Students’ conceptual understanding of natural resources in geography through research-based learning

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Abstract The purpose of this study was to explore grade 7 students’ conceptual understanding of natural resources taught in geography through research-based learning. The samples were 34 students in grade 7 of Khon Kaen Demonstration Secondary School, Khon Kaen Province. The interpretive method was used to analyze students’ conceptual understanding of natural resources collected from students’ presentation of the concept map as conclusion in the final stage of research-based learning approach. The lessons of natural resources, including soil, water, forest, and mineral were used to examine how students construct their conceptual understanding in the form of ‘concept map.’ Data were interpreted through the rubric scoring with three criteria as follows. Level 1 was given to students who could draw a concept map describing at least 1-2 natural resources in Thailand with readable handwriting in colors. Level 2 was given to students when they could draw a concept map describing at least 2-3 natural resources in Thailand with readable handwriting in colors showing their creativity. Level 3 was granted to students when they could draw a concept map describing at least 4 natural resources in Thailand 4 with readable handwriting in colors showing their high creativity. This study also proposed the guidelines to enhance students’ conceptual understanding of geography through research-based learning.

Keywords: Natural Resources, Geography, Research Based Learning

1. Introduction
In the 21st century, intellectual competence, called learning skill is necessary for learners since it consists of a wide range of skills, including information-seeking skills, reasoning, and critical thinking skills. It is important that learners maintain their knowledge construction holding self-guidance and self-learning approach to improve their long-term learning methods [1], [7].

However, Thailand’s education has failed to lead students to meet the standard of learning skill requirements. Most Thai students lack information-seeking skill, which is one of the important skills that directly improve students’ learning. Therefore, using research-based learning (RBL) activities, suggested as a method of teaching and learning that helps promote a variety of students’ skills development. The research-based learning activities allow students to acquire more information while seeking new approach to link the lessons taught in various subjects. This learning approach also shapes students to be aware of the necessity of learning [2],[3], [8], [9] especially in the lesson of natural resources which is relatively important to human’s living. Since humans take advantages of natural resources for four fundamental requirements of survival, including food resources, accommodation, clothing, and medicine. Indeed, humans nowadays desire even more than those survival requirements. Needs for convenience cause humans to greedily and carelessly exploit natural resources [4], [11], [12]e.g. as water, forest, soil, and mineral resources. To conserve natural resources, it is necessary to understand the various types and
properties of natural resources. When students understand how essential natural resources are to the world, the country, and the community, they can seek methods to optimize the value of natural resources by minimizing the environmental impacts.

Moreover, the solutions of natural resources conservation aim to prevent the occurrence of various environmental problems, for example, poor soil conditions causing the lower crop yields. If students understand the properties of natural resources, they can initiate alternative ways to improve natural resources conditions while improving the crop yields. This method can increase environmental sustainability in long term.

In Thailand, the Office of Natural Resources and Environmental Policy and Planning [5], [6], [10] emphasizes that economic growth and national development in various areas cause the increasing demand for natural resources, namely forest, soil, water, and mineral resources, resulting in the decreasing quantity and quality of resources. Therefore, the natural resources are to be monitored and inspected for the more effective planning and implementation. More importantly, the appropriate action plan for resource management must preliminary derive from deep understanding of the properties of each resource to prevent the consequences that may occur.

Hence, it can be concluded that using research-based learning (RBL) activities is a teaching and learning method that helps learners develop skills in seeking knowledge which is available at any time. Students therefore must pursue their self-learning to enhance their greater learning performance. Students’ conceptual understanding of natural resources is required to prevent the environmental consequences that may occur and to sustain the natural resources in a long run.

2. Research methodology

Students’ conceptual understanding of the natural resources in geography through research-based learning includes the following steps:

1. Questioning: is the most important step that teacher uses questions to encourage students to think about the issues they are interested by using open-ended questions: “Why the problem occurred? What are causes of that issue? What would happen next? If so, how to prevent it?” These questions lead students to help each other brainstorm and further seek more information to solve the problems using reasoning approach in accordance with the research-based learning.

2. Planning: aims at collecting data by identifying the work process, data recording or collecting process, assigning roles and responsibilities of group members.

3. Action, Observation & Reflection: are implementation of the students’ plan. Students should report the results as well as identify any problems or barriers found during the process along with their solutions.

4. Conclusion & Presentation: show how students summarize the findings from the beginning. They should highlight the issues that need to be researched and further examination or experiment that they have come up with the findings, summary of the knowledge obtained after the activities in the form of ‘mind map’ presentation in front of the class. Class presentation allows students to exchange their acquired knowledge with other groups, then evaluate each other’s work to further develop the greater results in the future. By doing this, students can learn to sustain their self-learning skill until it becomes a learning habit, resulting in such an active learning society.

3. Data analysis

Students’ conceptual understanding of Thailand’s natural resources through the research-based learning process reflecting as ‘mind map presentation’ was interpreted through following rubric scoring divided into 3 levels as follows:

Level 1: Students describe the topic and details of the natural resources by illustrating with pictures or symbols of 1-2 natural resources in Thailand, such as soil, water, forest, and mineral resources. If the information of the natural resources was correct, and results were summarized completely by using research-based learning process, students’ mind map would be scored as Level 1.

Level 2: Students describe the topic and details of the natural resources by illustrating with pictures or symbols of 3 natural resources in Thailand, such as soil, water, forest, and mineral resources. If the
information of the natural resources was correct, and results were summarized completely by using research-based learning process, students’ mind map would be scored as Level 2.

Level 3: Students describe the topic and details of the natural resources by illustrating with pictures or symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. If the information of the natural resources was correct, and results were summarized completely by using research-based learning process, students’ mind map would be scored as Level 3.

The samples were grade 7 students of 1 classroom, consisting of 34 students at Demonstration Secondary School, Khon Kaen University under the Department of Education, Muang District, Khon Kaen Province in the 1st semester of the academic year 2015, divided into 5 groups, making 6-7 members in each group. In addition, students with different level of learning performance: very good, fair, and poor, were randomly grouped in one group. Then, the mind map presentation of students was analyzed by using interpretative method.

The results showed 5 groups of students with their conceptual understanding of natural resources in the form of mind map presentation as illustrated below.

![Figure 1](image1.png)

**Figure 1.** showed main students’ mapping

From the Figure 1, students showed main concept and correct details of the natural resources with drawing and symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. The information was correct; therefore, students’ min map was scored as Level 3. They could to tell a detailed description of resources about soil details, specifying soil types that can be utilized and explained the resources of each region of Thailand.

![Figure 2](image2.png)

**Figure 2.** Show natural resources with details about Knowledge and resources.
From the Figure 2, students showed main concept and correct details of the natural resources with drawing and symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. The information was correct; therefore, students’ min map was scored as Level 3. They were present natural resources with details about Knowledge and resources. It's reflecting student understanding such as soil, explaining soil and soil type and explain about various water sources.

![Figure 3](image)

**Figure 3.** Show details of the soil and characteristics of soil in Thailand

From the Figure 3, students showed main concept and correct details of the natural resources with drawing and symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. The information was correct; therefore, students’ min map was scored as Level 3. They were explaining the details of the soil and characteristics of soil in Thailand which reflects the understanding of this group soil harvesting about soil and forest.

![Figure 4](image)

**Figure 4** show representing an understanding as draw a picture about resources

From the Figure 4, students showed main concept and correct details of the natural resources with drawing and symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. The information was correct; therefore, students’ min map was scored as Level 3. They were representing an understanding as draw a picture about resources their soil water and forest in Thailand.
Figure 5. show represent an understanding as mapping natural resources.

From the Figure 5, students showed main concept and correct details of the natural resources with drawing and symbols of all 4 natural resources in Thailand, including soil, water, forest, and mineral resources. The information was correct; therefore, students’ min map was scored as Level 3. They were representing an understanding as mapping about resources their soil water and forest in Thailand.

4. Result
From the results of students’ conceptual understanding of natural resources in Thailand through a research-based learning (RBL) divided into 3 levels, it is found that when students can develop their learning about natural resources in geography by using the research-based learning process (RBL). The presentation of mind map reflected that students have understood the main concepts of all 4 natural resources as well as the properties of each resource, namely soil, water, forest, and mineral resources. Furthermore, students’ seeking-information process to acquire further knowledge has been reflected in their mind map scored as Level 3. Thus, adoption of learning activities using research-based learning (RBL) helps students develop their self-learning skills, which in turn, improve their systematic learning process. By using research-based learning (RBL), students are encouraged to express their ideas and share with their classmate to construct even greater results of information searching. In conclusion, it is recommended that research-based teaching and learning activities should be continuously conducted at Demonstration School of Khon Kaen University, Department of Secondary Education, Faculty of Education.

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