RESEARCH ARTICLE

Study of students' argumentation ability through scientific approach in high schools with different accreditation ratings

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Abstract: This study aimed to determine differences in students' argumentation abilities on the subject matter of cell structure and function through a scientific approach in high schools with different accreditation ratings. The research design used is *ex post facto*. The sampling technique used was purposive sampling, with a total sample of 111 students consisting of high school students accredited A, namely Seputih State High School 1 Surabaya, high school students accredited B, namely Senior High School Bangun Cipta and high school students accredited C, namely Senior High School Miftahul Ulum. Research data in the form of test results describing argumentation skills were analyzed using the Anova and LSD tests at a significant level of 5%, student questionnaire data were analyzed descriptively in the form of percentages, data from teacher interviews and documentation studies were analyzed descriptively qualitatively using Miles and Huberman's model. The results showed that there was a significant difference in the ability to argue between high school students accredited A and B and C (sig. p<0.05). The argumentative abilities of senior high school students accredited B were not significantly different from senior high school students accredited C (sig. p> 0.05). The average argumentation ability of students from senior high school accredited A is higher than school accredited B and C, but most of the student scores from the senior high schools are still in the "very poor" category. Senior high school students accredited A, B and C are already able to make claims, but the grounds, warrants and backings given are not relevant to the claim. This is due to the application of learning that does not direct students to argue, the application of a scientific approach that is not optimal, and the characteristics of students'.

Keywords: argumentation ability; different accreditation ratings; structure and cell function material

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Introduction

The ability to argue is a very important ability in the world of science and must be taught and learned as part of inquiry and scientific literacy (Jim'nez-Aleixandre et al., 2000). Biology as part of science requires students to be able to produce and evaluate explanations and argue scientifically. The ability to argue is the main thing that underlies students in learning how to think, act and communicate scientifically (Anwar et al., 2019). The ability to argue is also important for students so that they can express opinions, make decisions and solve problems in their daily lives (Songsil et al., 2019).
Learning that includes argumentation activities in learning activities is still rarely done (Dwiretno & Setyarsih, 2018). Even though this provides opportunities for students to engage in collaborative and argumentative discourse which is a means to improve conceptual understanding and students' skills as well as abilities in scientific reasoning (Osborne, 2010). Research shows that student argumentation activities such as collecting data and then understanding a phenomenon when involved in scientific arguments in class are often found to be difficult for students (Sampson et al., 2011). This is because in general science learning in the classroom emphasizes practical work rather than involving students in thinking processes through a series of scientific discourses such as discussions, argumentation and

negotiation (Kim & Song, 2006).

A number of studies regarding the ability to argue related to a scientific approach, especially in learning science and biology, have been carried out a lot. As with the research conducted by Siswanto et al. (2014) and Mubarok et al. (2016) through applying a learning model using the scientific method is proven to significantly improve students' argumentation abilities compared to learning models without using the scientific method. The learning model accompanied by a scientific approach is proven to have a strong influence on students' scientific argumentation abilities. The result of another studies indicate that the use of learning models based scientific approach is proven to be able to improve students' argumentation abilities that were originally at level 1 or below after being given treatment experienced an increase reaching levels 2-3 argumentation (Marhamah et al., 2017; Okumus & Unal, 2012).

Learning using a scientific approach is suitable for teaching cell material. This was proven in a study conducted by Minianur et al. (2017) which shows that the use of a scientific approach has succeeded in increasing student motivation and learning outcomes in complex cell material. Cells are complex materials because they contain chemical components, structures, functions, and processes that take place in cells. In addition, material about cells is abstract in nature with lots of content to be learned making cell material not easy for students. Through a series of 5M activities on a scientific approach, it makes the learning experience more meaningful for students.

The results of a preliminary study conducted in April 2021 through interviews with high school biology teachers at three schools with different accreditation ratings (Seputih State High School 1 Surabaya, Senior High Schools Bangun Cipta and Senior High Schools Miftahul Ulum) show that a scientific approach has been applied in recent years. The results of the analysis of learning documents show that the three schools have implemented a scientific approach in their learning process. However, the application of the scientific approach has never been studied in relation to argumentation abilities. One of the reasons is that the teacher has never given questions that can be used to measure the argumentation ability.

Based on studies in previous studies, so far there have been no findings linking learning using a scientific approach to students' argumentation abilities in high schools with different accreditation ratings in one of the Biology subjects in Central Lampung district. Therefore, this study aims to determine differences in students' argumentation abilities, especially on the subject matter of cell structure and function in high schools with different accreditation ratings in Central Lampung district. The information obtained from this research is intended to be able to contribute ideas to improve the quality of education in schools and also become a reference for teachers in designing learning that is able to improve students' argumentative abilities.

Method

This research is a comparative research using a survey method that aims to determine differences in students' argumentative abilities on the subject matter of cell structure and function through a scientific approach in high schools with different accreditation ratings. This research was carried out in the odd semester of August for the 2022/2023 academic year at Seputih State High School 1 Surabaya, Senior High Schools Bangun Cipta and Senior High Schools Miftahul Ulum. The three high schools were selected based on differences in school accreditation ratings and the use of a scientific approach during the biology learning process. The population of this study came from all students majoring in science class XI at Seputih State High School 1 Surabaya (accredited A), Senior High Schools Bangun Cipta (accredited B) and Senior High Schools Miftahul Ulum (accredited C) totaling 231 students. Samples were taken using *purposive sampling* technique. Provisions for taking samples, students have studied the material on the structure and function of cells and are willing to participate in research. The samples obtained amounted to 111 students. The research design used is *ex post facto* (Table 1) (Hasnunidah, 2017), description: Argumentation Ability (Y) and Acreditation Ratings (A, B and C).

Table 1. Ex-Post Facto Design

(X) Scientific Approach		
XA	XB	XC
Y1	Y2	Y3

Quantitative data for this study were obtained by directly giving students some argumentation essay on structure and function of cells topic. The essay refer to The *Competiting Theory Strategy* which then the student answers obtained are analyzed using the scoring technique from the Toulmin framework (TAP). In the Table 2 is the argumentation rubric used based on adapted by Hazeltine, (2011).

After the score results from the rubric above were obtain, the final score of students' argumentation ability from each high school was grouped based on the argumentation ability achievement category according

to (Suwono et al., 2017) which is presented in Table 3.

Table 2. Argumentation Abilities Scoring Rubric

Aspect	Score			
	4	3	2	1
Claim	The claim is easily distinguishable and is well written.	The claim is well written, but could use some clarifying.	The claim is not quite clear, and needs developing.	The claim is indistinguishable or doesn't exis.
Grounds	The grounds to your argument are clear, concise, and easy to identify.	The grounds to your argument are easily identified, but need some clarifying.	The grounds to your argument are murky and need some development.	The grounds to your argument aren't displayed or aren't relevant.
Warrant	The warrant is well written, easily identifiable, and connects the claim and grounds of your argument efficiently	The warrant is clearly identifiable, but could use some clarifying.	The warrant is unclear, but there is something connecting your claims and grounds.	The warrant doesn't connect your claim to your grounds or it isn't easily identifiable.
Backing	Evidence supports the warrant.	Evidence that supports the warrant, but could use some clarifying to show connection as evidence.	Evidence that supports the warrant but the connections need to be clearer.	Evidence that supports the warrant is not identifiable or does not support the warrant.

Table 3. Achievement Category of Students' Argumentation Abilities

Argumentation Ability Final Score	Category
88-100	Very good
75-87	Good
62-74	Moderate
49-61	Poor
<49	Very poor

The qualitative data obtained from the results of student questionnaire responses related to student learning experiences and results of interviews with Biology class XI teachers related to the learning process. A documentation study was also carried out regarding the facilities provided by the school in supporting Biology learning.

Results and Discussion

Since the new school year in August 2022, all learning processes at Seputih State High School 1 Surabaya, Senior High Schools Bangun Cipta and Senior High Schools Miftahul Ulum have been carried out face-to-face. So that the research process can be carried out directly in each school. During the learning process each Biology teacher admitted that they had taught the subject matter of cell structure and function with scientific approach. The following are the results of research and discussion of research conducted in three high schools with different accreditation ratings to determine students' argumentative abilities

Description of Students' Argumentation Ability

Students' reasoning ability based on analysis of test results data in this study showed that there was an average difference between school groups at accreditation ratings A, B and C. The mean value, standard deviation, highest score and lowest score in the data can be seen in Table 4 (Description: N = total students).

Table 4. Argumentation Ability of High School Students with Different Accreditation Ratings

Accreditation Rating	N	Mean ± Standard Deviation	Highest score	Lowest score	Category
A	37	54.21 ± 11.77	70,63	31,32	Poor
B	37	43.92 ± 10.67	61.25	25.00	Very poor
C	37	41.37 ± 9.28	60,63	26,25	Very poor

Based on Table 4, it can be seen that the average argumentation ability of high school students accredited A is higher than that of high school students accredited B and C. Likewise, the average argumentation ability of high school students accredited B is higher than that of high school students accredited C. The average argumentation ability of high school students accredited A included in the "low" category, while high school students accredited B and C were in the "very poor" category. The average distribution of students' argumentation abilities classified into the achievement category of students' argumentation abilities can be seen in Figure 1.

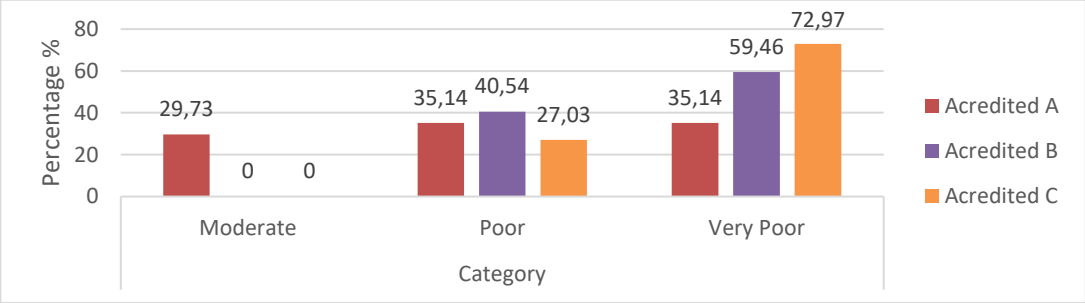

Figure 1. Graph of Achievement Categories of Argumentation Ability of Students in High Schools with Different Accreditation Ratings

Based on Figure 1, students in the three high schools studied showed a tendency for their ability to reason in the "very poor" category. Students who reach the "moderate" category are only found in Senior High School accredited A. The higher argumentation ability of Senior High School students accredited A than Senior High School students accredited B and C is allegedly due to differences in the learning processes experienced by students.

Factors Affecting Argumentation Ability

Based on the results of interviews and questionnaires, only Senior High School accredited A can carry out all 5M activities using a scientific approach. This is thought to be one of the reasons for the higher argumentation ability of high school students accredited A than high school students accredited B and C. Through 5M activities students can exchange ideas, carry out investigations in the form of practicum activities or seek information from various sources in order to solve a problem. These conditions support students to develop their argumentation skills. Mubarok et al. (2016) that a learning model based on a scientific approach has a strong influence on students' argumentative abilities. This can be happen because during learning students are directed to develop scientific argumentation skills through investigation, development and presentation of works and discussion that are applied using a scientific approach.

The qualifications of Biology teachers who teach in schools are also a consideration. Teachers in Senior High School accredited A and B come from biology study programs, so they are linear with the subjects they teach. Meanwhile, teachers in Senior High School accredited C come from physics study programs, so they are not linear. The non-linearity of study programs with the subjects taught by the teacher can be the cause of the lower argumentation abilities of C-accredited high school students than accredited A and B high school students. Teachers with the same educational background as the subjects they teach will be better able to plan, process and condition classes. well compared to teachers with different backgrounds. Waluyo et al. (2021) states that the suitability between a teacher's educational background and the subject he cares for will affect the way the teacher presents the material. Syaidah et al. (2018) also states that teachers must meet academic qualifications in the scientific field that are relevant to the subjects they teach so that they are called competent in their field of work. Competent teachers will be better able to manage their classes so that student learning outcomes are better. Comparison of students' argumentation abilities among high school students accreditated A, B and C was tested statistically using the ANOVA test which is presented in Table 5.

Table 5. One Way Anova Test Results

Source	Sum of Squares	Df	Mean Square	F	*Sig.*
Between Groups	3418.107	2	1709054	15.15	0.001
Within Groups	12186.234	108	112,835		
Total	15604.341	110			

Table 5 shows the sig. p<0.05, which means that there is a difference in argumentation ability between students in Senior High School accredited A, B and C. Furthermore, the LSD (Lesmal Significant Difference) test was conducted to find out which groups had significant differences. The results of the analysis can be seen in Table 6.

Table 6. Least significant difference test results

Accreditation Rating		Difference in Average Value	*Sig.*	Information
A	B	10.28730	0.001	Real different
	C	12.83784	0.001	Real different
B	A	-10.28730	0.001	Real different
	C	2.55054	0.304	Not really different
C	A	-12.83784	0.001	Real different
	B	-2.55054	0.304	Not really different

The results of the hypothesis test in Table 5 show that there are differences in the students' argumentation abilities in Senior High School accredited A, B and C. However, the results of the LSD follow-up test (Table 6) which were subsequently carried out, showed that there were no significant differences in the students' argumentation abilities in Senior High School accredited B with C. This allegedly happened because the school facilities provided by Senior High School accredited B and C were not much different. Based on observations, the high school library accredited A is well managed, the available books support the curriculum used, the biology laboratory is also well managed and inventoried. In contrast to Senior High School accredited B, where the school is not ready to serve the process of borrowing books for students, the school's laboratory cannot be used because it is used as a classroom. It is the same as the library in a C-accredited high school which cannot be used because it has changed its function to a classroom, besides that the school also does not yet have a laboratory that can support biology learning. This shows that both B and C accredited Senior High School have not met the minimum requirements for the standard of facilities and infrastructure of a school which can be one of the reasons for the not much difference in the argumentation abilities of their students. Permendiknas Number 24 of 2007 states that to ensure the achievement of learning, adequate facilities and infrastructure are needed. These facilities and infrastructure must meet the minimum requirements set out in the standard of facilities and infrastructure. A Senior High School has at least the following infrastructure: classrooms, library, and laboratories (physics, biology, chemistry, computer, language).
Based on the assessment of school accreditation, Senior High School accredited A received a score of 91, while Senior High School accredited B and C received almost the same scores, namely 82 and 80. This indicates that the fulfillment of SNP in Senior High School accredited B and C is not much different. Several standards in Senior High School accredited B such as: standards for teaching staff; standard of facilities and infrastructure; management standards and financing standards also still get scores that are categorized as sufficient. Fulfillment of all SNPs as well as possible is of course very useful in supporting the smooth learning process. Safahi et al. (2019) argues that schools with A accreditation are certainly quality schools that have fulfilled the SNP assessment better than schools with B or C accreditation. Through the fulfillment of the SNP the school can support the learning process well and reduce the presence of completeness disturbances that can hinder the learning process so that it does not run optimally.
Even though the average value of the argumentation abilities of high school students accredited A is higher than those of high school accredited B and C, in fact Figure 1 shows that most of the students' argumentation abilities from the three schools fall into the "very poor" category. This is thought to occur because the teacher has not fully implemented learning that can train students' scientific argumentation abilities. Analysis of the learning documents, namely the lesson plan and LKPD made by the three high school teachers with different accreditation ratings, shows that the objectives and learning steps of the three lesson plans have not directed students in compiling claims, grounds, warrants, and backing, while the LKPD made tends to only train students to collect grunds only. Zulainy et al. (2021) states that students have not been trained in their argumentation skills because the teacher has not implemented a learning model that can make students active in arguing. Teachers still use the lecture method

accompanied by assignments which causes students to be unable to develop their abilities through learning experiences while at school.

The results of student responses and teacher interviews showed that the teachers from the three high schools had never provided description questions which included aspects of argumentation and had never assessed students' scientific argumentation abilities. The questions given tend to only measure aspects of knowledge. Students who are not used to being trained in their argumentation skills during the learning process will find it difficult when faced with questions in the form of argumentation as used in this study. Indrawati & Febrilia (2019) state that students' low ability to argue is marked by students' difficulties in solving unfamiliar problems. This is because most students only follow directions from the teacher in class in solving a problem. Pitorini et al. (2020) and Karlina & Alberida (2021) also stated that students' low argumentation abilities were caused by teachers not providing a platform for developing argumentation abilities. Learning activities only focus on cognitive aspects but have not trained students in reasoning.

Efforts to develop students' argumentation abilities have been carried out by each teacher at the different accredited high schools. For example, by giving trigger questions and then asking students to express their opinions, getting students used to making presentations, making conclusions at the end of learning and conducting question-and-answer discussion activities. Such training can assist students in producing a rational argument, especially arguments in oral form. But in fact not all students can express their arguments, there are still high school students accredited A who lack confidence in expressing their opinions, some high school B students are less enthusiastic in arguing, and many high school students accredited C are still hesitant to give their opinion. As is well known, students have various characteristics, some students are more accustomed to being silent or giving answers as short as possible according to the questions given. This can happen because of a lack of self-confidence and motivation of students to argue. Siregar & Pakpahan (2020) in their research found that some students were not and were not active in discussions, were unable to provide arguments, and the arguments given were still weak. According to Mahardika et al. (2015) the lack of student activity in finding opinions independently is the main factor in the low ability to argue. This can be seen from the habits of students who only rely on other people's answers without issuing their own opinions.

Evaluation of the application of the scientific approach in Senior High School accredited A is carried out through supervision, while in Senior High School accredited B and C this has never been done. The scientific approach used by Senior High School teachers accredited B is not explained in detail in the lesson plans. The learning steps of the three lesson plans are also not carried out according to the learning model syntax. What's more, the researchers did not make direct observations during the learning process, so the suitability of each learning model and the scientific approach that teachers have used so far has not been known. If the scientific approach and learning model that has been applied so far is not optimal, then this can be one of the causes for the large number of students who have very poor argumentation skills. Hasnunidah et al. (2018) in his research showed that, 54% of teachers from his research did not use the 5M activities and 42% could not organize them in a logical sequence. Most teachers do not understand correctly learning models based on scientific approaches. The method often used is discussion, followed by assignments, lectures, and questions and answers. This shows that the teacher's understanding of implementing a scientific approach through appropriate learning models cannot be said to be good.

According to Budiyono, (2020), argumentation ability can develop well if students are able to master the concepts well. In other words, a lack of understanding of the concept of cell structure and function can be a factor causing students' low ability to argue. The lack of understanding of this concept is thought to be due to a less than optimal learning process. This can be seen from several stages in the scientific approach that cannot be implemented during the learning process. In fact, the implementation of all stages of the scientific approach to learning provides several advantages, including: 1) the learning process is more centered on students so they are more active in learning, 2) the learning steps are systematic so that it makes it easier for teachers to manage the implementation of learning, 3) provides opportunities for teachers to develop creativity and invite students to interact more actively with various learning resources, 4) the learning steps involve scientific process skills in constructing concepts, laws and principles, 5) the learning process involves cognitive processes that stimulate high-level thinking skills, and 6) develop student character (Rhosalia, 2017).

Cells are complex materials, containing chemical components, structure, function and processes that take place in cells. Cell material is also abstract with a lot of content that must be studied. There is still a lot of vocabulary that students feel is foreign. According to research conducted by Ramadanti, (2022) the level of student learning difficulty in the cell concept is classified as high with a percentage of 73.2%. Meanwhile, the highest level of learning difficulties is found in indicators of cell structure and function with a percentage of 90.3%, followed by indicators of transport mechanisms in membranes (84.3%), chemical components of cells (72.2%), function of plant and animal cell organelles (64.1%), and the structure of plant and animal cell organelles (55.1%). This shows that cells are material that is still considered difficult by students.

Analysis of each Aspect of Students' Argumentation Ability

Assessment of students' argumentation abilities is carried out based on their competence in providing claims (statements) accompanied by grounds (data/facts), warrants (guarantors), and backing (supporters) which are assessed by scoring referring to the TAP argumentation rubric (Toulmin Argumentation Pattern). Figure 2 below illustrates the scores for each aspect of the argumentation obtained by students from the three Senior High Schools.

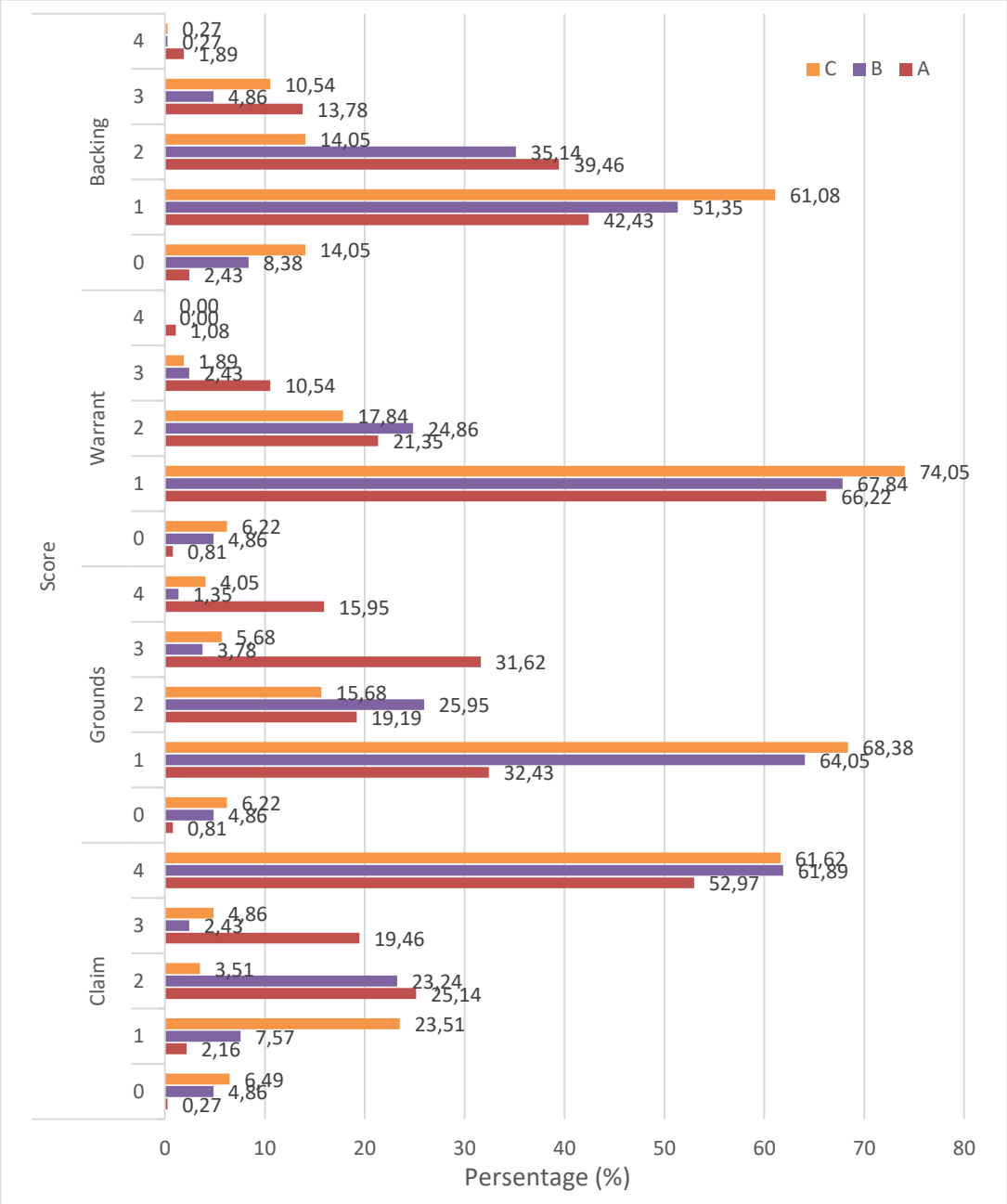

Figure 2. Graph of High School Students' Argumentation Ability at Different Accreditation Ratings Based on Each Aspect of Argumentation

Based on Figure 2, most of the students from the three high schools studied have been able to make

good claims, but have not been able to provide grounds, warrants and backing in accordance with the claims made. Through this graph it can be seen that the scores obtained by students on the argumentation component other than claims such as grounds, warrants and backing tend to only produce a score of 1. Even so, the percentage of obtaining scores 4 and 3 on almost all aspects of the argumentation of Senior High School students accredited A looks higher than students Senior High School accredited B and C. Even on the warrant aspect, only high school students accredited A are able to get the maximum score (4). However, the highest percentage of claims with the highest score (4) was produced by high school students accredited B and C although other aspects such as grounds, warrants, and backing still produced a low score (1 and 2).

Based on the analysis of each aspect of argumentation in the answers to the students' argumentative ability test, it was found that students from the three high schools studied tended to be able to make good claims, but more than 50% of these students had not or were not able to provide grounds, warrants, and backing. relevant to the claim. This can be seen through the graph in Figure 2 which shows the number of students with a score of 1 on each argumentation aspect except for the claim aspect. The following is an example of a comparison of the answers from the different accredited high school students on each aspect of the argument.

Comparison of student answers shows that students from the three schools studied were already able to make claims that were made and written well in accordance with the linguistic features of the argument. Here students are only asked to choose and rewrite the two statements contained in the problem. Thus, giving a claim is something that is easy for students. Based on questionnaires and interviews, teachers have also facilitated students in arguing by providing flexibility for students to discuss, ask questions, propose ideas/ideas and opinions during the learning process. Activities like this can encourage claims when arguing. Mubarok et al. (2016) in his research stated thatthe percentage of claim aspects reached 80.63% during the pretest and reached 88.63% during the posttest. This shows that the ability of students in the claim aspect is relatively high. This can be understood because the claim aspect is the easiest and most basic aspect in building a scientific argument. Ginanjar et al. (2015) states that claims often arise when the teacher gives directions or when students discuss preparations and steps for scientific investigation. Other studies such as those conducted by Devi et al. (2018); Handayani et al. (2015); Karlina & Alberida (2021) also stated that the most frequently found student arguments were arguments dominated by claims.

Aspects of argumentation other than claims which then often appear are grounds. The ground produced by most students from the three schools studied here is still relatively low, especially among high school students accredited B and C. This can be seen from the graph presented which shows that most (> 64%) of the grounds provided by students get a low score (1). However, the percentage of Senior High School students accredited A who get scores of 3 and 4 seems to be greater than Senior High School students accredited B and C. Based on student answers show that there are differences in the ability of students from Senior High School accredited A, B and C in giving grounds. Grounds given by high school students with A accreditation are well written, in accordance with the claims given, although it still requires a sentence that can connect the grounds with the claims made. Senior High School students accredited A have also been able to provide evidence supporting the link between structure and function of the nuclear double membrane. On the other hand, grounds for high school students accredited B and C have not been able to provide evidence supporting the existence of a link between structure and function of the nuclear double membrane, even grounds for high school students accredited C tend to only move answers from claims previously made. This indicates that the conceptual understanding of Senior High School students accredited A is better than the conceptual understanding of Senior High School students accredited B and C in this material. Handayani et al. (2015) in her research stated that students were only able to understand the questions well, were able to express opinions based on the information they knew, but were unable to answer correctly based on appropriate evidence. This is due to the lack of understanding of the concept in theory.

The lesson plan analysis shows that the steps, media and learning resources used by the three different accredited Senior High Schools have supported development in compiling grounds aspects. But in fact, there are several obstacles in the implementation of lesson plans for accredited B and C high schools. Analysis of lesson plans for accredited B high schools shows that the learning steps do not fully describe the 5M activities in a scientific approach, the media and learning resources used are also not known for their suitability with the material. The activities of gathering information and associating at Senior High School accredited C also could not be carried out optimally due to a lack of learning resources. So there is not much literature that students can use to develop grounds. Sitirahayu & Purnomo (2021) argues that to achieve an increase in the quality of education, one of them must be supported by adequate learning facilities and an effective environment. The use of various media and learning resources will make a difference in student achievement. Learning media is very necessary and must be adapted to learning materials to improve the competence of both teachers and students so that learning can run efficiently.

The warrant aspect became the most difficult argumentation aspect for students from the three high

schools studied. Based on Figure 2, the majority (> 66%) of students from the three high schools gave warrants with a score of 1. In fact, only a few high school students accredited A were able to provide answers with a maximum score (4). The warrants given by high school students accredited A and C are in accordance with their linguistic features, but there is no link between claims and grounds. Likewise with the warrants of C-accredited high school students which are completely unrelated to the claims or warrants made. The low quality of warrants given by students is thought to have occurred because teachers have not facilitated students to make warrants. Based on the analysis of the LKPD used by each of the different accredited high schools, the three of them have not supported students in making warrants. The questions from the LKPD only ask students to write down the data obtained from the results of gathering information while working on the LKPD. Research conducted by Ambarawati et al. (2021) showed that 93.10% of students wrote claims correctly, 52.02% of students were able to write grounds, 48.85% of students were able to write warrants, and 45.50 % of students are able to write backing. Thus, warrants and backing are the aspects that students writes the least about. This means that students are still constrained in connecting data with claims, and including assumptions that can justify warrants and support claims. According to Rahman, (2021) students are not used to it and some have never honed their scientific argumentation skills. This is what teachers rarely do in the learning process at school. The teacher only explores students' arguments as limited to personal opinions that do not require evidence, facts, or support for other opinions.

The ability of students to support or provide backing as can be seen in Figure 2, the highest is at a score of 1. That is, the evidence supporting the warrant is not identified or does not exist. Most of the answers given by students are not related to the warrants made. Based on the students answer, there are no theories, laws, postulates, guidelines and others that support the warrants and claims of the three different accredited high school students, so the theoretical support given is weak. This can happen because during student learning the teacher is not accustomed to making theoretical support for the data provided.The results of the questionnaire show that more than 45% of Senior High School students accredited B and C in giving their opinions are not accompanied by clear sources, thus students tend to only convey what they know without providing supporting theory. Rahman (2021) through the results of his interviews with students said that the biggest difficulty in making answers was how students took key information from a source, then connected it with the facts and data they had. Many of the referenced literature sources come from unreliable non-scientific literature, not from research results. In addition, the students' initial theoretical foundation is still limited, the answers still refer to the textbooks used.

This research is in line with research conducted by Dewantari et al. (2022) which shows that there are significant differences in argumentation abilities between students in high school accredited A, B and C. The average argumentation ability of high school students accredited A is higher than high school students accredited B and C in working on argumentation questions in biology subjects. Mairing (2016) also shows that the ability score of school students accredited A is higher than the ability of school students accredited B, C, and has not been accredited significantly. The average student ability score for schools accredited A, B, C, and not yet accredited is 5.24; 2.29; 3.31; and 2.10. Research by Angraini & Sriyati (2019) also proves that the higher order thinking skills of Senior High School students accredited A are higher than students accredited B even though their abilities are still in the “very poor” category.

Conclusion

The conclusion from this study is that there is a significant difference in the ability to argue between high school students accredited A with B and C (sig. $p<0.05$). However, the argumentation abilities of Senior High School students accredited B were not significantly different from those of Senior High School accredited C (sig. $p> 0.05$). The average argumentation ability of students from Senior High School accredited A is higher than that of Senior High School accredited B and the average of students from Senior High School accredited B is higher than that of Senior High School accredited C. There are several factors that cause students to lack or greatly lack the ability to reason, such as the application of learning that does not lead students to argue, the application of the scientific approach is not optimal, the difference of students characteristics, and the different facilities provided by each accredited school.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

N. Hasnunidah: conceiver, research design, methodology, analysis. **W. Windayani:** data collector, data processing, and writing original draft preparation. **D. Maulina:** proofreader, writer, journal collector,

preceptor and review.

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