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High School Students' Argumentation Skills: A Study of Sundanese High School Students' Opinion-forming Skills about Human Cloning Issues

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abstract

Science education has progressed very rapidly both in terms of content and skills as learning experiences. This progress must be responded to by every student and their background, including Sundanese people. Cloning is one aspect of science education content that goes along its controversy, so that argumentation skills are very suitable for every student. It is hoped that they will form opinions based on their point of view on the issue. Sundanese people are known to be simple and to keep their ancestral knowledge from generation to generation. Therefore, it will be very interesting to research how they form opinions on the issue of cloning. This study aimed to investigate the argumentation skills of the eleventh-grade students of a Sundanese High School about Human cloning based on gender and cultural habits. This qualitative research probed argumentation skill quality by claim forming and evidence supplying. Forty-four students of the eleventh-grade were given a research instrument with a snowball sampling technique. Students' worksheet of cloning was used to trawl data of written argumentation skills. Semi-structured interviews encompassed oral argumentation skills data. The family's gender awareness data were obtained through questionnaires and interviews. Furthermore, this research utilized a data triangulation tool by using field notes. Four-scale rubrics were used to determine students' argumentation skills with inductive analysis as a tool to examine the data. The results show that most of the research subjects (Sundanese students) can create simple argument can create mentation skills better than written argumentation skills with relatively no significant differences based on gender differences. According to this research finding, several factors influencing Sundanese students' argumentation skills, such as freedom of opinion-forming in family life, students' role in the family, articulating ideas, and cultural influences, are suggestions.

1. Introduction

Science education should give fruitful experiences to students' real life. Students should develop their knowledge, thinking process, and good attitudes through science education for a better life. Knowledge acquisition, thinking process skills, and attitudes of the students accumulate learning experience and educational process (Anderson, 2012). One of the essential outcomes reflected in current high school science curricula throughout the world is enabling students to understand science to make an argument about socio-scientific issues. Students' argumentation skills will be one of the success indicators of their role in society. Students' argumentation skills are concerned with their decision-making ability to solve a problem (Erduran et al., 2004; Osborne et al., 2004) and linked to their reasoning ability

(Ekanara et al., 2018). Argumentation skills give a basic foundation to decision-makers to make the best decision from all available choices and to have awareness about the decision that has been taken (Kuhn & Udell, 2003).

Argumentation skills in science education, especially biology education, can be associated with biological concepts with controversial attributes, such as cloning, global, and embryonic stem-cell. These concepts will make a disputation in the public domain and sometimes affect social and political situations (Sadler & Zeidler, 2005). A problem that interlinks between social domain and science concepts and practices is called a socio-scientific issue (Sadler & Fowler, 2006). The socio-scientific issue is an appropriate context to reveal students' argumentation skills (Acar et al., 2010, Siska et al., 2020).

Indonesia is a country that has many ethnical groups with their thinking and rules. One of the biggest ethnic groups in Indonesia is the Sundanese. Argumentation skill forming backgrounded by cultural factors will be an interesting study. Therefore, revealing students' argumentation skills backgrounded by Sundanese culture becomes the focus of this research. Sundanese culture gives unique attributes to its people's thinking and reasoning. Besides, a comparison of boys and girls in this ethnic group will make this study richer. Different characteristics between boys and girls or gender differences are considered fundamental phenomena that interlink with an important aspect of life (Bussey & Bandura, 1999).

Some themes of socio-scientific issues and argumentation skills in science education have been studied by several researchers, such as the issue of human genetics (Zohar & Nemet, 2002) and biotechnology (cloning and gene modification) (Dawson & Venville, 2009). Science concepts such as genetic modification of animals and plants for food and medicine, cloning, and embryonic stem cells, often open a debate in society (Dawson, 2007). From several studies that have been carried out related to socio-scientific issues and argumentation skills, finding clear depictions of argumentation skills from a particular cultural group with all its distinctive characteristics is still rare. This study tried to explore argumentation skills in the Sundanese cultural group with all of the characteristics inherent in these cultural groups about human cloning issues.

Based on the research problems outlined above, three research questions guided the design and implementation of this research: (1) how is the profile of Sundanese students' argumentation skills about cloning? (2) how is the profile of Sundanese students' argumentation skills about cloning based on gender differences?, and (3) what kind of cultural

aspect affects the argumentation skills of Sundanese students?. Those three research questions guided and gave a direction to this research to remain on the expected focus.

This research needed to be done because there were still a few similar studies revealing how a certain cultural group with all its inherent characteristics formed arguments about socio-scientific issues. How students based on gender and family gender awareness in Sundanese cultural groups contribute to developing argumentation skills is very interesting to reveal.

2. Method

The research method used was qualitative research with a case study approach (Denzin & Lincoln, 2011; Fraenkel & Wallen, 2009) to reveal argumentation skills in Sundanese cultural groups. This study involved 44 participants by using cloning argumentation worksheet to trawl students' Written Argumentation Skills (WAS), cloning argumentation interviews to capture students' Oral Argumentation Skill (OAS), interview and questionnaire forms to obtain data on Family' Gender Awareness (FGA) and the field notes a triangulation instrument of the research data. Participants determined using the Snowball sampling technique came from a school near Kampung Naga, Tasikmalaya Regency in West Java, as a sample group of Sundanese culture. This research was conducted from March to May 2014.

OAS Data were obtained through interviews arguing students on cloning issues in the form of a controversial standpoint. The interview of the argument lasted about 20-30 minutes. In some cases, the interview contained introductory questions intended to provoke students to argue. The interview on argumentation needed to get special attention. For example, if there were doubts about the students informing their arguments regarding a particular issue, it would be continued on other occasions. The interview was carried out in conducive places such as the classrooms, the school garden, and the teachers' room.

The argumentation interview consisted of three controversial questions regarding the issue of cloning. In practice, students were given time to think about 3-5 minutes to form an opinion and provided evidence to substantiate their opinion. All students' answers were transcribed and coded without blaming any answers to students.

WAS data were obtained through an argumentation worksheet that was answered by the students. The worksheet contained standpoints related to cloning issues that students must respond to. Before answering the worksheet, students were explained that the worksheet was

intended to know the skills of argumentation in writing without the intention to assess each individual and their results would not affect the value of the report. A description of filling the worksheet to answer it honestly without cheating a friend was also provided. It was because the expected response was the personal opinions of each student.

The data that had been collected previously were analyzed shortly after accumulated to find a little description of the deficiencies and the depth of data. To overcome such things, these studies had an expansion draft research buffet through additional questions. Interviews followed up gender awareness of the students' families with some students' families showing unique data characteristics. Besides, field notes were also employed to triangulate data related to this. The selection of students was based on the uniqueness of the family data that had been analyzed before.

The implementation of the interview was conducted with ten selected families. Before asking the interview questions, the intention of the interview was explained. The language used in the interview was flexible. Sundanese language was used when there were families who could not fully capture the meaning of interview questions. Besides interviewing the students' families, interviews were also carried out with the indigenous people in Kampung Naga that still uphold Sundanese philosophy as a way of life. The technique of interview implementation was quite similar to one conducted with the students' families. All data obtained from the research instruments (worksheets, argumentative interviews, family's gender awareness, and field notes were analyzed using descriptive qualitative analysis by looking at the data's characteristics.

Data analysis was done using the interpretation technique on the data collected at the initial stage, and which aspects requiring confirmation (assertion) were reviewed. Then, it was used to formulate additional research questions as a guide on the next data retrieval. It was done to get sustainable results from the first to the last findings. It is done simultaneously with the data collection which is a characteristic of qualitative data analysis (Miles & Huberman, 1994). Data analysis on the level of students' argumentation skills obtained from argumentation sheets and interviews adapted the criteria developed by Dawson & Venville (2009), as shown in Table 1.

Table 1. Argumentation skill levelling

Argumentation skill Level	Description	Code
Level 1	Contains only claims (assertions, conclusions drawn, or proposition).	c
Level 2	Contains claims and data (evidence supporting claims) and/or a warrant (the relationship between the claims and the data).	cw, cb, cq
Level 3	Contains claims, data, warrant, and backing (there are assumptions to support the warrant) or qualifier (condition to support the truth of the claim).	cwb, cwq
Level 4	Contains all components of argumentation: a claim, data, warrant, backing, and qualifier.	cwbq

The data obtained from students' parents about gender awareness in the Sundanese culture ethnic were analyzed using specific criteria developed by the researchers. In the question form, points in each question describe to obtain inferences of consciousness of gender or gender consciousness tendency in educating family (children) were categorized by researchers into two family types based on gender awareness, namely: gender-literate family and conservative gender family.

3. Result and Discussion

This research examined the students' argumentation skills in spoken (OAS) and written (WAS) forms. OAS shows students' ability to establish claims and evidence and support the claims orally, while the WAS is in written form. OAS data were obtained through argumentative interview instruments, whereas students' written argumentation skills data were obtained through students' argumentation worksheets. OAS data recapitulation of students and its distribution can be seen in Table 2 and described in Figure 1.

Table 2. Students' oral argumentation skills (OAS)

	Level 1	Level 2	Level 3	Level 4
All (n=44)	1	15	24	4
Percentage	2.3%	34.1%	54.5%	9.1%
Girls (n=22)	0	8	12	2
Percentage	0%	36.4%	54.5%	9.1%
Boys (n=22)	1	7	12	2
Percentage	4.6%	31.8%	54.5%	9.1%

Table 2 shows that most of the students' OAS is at Level 3, which is about 54.5%. This means that 24 students consisting of 12 male students and 12 female students have been able to establish a claim (claim) correctly with accompanying evidence (backing) and guarantee (warrant) opinion on the claim. However, it has not reached a complete comprehensive

argument yet because there is still an argument component that is not included in their opinion.

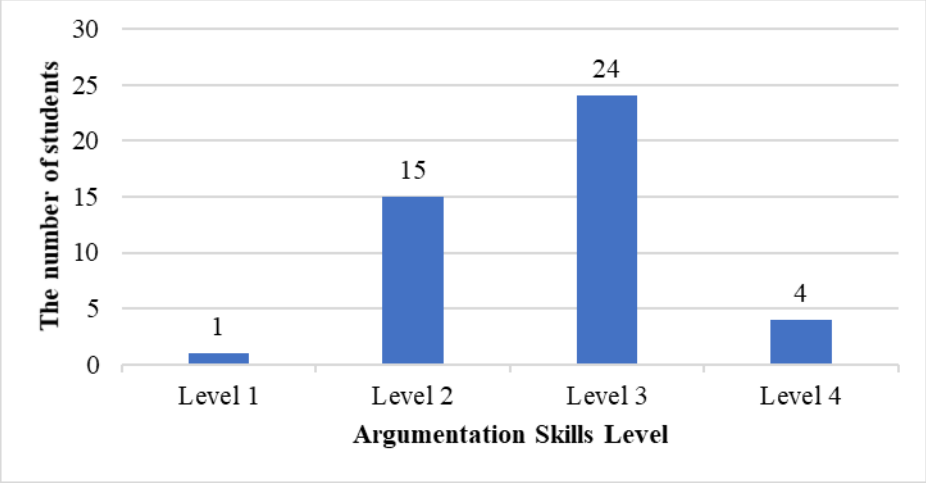

Figure 1. Sundanese students' oral argumentation skills

Students' Written Argumentation Skills (WAS) data and its distribution can be seen in Table 3 and described in Figure 2.

Table 3. Students' written argumentation skills (WAS)

	Level 1	Level 2	Level 3	Level 4
All (n=44)	2	26	14	2
Percentage	4.5%	59.1%	31.9%	4.5%
Girls (n=22)	1	10	9	2
Percentage	4.6%	45.4%	40.9%	9.1%
Boys (n=22)	1	16	5	0
Percentage	4.6%	72.7%	22.7%	0%

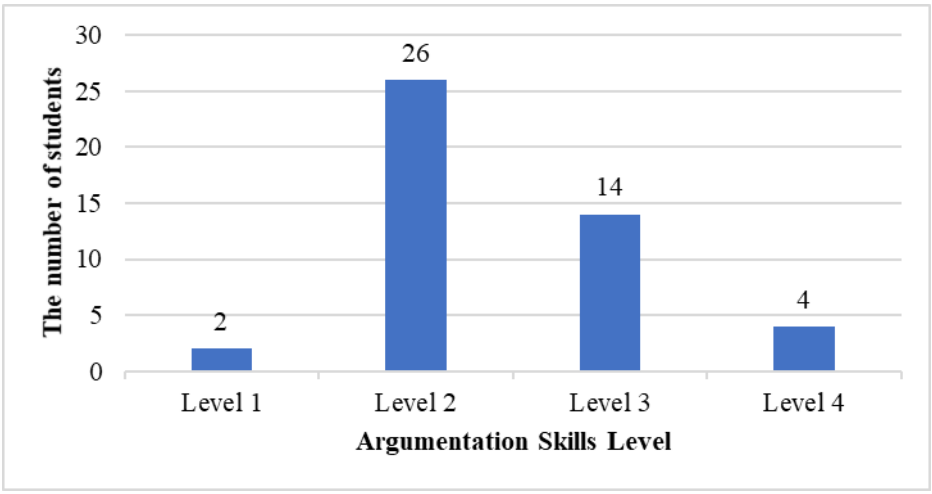

Figure 2. Sundanese students' written argumentation skills

Table 4. Family gender awareness

	Gender-conservative family	Gender-literate family	Unidentified
Total family (n=44)	4	37	3
Percentage	9.1%	84.1%	6.8%

Table 4 shows that most families of students in a group of Sundanese culture (84.1%) as the subjects of the research belong to gender-literate families, meaning that the families do not discriminate children's education or treat them according to the division of tasks, educational priorities, and freedom of speech in the family. However, four families (9.1%) belong to gender conservative families that still discriminate between boys and girls.

This research found that the average of students' argumentation skills in a high school group of Sundanese culture on socio-scientific issues was between Level 2 and 3, either in spoken or written forms. The finding can be interpreted that students of Sundanese ethnic groups can already form pretty good arguments. These findings contradict the research conducted by Perkins (1985), finding that students' ability to form an argument can be disappointing. Another study that is not in line with the findings was conducted by Darabi et al. (2003) on the history subject, revealing that high school students' argumentation skills on the history subject are still low. The findings are made possible because of the differences in themes or issues that are used in the research of Perkins (1985). Darabi et al. (2003) did not include the socio-scientific issues that could stimulate students' argument. Another study excluding the socio-scientific issues was conducted by Lubben et al. (2010), indicating a low level of student's argument.

Socio-scientific issues appear to be one of the key factors that can stimulate someone to argue. Research conducted by Dawson & Venville (2009) used the concept of biotechnology as an issue on how the socio-scientific argumentation skills stimulate the students. They posited the same findings with this research that students have established claims and proof of their opinions, although the data or evidence given by students is still simple. Social-science issues are organized interestingly to trigger someone to form an opinion or opinions. Knippels et al. (2009) did it by comparing the use of video media with modules to trigger students to form an opinion regarding the issue of genomics. They argued that with the same socio-scientific issue, groups that use the videos tend to form opinions better.

From the findings of this study and some relevant research, it can be concluded that the issue of socio-scientific research is an important theme in argumentation to stimulate the

students to form an opinion, especially in science education. However, the research on students' ability to give arguments still has its challenges though it has already used the socio-scientific issues. As suggested by Sadler (2004) that in forming an opinion, students have difficulties regarding the evaluation of the evidence, the conceptualization nature of science (NOS), and the making of decisions based on values on socio-scientific issues. Another problem is explained by Foong & Daniel (2010) regarding the issues related to the complexity of the structure of the argumentation and students' content knowledge. Therefore, the optimization of the role of science education teachers is desirable, especially in providing meaningful learning for students, particularly the supply of skills of making a good argument.

The study distinguished between the students' oral argumentation skill (OAS) and writing (WAS). The OAS shows that most students are at Level 3, while WAS shows that most students are at Level 2. It can be said that the students in Sundanese culture tend to be better in OAS than WAS. This is possible because parenting is applied within the students' families through the research instruments, and it is found directly on the field that students were given the freedom to give their opinion orally. One's thinking process happens in her or his brain and thought, and then it is stated through her or his tongue and later expressed through writing embodiment of a more complex expression.

The dialogues done between parents to their children consciously contribute positively towards students' WAS. Research conducted by Dawson & Venville (2009) and Ekanara et al. (2016) use continuous interviews to measure students' oral argumentation skills. They found more positive results compared to research conducted by Lubben et al. (2010) using the test in measuring the quality of students' argumentation skills in writing. Another explanation that may be associated with these research findings and Dawson & Venville (2010) and Lubben et al. (2010) is an oral argumentation skill quality has a more interactive characteristic, so the instrument can trigger more students to form an opinion.

Overall, many students have been able to form opinions regarding the socio-scientific issues given as has been explained earlier that the argument has some components like data, claim, warrant, backing, qualifier, and the reservation, with the determination that the students are on Level 2 for their written argumentation skills. It means that students have been able to make claims supported with backing or reservation for the claims. Research conducted by Chin & Osborne (2010) shows that about 42.9% of students were able to establish a claim

properly. The majority of students have been able to establish claims regarding socio-scientific issues, though most of them were just simple claims.

Students in a “Sunda” environment grew up with customs, and their families applied Sundanese culture. Therefore, either directly or indirectly, the cultural values will rub off on students through family education. A student's argumentation skill is one of the strong indicators of his or her ability. Students’ oral argumentation skills examined show that high school students in a Sundanese ethnic group have pretty good argumentation skills between Level 2 and Level 3. This refers to a group of Sundanese students who can share their opinion in the form of argument claims backed up with pretty good reasoning. One thing that is interesting to the argument put forward is revealed by students’ of Sundanese ethnic group about the cloning issue is dominated by claims of backing leading to religious values and the Sundanese culture itself, because the nuances of religion are very strong in each community of practice group and the vagaries of the Sundanese culture. Therefore, it is no surprise that religious values become the cornerstone of students to form an argument on certain issues.

The arguments are formed by students who oppose cloning largely based on their opinions on religion adhered. Due to very strong religious education in Sundanese ethnic groups, it is not surprising that religion becomes the cornerstone of their thinking to make an argument. Through interviews with students’ families, the conclusion obtained is that religion becomes the way of life of Sundanese culture to determine the group's actions as responses to problems that it faces. Religious teachings that condensed on this Sundanese ethnic group directly or indirectly affect the way of educating children.

Gender awareness is unearthed in this study aimed to look at the equation of treatment, the division of tasks, free speech, the role of treatment, and the priority of education between boys and girls in Sundanese culture families. It can be seen from the results of research that most families in the Sundanese ethnic group are categorized into the gender-literate family, which can be defined as a family whose children’s education is not determined according to one particular gender. In other words, the role of treatment, freedom of speech, and the priority of education between boys and girls in the family are likely to be equivalent. Gender equality is not marginalized with one particular gender. Based on the gender aspect, in general, there are no significant differences between male and female students related to the argumentation skills in responding to socio-scientific issues.

Female and male students' oral argumentation skills are relatively equal, and most of them are at Level 3. It is related to the previous explanation that gender equality between boys and girls in the group. The freedom of speech aspect of Sundanese culture is a rational explanation to explain the findings. Every boy or girl contributes to determining the family policy without discrimination. Therefore, the experience accumulated through family education and formal education is manifested in the form of claim when faced with the problem of (standpoint) socio-scientific issues. However, both male and female students still have difficulties forming or presenting evidence in the supporting argument they make. Ennis (2011) states that one should think about the reasons to support the conclusion that they have made and ensure that the reasons for these are acceptable before they can argue.

The argumentation skills of students in writing show a slight difference between boys and girls. The results show that girls tend to be a little better than boys. The girls' written skills are spreading evenly at Level 2 and 3, and some are at Level 4. In contrast, for boys, no one can achieve Level 4, and they are mostly at Level 2. These findings can be explained with a penchant for writing among students of both boys and girls. It was found that the majority of girls were fond of writing (had a diary book), while boys were not. Girls' written argumentation skills tend to be a little bit better also because girls can be more capable of expressing or revealing their thoughts through writing than boys.

An interesting research finding is that as long as children get equivalent priority roles, education, and the division of tasks within the family, boys and girls show equal argumentation skills. So, it can be concluded that gender is not the variable that can distinguish a person's abilities or skills, but rather the treatment or education (especially education within the family) that determines the matter.

4. Conclusion

This research investigated students' argumentation skills of the Sundanese ethnic group, which stood between Levels 2 and 3. It means that students have been able to establish claims that are supported with evidence and assurance opinion that they have made. The argumentation skills between female and male students tend to be equivalent during treatment or education. The family does not discriminate against one gender. In other words, as long as the family has an insight into gender and applies it to educating the family, gender is not a significant variable against the skills of argumentation. Students' Oral Argumentation Skills

(OAS) found tend to be better than students' Written Argumentation Skills (WAS). Students of the Sundanese ethnic group directed the establishment of the argument or claim on the cultural values considered acceptable. It can be seen that the greatest number of students formulate the argument through reasoning intuitively, leading to religious values and culture. Argumentation skills need to be developed in education curricula, especially in science education, since someone would see through the arguments and judge the matter at hand more thoroughly and critically. The study was not given the depth of knowledge content owned delineates skills related to students. It can be used as a consideration for doing further research on students' argumentation skills. Similar research with the subject of other cultural groups and even multiculturalism is highly recommended so that it is hoped that the cultural aspects related to this can be seen. Furthermore, it can be used as a reference in the preparation of the science education curriculum.

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