The Effect of the Use of HBA Media (Human Body Anatomy) on the Understanding of the Human Body Skeleton Concept in Grade VI Elementary School Students

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Abstract: This study aims to determine the effect of the use of HBA (Human Body Anatomy) media on the understanding of the concept of the human body skeleton in grade VI elementary school students. HBA media was developed as an interactive and visual learning tool to make it easier for students to understand the structure and function of the human body skeleton in a more real and interesting way. The research method used is quasi-experimental with a pretest-posttest control group design. Data was collected through concept comprehension tests before and after learning using HBA media. The test instrument used consists of 20 multiple-choice questions, where each question provides several answer options and participants are asked to choose one correct answer. The number of questions is designed to effectively and efficiently measure students' understanding in the context of learning or research, which are then analyzed using the Rasch model through WINSTEPS software. The research results showed a significant increase in the understanding of the human body skeleton concept in the experimental group analyzed with the Rasch model, compared to the control group using conventional learning methods. HBA media has been proven to be effective in increasing students' motivation to learn and understanding of human body skeletal materials. Thus, the use of HBA media can be used as an effective alternative learning media for human body skeletal materials in elementary schools.

Keywords: Elementary school; Human body anatomy media; Human body skeleton; Understanding concepts

Introduction

Education plays an important role in improving the quality of human resources, shaping individuals to be intelligent, mature, and critical, and supporting the creation of a peaceful, open, and democratic society amid scientific and technological advancements (Rahman et al., 2022). For basic education provided to students at the elementary school level, it must be synergistic and integrated because in reality, mastering the psychological skills of students this age supports each other depending on one capacity to another (Series, 2023). Education at the elementary school level plays an important role in building children's basic knowledge, especially science learning at the elementary level. Natural Science is a way to find out systematically about nature so that it masters 3 concepts, knowledge, facts, and discoveries, which are able to have science in explaining natural knowledge and physics (Nuriya et al., 2023).

Natural Sciences (IPA) is one of the important subjects in the elementary school curriculum, including grade VI of elementary school. Science not only provides an understanding of the natural environment, but also equips students with critical, analytical, and rational thinking skills (Talavera, 2024). However, in reality, science learning in grade VI of elementary school often encounters various obstacles that make it difficult for students to understand the subject. The main challenge for educators is to ensure that learners can fully understand and apply the concepts being taught. One of the main causes of the difficulty of understanding science teaching is the abstract and complex nature of the material (Fitria et al., 2024; Sukmawati, 2021; Wahjusaputri et al., 2022). Elements such as physics, biology, and chemistry concepts are often difficult to visualize without the help of appropriate learning media. In addition, the lack of ability of learners to relate these concepts to daily life makes it difficult for them to understand and apply them in a more real context (Sukmawati et al., 2021b, 2022). Many science lessons are theoretical and do not involve hands-on experience or experimentation, also weakening students' understanding of the topics being taught (Fauziah et al., 2023; Nurliana et al., 2023; Sukmawati et al., 2023).

Another factor that contributes to this difficulty is the lack of effective and interesting teaching materials. Monotonous learning materials such as textbooks and whiteboards are often insufficient to explain complex scientific concepts and require visual or direct understanding. As a result, students tend to lose interest and motivation to learn science, which has an impact on their knowledge of the subject. On the other hand, the quality of teaching also plays an important role. Educators who are not able to choose the right learning method or have not made the most of educational technology often have difficulty in providing scientific material effectively (Izzati et al., 2024; Sukmawati, 2020; Sulistiani et al., 2024). This can cause students to have difficulty following learning and risk lowering their interest in science.

In an effort to overcome these challenges, the use of appropriate media can maximize students' learning and understanding in capturing the material delivered in the human body skeletal material for science learning. Learning with concrete media helps students learn directly by experiencing their learning experience using concrete media (Fitria et al., 2022; Istiqomah et al., 2023; Novianti et al., 2023; Ramadhani et al., 2022). The learning process by experiencing it directly provides a meaningful learning experience. Students learn concepts in a constructive, direct, and structured way (Shoimah, 2020). Choosing the right learning media can increase interaction between educators and students and help students not get bored easily when learning. There are

media that can optimize students' learning interests so as to produce superior learning in all subjects, including the content of science subjects (Winangsih & Harahap, 2023). In this study, interactive learning media such as HBA (Human Body Anatomy) Media was developed to help students understand the skeletal structure of the human body in a more concrete way (Sukmawati, 2023; Sukmawati et al., 2021a). This media is designed to provide physical and three-dimensional visualization of the human body skeleton so that students can learn the structure and function of each part of the skeleton more easily and fun. Observations made by researchers in grade VI of SDN Ciracas 11 Am, that the learning process carried out by educators at the elementary school is known that in the learning process still using only book media and listening to educators' explanations (Putri et al., 2024; Saputri et al., 2024; Sukmawati et al., 2024). With the media of books and explanations from educators, students still do not pay attention such as chatting or telling stories during learning. This makes students not understand the material that has been explained. The lack of active involvement of students in learning can affect learning outcomes and students' understanding of subject matter.

This is evidenced by the understanding of the concept of science learning students in grade VI of elementary school. So that the researcher applies physical or three-dimensional media to improve students' understanding. The researcher intends to conduct research to improve students' understanding of concepts from learning science of human body skeletal materials. The researcher also wanted to know the application of physical or three-dimensional media to science learning and how students responded to the use of these media.

Method

This research using quantitative experiments, because in this study a quantitative approach of pseudo-experiments is used (quasi experiment). In an experimental study, it can be studied whether there is an influence or not in the study. This research was carried out in the form of a design quasi experiment control group pretest-posttest. Quasi-experiment is a research method that aims to explore the cause-and-effect relationship between variables using pre-existing groups, rather than creating random groups (JBGoup, 2024).

The objects in this study are students of grades VI A and VI B, SDN Ciracas 11 Am, East Jakarta. It will be held in May 2025. The form of questions is in the form of multiple choice with a total of 20 questions. Test results will be obtained as scores when students have completed the test, both before the treatment (Pre-test)

and the final test after the treatment (Post-test) completed by the student. Especially classes VI A (Control class) and VI B (Experimental class).

This study uses a Non-Probability Sampling technique. Non-Probability Sampling is a sampling method in which not all members of the population have an equal chance of being selected as samples (Fachreza et al., 2024). Then this research also uses the stacking analysis approach in Rasch modeling, namely Longitudinal analysis techniques are used to compare the abilities of individuals (learners) before and after treatment in understanding the concept of the human body skeleton. After the results are obtained, data processing is carried out by stacking analysis using the RASCH model (Nurliana & Sukmawati, 2023). This design is used because there are pretest to find out the condition of the subject before it is given treatment, as a result of treatment can be known accurately because there is a comparison of conditions before and after treatment.

Result and Discussion

Result

The influence of HBA (Human Body Anatomy) concrete learning media on the human body skeletal material shows that the increase in students' understanding of the material. Learning media Concrete HBA (Anatomy of the Human Body) provides a real picture of the structure and function of the human body skeleton which was previously abstract and difficult to understand only through verbal explanations or two-dimensional images. It is evident from the results of the class VI B SDN Ciracas 11 Am test, which is shown in the table and graph below. Descriptive statistic were first calculated to provide an overall picture of students performance before and after the intervention. Table 1 shows the group statistics from the posttest scores. The experimental class achieved a mean score of 64.65 with standard deviation of 6.621, while the control class had a mean of 56.00 with a standard deviation 7.407. this indicate a notable difference in average performance between the two groups.

Table 1. Groups Statistic

Class	N	Mean	Std. deviation	Std. error mean
Score posttest experiment	31	64.65	6.621	1.189
Score posttest control	29	56.00	7.407	1.375

The difference in learning outcomes between the experimental and control classes was tested using an independent samples t-test. The results showed a statistically significant difference in gain scores between

the two groups, with a Sig. (2-tailed) value of .000. This indicates that the intervention had a meaningful impact on improving the learning media for human anatomy.

Table 2. Independent Samples Test

F (levene)	Sig. (levene)	t	df	P (2-tailed)	Mean diff	95% CI lower	95%CI upper
.002	.962	-4.773	58	.000	-8.645	-12.271	-5.019
		-4.775	56.198	.000	-8.645	-12.287	-5.003

The Results of the Analysis of the Experimental Class with Learning Using HBA (Human Body Anatomy) Media on the Understanding of the Concept of Human Body Skeletal Material

Table 3 presents the pretest and posttest scores of 30 students in the experimental class. Based on the Rasch model analysis, 29 out of 30 students showed an increase in their ability measures, while one student showed no increase or decrease, which is referred to as stable.

Table 3. Results of Pre and Post Test Analysis of Experimental Class

Participants	Measure Pretest	Measure Posttest	Measure posttest-pretest	Information
1	0.62	2.89	2.27	Increase
2	0.62	1.23	0.61	Increase
3	1.56	2.35	0.79	Increase
4	0.03	2.35	2.32	Increase
5	-0.26	0.92	1.18	Increase
6	0.92	1.56	0.64	Increase
7	1.23	2.35	1.12	Increase
8	-0.57	1.92	2.49	Increase
9	0.92	1.56	0.64	Increase
10	0.92	1.92	1	Increase
11	0.62	2.35	1.73	Increase
12	-0.88	1.23	2.11	Increase
13	0.92	1.92	1	Increase
14	1.23	2.89	1.66	Increase
15	0.92	2.35	1.43	Increase
16	0.62	1.92	1.3	Increase
17	1.23	1.23	0	Remain
18	0.62	1.23	0.61	Increase
19	0.03	1.23	1.2	Increase
20	0.92	1.23	0.31	Increase
21	0.32	3.71	3.39	Increase
22	1.92	2.89	0.97	Increase
23	1.23	1.56	0.33	Increase
24	1.23	1.92	0.69	Increase
25	-0.26	1.56	1.82	Increase
26	0.32	2.89	2.57	Increase
27	0.62	2.35	1.73	Increase
28	0.62	2.35	1.73	Increase
29	-0.57	2.35	2.92	Increase
30	1.23	2.8	1.66	Increase

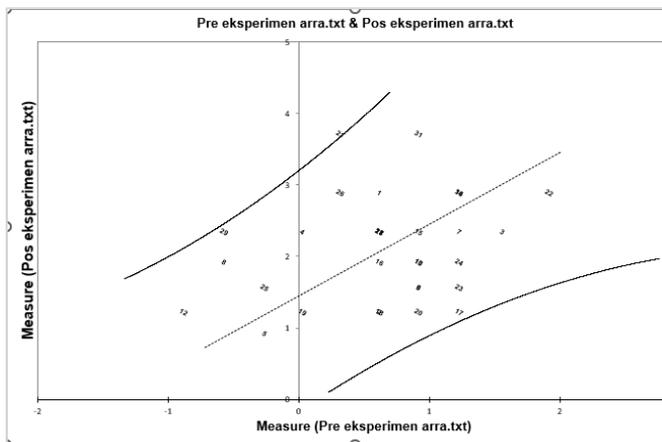**Figure** 1. Results of pre and post test analysis of experimental class
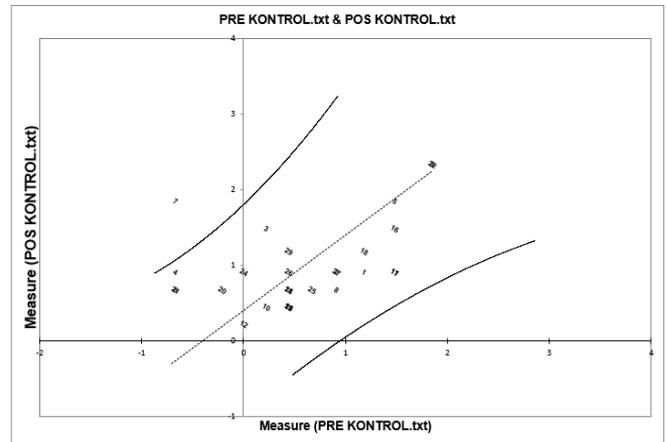

Figure 2. Results of pre and post test analysis of control class

Table 4 the results of the analysis from the control class, namely class VI A, can be seen in the table above. The table shows various groups such as the "increased," "decreased," and "unchanged" groups.

Table 4. Results of Pre and Post Test Analysis of Control Class

Participants	Measure		Measure	Information
	Pretest	Posttest	posttest-pretest	
1	1.18	0.91	-0.27	Decreased
2	0.91	0.91	0	Remain
3	0.22	1.48	1.26	Increase
4	-0.67	0.91	1.58	Increase
5	1.48	1.85	0.37	Increase
6	-0.67	0.67	1.34	Increase
7	-0.67	1.85	2.52	Increase
8	0.91	0.67	-0.24	Decreased
9	1.85	2.33	0.48	Increase
10	0.22	0.44	0.22	Increase
11	1.48	0.91	-0.57	Decreased
12	0	0.22	0.22	Increase
13	0.44	0.44	0	Remain
14	0.44	0.67	0.23	Increase
15	0.44	0.44	0	Remain
16	1.48	1.48	0	Remain
17	1.48	0.91	-0.57	Decreased
18	1.18	1.18	0	Remain
19	0.44	0,44	0	Remain
20	-0.21	0.67	0.88	Increase
21	-0.67	0.67	1.34	Increase
22	1.85	2.33	0.48	Increase
23	0.44	0.44	0	Remain
24	0	0.91	0.91	Increase
25	0.67	0.67	0	Remain
26	0.44	0.91	0.47	Increase
27	0.91	0.91	0	Remain
28	0.44	0.67	0.23	Increase
29	0.44	1.18	0.74	Increase

Discussion

Based on the table above, it shows that HBA (Human Body Anatomy) media has a significant positive influence on the learning process of human body skeletal material in class VI, especially class VI B. This media helps students understand the concept of skeletal anatomy in a more concrete and easily digestible way, so that the understanding of the material increases. It can be seen that participant number (21) experienced a very rapid increase from 0.32 to 3.71 which means that participant number (21) has a difference of 3.39 points.

The participants with numbers (8) (26) and (29) also had a large increase value, participant number (8) received an increase of 2.49 then participant number (26) increased by 2.57 and participant number (29) had an increase of 2.92. This increased value is an indicator that the treatment provided is successful in improving the understanding of the concept of human body skeletal material in the learning media of HBA (Human Body Anatomy).

Meanwhile, participant number (17) was the only participant who had a fixed score from the pretest and posttest, there was no change in the value in learning using media or not using media. This shows that the success of learning media is highly dependent on the characteristics of students or the focus of students on the learning process (Shabrina et al., 2025).

It can be seen that 29 students achieved scores with increased information after using HBA (Human Body Anatomy) media in understanding the concept of the human body skeleton. However, there is 1 student who has permanent information after the HBA (Human Body Anatomy) media is used in the learning process of human body skeletal material. Students who have fixed information such as lack of concentration in the learning process using media, therefore the test results of the students have fixed information (Sukmawati et al., 2024; Wahjusaputri et al., 2024). This indicates that concrete learning media is more effective in increasing the

motivation and learning outcomes of students who were previously not optimal, but have less effect on students whose learning outcomes have remained stable (Hidayati et al., 2025).

The results of the analysis of the control class, namely class VI A, can be seen from the table above. The table above shows the various groups such as "increasing", "decreasing" and "fixed". Participants number (3) (4) (5) (6) (7) (9) (10) (12) (14) (20) (21) (22) (24) (26) (28) (29) had increased information. Although the increase is smaller than the experimental class that uses interactive learning media such as HBA (Human Body Anatomy), this increase is still significant and shows that conventional learning still contributes to improving students' comprehension outcomes. The factors that contribute to the increase in student test results in conventional learning are due to the systematic repetition of the material provided by educators, direct interaction between educators and students during the learning process, and good student learning motivation even without additional learning media (Ilmiah et al., 2025).

Meanwhile, in the control class, there were 4 students who had decreased information, such as participants number (1) (8) (11) (17). The control class did not use interactive learning media such as HBA (Human Body Anatomy) media in understanding the concept of human body skeletal material, 4 students who had declining information because the material being taught required an understanding of abstract concepts or direct involvement of students in the learning process. Without interactive learning media, students tend to have difficulty understanding the material in depth because learning becomes less interesting and provides less real experience. As a result, posttest results can decrease compared to pretests, which reflects students' lack of understanding and motivation to learn (Astuti & Kristin, 2023).

Figure 3. Implementation procedures in experimental and control classes

There is another group, namely a fixed group, the control class has 9 participants who have fixed information. Participants number (2) (13) (15) (16) (18) (19) (23) (25) (27) have fixed information, this shows a lack of concrete learning experiences that help students understand concepts in depth and strengthen memory, so that without concrete media the learning process becomes less effective and the students' test results remain or stagnate (Femilianita et al., 2024).

Conclusion

Based on the results of this study, the use of ATM (Anatomi Tubuh Manusia) media has been proven to significantly improve students' understanding of the human skeletal system concepts in Grade VI. This media provides concrete visualization, making it easier for students to understand the structure and function of the skeletal system, which was previously abstract. The supporting factors include the fact that ATM media offers a real learning experience through 3D object manipulation, increases students' motivation and engagement, and the clear visualization of the skeletal structure helps students connect theoretical concepts with practical applications. On the other hand, the inhibiting factor is that one student in the experimental class (number 17) did not show improvement due to a lack of focus during learning, indicating that individual characteristics and student concentration influence the effectiveness of the media. In the control class, stagnation and a decline in scores occurred due to the absence of concrete media that supports the understanding of complex material.

Conflicts of Interest
The author states that there is no conflict of interest in the research until the writing of this article. The author also guarantees that there are no circumstances or personal interests that can be considered a reprentry or interpretation of the results of the research reported accurately.

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