

# The Application of Scientific Approach in Developing Students' Characters through Practicum

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**Abstract:** The 2013 curriculum emphasizes the formation of attitudes, skills and knowledge. Chemistry learning should be done creatively and innovatively by integrating phenomena in everyday life with the development of technology. Character development in chemistry learning is highly possible. This is from the blend of scientific process skills and attitude. This study aims to describe the application of scientific approach in developing students' characters. This study used classroom research. The results showed that the approach of scientific approach through practicum was able to develop students' characters. The observation stage can develop religious characters, the questioning stage can develop the character of curiosity, the stage of collecting data can develop communicative characters and responsibilities, the stage of association can develop the character of reading, hard work, independent and tolerant. Those stages were in moderate level to build students' characters.

## 1 INTRODUCTION

Practicum method is one method of learning that can be used to integrate knowledge, skills and attitudes of the students. In fact, this method has not provided an opportunity for students to develop the expected characters. Practicum methods are still aimed at improving cognitive learning outcomes only, without involving the characters of students, which became the goal of national education in achieving learning outcomes that must be taken seriously.

To develop students' characters, the teacher should look for the right learning approach to enable character development. The integration of character values in the application of scientific or inquiry learning takes place through questioning, hypothesizing, designing experiments and discussing (Suparson, 2012). The way the teacher inculcates the values of characters in learning is by giving, inserting character values in learning materials, adapting to learning methods, and connecting learning materials with daily life (Rhamdhani, 2016).

Characters can be developed with exemplary, habituating and conducive circumstances in learning (Ramdhani, 2014). They are instilled in chemistry learning in every stage of learning (Hikmah, 2013).

In the learning of scientific approach, students are invited to conduct the process of seeking knowledge related to the subject matter through various scientific activities as conducted by scientists in doing investigation (Arumsari, 2014). This study focuses on the application of a scientific approach to develop the character of students through practicum.

## 2 METHOD

This study used a classroom action method (Hopkins, 2002). This research was conducted to third grade senior high school students of Mathematics and Natural Sciences in one public school in Bandung, Indonesia. The study involved 36 students consisting of 16 men and 20 women, which were then divided into six heterogeneous groups based on achievement.

The learning process started from observing, planning, investigating, conducting experiments, explaining and communicating (Iyad Dkeidek, 2010). The steps are presented in Table 1.

Table 1: Characters developed in each scientific approach.

No	Scientific Stages	Developed Characters
1	Observing	Religious
2	Questioning	a. Curious b. Environmentally care
3	Collecting Data	a. Patient b. Honest c. Careful d. Communicative e. Serious f. Socially care g. Responsibility
4	Associating	a. Interested in reading b. Hard working c. Independent
5	Communicating	a. Tolerant b. Democratic

Based on table 1, characters developed in every stage of scientific learning are as follows:

### 2.1 Observing

At this stage, students are given a worksheet that contains a text about the solubility of a soluble electrolyte, such as stalactites and stalagmites that we can find in everyday life.

### 2.2 Questioning

At this stage students are given the opportunity to write questions based on the text given. By asking questions, we can improve students' thinking and attitude skills (Wenning, 2004).

### 2.3 Collecting Data

At the stage of collecting data students are required to write tools and materials on the lab that will be used. After the practicum, the teacher guides the students to fill in the observation data already available on the worksheet.

### 2.4 Associating

At this stage students are asked to answer questions about unsaturated and saturated solutions, and the factors that affect solubility and solubility products.

### 2.5 Communicating

Communicating is the activity of writing or telling what is found in finding information, associating and

finding patterns (Ida Ayu Km Mirah Wartini, 2014). After students follow a series of lessons, the final stage of the scientific approach is communicating. At this stage students are asked to draw conclusions on the worksheet and present the results of the practicum and discuss it with members in a group.

## 3 RESULTS AND DISCUSSION

The observing stage in scientific learning aims to motivate students to find out the process of formation of stalactites and stalagmites. In addition students can learn the beauty of one of the chemical minerals that Allah created. Researchers hope that this phenomenon will make students have curiosity and gratitude towards the favors Allah has created.

Based on the observations, the characters developed in the observing stages for each study group can be seen in table 2 below:

Table 2: Character analysis of students at the observing stage.

Developed Characters	Group	Score	Category
Religious	High	50	Moderate
	Medium	50	Moderate
	Low	50	Moderate

Based on table 2, the stages of questioning religious indicators in each group are still in the moderate category. This is because students have not maximized their senses in making observations. Students are still accustomed to observations only by looking at objects only. It should involve many senses. As Farida observes, it is the process of using the senses of sight, smell, listener, taste, and touch (Sanjaya, 2012).

Religious characters for all study groups are in moderate categories. This teacher always instills religious character in learning. Scientific approach is better and more effective to improve the characters of students in the learning process.

Some characters developed in the questioning stage are presented in Table 3:

Table 3: Character analysis of students at questioning stage.

Developed Characters	Group	Score	Category
Curiosity	High	78	Good
	Medium	65	Moderate
	Low	60	Moderate

Table 3 shows that the level of curiosity in questioning stage was different among groups of students. High level students showed a good category of curiosity level, while medium and low group of students showed moderate level of curiosity. The behavior of environmental care accounted only 20% among the high level of students. It is indicated by a question by the students, such as 'How to preserves stalactite and stalagmite from damage? Meanwhile, the results from questionnaire showed that high and medium level of students had a moderate category on identifying cause and effect. Based on the analysis, students' level of creativity should be improved as students seemed to be less enthusiastic in identifying the problems arise. Mostly students tended to search information without using books as guidance for learning. Whereas, chemistry learning is to search and to experiment so that students learning can be helped, particularly to understand much deeper on their surroundings (BSNP, 2006).

In the stage of collecting data, students do a practicum about the solubility of lime ( $\text{CaCO}_3$ ). When students weigh  $\text{CaCO}_3$  compounds, students must be patient and honest. Students must be thorough in expressing the reaction that occurs, serious in doing practicum, and communicative with friends of his group. Students also show social concern when there are friends in the group who ask for help, as well as responsibility in disposing waste generated according to the type of waste. Student character at the stage of collecting data can be seen in table 4 below:

Table 4: Character analysis of students at the stage of collecting data.

Developed Characters	Group	Score	Category
Communicative	High	75	Good
	Medium	65	Moderate
	Low	65	Moderate
Responsible	High	72	Good
	Medium	70	Good
	Low	50	Low

Based on table 4, students' ability in communication is in good and sufficient category. This shows that students are very enthusiastic in following the learning process and put forward the results of the lab data. Scientific learning (Laboratories Inquiry) can improve communication skills (Council, 2000). In responsibility, high and medium group have good category, while low group has less category. Student characters still need to be

improved, for example in clearing the practicum table, room, and throwing garbage including cleaning the sink.

At the association stage, the characters that can be developed are love to read and independent. Students are required to be independent in completing their duties. In addition, hard work is a character that must be owned by students in doing the task.

Student characters at the association stage can be seen in Table 5 below:

Table 5: Character analysis of students at association stage.

Developed Characters	Group	Score	Category
Love to read	High	65	Moderate
	Medium	66	Moderate
	Low	65	Moderate
Hardworking	High	65	Moderate
	Medium	75	Good
	Low	50	Low
Independent	High	75	Good
	Medium	60	Moderate
	Low	68	Moderate

Based on table 5, students' favorite reading is in enough categories for each study group. This happens because students are less interested in the given teaching materials. In the character of hard work, the high group has sufficient category, while the medium group is having good category and low group has less category. Independent characters have well to enough categories. This happens when students find failure in practicum there are some groups who do not want to fix the failure. Whereas, checking the data obtained from experiment is highly needed (Dewi, 2008).

In the stage of communicating the character that can be developed is tolerance and democratic. Percentage of student characters can be seen in Table 6.

Table 6: Character analysis of students at communicating stage.

Developed Characters	Group	Score	Category
Tolerance	High	75	Good
	Medium	50	Low
	Low	65	Moderate

Based on the analysis of the observation, the tolerance level on the students with high achievement in communicating stage is in good category, while the students with moderate

achievement are in low category and the low group students are in moderate category. Tolerance is demonstrated during discussions, for example giving students the opportunity to ask questions, expressing opinions and listening when one speaks. This is in accordance with the purpose of scientific inquiry process is to cultivate a scientific attitude one of which tolerance (BSNP, 2006).

## 4 CONCLUSIONS

The application of a scientific approach is appropriate to apply. This approach can develop the character of the student at the observing stage in order to develop the religious character, the stage of questioning in order to develop the character of curiosity, the stage of collecting data in order to develop communicative character and responsibility, the stage of association to be able to develop the character of reading, hard work, independent and tolerant and communicative stages to be able to develop a character of tolerance. On average all the characters above can be developed through a scientific approach with moderate level.

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