Using history of physics as a media to introduce and internalize characters values in physics instruction

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Using history of physics as a media to introduce and internalize characters values in physics instruction

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Abstract. One important impact in the education process is the formation of one's attitude. A person's attitude is a manifestation of the value of a person's existing character. In the education process at school, the introduction and planting of character values can be integrated with the process of the schooling itself. The history of physics subject can be used in an integrated manner in the formation of attitudes simultaneously with the subject studied, so do in physics learning. To know the utilization of the history of physics in integrating the character values in line with the process of physics learning, has been done a research to physics teachers at the physics teacher working group (known as MGMP Fisika) in Semarang city. The teachers have various perceptions toward the history of physics, at least the history of physics could be complemented to the physics, but they have not realized the usefulness of the history of physics in relation with the character education. Only about 42% of the physics teachers studied harnessed the history of physics for the development of education character attitudes integrated with the learning of physics itself. To achieve this goal physics teachers should carefully choose the right expression when explaining the phenomena and theories of physics. Recognizing the importance of the history of physics in a comprehensive physics learning, not just only to emphasize in the cognitive aspect, it is necessary to strengthen the mastery of physics history for prospective teachers and physics teachers through various ways.

1. Introduction

Physics as the most basic natural science is often seen as a rigorous basic science, which is based on rigid and mathematical logic. Yet if we look at how the physics develops, this view is not entirely true. Physics is concerned about natural phenomena, initiated by a curiosity of a group of people toward a natural phenomenon [1]. The observation and appreciation of this phenomenon leads them to a systematic record of order, meaning and harmony to these phenomena.

From the knowledge of the History of Physics, it is known that Physics evolved from observation because of curiosity awareness, then appreciate the meaning and harmony of order this is in line with the formation of moral/value in character education [2]. There is a moral value attached in understanding and interpreting a natural phenomenon. They tried to use their logical thought to obtain a causality relationship among the cases. One natural phenomena are not stand alone, but always some relationships around it. This means that it is possible to use the History of Physics as a medium for introducing and growing character values in Physics learning [3,4].

Integrating character education in Physics learning will give multiple benefits, which are to achieve the goals of cognitive competence and at the same time achieve the goal character of attitude and understanding.
2. Methods
This research was conducted in the forum of Teachers' Physics Meeting of Semarang High School Semarang by completing questionnaires and interviews. The subjects were 38 teachers. Based on their working experienced and their notion in history of physics, they were classified and interviewed. Focus questions about their perceptions of the history of physics and the use of the history of physics for the cultivation and development of value on the character education of students. The confidence test of the information obtained is done by comparing the results of the questionnaire with the findings of the interview [5].

3. Result and Discussions

Table 1. Characteristics of research subject

| Working Experience | Ever took a course of Physics History |
|--------------------|--------------------------------------|
|                    | Yes | No/Not Yet |
| I                  | 11 people | 4 people |
| II                 | 6 people | 8 people |
| III                | -   | 7 people |
| IV                 | -   | 2 people |

The results of questionnaires and interviews show that 21 out of 38 teachers studied have not / never taken a Physics History course (Table 1). Because of that, they view the History of Physics more on the facts of years and figures of the past, when a scientist born or died, when a law of physics had been formulated, without any direct connection or reason with the subject matter of learning. For example, only submitted and exposed figure X of who finds a physics theory or certain apparatus invention, was born in which country, birth and died of what year. Usually this is done in asperses or quiz section at the end of the lesson.

Introducing years of invention theories helps students in understanding how a theory influences or inspires other theories or ideas. For example, in explaining the photoelectric phenomena, Einstein inspired and then “borrowed” Max Planck theory on oscillator energy. Einstein implementing this theory on a quanta energy of light which called as photon [6].

While 17 teachers who have ever received a lecture of the history of physics can utilize the knowledge of the history of physics to convey the value of values associated with character education in a certain degree. Furthermore, they can link the concept of physics to the daily experienced life and cultivating an admire sense to the Almighty. For example, we thank to God that each phase of substance has their own characteristics, so we can decide when we should choose solid or liquid or gaseous for special purposes. A notion that they gained from History of Physics course give them a chance and flexibility to use this competencies in making physics instruction more attractive. The history of physics which is integrated with the subject can be taught and packed as a moral message in introducing character education [7-9].

At least there are three ways to convey a moral message in the use of the History of Physics in Physics learning: (1) through the scientist and his/her characters. For example, when discussing the law of Newton law, alluded to the history of Newton, the work and life experience and the value of existing characters in Newton. Newton was born into a poor family his father already passed away few months prior his born, but because of his tenacity to become a famous scientist [10]. The life story of Faraday also interesting to tell. A man who never got good formal education, whoever work as a bookstore boy, but he keeps the reading habit alive. His intelligently reading and make a resume note attracted Mr. Davy a famous scientist at that time and gave Faraday a job in his laboratory. His
intelligence, curiosity and never easy to give up, finally lead him became a very famous scientist up to now. Historical part of scientist biography gives a human side of physics. Physics should not consider as a hard, difficult and inhumane discipline, (2) through carefulness in choosing words/phrases. Teachers are sometimes reckless in using words, which affects students' confusion. For example, the teacher says the object falls down because it follows Newton's law. A critical student might think, before Newton's law objects fall into any direction? This student thinks like a rule in society, that someone after age 18 must have ID card. The choice of the teacher's words caused confusion because the Physicists did not make laws in the sense such as that the government made the rules, Physicists simply summarized systematically from the observations made on natural phenomena [11], (3) a sense of gratitude for the greatness of the Almighty. This phenomenon is often simply taught as a fact of knowledge. E.g. anomaly nature of water or iron which expands its volume whenever the temperature falls (frozen). The water is frozen into ice, and ice floats in the water. This condition in the sea is simply give a hint to the sailor about the danger of collision with ice boulder that they must avoid it. The frozen liquid iron will expand, allowing humans to make iron cast of solid [11]. Without this special manner, it is impossible for man to utilize iron for special purpose. Casting iron will be brittle stuffed and weak.

The moral values, such as: challenging work, not easy to give up, curiosity, carefulness, intelligence, gratefulness is important in character education. All the values are easy to cultivate and introduce through physics instruction, but the teacher should have a notion in history of physics and eager to integrate it.

4. Conclusion
Utilization of the History of Physics in the study of physics will be able to give a humanist, the familiar environment and learning becomes contextual [8,12]. In the current era of information disclosure, where one can easily search for information, the course of Physics History may itself be abolished, provided that prospective teachers are trained how to utilize knowledge of Physics History in the implementation of Physics learning [13].

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