



## Capturing Student's Profile of Nature of Science in Sekolah Indonesia Kuala Lumpur

**Amaira Utami\***

Universitas Nahdlatul Ulama Indonesia,  
Jakarta, Indonesia

E-mail: [amairautami@gmail.com](mailto:amairautami@gmail.com)

\*) Corresponding Author

### Article History

Received : 25 Januari 2022

Revised : 18 Maret 2022

Accepted : 25 Maret 2022

**Abstract:** The purpose of this research is to analyze the profile of students' Nature of Science (NOS) of 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> grade Junior High School in Sekolah Indonesia Kuala Lumpur. Descriptive method is used to describe the current condition of students' Nature of Science (NOS) after science lesson on interaction of organisms and its environment topic conducted in the class. The data in this research is gained through constructed response item test that is given without any academics treatment before. The result shows that the tentative Nature of Science (NOS) aspect is the most achieved by the students, while creative and imaginative nature of scientific knowledge possess the least. This research suggested the teachers to execute learning activity that cover the entire aspects of Nature of Science (NOS).

**Intisari:** Penelitian ini bertujuan untuk menganalisis profil Nature of Science (NOS) siswa kelas 7, 8 dan 9 di Sekolah Indonesia Kuala Lumpur. Metode deskriptif digunakan untuk menggambarkan kondisi Nature of Science (NOS) setelah melakukan kegiatan pembelajaran IPA pada topic Interaksi Organisme dan Lingkungannya. Data dalam penelitian ini diperoleh melalui tes item respon yang diberikan tanpa perlakuan akademis sebelumnya. Hasil penelitian menunjukkan bahwa aspek Nature of Science (NOS) yang bersifat tentatif paling banyak dicapai oleh siswa, sedangkan yang bersifat imajinatif dan kreatif adalah yang paling sedikit. Penelitian ini menyarankan kepada para guru untuk mengimplementasikan kegiatan pembelajaran yang mencakup semua aspek Nature of Science (NOS).

**Keywords:** Nature of Science, Student's Profile, Science Education, Interaction of Organisms and Its Environment Topic

### INTRODUCTION

Science is important because we live in a world where the nature is always changing in every second, such as the technology that never stop developing. It is in line with McFarlane (2013) that science is not a static disciplines. Involving science with education, culture, scientific theory and philosophy of science have been a long tradition in order to build up scientific way of thinking (Matthews, 2012). Science is real and focuses on the realism that occur in daily life, science is also the reality of progress and survival that

relative to individual and societal experiences in contemporary setting (McFarlane, 2013). Science is the knowledge that is talked and written in words, not the the ideas that are expressed by the numbers. So, learning science is learning a new dialect with the acquisition with other knowledge, theories and languages (Erickson, 2012). Science helps students to develop scientific habits of mind, giving rise to the interest and excitement that underlie decisions to participate in science especially in daily life (Hayes and Trexler, 2016). Learning

science can not be apart from human life especially for the learners, because we live in a nature where everything relates to science.

Learning of science can not be apart from the Nature of Science (NOS). Nature of science (NOS) has been studied as an important goal of teaching and learning as well as assessment in science education (Lederman et al., 2002). Nature of Science is non-static as well as dynamic where the new knowledge and the theory gained through new studies and new investigations. Nature of Science is an epistemology of science, as the way of knowing, beliefs, assumptions and values that is inherent to scientific knowledge (Celik and Karatas, 2014). Nature of Science (NOS) is an important aspect because by learning science students' way of thinking will be able to face the real situations objectively and have methodical manners in solving the problems that may arise in daily life. Matthews (2012) stated the seven aspects of Nature of Science (NOS) known as "Lederman Seven" that cover all of scientific needs.

Based on the statement of the experts above, Nature of Science (NOS) can not be apart from learning science in classroom. The seven aspects of Nature of Science (NOS) should be reviewed from the result of students' achievement, because it covers all of students' scientific knowledge. Today's condition is, in most of the schools especially Junior High Schools who taught science to the students, the seven aspects of Nature of Science (NOS) are mostly neglected.

The students in Sekolah Indonesia Kuala Lumpur (SIKL) come from various cities in Indonesia who definitely have different social, cultural, educational and religious background. This will impact to how the students communicate and experience learning activity at school. The students in Sekolah Indonesia Kuala Lumpur (SIKL) should be able to adapt with new environment especially the culture and strive to be able to solve the

problem that would arise. Therefore, this would be a specific condition which would contribute to the Nature of Science (NOS). The research presents the students' profile of Nature of Science in Sekolah Indonesia Kuala Lumpur through science learning.

## METHOD

This research is aimed to describe current situation of students' Nature of Science (NOS) in interaction of organisms and its environment topic, not including its impact or effectiveness toward students' achievement. Accordingly, descriptive research method is used to fulfill the aim of this research. Descriptive research is concerned with how what is or what exists is related to some preceding event that has influenced or affected a present condition or event (Cohen et al., 2007). Furthermore, Fraenkel, Wallen and Hyun (2007) reveal that descriptive studies describe a given state of affairs as fully and carefully as possible. Thus, in this research, the object of research is not given any treatment and natural condition is set without any manipulation. It will provide reasonable answer why something is occurred (Arikunto, 2010).

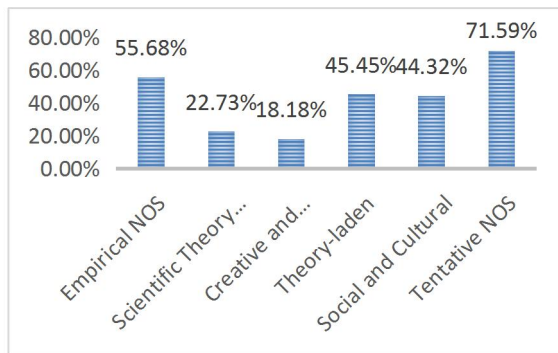
The location of this research is at Sekolah Indonesia Kuala Lumpur (SIKL) Malaysia that uses National Curriculum of 2013 for 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> grade.

The population of this research is the entire junior high school students in Sekolah Indonesia Kuala Lumpur. The samples are Junior high school students from 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> grade which are 88 students in total. The subject of this research is defined under purposed of the responsible teacher of subject which used to implement the constructed response test which is about interaction of organisms and its environment.

## RESULT AND DISCUSSION

Nature of Science refers to the epistemology of scientific knowledge that consist of six aspects in this research

which are (a) empirical nature of science, (b) scientific theory and law, (c) creative and imaginative nature of scientific knowledge, (d) theory-laden nature of scientific knowledge, (e) social and cultural embeddedness of scientific knowledge and finally (f) tentative nature of science. Nature of science was measured using constructed response item test that consist of six questions followed by 88 participants. The result of each aspects of Nature of Science is perceived below on Figure 1.



**Figure 1.** The Percentage of Nature of Science (NOS) Aspect

Figure 1 shows the percentage of six Nature of Science (NOS) aspects achieved by the students. The first aspect is empirical Nature of Science (NOS) which was measured based on natural phenomena, evidence, data and observation. This aspect is being measured from students' answer when listing the abiotic component in class. When students answer the question based on natural phenomena, evidence, data or observation that they found at classroom means that they have good empirical nature of science aspect. The result of students' achievement on empirical nature of science aspect is shown on Table 1.

**Table 1.** The Result of Empirical Nature of Science Aspect

Score	Number of Students
4	49 students
3	18 students
2	21 students

Scientific theory and law is a distinct but equally valid form of scientific

knowledge. Scientific theory and law aspect was measured by how students respond and implement the theories in order to answer the question. The result of students' achievement on scientific theory and law aspect is described on Table 2.

**Table 2.** The Result of Scientific Theory and Law Aspect

Score	Number of Students
4	20 students
3	15 students
2	42 students
1	9 students
0	2 students

Creativity permeates the scientific process, creativity and imagination could not be apart with science because the invention of science comes from it. Creative and imaginative nature of scientific knowledge aspect was measured from students' answer sheet by analyze the way students response the question. Here is the result of creativity and imaginative scientific knowledge aspect that is shown on Table 3.

**Table 3.** The Result of Creative and Imaginative Nature of Scientific Knowledge Aspect

Score	Number of Students
6	16 students
4	14 students
2	56 students
1	1 student
0	1 student

Theory-laden nature of scientific knowledge aspect was measured from students' background, prior knowledge, philosophical perspectives, theoretical commitments, personal experiences and beliefs. Theory-laden Nature of Scientific Knowledge was measured using crossword that consists of 8 clues, and the result was measured by each perfect answer of the clues that got score 1. The result of theory-laden nature of scientific knowledge aspect is described on Table 4.

**Table 4.** The Result of Theory-laden Nature of Scientific Knowledge Aspect

Score	Number of Students
8	40 students
7	26 students
6	12 students
5	5 students
4	4 students
3	1 students

Social and cultural embeddedness of scientific knowledge aspect was measured based on students' essays that relates the answer to the culture of science, or relates to the influence of societal factors such as politics, economics and religion. The scoring system is between 4, 2 and 1. Score 4 means that students' answer relates to the criteria of social and cultural embeddedness of scientific knowledge aspect. The lowest score indicates that students' answer is totally out of social and cultural embeddedness of scientific knowledge criteria. The result of social and cultural embeddedness of scientific knowledge aspect is shown on Table 5.

**Table 5.** The Result of Social and Cultural Embeddedness of Scientific Knowledge Aspect

Score	Number of Students
4	39 students
2	41 students
1	7 students
0	1 student

Science is tentative. There is not any exact theory and law of science because the nature is always changing. Tentative nature of science measures science as the students' perfective as long as it is still based on the theory. The result of tentative nature of science aspect is shown on Table 6.

**Table 6.** The Result of Tentative Nature of Science Aspect

Score	Number of Students
4	54 students
3	9 students
2	19 students
1	2 students
0	1 student

According to the result of the research, the detail of students' achievement on six aspects of Nature of Science (NOS) could be described. The percentage of the students who achieved the maximum score in each aspects of Nature of Science were taken and discussed. Tentative nature of science aspect is mostly achieved by students while creative and imaginative nature of scientific knowledge aspect is the least.

This result is in contrast with Celik and Karatas (2014) who found that role of creativity and imagination aspect of Nature of Science (NOS) score is 39,13 which is higher compare with tentative nature of science aspect score which is just 23,24 given to 220 pre-service teachers. Surprisingly on another reference found that from 38 total participants, there are 22 participants categorized to have good tentative nature of science result, while only 5 participants who are categorized to have a good creative and imaginative nature of science aspect (Buxner, 2015).

Tentative nature of science aspect is mostly achieved by students based on the result of the research which describes science that is never absolute or certain although it is reliable and durable. Furthermore, tentative nature of science is also subject to change shows that the knowledge is based on the result of new evidence and innovation so that previous theory and law can be changed. The instrument of the research was given to 88 students directly without any treatment before. Based on the result of the research, tentative nature of science has not any exact answer although the answer of this question is in the form of number not statement. As long as the answer is still in line with the theory, the students will have good score on tentative nature of science. It proves that science is never absolute and subject to change. Hence, the possibilities of the students to achieve the maximum score will be higher.

Tentative nature of science that mostly achieved by the participants who

are Junior High School students of Sekolah Indonesia Kuala Lumpur (SIKL) will be good for their future. It is because the person who thinks scientifically could understand the nature so that they will do everything wisely in order to keep the nature and avoid some disadvantages that would arise. It is in line with Chen (2006) that tentative nature of science will lead human to be natural and blend with the nature. If this happen, the nature will always be in balance and both of the organisms which are plants and animals as well as human could live in togetherness. More than that, if the students face the problem that would arise in daily life, the students who have good score in tentative nature of science will not depend on one choice only, they will have various choices to do. Chen (2006) stated that science is tentative and never absolute that is applied in daily life. So that. if one choice failed, someone who has tentative nature of science mind-set will directly have other choices so they will not stuck in just one choice. Tentative nature of science ruled students' mind-set to think tentatively and not depend on one perspective only because there is nothing absolute in science. Furthermore, this condition is in line with the nature of science that is always changing as the changing of time, technologies and knowledge (Buxner, 2014). Future, the students who got good result of tentative nature of science will be able to follow the advancement of global era so they will be able to compete with others globally.

From the result of the research, creative and imaginative nature of scientific knowledge is the least achieved by the students. It is proven due to the result of the research that less than a quarter of the participants got the highest score in creative and imaginative nature of scientific knowledge or about 18,18%. Imagination and creativity is source of inspiration and innovation in science which is used along with logic and prior knowledge. Science involves the invention

of theoretical and explanation requires a great deal of creativity so that, creativity and science could not be apart because it is involved in all stages of scientific investigation and particularly relevant to generating and interpreting data starting from the beginning, during and following the collection of data (Lederman et al., 2002; Chen, 2006; Abd-El-Khalick, 2012). Both creative and imaginative almost have the same meaning and both creative and imaginative are really needed almost in every stages of science. Creative and imaginative support science becomes unique and innovative.

A good scientist must be creative in designing a good experiment and also should be imaginative in coming up with a theory, but should use scientific method to stay objective (Akerson, Abd-El-Khalick and Lederman, 2000). Creativity and imaginative is something needed in science and cannot be separated from science, because science without creativity and imaginative will not be a great innovation. Coming up to the result of the research that creative and imaginative nature of scientific knowledge aspect is the least achieved by students that possess the critical position which is less than a quarter or only 18,18% of the students who achieved maximum result on this aspect. Creativity and imagination is really something crucial in science. It is like to build a car with the same specification will sell better the one which is with better design, because people like the design better. It is the real phenomena of creativity and imagination of science in daily life. The low result of creative and imaginative nature of scientific knowledge aspect is not good for students' future, because creative and imaginative are needed in all aspects in life.

Creativity is an important component of problem solving, healthy social, cognitive abilities as well as adult vocational and life success. In education, creativity contributes to future academic performance and academic skills which

help students become better interpersonal and intrapersonal problem solvers (Plucker, Beghetto and Dow, 2004; Mourgues et al., 2016). Moreover, as if although the students are clever but their creativity and imaginative nature of science aspect is lack it will not good, the students will not able to compete globally, because not only clever and smart is needed but creativity and imagination are also needed in this modern era. Someone who has good creative and imaginative nature of science aspect will be able to compete the global competition. It is in line with Militaru, Pollifroni and Niculescu (2015) that the increasing of global competition is based on agility, creativity and innovation. Future, the students who lack creative and imaginative nature of scientific knowledge will not be able to create the innovation in science that could be used and helped others. Therefore, creative and imaginative nature of scientific aspect of Junior High School students of Sekolah Indonesia Kuala Lumpur need to be improved, both of the students, teachers and the parents should cooperate in a way of increasing students' creative and imaginative nature of scientific knowledge aspect.

#### CONCLUSION AND RECOMMENDATION

Research of profiling students' Nature of Science (NOS) has been conducted systematically, based on the research result it is acquired some conclusions that the profile of Nature of Science (NOS) of junior high school students at Sekolah Indonesia Kuala Lumpur mostly achieved tentative aspect and creative and imaginative aspect is the least.

Tentative nature of science aspect is the most highly achieved by the students of junior high school of Sekolah Indonesia Kuala Lumpur. It is proven due to the result of the research that 61,36% of the students achieve the highest score on tentative nature of science aspect, or there are 54 students.

Creative and Imaginative nature of scientific knowledge aspect possess the least achieved by the students of junior high school students of Sekolah Indonesia Kuala Lumpur. It is proven due to the result of the research that it is just 18,18% of the students or there are 16 students who achieve the highest score on creative and imaginative nature of scientific knowledge aspect.

Considering that this research is needed to be developed future, then this research give such recommendations not only for the future researches but also for the teachers to implement it in learning activity especially on Nature of Science (NOS).

#### REFERENCE

- Abd-El-Khalick, F. (2013). Teaching with and About Nature of Science, and Science Teacher Knowledge Domains. *Science & Education*, 22(9), 2087-2107.
- Akerson, V. L., Abd-El-Khalick, F., & Lederman, N. G. (2000). Influence of a reflective explicit activity-based approach on elementary teachers' conceptions of nature of science. *Journal of research in Science Teaching*, 37(4), 295-317.
- Arikunto, S. (2010). Manajemen penelitian. Jakarta. Bumi Aksara.
- Buxner, S. R. (2015). Exploring How Research Experiences For Teachers Changes Their Understandings Of The Nature Of Science And Scientific Inquiry. *Journal of Astronomy & Earth Sciences Education (JAESE)*, 1(1), 53-68.
- Çelik, S., & Karataş, F. Ö. (2015). Relationship Between Pre-Service Teachers' Views of Nature of Science and Their Study Subjects. *Kastamonu Eğitim Dergisi*, 23(2), 755-772.

- Chen, S. (2006). Development of an instrument to assess views on nature of science and attitudes toward teaching science. *Science Education*, 90(5), 803-819.
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*. London and New York: Routledge.
- Erickson, F. (2012). Qualitative research methods for science education. In *Second international handbook of science education* (pp. 1451-1469). Springer Netherlands.
- Fraenkel, J.R., Wallen, N.E., & Hyun, H.H. (2007). *How to Design and Evaluate Research in Education*. San Francisco: Mc Graw Hill.
- Hayes, K. N., & Trexler, C. J. (2016). Testing predictors of instructional practice in elementary science education: The significant role of accountability. *Science Education*, 100(2), 266-289.
- Lederman, N. G., Abd-El-Khalick, F., Bell, R. L., & Schwartz, R. S. (2002). Views of nature of science questionnaire: Toward valid and meaningful assessment of learners' conceptions of nature of science. *Journal of research in science teaching*, 39(6), 497-521.
- Matthews, M. R. (2012). Changing the focus: From nature of science (NOS) to features of science (FOS). In *Advances in nature of science research* (pp. 3-26). Springer Netherlands.
- McFarlane, D. A. (2013). Understanding the challenges of science education in the 21st century: New opportunities for scientific literacy. *International Letters of Social and Humanistic Sciences*, 4(1), 35-44.
- Militaru, G., Pollifroni, M., & Niculescu, C. (2015, November). The Role of Technology Entrepreneurship Education in Encouraging to Launch New Ventures. In *Balkan Region Conference on Engineering and Business Education* (Vol. 1, No. 1).
- Mourgues, C., Tan, M., Hein, S., Elliott, J. G., & Grigorenko, E. L. (2016). Using creativity to predict future academic performance: An application of Aurora's five subtests for creativity. *Learning and Individual Differences*.
- Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational psychologist*, 39(2), 83-96.