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STUDENTS WITH HEARING IMPAIRMENTS' COMPREHENSION LEVEL TOWARDS THE EXAM QUESTIONS OF NATURAL SCIENCE LESSONS

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Abstract

This study aims to determine students with hearing impairments' comprehension level towards the natural science examination questions. This research uses a descriptive exploratory method. The subjects of this study are 14 grade six students who study at a special school for hearing impairment in Bandung, Cimahi, and Wonosobo. We use 40 multiple choice questions as an instrument for evaluating students' comprehension level. In addition, we use descriptive statistics in data analysis techniques. The results show that students with hearing impairments comprehension are low because most students have an average score below or less than 0.5. The average score for the student's comprehension level in total is 0.477. The average value of the material scope is 0.411, the average value of the material is 0.48, and the average value of the indicators is 0.45. The low comprehension level is caused by the choice of words in the questions that are not adjusted to students with hearing impairments' characteristics as they have limited comprehension of more and complex vocabulary. The results of this study are expected to serve as a reference for improving the quality of national standard learning services for students with hearing impairments.

Keywords: Comprehension level, Natural sciences, School exam questions, Students with hearing impairments.

1. Introduction

Science is a discipline that has an important role in life [1]. Science is taught at various levels of education. In formal education, science is taught through natural science subjects [2]. Science is important to teach students because science lessons are included in the Indonesian education curriculum, and science has numerous benefits in everyday life [3]. Students are expected to investigate the phenomena around them when they understand science because science is aligned as a way of thinking instead of just reference knowledge. Since science is a practical guide in understanding natural phenomena, students who understand science thoroughly can make scientific decisions about personal or social problems. Students in primary and secondary school must cohesively understand science to be prepared for the next level of education [4, 5]. A test of learning outcomes is important to determine the level of understanding of students.

A learning outcomes test is necessary to identify the level of achievement of the specified standards and to assess student's progress in the teaching and learning process. The school examination is one type of learning outcomes test used in educational institutions [6]. Every educational unit administers a national-standard school examination [7]. In the regulation of the Minister of Education and Culture of the Republic of Indonesia (PERMENDIKBUD RI) Number 58 of 2015 concerning the implementation of school exams, it states that school exams are an activity designed to assess students' achievement of competence in all subjects under the competency standards for graduates for both regular students and students with special needs [8].

At present, many studies discuss school exams ranging from the quality of school exam questions [9], analysis of school exam items [10], methods to predict school exam scores [11], school examination examinations [12], and factors affecting school exam results [13]. However, until now there has been no research discussing the students with hearing impairments' comprehension level on natural science exams.

It is important to know the students with hearing impairments' comprehension level, especially on exam questions in natural sciences. Natural science lessons serve a greater purpose than simply teaching a concept that must be memorized. This condition indicates that further analysis is required to diagnose problems encountered by students with hearing impairments when answering questions. Although school exam questions are used to assess the achievement of learning outcomes, they are debatable. This is because many students with hearing impairments fail school exams despite having good learning outcomes in the daily learning process, particularly in natural science learning. The results of the Special Elementary School (SDLB-B) Examination on natural science subjects show low scores.

Therefore, this study aims to determine the students with hearing impairments' comprehension level on the examination questions of natural science subject. The descriptive exploratory method is used in this study. We used 40 multiple-choice questions as evaluation instruments to determine students' level of comprehension. In this study, descriptive statistics are used for data analysis. The results of this study show that students with hearing impairments have a low comprehension level of the exam questions in natural science subjects. The majority of the students have an average score of less than 0.5. The overall level of student comprehension is 0.477, an average value of the material scope is 0.411, an average value of the material is 0.48, and an average value of indicators is 0.45. This is due to the editing of sentences in the items that do not correspond to the characteristics of students

with hearing impairments. Students with hearing impairments have problems understanding complex vocabulary and abstract explanations.

2. Logical Framework

2.1. Natural science lessons

Natural Sciences (IPA) is the science of natural phenomena expressed in proven facts, concepts, principles, laws, and through a series of activities in the scientific method [14]. In formal education, natural science subjects are divided into several branches of basic science including biology, physics, chemistry [15]. Natural science subject matter at the Special Elementary School (SDLB-B) consists of chemistry, biology, and physics [15]. Students with hearing impairments need natural science lessons, so they have knowledge related to natural phenomena.

2.2. Ability to understand school exam questions

Ability is a person's capacity to master a skill and use it to perform various tasks in a job [16]. There are several types of learning abilities, including cognitive abilities, affective abilities, and psychomotor abilities [17]. An evaluation instrument is required to assess a person's level of comprehension. School exam questions are one of the evaluation instruments used to assess students' understanding of the material taught in school.

The level of student understanding is determined by the student's ability to obtain and comprehend a material so that students can correctly comprehend the material received [18]. When a student achieves good learning outcomes, he or she can effectively question school exams [19]. Several factors must be considered when making exam questions. A good exam question is an exam question that is easily understood by students [20].

2.3. Students with hearing impairments

Students with hearing impairments are students with special needs [21]. They have problems in the aspects of the organs and function of hearing. Damage to hearing organs and functions results in students having various problems in the learning process [22]. Students with hearing impairments struggle to understand abstract information, complex explanations, and verbal communication [23]. They are visual learners, so they require methods and media that are appropriate for them [24]. In general, students with hearing impairments do not have problems in academic aspects [25]. Usually, they have the same level of intelligence as students in general [26, 27]. However, when the teaching process is not adapted to the needs of the students, some students experience poor learning outcomes.

3. Methods

3.1. Research subject

The subjects in this study are 14 students with hearing impairments (9 boys and 5 girls) grade VI SDLB-B in Indonesia (Bandung, Cimahi, and Wonosobo). Students with hearing impairments are rarely sent to school by their parents, so we have difficulty finding subjects. This research is descriptive exploratory research.

A total of 40 multiple choice questions in the school examination package for natural science subjects are used as data collection instruments. The data analysis technique uses

descriptive statistics. Besides, an unstructured interview format is used to obtain additional information needed to interpret or make sense of the research results.

This study describes the students with hearing impairments' comprehension level on the 2017 natural science subject exam questions in Bandung, Cimahi, and Wonosobo. The level of student understanding is calculated by comparing the number of items answered correctly by the total number of items answered by the student.

3.2. Teaching method

The commonly used methods of learning science at the special school for hearing impairments are lectures/presentation, questions and answers, and demonstrations. The use of presentation and question and answer methods is a common learning method; in practice, it is accompanied by props such as pictures or artificial/real objects depending on the lesson. The use of pictures and objects aims to help students to learn the material being taught; because the pictures and objects can be seen and allow students with hearing impairments to understand the lesson. It is following the characteristics of students with hearing impairments. All the lessons are taught visually as a substitute for the impairments.

4. Results and Discussion

4.1. School exam scores for natural science subjects

Table 1 describes the school test scores for natural science for students with hearing impairments in 6 grades. The subjects are from 4 schools: 2 schools from Bandung City (SLB-B Suk and SLB Sum), 1 school from Cimahi (SLB-B Karya), and 1 school from Wonosobo (SLB-B Karya). The SLB-B in Wonosobo has the highest average score for each school (54.6), while SLB-B in Bandung has the lowest average score. The overall average score is 44.65. Eight students score above the overall average and 6 students below the average score. Although almost half of the students are above average, the calculation of the comprehension level shows that the score obtained is 0.477 (Table 2). The level of comprehension is 0.477 belongs to the low category because the value is below or less than 0.5 or 50%. The students' comprehension level is influenced by several factors. The wording used in the questions has an impact on the level of student understanding of the exam questions [28].

Table 1. School exam scores for students with hearing impairments in the SDLB in natural sciences 2017.

School	Student name	Total correct	Total incorrect	Value	Average score
SLB-B Suka	DMN	14	26	35	35
SLB-B Sum	IP	14	26	35	35
	AD	22	18	55	
	HSN	15	25	37.5	
SLB-B Prima	RMA	17	23	42.5	54
	DW	29	11	72.5	
	TSR	25	15	62.5	
	LC	22	18	55	
	HD	24	16	60	
	KHD	19	21	47.5	
SLB-B Karya	DFF	17	23	42.5	54.6
	NS	29	11	72.5	
	JNT	25	15	62.5	
	ZDN	17	23	42.5	
Standard deviation=12,04159		**Average**		**51.6**	**44.65**

The number of students with special needs in special schools (SLB) is not large. This results in the number of students at each level of education are not too much. As in special schools in Bandung, we only find a student with hearing impairments in grade VI SDLB. Most parents do not send children with hearing impairments to special schools. One of the factors is that parents feel ashamed to send their children to special schools [26].

4.2. The value of the student comprehension level towards the exam questions of natural science in each school

After calculating the final scores for the 2017 school exam questions in the natural sciences, we count the students' comprehension level on the school exam questions from each school.

Table 2 describes the level of understanding of students with hearing impairments on school exam questions in natural science subjects in each school. The SLB-B Karya from Wonosobo has the highest average understanding level of 0.581, while the SLB-B Suk and Sum from Bandung City have the lowest average understanding level of 0.38. The difference between the schools with the highest and lowest scores is 0.21 or 21%. The average level of understanding of the questions throughout the school is 0.477.

Table 2. The value of student's comprehension level of the school examination questions of natural science subjects in each school.

School	Number of participants	Average absorption
SLB-B Suk	1	0.38
SLB-B Sum	1	0.39
SLB-B Prima	5	0.557
SLB-B Karya	7	0.581
Average		**0.477**

Several factors affect students' comprehension level. From the results of the interview, it is found that the schools with the highest scores applied to the oral method and the reflective maternal method in the learning process. This method has been recognized as an effective method to use with children who have hearing impairments [15]. Also, the school provides compensatory services for children with hearing impairments. The implementation of these two methods is supported by articulation development services and the development of good sound and rhythm perception communication services. To support the method applied, these two schools both have supporting teaching resources and infrastructure. The infrastructure and teaching staff affect the success rate of the teaching process [29].

The two schools with low average scores use the total communication method and do not provide compensatory services on a routine or scheduled basis. However, this does not imply that the total communication method is unsuitable for use in teaching children with hearing impairments because even the best method will fail if it is not supported by other factors such as the techniques and approaches employed, educational resources, and the necessary infrastructure. As a form of enrichment, support for inclusion programs that introduce language to deaf students is critical [30]. This is because language and communication skills are intertwined in their education. Aside from that, parental involvement helps to support the learning program that has been designed specifically for them.

4.3. The value of the student's comprehension level towards the school exam questions in natural science subjects for each scope of material

In general, science subjects are divided into several basic branches of science. At SLB-Deaf natural science subjects study the basic sciences, namely biology, chemistry, and physics.

Table 3 describes the level of understanding of students with hearing impairments on school exam questions in natural science subjects in each scope of material. Researchers take two natural science subjects at SDLB, namely biology and physics. There are six scopes of topics on natural science subjects in grade six. We calculate the comprehension level on the exam questions for each basic science and scope using formulas. Natural science school exam questions consist of 23 biology questions and 17 physics questions. The average value of the comprehension level of the scope of biological material is 0.426 and the scope of physics material is 0.456.

Table 3. The value of students' comprehension level of the school exam questions in natural science subjects for each scope of material

Branch of basic Science	Material scope	Number of questions	Absorption value	Average
Biology (number of questions: 23)	Living things and their environment	7	0.49	0.426
	Structure and functions of living things	14	0.569	
	Earth and the universe (natural resources)	2	0.22	
Physics (number of questions: 17)	Objects and their properties	3	0.57	0.456
	Energy and its changes	11	0.43	
	Earth and the universe (solar system)	3	0.37	

The scores of the two branches of basic biology and physics are almost the same, reaching a value of more than 0.4. This shows that there is no significant difference between the scope of material included in the basic science of biology and physics. The distinguishing factor for the absorption value is only found in the composition of the questions between biology and physics which are not the same, namely there are 23 questions for biology and 17 questions for physics. Many of the questions in the basic science of physics, when viewed from the structure of the problem, allude to activities or tools used in human daily life, allowing test participants to easily conclude from questions in the basic branch of biology, where most of the questions and answers are memorized. This indicates that perceptual and language skills play an important role for students with hearing impairments to understand school exam questions. Meanwhile, students with hearing impairments have communication barriers and difficulty in understanding complex information

[3]. They need a simple sentence structure on the exam questions so they can easily understand the purpose of the questions given.

4.4. The value of students' comprehension level of the school exam questions in natural science subjects for each material and indicator

Table 4 describes the level of student comprehension towards the 2017 SLB-B school exam questions for Natural Sciences subjects based on each material. The school exam questions are divided into 17 materials.

Table 4. The value of the student's comprehension level of the school exam questions in natural science subjects for each material.

Material	Total of questions	Special school				Average
		Suka	Sumb	Prima	Karya	
1	2	0.5	0	0.7	0.65	0.457
2	2	0.5	0	0.3	0.495	0.32
3	1	1	1	0.6	0.71	0.827
4	2	0	0	0.3	0.565	0.355
5	3	0.34	0.67	0.6	0.376	0.496
6	1	0	1	0.6	0.85	0.61
7	2	0.5	0	0.8	0.565	0.467
8	1	1	1	0.8	1	0.95
9	5	0.4	0.6	0.44	0.482	0.48
10	2	0.5	0	0.5	0.64	0.41
11	3	0.67	0.34	0.67	0.613	0.57
12	3	0	0	0.6	0.52	0.28
13	3	0.34	0.67	0.67	0.613	0.57
14	3	0	0	0.4	0.473	0.22
15	2	0.5	1	0.7	0.425	0.65
16	2	0	0	0.4	0.495	0.22
17	3	0.34	0.34	0.4	0.423	0.37
Total	40	6.59	6.62	9.48	9.877	8.242
Average		0.38	0.39	0.55	0.581	0.48

The results of the analysis show that item eight has the highest average value compared to the others. This is because students are only required to reach the second cognitive domain (understanding C2) about human development which is basic knowledge. This knowledge is about the physical characteristics experienced by women at puberty. While material questions 14 and 16 are included in the third cognitive domain questions (C3 application), as a result, students must think more complexly in these questions than in the first and second cognitive domains. The difference in cognitive achievement is a factor that results in higher or lower levels of test-takers who can answer the questions correctly because the differences in cognitive abilities of each test taker are different. Each student has a different level of intelligence [31], which affects the level of understanding of students when understanding information, especially students with hearing impairments [31].

Table 5 describes the level of students' understanding of the school exam questions in natural science subjects for each indicator. Natural science exam questions consist of 40 multiple-choice questions.

Table 5. The value students' comprehension level towards the school exam questions in natural science subjects for each indicator.

Indicator	Special School (SLB-B)				Total	Average
	Suk	Sum	Prima	Karya		
1	1	0	0.6	0.85	2.45	0.61
2	0	0	0.8	0.42	1.22	0.305
3	0	0	0	0.71	0.71	0.177
4	1	0	0.6	0.28	1.88	0.47
5	1	1	0.6	0.71	3.31	0.83
6	0	0	0.2	0.42	0.62	0.155
7	0	0	0.4	0.71	1.11	0.55
8	0	1	0.6	0.28	1.88	0.47
9	1	1	0.6	0.28	2.88	0.72
10	0	0	0.6	0.57	1.17	0.3
11	0	1	0.6	0.85	2.45	0.61
12	0	0	1	0.71	1.71	0.43
13	1	0	0.6	0.42	2.02	0.5
14	1	1	0.8	1	3.8	0.95
15	1	1	0.4	0.85	3.25	0.81
16	0	1	0.4	0.28	1.68	0.42
17	0	0	0	0.14	0.14	0.035
18	0	1	0.4	0.14	1.54	0.385
19	1	0	1	1	3	0.75
20	1	0	0.6	0.71	2.31	0.58
21	0	0	0.4	0.57	0.97	0.24
22	1	0	0.6	0.71	2.31	0.58
23	0	0	0.6	0.42	1.02	0.255
24	1	1	0.8	0.71	3.51	0.88
25	0	0	0.2	0.71	0.91	0.23
26	0	0	1	0.85	1.85	0.46
27	0	0	0.6	0	0.6	0.15
28	0	1	0.2	0.71	1.91	0.48
29	1	1	1	0.85	3.85	0.96
30	0	0	0.8	0.28	1.08	0.27
31	0	0	0.4	0.14	0.54	0.135
32	0	0	0.6	0.71	1.31	0.33
33	0	0	0.2	0.57	0.77	0.19
34	0	1	0.4	0.28	1.68	0.42
35	1	1	1	0.57	3.57	0.89
36	0	0	0	0.42	0.42	0.1
37	0	0	0.8	0.57	1.37	0.34
38	0	0	0.2	0.71	0.91	0.23
39	0	0	0.2	0.14	0.34	0.085
40	1	1	0.8	0.42	3.22	0.8
Total	14	14	21.6	21.67	71.27	18.082
Average	0.35	0.35	0.54	0.541	1.782	0.45

Based on the results of the analysis, in question number 29 students are required to reach the cognitive realm number 3, namely application (C3), however, the question is accompanied by a picture that explains the question, and the material that becomes the

content of the question is electronic devices that test participants frequently encounter in everyday life, so the test taker already understands how the electronic device works and functions the question material. This resulted in a high percentage of students who can answer the questions correctly. Key aspects of language relating to sign, spoken, and written language are important to consider when making an assessment plan [32, 33]. The use of images or visual codes is one way that can be used to introduce words that have no equivalent in sign language [34]. This is because students with hearing impairments are visual learning students [24]

Based on the findings of the data above, information is obtained that students with hearing impairments have limitations in identifying and understanding complex new words. Pictures, symbols, and even representations that optimize the use of hands can help students with hearing impairments improve their communication skills, including questions in questions that are expected to help them [35, 36]. This is why there is a need for special treatment for supporting them [37-42]. Furthermore, the learning experience is a dominant factor that supports them in recognizing and comprehending the choices of the sentences in the questions. The choice of words and simple sentence structure must be considered in making the questions. This is because students with hearing impairments cannot understand complex information [3]. Visual media is needed to make it easier for students with hearing impairments to understand information [24]. To increase the level of student understanding, natural science material learning strategies must be considered. Methods and media must be adapted to the needs of students, especially students with hearing impairments [25]. The use of concrete media makes it easier for students to understand the natural science material being taught [26].

5. Conclusion

The students with hearing impairments' comprehension level to the natural science exam questions have various variations. More than 50% of students with hearing impairments have a low level of understanding of the science exam questions. This is because most students have an average score below or less than 0.5.

The average score for the student's comprehension level as a whole is 0.477. The average value of the material scope is 0.411, the average value of the material is 0.48, and the average value of the indicators is 0.45.

One of the factors contributing to the low level of student understanding is the use of words in questions that do not fall under the characteristics of students with hearing impairments. Students with hearing impairments have problems understanding complex vocabulary. Natural science learning strategies must be adapted to the learning needs of students with hearing impairments.

Direct involvement is required in the learning process, such as conducting direct and simple experiments, making observations, simplifying sentences, reducing abstract words, and making project reports in simple sentences, according to their language skills.

Analysis of the absorption capacity of schools can be compared, the minimum number of students is five, if the number of students is less than five, you should not make comparisons with the average absorption rate, because the average score is not stable. The results of this study are expected to be a reference for improving the quality of national standard learning services for students with hearing impairments.

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