A Survey of Scientific Concepts of Grade 11th Students in Thailand

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Abstract
The purpose of this study was to survey scientific concepts understanding of grade 11th students. The sample was 116 students of academic year 2017 from school in Thailand selected by purposive sampling. The instrument was conceptual understanding test consisting of 15 questions. Scientific concept understanding are divided in to 5 levels 1) Complete Understanding: CU, 2) Partial Understanding: PU, 3) Partial understanding with Specific alternative conception: PS, 4) Alternative Conception: AC, 5) No Understanding: NU. The results showed that percentage of students considered in CU and PU levels were only 4.36 and 4.20 while percentage of students recognized as PU PS and NU levels were 7.87, 12.47 and 71.10 respectively. The results indicated that most scientific concept understanding of grade 11th students was in a low level.

Keywords: Scientific Concepts Understanding, Survey, Thailand

Introduction

Science is the basis for learning to understand nature and the environment and this will result in the learner being able to link many knowledge into holistic knowledge. It will lead to create things, develop the quality of life, and develop the world sustainability. Science is important for developing countries. Science course is a system of activities which seek to describe, understand, and predict natural phenomena is term of cumulative body of experimentally verifiable laws, principles, and theories (Josef T yap, 1989). The core of science is scientific concept understanding. It is the ability to interpret, translate, explain about a particular topic from the stimulus experience observation or learning. Scientific concept understanding must requires fact and principles and then brought together into a conclusion. Then come to think of it as a conceptual. Physics is quite difficult to make students understand due to the fact that it compose of many abtract idea. Especially, The concept of electricity is abstract and hard to grasp. Electricity is invisible yet omnipresent in our lives. Many models of and analogies for electricity have been used, but none of them fully explains all of its aspects (Frederiksen, White, & Gutwill, 1999; Hart, 2008). Electricity is intangible nature causes many students, even those who have completed a physics course, to have incorrect ideas about it and about the behavior of electrical. If students did not understand basic concepts, it would be difficult for them to understand new physics concepts effectively. Therefore, teachers must know how their students perceive the concepts of electricity prior to designing appropriate learning activities to make the students understand the concepts correctly.

As above, the researcher want to survey the scientific concepts understading of grade 11th students. in Sarakhampittayakhom School, Mahasarakham Province, Thailand. The information will be useful and can be applied in the learning activities for developing students' scientific concepts understading.

Research Purpose

The purpose of this study was to survey about scientific concepts understanding of grade 11th students.

Sample

The samples was 116 grade 11th students from 3 classrooms which have same levels of the learning achievement of academic year 2017 from Sarakhampittayakhom school in Thailand.

Research Instruments

The instrument in this research was the writing test consisting of 15 questions about electricity. The findings on the scientific concepts understanding were analyzed and categorized using the criteria of Westbrook and Marek (1992), criteria of students' scientific concepts understanding into five levels as follows:

1. Complete Understanding (CU): Responses that include all components of the validated response.

2. Partial Understanding (PU): responses that include at least one of the components of validated response, but not all the components.

3. Partial understanding with Specific alternative conception (PS): responses that show understanding of the concept, but also make a statement, which demonstrates a misunderstanding.

4. Alternative Conception (AC): responses that include illogical or incorrect information.

5. No Understanding (NU): responses that repeat the question or contain irrelevant information or an unclear response or leave the response blank.

Procedure

In this research, the data of the scientific concepts understanding of grade 11th students was collected by using the scientific concepts test. The process of collecting data as following:

1. The researcher selected the sample from 3 classrooms of grade 11th student in academic year 2017 from Northeast of thailand by using purposive sampling.

2. The students were asked to do the test to identify scientific concepts understanding.

3. The data were analyzed and categorized using the criteria of Westbrook and Marek (1992).

Results

The levels of scientific concepts understanding of 11th grade students in Thailand shown in 5 levels 1) Complete Understanding (CU) was 4.36% 2) Partial Understanding (PU) was 4.20% 3) Partial understanding with Specific alternative conception (PS) was 7.87% 4) Alternative Conception (AC) was 12.47% and 5) No Understanding (NU) was 71.10%. The data were showed in Table 1.

Table 1: The levels of students' scientific concepts understanding of electricity

Concept	No.	levels of scientific concepts (number of participants)				
		CU	PU	PS	AC	NU
Electric current	1	4	5	19	38	50
	2	1	8	18	31	58
	3	0	1	17	14	84
Ohm's law and resistance	9	3	7	17	25	64
Electrical resistivity and electrical conductivity	7	5	6	11	17	77
	8	5	9	10	21	71
Electromotive force and electrical potential difference	4	3	6	11	24	72
	10	1	3	12	6	94
Electrical energy and electric power	14	5	1	1	10	99
Resistor	11	6	1	0	0	109
Electric meter	5	0	0	8	14	94
	6	10	5	3	4	94
Calculate the electrical energy of electronics and circuits and safe use electric	15	27	19	4	0	66
	12	4	1	0	0	111
	13	2	1	6	13	94
Included		76	73	137	217	1237
Percentage		4.36%	4.20%	7.87%	12.47%	71.10%

Note: CU = Complete Understanding, PU = Partial Understanding, PS = Partial Understanding with Specific alternative conception, AC = Alternative Conception and NU = No Understanding. (Westbrook, S.L., & Marek, E.A, 1992)

From the study, it was found that most students did not have scientific concept understanding of electricity especially concepts of resistor in question no.11 and calculate the electrical energy of electronics and circuits and safe use electric in question no.12 which were 109 and 111 students respectively.

Conclusion and discussion

According to the study, it was found that the answers of students were not correct because a lot of students could not describe the reason of their answer or do the calculations. From student informal interview, we found a lot of students did not understand concepts of electricity because it was difficult to understand and they had to calculate too many equations. Therefore, this might be the reasons why 116 students were classified to No Understanding (NU) and Alternative Conception (AC). These might be because teachers often taught electricity by merely explanation or having some illustrations, and as a result, the teachers could not explain the steps of calculate clearly, and the students hardly imagined and then misunderstood. In the learning process that encourages students to analyze information and to have concrete visualization by themselves, the teacher might use new learning activities or experimental that can help the students apply their experience. According to the constructivist teaching approach, information is constructed socially (Duit, 2002) and

internal motivation gained through group work has an important role in structuring the knowledge (Pintrich, Marx, & Boyle, 1993).

Recommendation

This research describes about the level of the scientific concepts understanding of only grade 11th students in Sarakhampittayakhom school, Thailand.

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References

Duit, R. (2002). Conceptual change – still a powerful frame for improving science teaching and learning? Paper presented in the third European Symposium on Conceptual Change, June 26-28. 2002, Turku, Finland.

Frederiksen, J. R., White, B. Y., & Gutwill, J. (1999). Dynamic mental models in learning science: The importance of constructing derivational linkages among models. Journal of Research in Science Teaching, 36, 806-836

Hart, C. (2008). Models in physics, models for physics learning, and why the distinction may matter in the case of electric circuits. Research in Science Education, 38, 529-544.

Josef T. yap. (1989). Concept paper on science and technology. Journal of Philippine Development. No 20-9, Vol 16, No 2.

Pintrich, P. R., Marx, R. W., & Boyle, R. A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. Review of Educational Research, 6, 167-199.

Westbrook, S.L., & Marek, E.A. (1992). A cross-age study of student understanding of the concept of diffusion. Journal of Research in Science Teaching: 649-660.

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