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Comparative Study on Green Energy Education Contents in Thai and Korean Elementary Curriculum

Sathaporn Pokpong[1]*, Chulalak Changul[2], Jang-Ho Son[3]

[1, 2] Faculty of Industrial Technology, Phranakhon Rajabhat University

[3] Department of Practical Arts Education, Daegu National University of Education

*E-mail: pokpong@pnru.ac.th

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Abstract

The objective of this study is to present a comparative study on green energy education contents for elementary school textbooks in Thailand and South Korea. It is believed that energy-related education plays crucial roles in shaping the pace of energy efficiency improvement and of technology innovation in the future. To accomplish these goals, the government in both countries have set procedures and combined various strategic plans to promote and enhance young learners' quality in gaining essential knowledge and awareness of effects of energy utilization on life and environment. Teaching and Learning Frameworks for green energy education are reviewed. The energy-related contents provided recently for elementary school textbooks are discussed. It is found that the development of elementary school curriculum in Thailand and South Korea is unique and inherently based on local phenomenon or context. According to this collaborative study, it reveals that the composition of contents to understand the concept of energy in elementary education curriculum is insufficient, and both countries are perceived that balanced energy consumption method is very important in elementary school curriculum.

Keywords : Green energy education, Elementary school textbook, Energy-related curriculum

Introduction

Thailand, under a mutual agreement by Ministry of Energy and Ministry of Education, has declared a strategic plan to enhance young learners' quality in energy education. It is aimed to gain essential knowledge and skills required for their lives in an everchanging society. A comprehensive project so called Thailand Integrated Energy Blueprint (TIEB), under the vision of the "Stability, Prosperity and Sustainability" by 2036, is a crucial determination to achieve sustainable development and offer a clear direction for long-term development [1]. According to The Basic Education Core Curriculum in Strand 5 of Science modules, it is indicated that Energy Education is one of the most important cores. These modules prescribe an understanding of relationship between energy and living; energy transformation; interrelationship between substances and energy; effects of energy utilization on life and the environment; having inquiring process for endeavoring to gain knowledge; and communicating acquired knowledge that could be applied for useful purposes. It is still questioned that the latest version of Basic Education Core Curriculum in Thailand is covered the basic knowledge for Thai people being able to follow the TIEB? In many countries, including Thailand and Korea, curriculum development is generally centralized, but at the implementation level there is a varying degree of autonomy of local authorities, schools and teachers. In Korea, National curriculum provides common features, but diversity through modification is also emphasized, while in Thailand, national standards for Basic Education outcomes and benchmarks are newly revised every 3-5 years for local schools to develop curriculum. It is also interesting to know how module of Energy Education, especially in Content and Organization, can be developed and implemented in Basic Education Core Curriculum to meet the challenges of the new green energy technology in both countries.

Objective

This study aims to present a comparative study on green energy education contents for elementary school textbooks in Thailand and South Korea.

Methodology

A comparative study is based on the energy-related contents in elementary schools through The Basic Education Core Curriculum B.E. 2551 (2008 version) defined by Ministry of Education in Thailand and The Institute for the Promotion of Teaching Science and Technology (IPST) and the

centralized National Science Curriculum in South Korea.

Science Education in Thailand and Korea

Science Education in Thailand is designed to provide the scientific knowledge so that students can achieve specific knowledge and understand nature and imitated technologies for applying logically, creatively and morally in their lives [2]. Thai students learn science as a compulsory subject over 12 years of Basic Education: from Grades 1 to 6 in Primary Education and from Grades 7 to 12 in Secondary Education. Science textbooks are particularly published by the government and private sectors. The National Curriculum provides the contents of each subject and defines the students' learning outcomes at each grade level differently. However, the lesson schedule of each school can be diversely arranged depending on school context [3]. While in Korea, students learn science as compulsory courses for 8 years, starting from Grades 3 to 10, according to the centralized National Science Curriculum. In early stage, the government-authorized science textbooks have been produced and used in every classroom all over the country, including one textbook for elementary schools and a number of textbooks for secondary schools. After an attempt to decentralize educational system in 2009, schools in Korea require their own school-based science curriculum through The National Curriculum framework. Similar to the Korean science curriculum, the Royal Thai government also aims to decentralize education system, and therefore, individual schools are able to develop their own curriculum and dominate differently depending on conditions at the school [3].

To give a support and facilitation to the government, a number of consulted agencies get involved to develop an effective curriculum. In Thailand, Department of Curriculum Development, local agencies, teachers, communities and welfare agencies are in-charge of an initiation of curriculum development, while in Korea, Research institutes e.g., KEDI and KICE, involved in developing a draft version and various groups e.g., teachers, parents, students, industries and academic associations are concerned. In Thailand, values education, education for the world of work, science and technology, information and communication technology, health education, and environmental education are integrated into existing subjects of the curriculum. In contrast, Korean curriculums offer both as separate subjects and often integrate also into other subject area to strengthen their emphasis, except foreign languages that is distinct both in Thailand and Korea.

Green Energy Education in Elementary School Textbooks

In 2014, Ministry of Education in Thailand defines and updates Teaching and Learning Framework by using STEM education approach on Energy achievement that cover 5 major plans including Power Development Plan (PDP), Alternative Energy Development Plan (AEDP), Energy Efficiency Plan (EEP), Oil and Gas Plan. In order to promote green energy education as a compulsory subject over 12 years of Basic Education, Ministry of Education and Ministry of Energy revises energy-related contents, improves teaching and learning process, and produces a set of practical instructional media to meet a designated body of knowledge as well as setting up a group of pilot schools for action learnings in energy education.

In Korea, the Green Growth literally means the growth achieved by saving and using energy and resources efficiently to reduce climate change and environmental degradation through research and development of green technology. The contents of energy conservation education is outlined by the Korea Energy Management Corporation (KEMCO) in 2004 including 1) Energy concepts that comprise forms, definition, types and properties, conversion and conservation, and role of energy; 2) Energy problems which the need, supply and demand and international distribution of energy resources and environmental issues of energy consumption are determined; 3) Methods for solving energy-related problems is proscribed by development of alternative resources and efficient energy consumption; 4) Political, social and economic relations with energy which consist of history of energy, energy and society, energy facilities location and international division of energy resources; and 5) Energy and economical living which divided into two parts as follows: energy efficient methods at home and school, and methods of saving electricity.

According to the Thailand Ministry of Education, STEM education will be implemented in 2014 at every level of the curriculum, starting from basic education to higher education, because The Thai government aims to produce enough graduates equipped with the necessary STEM knowledge and critical thinking skills needed for facing the challenges and seizing the opportunities of the 21st century's workforce. In addition, Thailand Ministry of Energy also revised the strategic plan to launch a new energy policy in the period from 2015 to 2036, therefore, the energy contents provided in Basic Education need to be determinedly

improvised. It is noticed that traditional approach taken for energy education in elementary school level, involving many prerequisite concepts that are themselves difficult to teach to young students. In order to prepare prospective elementary school teachers, instructional guidelines are developed and funded by Thailand Ministry of Energy and higher educational institutions in Thailand. Textbook for elementary students released in 2016 consists of 5 main chapters including, 1) introduction to energy, 2) an overview of different energy sources that are in use, and what's the potential issue for each of them, 3) energy situation in Thailand, 4) problem and energy vulnerabilities for key resources and environment, and 5) energy conservation and environmental impacts of energy production and consumption.

In Korea, the framework of energy education content has been recently revised in 2015 and concisely keep in some certain parts including energy concepts, energy problems and solving energy problems, as there are duplicated parts in the necessary contents. Regarding energy concepts, the definition and forms of energy associated with sources are described. In addition, the principle of energy conversion and conservation is hinted at energy concepts division. Solving energy problems were added aiming at the development of green energy and the ways to wisely save energy.

A study on energy and green energy of elementary school's education curriculum in 2011, it is indicated that the ratio of the energy and green energy education was 3% and 0.78% from total classes [4]. There are three main areas consisting of energy concept, energy problem and energy problem-solving strategy. It is revealed that energy problem-solving is remarkably mentioned the most, followed by issues on energy problem. The direction of education contents related to energy and green energy shows that it is necessary to balance the information provided in the aforementioned areas evenly. It is also noted that it is required to additionally place green energy contents not only for specific grades but for various grades equally. In addition, it is revealed that school textbooks require to offer more information about green energy-related configuration that may increase student engagement in energy and environment problem and practice students for green energy uses through lifelong learning process.

Conclusion and Discussion

The development of the elementary energy-related curriculum of Thailand and Korea is unique in both countries. Both government policies and preferences evidently play a crucial role in shaping the pace of energy efficiency improvement and of technology innovation. It is believed that young people have the adaptability, the motivation, and a lifetime of opportunity to make meaningful changes in society's energy systems. They need only to understand those systems and find the confidence to move ahead. Public awareness must be positively converted, and the best method for communicating accurate knowledge is through education.

It is obvious that a set of Thai elementary school textbooks updated in 2014 has predominantly changed by adding noticeably course contents in energy- and green-energy-related knowledge as a previous version released in 2008 rarely included those in Science textbooks for elementary students. Green energy sources are generally taught including solar energy, biomass products, wind energy and hydropower energy that are widely used across the nation. As a result, targeted young learners in elementary schools can easily get engaged and understand better how green or renewable energy important for environment and daily-life activities. Public awareness in energy consumption at school or home can be potentially developed. Thailand has an attempt to raise an energy-aware generation through hands-on education as STEM Education plays a crucial role in teaching youth the complex issues facing our energy challenges. It is evidence that there are numerous school districts and individual teachers who are coming up for training and Ministry of Energy provides teachers manual giving not only theoretical contents in green energy but also exciting ways to teach elementary school students using hands-on or project-based learning approaches.

While in Korea, identical approach has been launched for energy-related contents in elementary school curricula. Korean adapts their science curricula in elementary level to the context of the daily-life experience of young students. This is important in designing the green-energy-related curriculum responsive and relevant to the needs and demands of current energy situation. The designated programs in Korea are mainly focused on delivering relevant knowledge in green energy which consists of 9 individual programs as follows: Solar energy, Bioenergy, Wind energy, Hydropower, Electrical energy, Marine energy, Waste energy, Geothermal energy,

and Hydrogen energy. Hands-on activities, such as solar cookers or solar cars, are provided directly or indirectly and allowed students to easily encounter and apply in their daily life. School teachers employ a various kind of video clips, games or drawings a six-cut cartoon. Moreover, it is very interesting that teachers can apparently provide an example or experiment based on an inherently local phenomenon, such as Sihwa Lake tidal power station, that green energy sources can be generated and converted to electricity. Although both curricula are anchored on specific needs and contexts, linking science with peoples' culture. A framework for Energy Education Content in Thailand and Korea is comparatively represented in Table 1. This reveals that the definition of energy and development of green energy are required to provide a clearer detail for elementary students' textbooks.

Table 1 Analysis framework for Green Energy Education Content of Thai and Korean Elementary Textbooks

Module	Energy Education Contents	Degree to which individuals have an ability to understand	
		Thailand	Korea
Energy Concepts	Forms of energy	⦿	○
	Definition of energy	◇	◇
	Energy conversion and conservation	○	◇
Energy problems	Need of energy sources	◇	○
	Distribution of energy sources	○	◇
	Environmental issues of energy use	◇	○
	Supply and demand of energy sources	○	○
Solving energy problem	Development of green energy	◇	◇
	Ways to save energy	⦿	⦿

Remarks: ⦿ = Understanding clearly ○ = Understanding ◇ = Weak understanding

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