not easy, of course there are challenges that students must face in science learning for blind students, namely:

a. Obstacles in the classroom

One of the challenges faced in science learning for blind students is obstacles in the classroom such as when explaining the material, teachers find it difficult to explain abstract things, for example what a rainbow is to totally blind students because a rainbow is something that cannot be touched or felt. This is in accordance with the results of an interview with a blind class teacher who said that "Their difficulty is when the teacher gives science learning that is imaginary in nature that cannot be guessed or imagined by blind children such as totally blind people, I have difficulty explaining the rainbow, what the shape of the rainbow is like, well that's something that can't be held or abstract. So they also can't imagine how big the mountain is, it can't be drawn by them, even though there is a scale, it still can't be drawn because they can't touch it, unlike something they can hold like a buffalo, they can hold it directly or hold a buffalo statue so they can imagine how big the buffalo is. So the point is the difficulty in describing something that is abstract and cannot be touched, like at night there are many stars or the weather is dim, what is dim like, it can't be described because their perception is dark so I just answer dim is half dark "(CHW.GKT)

Furthermore, to create a pleasant learning atmosphere, the teacher held a visiting class such as the Bogor museum, but there were obstacles or challenges when this activity was carried out, namely that students had to spend money on independent transportation. This is in accordance with the results of an interview with a blind class teacher who said that: "but the drawback is that they have to spend money on transportation because most of them are from lower middle class families, so I told them to save money, if they have enough money, then I take them to places that have teaching aids that students can hold" (CHW.GKT)

b. Facilities and infrastructure

1) Learning Media

Facilities and infrastructure are also one of the challenges faced in science learning for blind students. Because science learning must be done with concrete media, this blind class should have media that can be used especially during science learning, but the results of interviews and observations by researchers saw that the facilities and infrastructure in this blind class did not support learning, especially in science learning. This is in accordance with the results of interviews with blind class teachers who said that: "Well, actually here we really need teaching aids, it's not lacking anymore, even none, especially in science learning. I need a statue to explain the function of the liver or the functions of

organs in the human body, but there aren't any" (CHW.GKT) Due to the lack of media that can be used in science learning, teachers finally prioritize materials related to media or teaching aids that can be found in schools, such as plants that are easy to find around the school.

c. Characteristics of the blind

Blind children are actually physically the same as children in general, but there are several things that differentiate the two. There are several characteristics of blind children, namely:

1) Personal and social

One of the characteristics of blind children, namely in personal and social, the results of the interview showed that the personality of blind children tends to have a nature that is easily offended and quick to anger, besides always curious because they have limited vision so they are easily suspicious, therefore teachers must always communicate what is really happening so that there is no misunderstanding. This is in accordance with the results of the interview with the teacher of the blind class:

"Because the character of children varies in terms of the characteristics of blind children, yes, they are easily offended, quickly angry because they are easily offended, then these blind children are always curious because of their limited vision, they are also easily suspicious, for example, when it is quiet and a teacher accidentally hits the table so that it makes a sound, these blind students can think of negative things or think that the teacher is angry with the students, therefore they must explain so that students do not think of negative things "(CHW.GKT)

2) Cognitive abilities

Furthermore, in an interview with a teacher of a blind class, it was explained that blind children have difficulty in understanding language that is illustrated in an imaginary or abstract way, therefore learning for blind students must be carried out using concrete media. "At this time, the characteristics of blind children are that they cannot understand imaginary or abstract language, so blind people need concrete learning" (CHW.GKT)

This was also said by the Blind Class Students (SKT) that they experience difficulties if science learning does not use concrete media "Yes, it is difficult to understand because it is difficult to imagine, there is no media so it is difficult to understand the material" (CHW.SKT1) "If science lessons are difficult because they are less understandable if only the material is explained" (CHW.SKT5) "The difficulty is when studying continues without media because I can't imagine it" (CHW.SKT3)

From the results of the interview above, it can be seen that science learning for blind students requires concrete learning and is not abstract so that students can easily understand what is being learned, therefore it means that learning media for science subjects is very important for blind students.

Discussion

Based on the research findings obtained through interviews and observations, the findings are different from the theory explained in the journal entitled "Learning Strategies for Children with Special Needs in SLB" which states that Learning strategies for blind children Learning strategies are basically the proper and optimal utilization of all components involved in the learning process which include objectives, subject matter, media, methods, students, teachers, learning environment and evaluation so that the learning process runs effectively and efficiently. Several things that can be used as considerations in determining learning strategies, including: Based on message processing, there are two strategies, namely deductive and inductive learning strategies (Dermawan, 2013). After analyzing the data from the research findings. The next step is to conduct a discussion in accordance with the theory and logic that are adjusted to the problems that researchers do in the field regarding science learning strategies at SDLB Negeri Sejahtera, Bogor City.

Learning strategies that can be applied to involve blind students in science learning

Learning strategies that can be applied to involve blind students in science learning from the results of the study found several things, namely school policies, curriculum adjustments, teacher abilities, learning outside the classroom, student mobility orientation. The learning strategies used by teachers aim to achieve students' competence and cognition in science learning to the maximum.

a. School policies

School policies are one of the learning strategies so that the learning process can be carried out effectively and optimally. Inclusive education will be very difficult to implement if the components above are not modified. The educational component that feels the most burden is the component of educators or teachers. Teachers will find it very difficult to carry out quality learning if the curriculum is not modified, likewise other components need to be adjusted (Salim, 2010). From the statement above, inclusive schools or special schools, modifications to the curriculum are very necessary in accordance with the policies of each school. Some school policies implemented at SLB Negeri Sejahtera Kota Bogor are curriculum adjustments and learning outside the classroom. 1) Curriculum adjustment

Curriculum adjustment is very necessary in special schools because the students' abilities cannot be equated with regular students, besides that teachers will have difficulty when providing material if the curriculum does not match the students' abilities. Therefore, the importance of individual differences is needed both in individual and classical education systems. Not only students must adjust to the situation and substance of education, but also the education system must adjust to the abilities, difficulties, speed, and interests of students. This means that ABK are not forced to master competencies that are beyond their abilities. However, they are not confined to existing materials because there is an a priori assumption that the next material is too difficult. ABK are also not asked to catch up with their smarter friends, nor are they left waiting for their slower friends. Students who fail in a teaching method and technique will not necessarily fail in other methods and techniques (Salim, 2010).

2) Learning outside the classroom

Learning outside the classroom is usually carried out by visiting classes such as to museums or places that provide or goods that can be used as learning media for blind students, in addition, teachers at the Sejahtera State Special Needs School in Bogor City usually give assignments so that their students can use their surroundings as learning media such as going to the garden to feel how tree trunks, leaves or roots are, in addition to being able to learn science, they can also learn about student mobility. Blind students need concrete experiences through direct interaction with learning resources to develop knowledge about objects around them.

b. Teacher ability

Teacher ability can be interpreted as a teacher's mastery of learning methods in providing understanding and direction to students in the teaching and learning process. Teachers are also required to master the knowledge and skills learned in the education they have taken, then teachers are also required to have behavior or attitudes in completing their professional work or tasks (Nufus, 2019). The ability of teachers in special schools of course greatly influences the learning process, therefore teachers who teach in special schools should have special abilities to educate students with special needs or disabilities. The competence of novice teachers in Special Education (PLB) is as personality and professional development, understanding of students, mastery of educational learning and mastery of the field of study. Teachers for students with disabilities must condition each student to be ready to learn. This condition distinguishes learning for regular students (normal conditions) which can be conditioned by teachers classically from the aspect of teaching materials, strategies and learning tasks, because normal students have responsibility in learning and are able to manage themselves by

following the applicable rules. While students with disabilities are weak in this regard. These conditions underlie the differences in learning management needs for students with disabilities. Therefore, a special school teacher must have the competence to direct and guide students with special needs by understanding the uniqueness of students with disabilities, in the sense that they must be a professional teacher. A teacher who has the ability to teach, but does not have the ability to educate, guide, and train, is not called a professional teacher (Nufus, 2019).

c. Student mobility orientation

Student mobility orientation learning is routinely carried out on Wednesdays for blind students. This learning is carried out to train blind students to recognize the road environment that they must pass through and learn to determine the compass direction when they are in a place they do not know. Orientation and mobility programs are given to blind students as a special program. In the Education Unit Level Curriculum, the mobility orientation program is a stand-alone program and only contains mobility orientation learning, while in the 2013 curriculum, the mobility orientation program is integrated with two other special programs, namely social and communication, so this program is named a special program for mobility orientation, social and communication (OMSK). Basically, the KTSP or 2013 Curriculum seeks to provide special programs as a form of compensation for visual impairments experienced by blind students with the aim of minimizing barriers and increasing access to learning (Yudhiastuti & Azizah, 2019).

Challenges faced in science learning for blind students

Based on the research results, there are several things that are challenges in science learning for blind students, namely:

a. Obstacles in the classroom

Obstacles in the classroom that occur in the blind class are that students have difficulty understanding the material if science learning and the material are abstract, such as what a rainbow is, how big a mountain is, even though with mathematical calculations they still have difficulty imagining how big a mountain is, besides that they also have difficulty imagining how the sky is when it is cloudy, especially for blind students. Science learning is an active process that requires the involvement of almost all senses, the entire thinking process, and various muscle movements to access the natural environment around them. Science learning can be a vehicle for students to learn about themselves and the environment around them to solve problems in everyday life (Kemendikbud, 2014). However, teaching science material is not an easy matter, especially for a blind person who has lost the information channel from his visual senses (Lestari, 2017).

b. Facilities and infrastructure

1) Learning Media

Facilities and infrastructure play a role in determining the quality of education delivery, so that facilities and infrastructure can be considered as a driving force in the implementation of the education process. Educational institutions are tools and equipment that are used directly in the education process, especially the teaching and learning process, such as blackboards, stationery, and others. Educational infrastructure refers to facilities that indirectly support the education and education process in educational institutions. However, in reality, the condition of facilities and infrastructure in elementary schools still receives less attention from schools and the government. Facilities and infrastructure are the most important aspect to make learning more meaningful. Lack of facilities and infrastructure can also be an inhibiting factor in learning for students. With the availability of facilities and infrastructure, teachers can provide better quality learning because teachers and students will be more comfortable and also enthusiastic if facilities and infrastructure are available at school (Lisnawati et al., 2023).

c. Characteristics of the blind

1) Personal and social

Personal and social behavior is one of the characteristics of blind students because limited vision makes it difficult for students to understand and observe the surrounding situation. This is in accordance with previous research entitled "Getting to Know Blind Children Closer" which states that limited vision in blind children has an impact on their social abilities. They have difficulty observing and imitating social behavior correctly. They need practice in developing friendships with those around them, maintaining eye contact or facial orientation, good posture, using body movements and facial expressions, using voice intonation in expressing feelings, and conveying the right message when communicating. Meanwhile, the social characteristics commonly seen in blind children are personality barriers such as suspicion, irritability, and great dependence on those around them (Mahastuti, 2011).

2) Cognitive abilities

Limited or incapable vision affects the development and learning process of students. However, this influence does not mean giving weakness or inability. It's just that the experiences gained are different from normal children. The differences can be seen from three sides, including:

a) Level and diversity of experience, the experience of blind children is obtained from the senses that are still functioning in their bodies, especially the senses of hearing and touch. However, these two senses cannot provide comprehensive information such as color, size, and space;

b) Ability to move, limited vision makes blind children have to learn to walk and recognize their environment in order to be able to carry out mobility safely, effectively, and efficiently;

c) Interaction with the environment Blind children find it difficult to interact with the environment, because of their limited vision. They need a relatively longer time to recognize their environment (Mahastuti, 2011).

Conclusion

The results of this study obtained based on the sub-focus of the study include:

1. Science learning strategies for blind students at SDLB Negeri Sejahtera Kota Bogor, namely by holding school policies that are carried out by adjusting the curriculum so that students are not burdened and can learn according to their abilities, then learning outside the classroom is also one of the school policies so that students do not feel bored learning in the classroom, in addition to utilizing the environment to be used as a learning medium that is not available at school. Furthermore, teacher ability is one of the strategies used at SDLB Negeri Sejahtera Kota Bogor because teacher ability greatly influences the process and learning outcomes of blind students. and the last one that is a science learning strategy at SDLB Negeri Sejahtera Kota Bogor is the orientation of student mobility, this learning will greatly help blind students in recognizing and memorizing their surroundings.

2. Challenges faced in science learning for blind students are obstacles that occur in the classroom such as difficulty understanding imaginary or abstract material, and the lack of facilities and infrastructure that can support students in learning, especially in science learning. The last challenge is the personal and social characteristics of blind people such as being easily offended and students' cognitive abilities making it difficult to understand the material given without learning media.

Acknowledgements

The author team would like to thank Djuanda University, especially the Elementary School Teacher Education study program, which has provided support for the implementation of this research.

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