



## Profile of *Pesantren* Students' Character, Scientific Reasoning Skills and Its' Relationship

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### abstract

*Pesantren* is an institution that focuses on students' character building. Students have to stay 24 hours in *pesantren* to participate in character building conducted by *pesantren*. Many people trust to educate their children in *pesantren*. Due to people's trust in *pesantren* and 21<sup>st</sup> century skills that should be conquered, the research was conducted to identify students' character, scientific reasoning skills, and its' relationship. The research was conducted in a survey method, using the LCTSR version of 2000 and character self-assessment. It was conducted in one of *pesantren* in Pamekasan. 56 students were participated as the sample of the research. Learning instruction and character building in *pesantren* were also described. The result shows that students in *pesantren* have hard work character as the highest character score and honesty as the lowest character score. It indicates that *pesantren* needs to reform character building program, especially to build honesty. Students' scientific reasoning skills are low. More than 98% are at a concrete level of cognitive development and there is no correlation between students' character and scientific reasoning skills. Due to the result, there should be a transformation in the learning system in *pesantren*, to improve students' scientific reasoning skills.

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## 1. Introduction

Education in the 21<sup>st</sup> century should not focus only on content knowledge, but also on other skills/abilities, such as problem-solving, scientific explanation, scientific reasoning, and creativity. Those skills are needed in the society of the 21<sup>st</sup> century (NRC, 2012), as higher-order thinking skills. Without that skills, the students will not be able to think critically and scientifically. As an educator, designing curriculum, learning instruction, or media embedded with that ability is one of the important tasks in the 21<sup>st</sup> century (Sahin, 2009; Hope & Allen, 2012; Saveedra, 2012).

Scientific reasoning skills, one of the skills that should be conquered in 21<sup>st</sup>-century society, is the ability to explore problems, compose and test hypotheses, manipulate variables, conduct experiments, and evaluate the result of the experiment (Bao et al., 2009; Tajudin & Chinnappan, 2017; Kambeyo et al., 2018). This ability is the scientists' basic ability. As time flies, problems grow much more complicated. Mastering those abilities means being prepared for the more complicated problems students going to face, in their next chapter of life. This ability is not only needed by scientists but all 21<sup>st</sup> century society.

Character building is one of the important tasks in educating the young generation, especially in the 21<sup>st</sup> century. Indonesia aims to have holistic education, to create a young generation being optimal in character, knowledge, and skills. Being skilled and knowledgeable is not enough for human being. Having good character is the main goal of education, to live in a community. '*Cipta, Rasa, Karsa*' is one of the educational philosophies in Indonesia (Rachmawati, 2020) which relates to character building (Rachmawati, 2012).

*Pesantren* is a kind of educational institution in Indonesia. One of the main goals of this institution is to build students' character and deepen students' understanding of Islam (Mashudi, 2020). This institution sharpens students' dimensions of '*Cipta, Rasa, and Karsa*'. *Cipta* means thinking creatively to create some product. *Rasa* means something connected to emotion. It is about what people feel. *Karsa* means the motivation to do something. Improving the component of *Cipta, Rasa, and Karsa* means creating a holistic human being.

There are two kinds of *pesantren*, modern *pesantren* and *salafiyah pesantren* (Junaidi, 2016). Modern *Pesantren* conducts formal education following the ministry of education or ministry of religion in Indonesia regulation while *salafiyah pesantren*, the former concept of *pesantren*, only conducts the learning about religion to deepen students' understanding about Islam, and usually follow ministry of religion in Indonesia regulation, especially the regulation about *pesantren*. This difference affects the instruction that is conducted in their institution. Modern *pesantren* improves their learning instruction as recommended by the ministry of education or ministry of religion (Sumardi, 2012 and Junaidi, 2016) while *salafiyah pesantren* maintain their conventional learning tradition (Sumardi, 2012 and Junaidi, 2016). Although the concept of learning instruction in modern *pesantren* is already different from the concept of learning instruction in *salafiyah pesantren*, many institutions are still influenced by their former concept of *pesantren, salafiyah pesantren*, which influence its' learning system.

Many people trust to educate their children in this kind of institution, *pesantren*. Madura, an island in east java, Indonesia, has more than 800 *pesantren* (<https://ditpdpontren.kemenag.go.id/pdpp/statistik?id=35>). This amount of institution in Madura is evidence that many people, especially in Madura, trust this kind of institution, *pesantren*. People's trust to this kind of institution should be supported by giving optimal service and a learning system for educating their students.

Learning system affects learning outcomes. Student-centered learning tends to increase students' scientific reasoning skills. To have students with good problem-solving skills, learning instruction should practice the strategy to solve the problem efficiently and effectively, such as conceptual problem solving (Doktor, et al., 2015; Wulandari & Shofiyah, 2018). To have students with good scientific reasoning skills, learning instruction should embed it explicitly, such as modeling instruction (Stammen, et al., 2018). To train the students to be able to argue scientifically, learning should embed the way to argue scientifically, such as Argument-Driven Inquiry (Inthaud, et al., 2018). The learning system in *pesantren*, as an institution trusted by many people, also affects students' learning outcomes. Focusing on the learning system in *pesantren* is an important task because many people graduated from *pesantren*.

Some obstacles in *pesantren* education are the competence of teacher and their learning systems (Kesuma, 2017; PS, 2019). Learning system in *pesantren* were still influenced by their former *pesantren* learning system, *salafiyah pesantren*, that tend to conduct teacher-centered environment in their learning instruction (Junaidi, 2016; Winata et al., 2021). Teachers' competence is also essential in transforming the educational system. Teachers' beliefs, pedagogic competence, and content knowledge competence affect learning instruction and the outcome of learning instruction conducted in *pesantren* (Buric & Kim, 2020; Perera & John, 2020). These form *pesantren* students to

be obedient students to their teachers, to observe and follow every teacher's direction (Junaidi, 2016; Ma'arif, 2018; Winata et al., 2021), but there was no evidence in improving students' scientific reasoning skills.

So far, many researches have been conducted in *pesantren*. Most of it explores character-building (Sumardi, 2012; Mashudi, 2020; Zafi, 2021). However, to the educational needs of the 21<sup>st</sup> century, students should not be educated in only one dimension but be educated holistically (Sahin, 2009). Scientific reasoning skills, as one of the skills needed in the 21<sup>st</sup> century, should be embedded in their learning system. This research is conducted to identify the profile of students' character and scientific reasoning skills in *pesantren*, and also the relationship between them due to the characteristic of students in *pesantren* and the learning system in *pesantren*. This research should be conducted as the base to develop learning instruction or media to improve the scientific reasoning skills and character of students in *pesantren*.

## 2. Method

This research was conducted in a survey method. The population was the students in one *pesantren* in Pamekasan. The sampling technique used in this research was cluster sampling. There were 56 students from three classes in *pesantren* as the participant in the research. The research was conducted in a modern *pesantren* with an A level of accreditation.

There were two kinds of instruments used in the research. Instrument to collect students' character and instrument to collect students' scientific reasoning skills. Students' scientific reasoning skills were collected using LCTSR (Lawson Classroom Test Scientific Reasoning Skills) version 2000 (Han, 2013) while students' character was collected using self-assessment of students' character.

There were 24 questions in LCTSR. 11 paired questions and 2 questions. For 11 paired questions, students will get a score of 1 if they could answer the paired questions correctly. The result of the correct answer could be categorized using Piaget's level of cognitive development, in Table 1. The result of students' scientific reasoning skills was analyzed descriptively, as a profile of students' scientific reasoning skills. Learning instruction in *pesantren* was also described, as supporting data to identify students' profile of scientific reasoning skills. It was known by interviewing science teachers and some students there.

**Table 1.** Piaget's level of cognitive development (Stammen et al., 2018)

Piaget's Level	Score
Concrete	0-4
Early transition	5-7
Late Transition	8-10
Formal	11-13

Students' character survey instrument was validated by 2 experts. 33 questions were asked during the survey. Students need to choose 1-4 (Likert scale) due to the frequency they did in their daily. Assessed characters were honesty, responsibility, religious, discipline, hard work, independence, and curiosity. These characters are related to their state as *pesantren* students and the other variable of research (scientific reasoning skills). The score was converted to a 100 scale, then analyzed descriptively and categorized refers to Table 2, as students' character profiles. Such as science learning instruction, character building in *pesantren* was also described as supporting data to identify students' character in *pesantren*.

**Table 2.** Category of character achievement

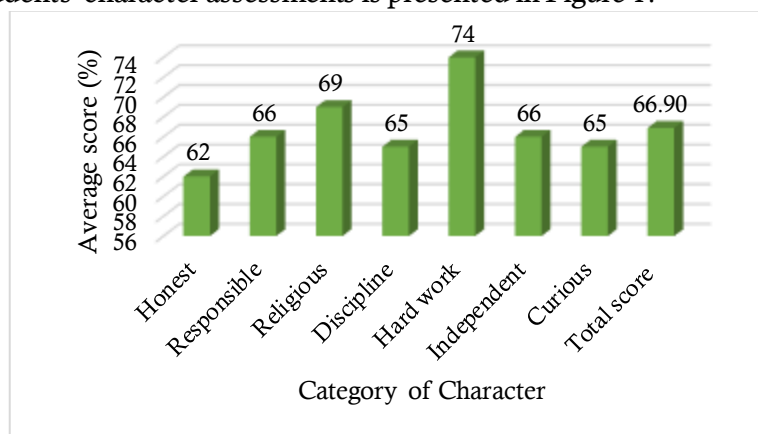
Category	Percentage (%)
Very good	76-100
Good	51-75
Enough	26-50
Not good	0-25

Inferential statistics were used to identify any relationship between students' character and scientific reasoning skills. It is presented in the last part of the result and discussion. Due to the violation of the assumption, that the data was not in the normal distribution, non-parametric analysis was chosen to analyze the correlation between them.

### 3. Result and Discussion

#### Profile of *Pesantren* Students' Character

The result of students' character assessments is presented in Figure 1.



**Figure 1.** Diagram of students' character average score

Figure 1 shows that honesty is the lowest students' character achieved, while hard work is the highest students' character achieved. Students' average total score is 66.9%, which is in the good category of students' character.

A sample of asked questions about honesty is presented in Figure 2 and Figure 3.

I prefer to be punished because of not doing my homework rather than cheating on my friend's assignment

**Figure 2.** Question sample about an honesty character in a positive statement

The question shown in Figure 2 is one of the positive questions about honesty that was asked to the students during the character survey. Students were asked if they keep being honest even though they would be punished by the teacher for not doing their homework.

I let my friends copy my assignments because we help each other when we are in a pinch

**Figure 3.** Question sample about an honesty character in a negative statement

The question shown in Figure 3 is one of the negative questions about honesty that was asked to the students during the character survey. Students were asked to choose between letting their friends commit dishonesty or maintaining honesty in their class.

Based on Figure 1, honesty is one of the characters should be the main focus of students' character building. The average total score for honesty achieved by students is 62%. This score is in a good category, but it is the worst score among characters assessed in *pesantren*. Due to character

building, this score is one of the evidence that education should focus more on this kind of character, even in *pesantren*.

A sample of asked questions about hard work is presented in Figure 4 and Figure 5.

When I find a difficult task/question, I ask a friend/teacher, so that I can understand it well

**Figure 4.** Question sample about hard work character in a positive statement

Figure 4 is an asked question in a positive statement and Figure 5 is an asked question in a negative statement. Students were asked whether they choose to stay or give up when they find difficulties.

I give up every time I know there will be a science test

**Figure 5.** Question sample about hard work character in a negative statement

Based on Figure 1, hard work is the character with the highest average score in *pesantren*. It is still in the good category, but this is the highest score students achieved.

### **Character Building in *Pesantren***

*Pesantren*, an Islamic boarding school, is one of the educational institutions that obligate the students to stay for 24 hours. They live in *pesantren* while attending school. The name *pesantren* refers to a boarding school specializing in Islamic studies. The students stay in *pesantren* for 24 hours, which means they stay far away from their parents. Staying far away from a parent means solving their problem independently, at a younger age.

Students begin activity at school, like other students in other schools, at 07.00 AM and end at 11.30 AM. Learning begins with praying and reciting some of the chapters in the Holy Quran. The teacher comes to the class to lead their praying. During their free time, students are obligated to pray *dhuha*, a kind of *sunnah* praying. They are disciplined to make it their habit. Once they are absent, they are going to be punished. Every praying time, they are obligated to pray together, *jamaah*, at the mosque. There will be a short religious lecturing session after praying. After *maghrib*, the students are obligated to be at the mosque, waiting for *isya* praying. While waiting for *isya* praying, they spend their time reciting and memorizing the Holy Qur'an.

The routine activity in *pesantren* aims to build students' character. By making rules in *pesantren*, students are trained to be discipline and hard worker students. Students are also trained to be honest. Every violation of the rules refers to a particular consequence. They are conditioned to be honest, admit mistakes, and be responsible for the consequences they will get. By staying far away from adults (parent and their families), they are trained to be independent students. They should solve every problem on their own. The activity, such as praying together, reciting and memorizing the Holy Qur'an, and short religious lecturing session aim to build their religious character.

At school, character building is implemented implicitly during learning instruction in the classroom. Students are trained to be responsible for their clean environment. Learning will not start until the classroom is clean. Character building is also embedded with material, such as presented in Figure 6.

By learning science, we educate students to be responsible of their own body and utilize it appropriately

**Figure 6.** Teacher's statement about building character embedded with content knowledge explanation

Based on Figure 1, hard work is the character that achieves the highest score. The students in *pesantren* are trained to be independent and responsible every facing their daily problems. It influences their hard work habit (Baharun, 2017; Zurqoni et al., 2018). This habit explains the reason for their highest achievement in hard work character. Honesty is a character that should be focused on more than other characters. During learning instruction or staying in *pesantren*, the

institution should train students to have high honesty. There are many ways to build students' honest character, such as integrating modules with honesty character building (Afifi & Rahim, 2021; Mulyanto et al., 2017; Sitorus et al., 2019), conducting contextual-based discovery learning (Sugiarti & Husain, 2021; Sugiarti & Husain, 2019; Wahyono, 2020), or conducting a parenting approach, because parenting style and method of socialization between students and parent influence students' honesty (Kosterelioglu, 2018; Pasaribu et al., 2013).

### **Profile of *Pesantren* Students' Scientific Reasoning Skills**

Categories of students' scientific reasoning skills are presented in Table 3. Table 3 shows the level of students' cognitive development based on Piagets' theory.

**Table 3.** Category of students' scientific reasoning skills

Category	n	%
Concrete	55	98.2
Early transition	1	1.8
Late Transition	0	0
Formal	0	0

Based on Table 3, most students are in concrete Piaget's level. Only 1 student reaches the early transition level. Due to Piaget's cognitive development, students in age 12 and more should be at the formal level (Ibda, 2015). Based on the result, *pesantren* students' cognitive development is not consistent with Piaget's level of cognitive development. This finding confirms the previous finding (Yediarani, et al., 2019).

Junior high school students in Jambi were 100% in concrete Piaget's level of cognitive development. In the same city, Jambi, research on scientific reasoning skills was also conducted in high school. Surprisingly, of 12.107 participants, 97% were in the concrete level of cognitive development (Utama, et al., 2018). In Malaysia, the average score of students from 11-16 years old was in the concrete level of cognitive development, while in Thailand, most of the students in high school were already in the transition level of cognitive development (Prasitpong & Rakkapao, 2020). These results need to be researched deeply, due to Piaget's level of cognitive development. It indicates that students' age is not the main factor that contributes to their cognitive development (Mu'min, 2013; Danoebroto, 2015).

### **Science Learning in *Pesantren***

There are three components of learning instruction identified in the *pesantren*-based school during the research: (1) the transfer of knowledge process; (2) competence trained on students; and (3) laboratory activity. These components are related to the success or the failure in students' training on scientific reasoning skills. A classroom with student-centered learning instruction tends to improve students' scientific reasoning skills better (Stammen et al., 2018).

Based on interviews conducted with teacher and students, learning instruction tends to be conducted in a teacher-centered atmosphere. In the transfer of knowledge process, students are not always sitting at their desks and the teacher is not always standing in front of the classroom, but learning instruction focuses on students' activity books. Conducted activity in the classroom is influenced by students' activity books. The students' activity book is one of the students' references during science learning. The students usually get this kind of book at the beginning of school, published by a certain publisher. This activity book is not compiled based on the need assessment of students in *pesantren*.

The ability to communicate well is the competence usually trained in the students. In every learning activity, the teacher tries to stimulate the students to communicate (asking or arguing) during the class. However, some students tend to keep silent, being shy and afraid to ask the

teacher. There is no specific method to improve students' ability to argue or make a scientific explanation, but the teacher keeps trying to stimulate them, to be brave in communicating their ideas.

There is no specific strategy to solve problems trained to the students. Students usually solve the problem in the activity book. The teacher provides continuous feedback to improve students' understanding.

Laboratory activity is a variation conducted in learning. The teacher chooses the appropriate material to be observed in the laboratory, usually related to biology. The microscope is one of the pieces of equipment used in laboratory activity. They observe plant cells using microscopes interchangeably, in a large group. Conducting laboratory activity is adjusted to the equipment they have. Some contents of knowledge are taught through simple activities, which do not require complex laboratory equipment, such as force in physics. They learn the force concept through simple activities such as pushing and pulling the table. Some activities that need to be connected to their daily observation, such as the kind of leaves, are constrained by the kind of leaves around their *pesantren*.

To train certain competencies, learning should be integrated with competencies that will be trained. Scientific reasoning skills will not gain without explicit instruction in scientific reasoning skills patterns (Moore & Rubbo, 2012). In some Chinese universities, there is no improvement in scientific reasoning skills during studying for 4 years in university (Ding, 2013; Ding et al., 2016). Prasitpong & Rakkapao (2020) found that there was no correlation between scientific reasoning skills and high school GPA (Grade Point Average). These findings proved that learning instruction or activity should not only focus on content knowledge but also scientific reasoning skills (Talib, et al., 2018). Based on the description, learning instruction in *pesantren* was focused on content knowledge. Scientific reasoning skills have not been the competence training for the students. This kind of learning instruction, in *pesantren*, is suspected as the reason for the low scores of students' scientific reasoning skills.

### Relationship between Students' Character and Scientific Reasoning Skills

Relationship between students' character assessment result and scientific reasoning skills are presented in Table 3. Table 3 shows every aspect of character assessed during the research.

**Table 3.** Correlation between students' character and scientific reasoning skills (SRS)

		Honesty	Responsibility	Religious	Discipline	Hard work	Independent	Curiosity
SRS	Correla							
	tion	.134	.122	.068	.003	-.001	.225	-.072
	Coeff.							
	Sig. (2-	.325	.370	.621	.983	.993	.096	.599
	tailed)							
	N	56	56	56	56	56	56	56

Based on the result in Table 3, there is no correlation between students' every aspect of character and scientific reasoning skills.

Some researchers tried to find the relationship between scientific reasoning skills and other variables, such as students' GPA (Prasitpong & Rakkapao, 2020), gender (Talib et al., 2018), and consistency of representation (Nieminen, et al., 2018). There was a correlation between some of those variables, and there was no correlation between some other variables. Talib et al. (2018) found that both males and females got a low score for scientific reasoning skills. Prasitpong &

Rakkapao (2020) found that there was no correlation between students' scientific reasoning skills and their GPA. There was a similarity in both. Talib, et al. (2018) found that most of the students were at a concrete level, while Prasitpong & Rakkapao (2020) found that most of the university students in their research were at a transition level. Both found the low scores on students' scientific reasoning skills. This similarity, the low students' scientific reasoning skills, is assumed as the reason for the relationship absence between those two variables. Further research is needed to explore whether the results of combining the two variables in this study show consistent results or not.

#### 4. Conclusion

Based on the result of research, hard work is the students' character highest achievement while honesty is the lowest. The regulation and daily routine in *pesantren* shape students to be hard workers. Honesty is the character that needs to be educated in students more than other, based on the result. Some methods should be tried to improve students' honesty such as embedding honesty education with module, designing contextual-based discovery learning, or conducting consultation sessions with parents to improve parenting style and method of socialization between parent and students because it influences their habits, to be honest. Students' scientific reasoning skills are low. More than 98% are at the concrete level of cognitive development. A learning system that trains students' scientific reasoning skills explicitly is needed to improve students' scientific reasoning skills. There is no correlation between students' character and scientific reasoning skills. Further research is needed to explore the cause of this uncorrelated relationship.

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