The Perception of Science Secondary School Teachers towards the Science Learning Problems of Lower Secondary School Students in Thailand

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Abstract
The purposes of this study were to investigate the science learning problems of lower secondary school students through science teachers' perception. This study included a comparison of science learning problems between different levels of school achievement, and investigation of the issues that science secondary school teachers need to solve in science learning. An open-ended questionnaire was responded by thirty-six science teachers from schools located in nine different areas across Thailand during September 2014. Certain teachers were interviewed for obtaining more details. The obtained data were analyzed by content analysis. The results indicated that problems in science learning included students lacked science process skills and had less interest and responsibility in science as well as lacking of science laboratory equipment in schools. The gap of student's chance to do the experiment between schools in rural area and urban area was found. Moreover, learning activities for increasing students' achievement and their process skills including students' ability in language were the issues that needed to be solved. These findings provided the data for the authors to further develop the learning model and activities to solve these problems.

Keywords: teacher perception, science process skills, science learning problem, lower secondary school student

Introduction

Science is a subject that enables students to get skills to solve problems in daily life. Students' ability to solve science problems can demonstrate the competence of economic and development of a country in the future (Klainin, Dechsri, & Pramojnee, 2008). However, the Programme for International Student Assessment: PISA 2006 which was a system of international assessments that measured 15-year-olds' performance in science literacy. It measured students' ability to apply knowledge and skills throughout their lives in the future showed that the scores of Thai students placed below the mean scores of OECD (OECD, 2007). Moreover, the Ordinary National Educational Test (O-NET) which evaluated the quality of education at the national level based on the Basic Education Core Curriculum B.E. 2551 (A.D. 2008) indicated that grade 9 Thai students' mean score in science have placed almost the lowest among the other subjects. The results of science mean scores of Thai students during the year B.E. 2554-2556 were; 32.19, 35.37, and 37.95 respectively (National Institute of Educational Teaching Servic, 2013). Some studies identified that Thai education has limitations and problems about instructional strategies such as insufficient basic concept in science, lack of thinking skills (Katesing, 2005, Klainin, 2006; NIETS, 2008; IPST, 2009 cited in Cojorn, Koocharoenpisal, Haemaprasith, & Siripankaew , 2012), time limitation (Colangelo, Okumura, Patrick, Whitten-Kassner, Chen, & Thammasunthorn, 2009; Lati, Supasorn, & Promarak, 2012; Kruea-In & Thongperm, 2014) and lack of science equipment (Klainin, Dechsri, & Pramojnee, 2008; Colangelo, Okumura, Patrick, Whitten-Kassner, Chen, & Thammasunthorn, 2009). In addition, to solve problem of Thai students' achievement, the context of science learning in the classroom has to be known. Teaching-learning activity was one of the issues that affected students' learning and conceptual development. The actions and details of classroom atmosphere affected science learning can be explained by teacher. Therefore, the authors conducted this study to investigate the science learning problems through teacher.

Research Methodology

Objectives of study

1. To investigate the science learning problems of lower secondary school students through science teachers' perception.
2. To compare the science learning problems between students from schools having O-NET test scores above and below the mean score of national O-NET test.
3. To investigate the issues that secondary school science teachers need to solve in science learning.

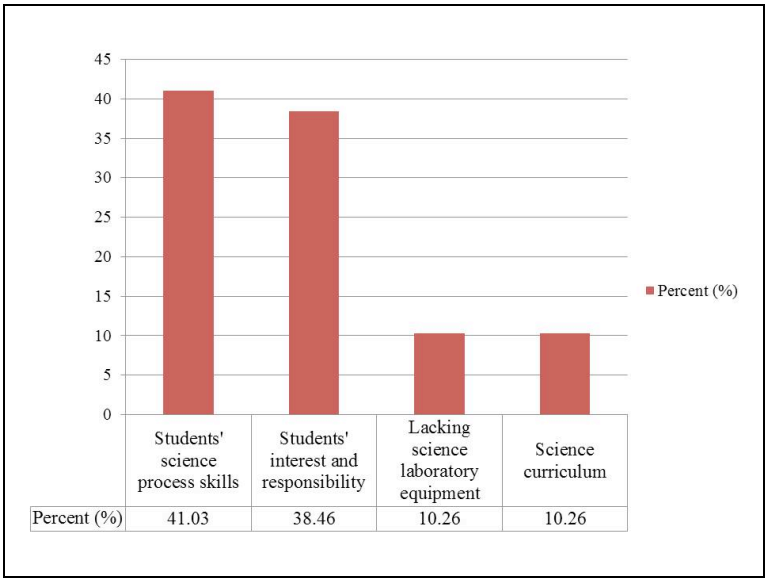
Method

The mail surveys were used to collect the data. The open-ended questionnaire was responded by the eighth grade science teachers. There were thirty-six science teachers (36 schools) from nine areas throughout Thailand; upper northern, lower northern, upper northeastern, lower northeastern, west, eastern, southern, central, and Bangkok of Thailand in September 2014. Those schools were located in rural area, city and big city area. Five teachers were interviewed via telephone for obtaining more details and

for the reliability of the data. Those teachers from five schools which placed at different school achievement and located both urban and rural area of upper northeastern, lower northeastern, upper northern, southern, and Bangkok area. Privacy and be allowed were the limitation for conducting the interview. Based on the reported O-NET science test of academic year B.E. 2556(A.D. 2013), the authors categorized the answers of thirty-six science teachers into two groups; teachers' perceptions from school that having O-NET test scores above and below the O-NET national mean score. Their answers were analyzed by content analysis. The levels of school achievement were also considered for the trend of problems. Triangulation was used in terms of data angulation and review triangulation for increasing the reliability.

Findings

Finding 1:



	Students' science process skills	Students' interest and responsibility	Lacking science laboratory equipment	Science curriculum
Percent (%)	41.03	38.46	10.26	10.26

Figure 1: Type of Problem on Thai Science Classroom

To answer the objective 1; to investigate the science learning problems of lower secondary school students through of science teachers' perception. The results were categorized into four themes of problems namely students' prior knowledge, student behavior, science equipment, and curriculum.

The answers were counted for investigation the trend of problems. Finally, the identified problems on Thai science classroom context sorted by descending were students lack science process skills; students showed less interest in science and responsibility, lacking of science laboratory equipment, and improper science curriculum (see Figure 1). First of all, problems related to students lacked science process skills were mentioned by science teachers as following; *measuring*- students used improper tools such as using the beaker instead of the test tube, some student had no skills of using microscope and wrongly hold the microscope. Teachers also mentioned that students did not know the correct way on how to maintain or keep the science laboratory equipment. In terms of *using number,* students could not calculate mathematics when they solved the science questions. For *communication skill*, the

teachers from the school having O-NET score higher than mean score of the O-NET test mentioned that students could not explain their understanding in order fashion. They wrote in a meandering fashion. It demonstrated that students were not good at writing in paragraph. Some teachers from school having O-NET score below the mean score of O-NET test mentioned the problem related to students' abilities in reading and spelling words. In terms of *formulating hypotheses*, students could not identify science question and their questions did not reflect dependent or independent variable. For *interpreting data*, students drew wrong conclusion. For *experimentation*, teachers mentioned that students had no plan on working. The examples of quotation were as following;

"Students cannot use equipment appropriately"
"Students had no skills on using equipment and chemical substance"
✎ *These sentences refer to….. Measuring skill*

"Students cannot discuss the results"
"Students cannot make the conclusion"
✎ *These refer to…. Interpreting skill*

"Students did the experiment without planning"
✎ *It refers to…. Experiment skill*

The second problem was students had less interest and responsibility. For example, students returned late assignment and talking too much in the classroom. They also showed less interest while learning, no enthusiastic and using mobile phone. Moreover, some teachers from school having O-NET score below mean score of O-NET mentioned that students had low motivation and need inspiration for learning.

The third was lacking of science laboratory and learning equipment. Teachers from different levels of school achievement mentioned the different types of lacking equipment. Problems of lacking basic science laboratory equipment such as microscope shortage or malfunction were found in some schools having O-NET score below mean score of O-NET test. As a result, students had no chance to do the experiments. To enable the complete contents, teachers used the video clip involving those experiments instead even though they still concerned about students' process skills on using microscope. In the science toy course, the advanced science learning materials such as robots, used for science engagement were not enough for students from school having O-NET score above mean score of O-NET test. It demonstrated that each school had different problems including the gap between students from schools in rural area having O-NET score below mean score of O-NET and big city having O-NET score above mean score of O-NET. These showed the quotations that categorized by keyword into each theme (see Table 1).

Themes	The example of quotations referred in each theme
(i) Students' prior knowledge in science and others	-Low achieving students need a longer time learning and they were false on spelling -Wrong procedure on the experiment, -Students cannot use equipment appropriately -Students lack of skills of equipment and chemical substance -Students had no plan on working -Could not propose the ways to solve problems. -Write in a meandering fashion -Students cannot make the conclusion -Students could not identify science question -Lack of ability in reading and reading comprehension
(ii) Student behavior	-Less concentrated on learning, Less effort -Less attention while doing the experiment, Lack motivation in learning, Less confident to do the activities, Students late handing assignment -Talking too much in the classroom -Using mobile phone -Did not submit science task.
(iii) Science equipment	-The tools and equipment for enhancing science skills were limited. -Lack science equipment, teacher demonstrated the lab instead. -The equipment was not enough; therefore, the class could not complete the experiment. The video clip was used instead. -Malfunctioned science equipment
(iv) Curriculum	-The content related to mathematics was not paralleled with science content. Therefore, science teacher need to teach some content of mathematics for applying to science question i.e. square root. -The amount of content was not suitable for timing; as a result some experiments were skipped. -Science content was not sequenced in order.

Table 1: The example of quotations categorized by keyword into each theme

Finding 2:

To answer the objective 2; to compare the science learning problems between students from schools having O-NET test scores above and below the mean score of national O-NET test.

The national mean score of the science O-NET test (37.95) was used for grouping the level of school achievement. Consequently, there were two groups of school achievement; below and above the mean score of O-NET test. By categorized teacher's perceptions about trend of problems, the results showed that the percentage of students' interest and responsibility problems found in both groups were quite

similar (40% and 45%) as shown in Figure 2. However, the problems related to lacking of process skills in students between two groups were different (40% and 50%, Figure 2). Moreover, details of teachers' responses indicated that students from different levels of school achievement had different issues of lacking science process skills. For example, lack of basic science process skill such as measuring skill was mentioned by most teachers from school having O-NET test score below mean score of national O-NET test while lacking of integrated science process skills such as interpreting data was mentioned by most teachers from school having O-NET test score above mean score of O-NET test. However, lacking of communication skill was mentioned in both groups including spelling and ability to read (below mean score group) and writing skill (below and above mean score group). In terms of lacking science equipment, schools having O-NET test below mean score group displayed higher percentage (20%) than that of school having O-NET test score above mean score of O-NET test (5%) as shown in Figure 2. The issues of lacking science equipment were different; basic science laboratory equipment (below mean score group) and advanced equipment (above mean score group).

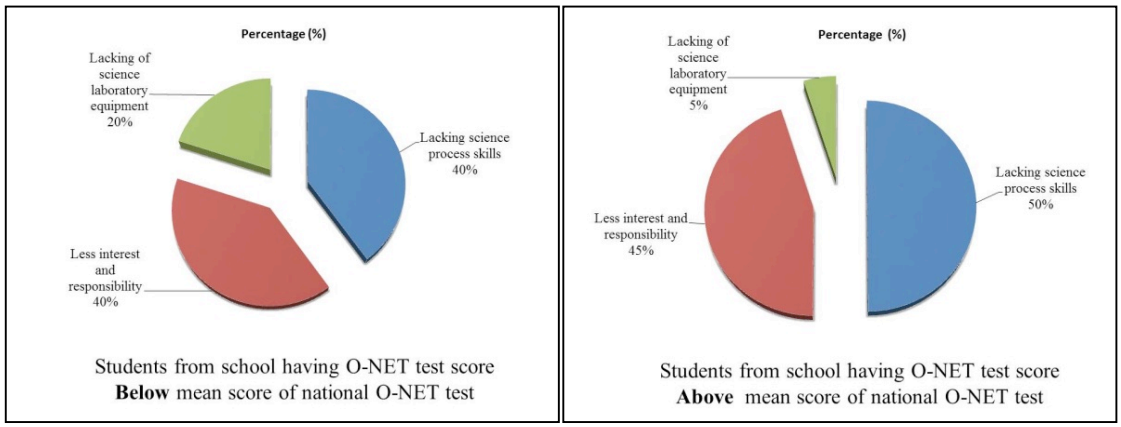


Figure 2: Comparison Trend of Problem in Schools

Finding 3:

To answer the objective 3; to investigate the issues those secondary school science teachers need to solve in science learning.

Teachers gave various answers in the questionnaire. The answers were categorized into seven types namely; using tablet as the learning tool in science classroom, higher order thinking skill, students' science process skills, students' interest and responsibility, ability in language, curriculum, and learning activities for increasing students' achievement. The highest percentage of issue that teachers need to solve was learning activities for increasing students' achievement (22.22%). The second was students' interest and responsibility (19.44%) and the third was students' science process skills (16.66%). Other issues including students' ability in language which involved students' spelling ability, reading comprehension, and writing skill were also needed to solve. (see Figure 3)

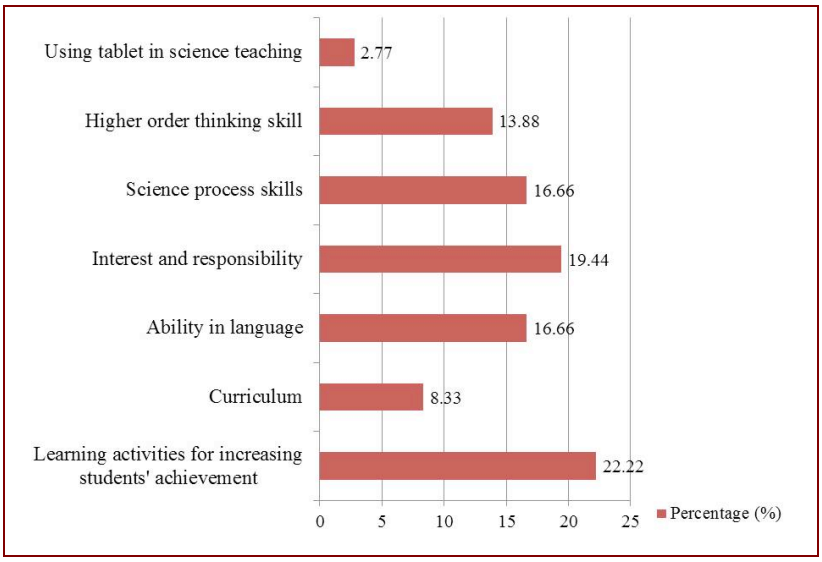


Figure 3: Issues that teachers need to solve

Discussions

Discussion of finding 1: science learning problems of lower secondary school students through science teachers' perception.

According to Harnischfeger-Wiley Model (Gross determinants of pupil achievement) consisted of three categories: background characteristics, teaching-learning activities, and pupil acquisitions (Harnischfeger & Wiley, 1976; Haertel,Walberg, & Weinstein, 1980).

The authors hypothesized that students' achievement in science was influenced by teaching-learning processes (consisted of teacher activities and pupil pursuits) and background factor (consisted of curriculum institutional and pupil background). The findings of this survey in terms of actions or activities which were obstacles for teaching – learning science was named as "problem in science classroom". A finding, problems related to teacher activities was students' lacking science process skills. It probably affected learning activities that created by teacher. For example, teachers stated "*students did the wrong procedure, used improper science equipment and drew a wrong conclusion*". It demonstrated that students' lack those process skills might related to learning activities and finally students could not acquire science knowledge. Furthermore, the problem of lacking science laboratory equipment in this survey might affect creating activity of learning in science classroom; therefore, students had less chance to do the experiments. A study of Kruea-In & Thongperm (2013) stated that insufficiency of laboratory equipment was a significant obstacle in the integration of science process skills into teaching. Therefore, students' achievement became low. Moreover, several reports showed that science process skills correlated with science performance and achievement (Feyzioglu, 2009; Oloyede, 2012; Volkan, Dilber, & Yasemin, 2012; Chaurasia, 2015) even though a study reported low positive correlation between the science process skills and achievement in science among high school students (Raj & Devi, 2014). Consequently, lacking of science process skills might affect their achievement.

The problem of students had less interest and responsibility including talking too much in the classroom, less discipline, not enthusiastic and late handing assignment might involve pupil pursuits. These actions led the teacher spent time for classroom management; therefore, the actually learning time became less. Students did not submit assignment on time would affect their learning experience. Therefore, students did not have enough practicing in learning. Moreover, students lacked responsibility including low motivation or inspiration could be explained in terms of pupil background factor. These problems might cause students having low achievement. Some studies indicated that responsibility affected students' achievement (Sangkapan & Laeheem, 2011) and motivation had correlated with achievement (Cavas, 2011; Akpan & Umobong, 2013 ; Muhammad, Bakar, Mijinyawa, & Halabi, 2015).

Discussion of finding 2: comparison the science learning problems between students from schools having O-NET test scores above and below the mean score of national O-NET test.

The findings were considered in three aspects as shown in Figure 2. According to the amount of lacking science laboratory equipment of schools having O-NET below and above mean score of national O-NET test were 20% and 5%, respectively. It indicated that lacking of science laboratory equipment in schools located at rural area or small city still have been found. This finding was consistent with the study of Vailikhit et al (2013). Moreover, Boonklurb (2000) reported that lacking of science equipment was a limitation of teaching/learning science in Thailand and the study of Colangelo et al (2009) suggested that school should support the lab material for science learning. It demonstrated that lacking science laboratory equipment affected students science process skills in below mean score group because they had less chance to do the experiment. Consistent with previous study, lacking of laboratory equipment was the significant obstacle when science learning activities needed to be integrated into science process skills (Kruea-In & Thongperm, 2014). However, the amount of students' lacking science process skills in above mean score group (50%) was higher than that of the below mean score of O-NET test group (40%). These result related to the opportunities to do the experiment. Students from above mean score group had more chance to do the experiment as a result teacher could observe students' science process skills in more details. The responsibilities of students were not different and it showed a great impact to Thai student learning even in other subjects.

Discussion of finding 3: the issues that secondary school science teachers need to solve in science learning.

Teachers gave the priority to problem solving on science achievement and process skills. They wanted to learn and discovered the learning activities to increase students' achievement. In other words, teachers wanted to increase student performance for both science and language. However, teachers also stated that the problems of interest and responsibility should be solved. A study showed that responsibility affected students' achievement (Sangkapan & Laeheem, 2011).

Conclusion

According to teachers' perceptions, students having less interest and responsibility in science were found in science classroom. Lacking of science laboratory equipment still has been found in Thai science classroom context. The challenged problem on Thai classroom was students' lacking science process skill Students' ability in using language was frequently mentioned by science teachers. Moreover, solving problems of learning activities for increasing students' achievement and their process skills were needed as well. These findings provided the basic data to further develop the learning model for solving problems.

Limitation of this study

This survey was the first stage of learning model development. This survey was conducted from only eighth grade science teachers from certain areas. Time, place including situations involved science teachers might affect the responses to the questionnaire and interviewing. Moreover, it was only the teachers' perception. It did not evaluate students' abilities directly or given data by students for confirmation.

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