

Building Character Through Science Learning with Scientific Literacy Based

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Abstract. Learning science is basically aims to enhance scientific literacy of students. The scope of learning science is to recognize, respond to, appreciate and understand the science, develop the habit of scientific thinking such as critical thinking and creative, independent, and build the positive attitude (soft Skills). Moreover, it will lead to habits on mind, habit to do, and finally build the students' character. The study was done to learn the impact of learning science in relation to enhance character. The descriptive methods were used to observe and learn the science class (chosen under purposive sampling) in middle school. The instruments used were science literacy test and portfolio consist of student observation sheet and the interview format. The research shows, learning science that maximize student's activities through scientific inquiry is the potential way to develop scientific literacy as well as character. Some pillars of character can be built, such as trustworthiness, responsibility, respect, caring, fairness, citizenship, courage, diligence, and integrity.

1. Introduction

Scientific literacy is the capacity of ones to use scientific knowledge, to identify questions, and to draw evidence-based conclusion in order to understand and help make decisions about the world and the change made to it through human activity [1]. Ones who has literate on science will use his/her knowledge on science to think, to solve the problems towards science, especially in his/her daily life.

OECD in PISA 2012 result define scientific literacy as (1) individual scientific knowledge and skills to use the knowledge to identify problems, to gain new knowledge, to describe scientific phenomena, and to make conclusions based on evidence related to the issues on science, (2) Understand the main characteristic of knowledge that is built based on human knowledge and inquiry, (3) sensitive to how science and technology are reshaping the material, intellectual and cultural environment and (4) the willingness to engage with the issues and ideas that relate to science [1]. Synthesis result from some resources [2,3,4] revealed that someone who has a scientific literacy has the following characteristics: using scientific concepts, process skills and values when taking responsible decisions in everyday life, knowing how society influences science and technology and how science affect society, knowing that public controls science through the management of natural resources, recognizing the limitations and usefulness of science to improve human welfare, complying the scientific concepts, hypotheses and theories of science and can be able to use it, appreciate science as its intellectual stimulus, distinguish



scientific facts and personal opinions, and knowing the technology application and decision-making based on technology.

If the students have already an understanding of science and its impact on himself and his environment, then students will start thinking about what to do to solve the problem in daily life related to science [5]. Slowly but sure, this will encourage students to do something. Moreover, this will lead to the enhancement of their skills, critical thinking, as well as attitude. Habits on mind is the initial step toward habits to do. If both of habits have already handed, so the character will change.

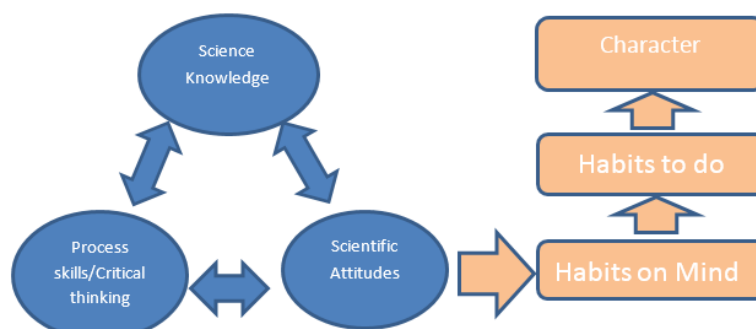


Figure 1. Scientific literacy based learning leads to building character

2. Methods

The research was designed to explore the character indicators emerged after science learning (4 x 90 minutes). Topics studied in learning was electricity (consist of Voltage and Electric Current measurement, Ohm law, 1st Kirchoff law, Conductor Resistance, Resistance Series, and Electrical Power), involving 34 students of middle school, and was arranged with laboratory work. The character indicators that emerged during the lesson was assessed on using portfolio and observed with a check sheet instrument for each student (4 observers). Character was classified into some indicators: trustworthiness, responsibility, respect, caring, fairness, citizenship, courage, diligence, and integrity. Data from four times observations of each student were then classified, processed, and interpreted. The assessment of learning outcomes was also done to see how far the success of science learning from the side of concepts and competencies is in line with the character. The interview was done to support the main data.

3. Results and discussion

The lesson was designed for four meetings: one meeting for initiation and preliminary discussion of concepts (with a simple laboratory work); the next two meetings were laboratory work activities interspersed with discussion, and one final meeting for simple laboratory work, the wrap up and ensuring the student's conception. The observations were done along the fourth meeting, done by four observers (include teacher) who have expertise in science teaching.

The observation result shows that almost all of character indicators appears in each meeting. Citizenship was an indicator that only appears on two students and only twice occurred, in second and third meetings. The other indicators appeared on each meeting. However, not all indicators were performed by all students at each meeting. The most common character indicators in each meeting was responsibility, respect, caring, and integrity. In the last session, most of students were very responsible to their work. They tried to finish their task in group. After completing the task, they tried to help their friends in the group to finish as soon as possible. Most of them said, that they will get the success if all of friends in the group can finish all together. This will lead them to build a solid team work. This is one of the 21st century skills.

After the class teacher asked some students:” why did you help your friends to do their task, the task is not your responsibility, isn’t it?” they answered: one day I will definitely need his help mam..... The other student said, “I am happy to help anyway mam.....! This is exactly what we expected. This means that they are already starting to show good character, and we believe that this is the impact of learning science. Along the class, teacher has always tried to instill the character through the story, being a model, and gave appreciation to student who demonstrate good manner.

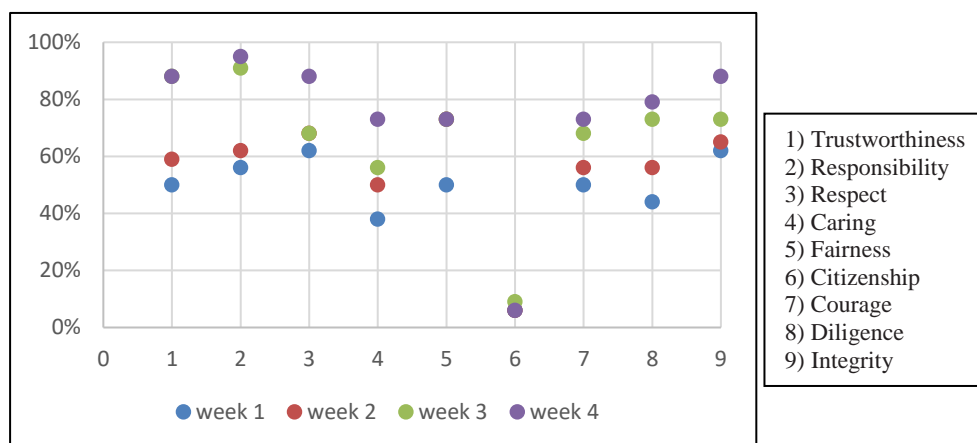


Figure 2. The percentage of student who performed the nine indicators of student character along four times meeting

Citizenship is an indicator that is not expected to emerge along the lesson, because the topic is not quite relevant to that indicator. However, beyond the alleged there were two students who demonstrated this indicator. In all of the meeting the two students always commented on the instrument was used in practical works. The instrument used was created by teacher, and they were very amazed to the very smart tools and easy to use. They said thank god.... Finally, we have our own instead of an imported one.....!! They always say it in every time they used the instrument.

Learning science with student activities as much as possible will shape the good attitude and value of student [6]. If the science learning is designed and implemented as its goals, so it will impact to the enhancement of trustworthiness, responsibility, respect, and caring of student [7,8]. In a conventional science classroom, finding time for building character can be a challenge [9]. However, school or classroom is the first social structure the child encounters, and it provides an excellent opportunity for character-building.

Science class is not just about learning science concepts; it is also a place where a foundation can be built for becoming upstanding adults. Every science class should set a tone of respect, honesty and genuine kindness for all students. Whether they like it or not, science teachers are role models for students and can provide examples of good character every day in the classroom. Student notice what teachers do, say, tolerate, and how they handle challenges [10].

As the influence of good learning attitude, the understanding student towards science were also getting better. The result shows that the % N-gain of students’ science score is 49 (fair category). Based on previous experience, the students’ achievement were always in low category. This is means that the learning could facilitate both of concept understanding and character.

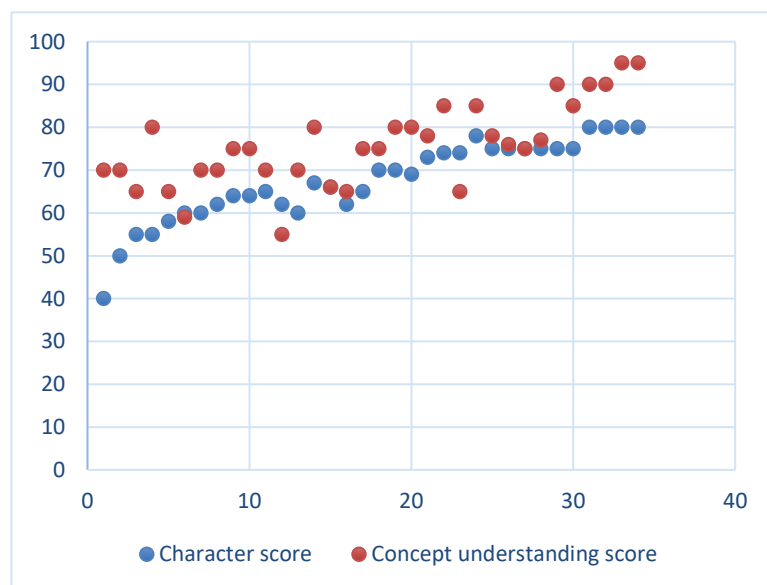
From the table 1, some students still have low score (two students gaining the score below 50). This is means that the learning not been fullest empowers the whole modality of students. Based on the observation, the learning can be enhanced, for example by raising the issues facing by student in everyday life. Considering the related issues that directly affect human beings in learning science led to the scientific literacy of student [5,11].

Table 1. Pre-post test scores before-after learning science

	Pretest	Posttest
Number of Student	34	34
Concept understanding	54 \pm 12	76 \pm 11
Highest score	75	95
Lowest score	35	45
% N-gain	49 (fair)	

Noted. The maximum score is 100

As the final step, the correlation between character score and concept understanding was tested on using simple statistic techniques (Pearson regression coefficient). The result shows that the correlation coefficient is +0.668 with the high relation category.

**Figure 3.** Correlation between character and conceptual understanding**Table 2.** The statistic Calculation for Pearson Correlation Coefficient

		CHARACTER	CONCEPT
CHARACTER	Pearson Correlation	1	.668**
	Sig. (2-tailed)		.000
	N	34	34
CONCEPT	Pearson Correlation	.668**	1
	Sig. (2-tailed)	.000	
	N	34	34

**. Correlation is significant at the 0.01 level (2-tailed).

Statistical data conclude that understanding science is in line with character. Ones who understand science will also show the good character. Firman [12] and Rubini et al. [13] stated that science class is

not just about learning science concepts; it is also a place where a foundation can be built for becoming upstanding adults. Every science class should set a tone of respect, honesty and genuine kindness for all students. Whether they like it or not, science teachers are role models for students and can provide examples of good character every day in the classroom. Students notice what teachers, do, say, tolerate, and how they handle challenges.

4. Conclusion

Learning science with the right ways will lead to scientific literacy of student. Scientific literacy is individual scientific knowledge and skills to use the knowledge to identify problems, to gain new knowledge, to describe scientific phenomena, and to make conclusions based on evidence related to the issues on science, with accompanied with the attitude towards science. Scientific literacy will lead to habits on mind, habit to do, and finally can build the students' character. The enhancement of character can be monitored on using portfolio assessment. Some pillars of character can be used for assessing character, such as trustworthiness, responsibility, respect, caring, fairness, citizenship. Courage, diligence, and integrity. Understanding science show a good relationship with character. Ones who has the understanding to science will also perform the good character.

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