Profile of students’ argumentation ability on the topic of environmental pollution

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Abstract. The purpose of this research was identified argumentation ability profile of middle school students on the topic of environmental pollution. This research was used descriptive quantitative method. The sample used in this research was 29 students of class VII.G in one of junior high school. The research instrument used was 6 items essay questions that have been validated by experts and then analysed using TAP (Toulmin’s Argument Pattern) which consist of some components of argument such as data, claim, warrant, and backing. The results showed that 93.10% of students made claims correctly, 54.02% of students presented data, 48.85% of students wrote warrant, and 45.40% of students completed it with backing. Based on the percentage of students’ argumentation ability, it can be concluded that most students have been able to made claims but some of them have difficulty in expressing data, warrant, and backing. It can be used as a reference for teachers so that in the future they can determine design or learning activities that are not only focused on understanding concepts but also can develop students' ability in argumentation.

1. Introduction
The ability of argument is considered significant with the education purpose [1] and important role in Natural Science [2,3]. Argumentation is considered as an important ability to assist students. Thus, students can be actively involved in creating idea in valuating various opinion, considering scientific evidence and making right decision from each problem faced [4,5]. The argument ability is important to be analyzed by student because argumentation lead them to be able to reveal opinion in form of argument, give reason or evidence based on fact, evaluate and justify information from various sources during the observation until drawing the conclusion.

The importance of argumentation requires the need of aspect developed through learning process at school. In fact, learning at school has not practiced good ability to argue well. The result of survey by Ministry of Education and Culture shows that only 2% of Junior High School students in Indonesia who have ability to give written argument well [6,7]. the result of the research shows that students generally are only able to give answers from the questions in opinion (clam), but they hasn’t given reason related to the question with specific evidence.
Argumentation has some components. According to Toulmin’s Argument Pattern (TAP), there are (1) claim (statement or opinion); (2) data (evidence or fact supporting the claim); (3) warrant (the relation between data and claim); (4) backing (support toward claim); (5) Rebuttals (refutation or statement that determines the condition when the argument might be incorrect) [8,9,10].

![Figure 1. Component of Toulmin’s argumentation pattern](image)

Analysis of argumentation ability doesn’t only focus on argumentation components that tries to be raised but it is also important to adjust to relevant topics or learning material. Examples of learning material chosen by researchers in this study is an environmental pollution. This material was chosen because it is very contextual with the lives of students’ daily activity. The number of cases of water pollution, air pollution, and soil pollution that can be found in the environment around students makes this material relevant to be presented and certainly requires argumentation to be able to examine these environmental problems [11,12]. The argument is trying to be built on students in terms of expressing ideas or opinions related to the causes of pollution, the impact of pollution on the environment, or in the form of ideas/solutions to overcome pollution problems in their environment.

From importance of argumentation above, it needs to analyze students’ argumentation ability at school. The analysis of students’ argumentation ability aims to determine students’ argumentative abilities. Thus, data on students’ initial abilities in this argument can be used by teachers to determine the design of learning that is more suitable for students going forward. It is not only guiding students to understand concepts but also can build or train their abilities in terms of argumentation.

2. Methods
The method used in this research is descriptive method with quantitative approach. The sample used in this study was 29 students of class VII G who had studied environmental pollution material, in one of junior high school in Lembang, West Bandung regency.

Collecting the data in sample used argumentative test instrument such as essay of 6 questions arranged based on indicator of argumentation ability (claim, data, warrant, and backing). The instrument used was validated by three validators, such as two expert lecturers and one teacher in the science study field. After following the suggested improvements, the argumentation test instrument had been declared feasible to be implemented.

Instrument of argumentation were distributed to 29 students. Six items were then finished by students. Furthermore, students' answers were analysed based on the components of argumentation contained according to Toulmin’s Argument Pattern (TAP) such as claim, data, warrant, and backing correctly if it matched the criteria found in Table 1.

If claim, data, warrant ad backing which was correctly written by student had given 1 score in each components, if incorrectly, it was given a score of 0. The total score on each component then was counted the total amount for each student to find out what percentage of students write the claim, data, warrant, and backing correctly.
Table 1. Argumentation component

| Argumentation Indicator | Criteria |
|-------------------------|----------|
| Claim                   | Student writes the statement of opinion/claim or decision revealed related to scientific phenomenon. |
| Data                    | Student writes evidence or fact to support claim. |
| Warrant                 | Student writes reasons for justifying a data with knowledge related to claims (relationship of data with claims) |
| Backing                 | Student writes basic assumption of support or theory which can strengthen a claim so it can be trusted. |

3. Result and Discussion

Data of research’s result obtained were data of argumentation test result from 29 students. Argumentation tests of 6 items were analysed to find out the existence of components of argumentation such as claim, data, warrant, and backing on each item that students had worked on. The results of the analysis of the argumentation components in each item were then summed up in their entirety from all students. Thus, the percentage was obtained as shown in Figure 2.

![Figure 2. Percentage of students’ argumentation ability](image)

Based on analysis conducted to students’ argumentation test result shown in Figure 2, it showed that 93.10% students made right claim, for example students wrote claims "fish in polluted rivers will die". In general, students had been able to write claims properly and correctly, but it was different from the data, warrant, and backing components.

Percentage of students write the data were 54.02%. It showed that some students only wrote claim but they could not give data to support their claim. Data is the reason in the form of evidence or facts that support the claim, for example "fish can die because the river is polluted by detergent waste".

The third position was warrant, in which 48.85% students could write warrant properly. They wrote the reason for justifying a data or the relationship between data and claim. Students who wrote warrant such as "detergent waste containing harmful substances cause river water to appear to turn cloudy and foamy, thus, it can cause dead fish".

Furthermore, the last position was component with the lowest percentage, it was backing, in which only 45.40% of students could write basic assumptions in the form of support or theory that could strengthen a claim, for example they wrote "rivers contaminated with detergent waste make water cloudy, foamy, and alkaline (water pH is too high). Fish cannot live in water with too high pH".

Percentage of students’ argument ability shown in Figure 2 explains that in general, students had been able to write claims but they still had difficulty expressing data, warrant, and backing. This meant that students had sufficient ability to express their statements or opinions regarding the phenomena...
presented in the question, but they were still constrained in terms of writing down reasons such as evidence, facts, connecting data with claims, and including assumptions or theories that justify warrant and support claims.

The result obtained had similarity with the findings of some previous researches. The student arguments that were most commonly found were arguments dominated by claim [13]. Students were only able to provide answers in the form of claims but they had not been written the reasons that linked their statements with scientific evidence [7].

In general, most students had been able to write claim correctly. However, only few students were able to include their claims with the right data, wrote down the warrant and the backing. Students had not been able to write their arguments perfectly indicating that students were still poorly trained in terms of arguing or it could also because students had lack mastery in learning material. Data on student argumentation ability can be a reference for teachers to be able to design so that learning activities not only focus on understanding concepts but also can build or train students' argumentative abilities.

4. Conclusion
Students' argument ability is more dominant in revealing claim with percentage of 93.10%. The second position in the data component with a percentage of 54.02%. The third position is a warrant with a percentage of 48.85%. Whereas in the last position is a backing with the lowest percentage of 45.40%. The percentage of this argumentation component shows that most students have been able to write claims but they have difficulty expressing data, warrant, and backing. Students were still poorly trained in terms of arguing or it could also because students had lack mastery in learning material. This percentage illustrates the students initial argumentative ability which can be a reference for teachers to determine future learning activities, with the expectation that learning activities designed by teachers are not only focused on achieving conceptual understanding but also can improve and develop students' ability in terms of argumentation.

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