Profile affective abilities of vocational students in electrical energy conservation

A Kurniawan1,2,*, N Y Rustaman1, I Kaniawati3 and I Hasanah3

1 Program Studi Pendidikan Ilmu Pengetahuan Alam, Sekolah Pascasarjana, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia
2 Program Studi Teknologi dan Informasi, Sekolah Menengah Kejuruan Daarut Tauhid, Jl. Gegerkalong Girang Kav. 25-26, Bandung 40154, Indonesia
3 Departemen Pendidikan Fisika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

*aguskurniawan@student.upi.edu

Abstract. The purpose of this study is to obtain an overview of the profile of the affective abilities of vocational students concerning the discourse of electrical energy conservation. The research method used is qualitative research which aims to explain the phenomenon of problems experienced by students in understanding the concept of electricity. Research activities are carried out in the odd semester of the school year 2017/2018. The research subjects were students of class X in one of the private vocational schools in the city of Bandung which consisted of one class randomly selected. The results showed that the profile of affective ability which is a result of the representation of the value / energy-saving attitude of students in SMK S Bandung was still low. This can be seen from the average value of affective goals which include a willingness to respond, satisfaction in response, acceptance of a value, preference for a value, commitment, and conceptualisation of a value of 43.83 which is still in the low category. This shows that physics learning, especially on the concept of electricity at the SMK level has not been oriented towards affective goals.

1. Introduction

The limitation of electrical energy is one of the crucial issues which is currently being raised in various countries in the world. Even this crucial issue became one of the targets listed in the sustainable development goals of 2030 that had been agreed upon by world leaders to be overcome [1]. Besides, this crucial issue is also a grave concern for Indonesia, considering that data from the ASEAN Center for Energy (ACE) in 2013 stated that Indonesia is the country with the highest level of waste of electricity today [2]. Though the electricity supply in Indonesia itself is currently in a critical and standby condition because the remaining reserves are not widely available. As reported in the 2014 Technology Assessment and Application Agency (BPPT) by PT PLN (Persero), in the last five years the growth of power plant development, amounting to 6.5% per year, was unable to catch up with 8.5% electricity demand growth per year [3].

In several other countries, efforts to save/conserve electricity, which is one of the easiest ways to overcome the limitations of electricity, rather than having to build a supply of electrical energy
resources, have entered the policy level such as reducing the use of electricity for industrial use. That is, only 20% of industrial activity uses electricity, while the rest has used natural energy (solar thermal energy, gas energy, wind, sea tides and others). As for Indonesia, even though it has not yet reached the regulation of the percentage of electricity use for industrial purposes, the Government has taken various efforts through a 10% cut campaign program to reduce the large electricity use rate. The 10% campaign program includes invitations related to saving electricity use during the day, turning off lights when not in use, even using energy-saving lamps. Even so, the culture of the people who still like to turn on the lights during the day or use electricity for things that are not important is still happening.

Krathwohl and Bloom in his second book entitled Taxonomy of Educational Objective: Affective Domain, writes that the relationship between cognitive and affective domains is of three types. First, cognitive objectives as means to affective goals. A process of teaching cognitive domains with the ultimate goal is the affective domain. In this case, the cognitive domain is a means of achieving the objectives of the affective domain. Second, affective objectives mean to cognitive goals. A process of teaching affective domains with the ultimate goal is the cognitive domain. In this case, the affective domain is a means to achieve cognitive domain goals. Third, simultaneous achievement of cognitive and affective goals. A process of teaching cognitive and affective domains simultaneously [4].

Of the three types of cognitive and affective domain relationships above, the two domains are closely interrelated. There are several correlations between the taxonomic level of an affective and cognitive goal. Each domain is sometimes used as a means for others even though the more common pathways are from cognitive to affective. In the cognitive domain, students must be able to do a task when asked. Whereas, in the affective domain students do something when it is following their beliefs and awareness from the knowledge they have. Although almost every school gives more appreciation to students from "doable" than from "doing something". By emphasising this affective component aspect, the affective domain carries an essential element and is often lost in cognitive goals. Figure 1 below illustrates the structure of the affective domain that can represent adjustment, value and attitudes, appreciation, and interest.

![Figure 1. Affective domain structure.](image-url)
Besides, in one item the objectives of physics subjects at the SMK/MAK level are stated that the implementation of physics subjects at the SMK/MAK level is intended as a vehicle or means to train students to master the knowledge, concepts, and principles of physics [5]. In the process of learning physics not only emphasizes mastery of concepts (content) but also should contain four things, namely: content or products, processes or methods, attitudes, and technology so that students' understanding of physics becomes intact and can be useful to overcome problems that it faces in everyday life [6]. Content or product means that in physics there are facts, laws, principles, and theories that have been accepted. Process or method means physics is a process or method for gaining knowledge. Attitude means that physics can develop scientific attitudes such as diligent, thorough, open and honest. Technology means that physics is related to improving the quality of life.

Based on the description above, the purpose of this study is to obtain an overview of the physics learning process and the profile of students' affective abilities which are representations of the values/attitudes that students have regarding the conservation of electrical energy.

2. Experimental method
The research method used is mixed-method with the sequential explanatory design [7,8]. The data collection techniques used were observing the activities of teachers and students, providing affective ability test instruments, interviews with teaching teachers of physics subjects, and ending with the distribution of questionnaires on students' responses to lessons and learning carried out by teaching teachers of physics subjects.

| No. | Necessary data | Data source | Data Retrieval Techniques |
|-----|----------------|-------------|--------------------------|
| 1.  | Profile of teaching and learning activities conducted by teachers and students | Observation note, Interview data, Student response questionnaire data | Observation, Interview, Post student response |
| 2.  | Profile of students' affective abilities | Data test results, affective ability | Test affective abilities |

The student's affective ability test used in this study is a question that can represent students' values/attitudes related to the conservation of electrical energy. This test instrument consists of 9 multiple choice questions regarding the concept of electrical energy conservation. The research data in the form of the results of the test of affective ability were analysed descriptively and qualitatively. The research data is then analysed and compared with the predetermined indicators of success. The success parameter used to see the achievement of affective abilities is the achievement of minimum completeness criteria for subjects, namely 75.

Research activities are carried out in the odd semester of the school year 2017/2018. The research subjects were students of class X and XI in one of the Private Vocational Schools in Bandung which consisted of one class for each level randomly.

3. Result and discussion

3.1. Description of physics learning
Data on the results of observations of physics learning in class, it is known that teachers more often explain concepts and provide reinforcement at the end of learning. After the explanation of the concept, students are given a practice exercise and to practice bravery and check the understanding of one of the
students working on the board then the teacher discusses it. Based on these data, it can be analysed that most of the learning process in the classroom is still teacher-centred (teacher centred) and is the transfer of knowledge from teacher to a student only so that learning is only directed at students' ability to remember information. Students are more directed to remembering various information and less understanding of the information they get and are not positioned as constructors of knowledge. As a result, when students return to the community environment, they do not know the meaning of the theory they learned.

Besides, based on the results of the preliminary study, it can be analysed that the learning process in the class is only oriented towards students' cognitive abilities. Even if there is an orientation towards affective abilities or attitudes, it is still separate and constrained to certain scientific attitudes such as being brave and honest, but even then it has nothing to do with the context of the teaching material delivered.

3.2. Student affective ability profile
The affective abilities referred to in this study are affective abilities as stated by Krathwohl and Bloom, namely the ability to do something when it is following beliefs and awareness by the knowledge they have. Then, the value/attitude referred to in this study is the affective domain which includes the desire to respond, confidence in responding, acceptance of value, the choice for value, commitment, and value conceptualization. The profile of affective ability can be seen in Table 2 and Figure 2 below.

| Affective Goal | Grade |
|----------------|-------|
| Willingness to respond | 44.00 |
| Satisfaction in response | 43.00 |
| Acceptance of a value | 70.00 |
| Preference for a value | 52.00 |
| Commitment | 37.00 |
| The conceptualization of a value | 17.00 |
| **Average** | **43.83** |

![Figure 2. Profile of the affective ability of SMK S students.](image-url)
Table 2 above shows the recapitulation of the results of the average affective ability of students for values/attitudes of 43.83. This result is in a low category when compared to the KKM of 75.00. Figure 2 above shows that of the 57 students, the affective ability for the scope of values/attitudes is all still in the low category as well. This can be seen from the value of the average acquisition of affective abilities of students in the realm of desire to respond at 44.00, beliefs in the response of 43.00, acceptance of values of 70.00, the choice for a value of 52.00, commitment of 37.00, and conceptualization of values of 17.00.

4. Conclusion
Based on the research that has been done, it can be concluded that the profile of affective abilities of students in Bandung S Vocational High School is still low. This can be seen from the value of the average acquisition of affective abilities in the realm of desire to respond (A2.2) of 44.00, confidence in response (A2.3) of 43.00, acceptance of the value (A3.1) of 70.00, choice for a value (A3.2) of 52.00, commitment (A3.3) of 37.00, and conceptualization of value (A4.1) of 17.00. One of the possible causes of low affective abilities of students is because implementing physics learning in schools still uses conventional learning and is only oriented to cognitive abilities. Therefore, physics learning is more informative in that the teacher delivers the material to the student as a whole and does not involve students in the learning process. Also, from the results of learning observation and interviews with subject matter teachers, it can be seen that in the learning process the teacher does not facilitate the affective abilities of students and feels there is not enough time to direct the concept of electricity to the issue of electrical energy conservation.

In connection with the results of these studies, it is necessary to make efforts to improve or innovate the learning process so that affective goals become the ultimate goal in the learning process. So that the learning process is complete, each student is not only limited to understanding concepts in the cognitive domain alone. However, each student will have a sensitivity to the various problems that exist in their surroundings according to their beliefs and awareness by the knowledge they have. Then by combining the affective domain in contextual learning in the classroom, it will increase motivation and better learning benefits for students [9-12].

Acknowledgments
That is what the writer can convey about the material that has been discussed in this article. Thank you to all those who helped in carrying out this research. One of them is the LPDP which has been willing to finance the education program at the Indonesian Education University. Not to forget, the author also realised that this research or article still lacked a lot. Therefore, the authors expect various constructive suggestions and criticisms so that they can correct the deficiencies found in this study or article. Finally, the authors hope that this article can be useful for all parties in improving the quality of physics learning that is oriented to the affective domain.

References
[1] United Nations Development Programme 2016 Sustainable Development Goals 2030
[2] ASEAN Centre for Energy 2013 ASEAN Guideline on Off-grid Rural Electrification Approaches
[3] Badan Pengkajian dan Penerapan Teknologi 2014 Indonesia Energy Outlook 2014 (Jakarta: Perpustakaan Nasional RI)
[4] Krathwohl, Bloom and Masia 1964 Taxonomy of Educational Objectives: Book 2 Affective Domain (New York: Longman)
[5] Depdiknas 2010 Kurikulum Sekolah Menengah (Jakarta: Depdiknas)
[6] Depdiknas 2010 Strategi pembelajaran MIPA (Jakarta: Direktorat Tenaga Kependidikan Direktorat Jenderal Peningkatan Mutu Pendidikan Dan Tenaga Kependidikan)
[7] Creswell and Clark 2011 Design and Conducting Mixed Methods Research (Thousand Oaks, CA: Sage Publication, Inc)
[8] Creswell 2014 Research Design. Qualitative, Quantitative and Mixed Methods Approaches (Thousand Oaks, CA: Sage Publication, Inc)

[9] Kuboja and Ngussa 2015 Affective Learning and Cognitive Skills Improvement: Experience of Selected Schools in Arusha, Tanzania International Journal of Academic Research in Progressive Education and Development 4 (2) 38-50

[10] Kraft, Srogi, Husman, Semken and Fuhrman 2011 Engaging Students to Learn Through the Affective Domain: A New Framework for Teaching in the Geosciences Journal Geoscience of Education 59 71-84

[11] Shofner 2009 The place of the personal: Exploring the affective domain through reflection in teacher preparation Journal Teaching and Teacher Education 25 (6) 783-789

[12] Zajonc 2006 Cognitive-affective connections in teaching and learning: the relationship between love and knowledge Journal of Cognitive Affective Learning 3 (1) 1-9