ORIGINAL ARTICLE

Inquiry-based Learning in Junior Secondary Geography Education: A Lesson Analysis of China's Natural Resources Teaching

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***Abstract**: This paper is a lesson study of the instruction of China's Natural Resources (the third unit of eighth-grade geography), and its objective is to examine the efficacy of inquiry-based learning in geography education. In the experimental lesson, we reorganized the teaching content by integrating the learning materials from the four sections of Natural Resources Overview, Land Resources, Water Resources, and Marine Resources in the unit. With proposed real-world situations and learning tasks, students posed research questions and conducted independent inquiry into issues such as the characteristics, distribution, and utilization of Chinese natural resources, as well as the existing problems. In this procedure, students gained the right methods and skills for geographical study, thereby enhancing their academic competency in geography.*

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GEOGRAPHY, a subject that combines elements of the natural and social sciences, can not only offer students a wealth of geographical knowledge but also heighten their understanding of the connections between the environment and human activity. China's junior secondary geography education is now plagued by its traditional teaching methodology, which mainly relies on the instructor providing information from textbooks and their own expertise of the subject. In such a mode of instruction, students are passive recipients of knowledge that has limited potential to be transformed into practical abilities; hence, their geographical competence cannot be enhanced. For instance, students may have theoretically mastered a number of methods for identifying directions, but in practice they are unable to recognize the east, west, north, and south. However, students cannot appreciate the complicated relationships between the environment and human activity through lecture alone. Students' perception and comprehension of the disciplinary principles underlying geographical phenomena are enhanced through inquiry-based learning in authentic contexts.

What Is Inquiry-based Learning?

Instead of experiencing the process of learning new things, experimenting with different teaching strategies, and developing moral principles, students have traditionally been expected to memorize information from textbooks. The development of imaginative skills has become a social need for education in the information age, and all countries have made it their educational objective to help students develop these skills and an exploratory spirit. In this context, inquiry-based learning has received a lot of attention from educators throughout the globe as a pedagogical strategy intended to help students develop their higher-order thinking abilities. In their current reform of education and teaching, Chinese teachers are also aware of it.

Inquiry-based learning is a type of active learning that begins by providing questions, challenges, or scenarios and is dominated by students' independent, explorative research, according to the experience of the discovery learning movement (Wang, 2019). It includes coming up with questions, making observations, looking into information that already exists, designing experimental techniques, gathering, analyzing, and interpreting data, writing potential explanations, etc.

The status of geography education, where direction instruction and rote learning are predominant, can be changed by including inquiry-based learning, and students' abilities to recognize issues, process information, research, and analyze can be improved. In our investigation of inquiry-based learning in junior secondary geography instruction, phenomena are proposed by the teacher, research questions are raised by students, and study groups

are formed to collaboratively carry out learning tasks with the aim of developing students' critical thinking and problem-solving skills.

Teaching Practice Based on Inquiry-Based Learning

Requirements of the Course Standards and Learning Situations

Chinese Natural Resources Overview, Land Resources, Water Resources, and Sea Resources are the four sections that make up the China's Natural Resources subject in Volume One of the eighth-grade geography textbook. Students should be able to describe the key features of China's water, land, mineral, and marine resources, among other resources, using maps and pertinent materials, to illustrate the relationship between natural resources and human production and life with examples, and to comprehend the significance of natural resource exploitation, utilization, and preservation, all through the study of this unit, in accordance with the Compulsory Education Course Standards for Geography 2022 (Ministry of Education of China, 2022). Evidently, the national course standards set quite high standards for academic ability for the study of this unit, emphasizing that students need to understand the current state of China's natural resources, be able to explain how human activities and natural resources relate to one another from a regional perspective, and initially establish a scientific outlook on development that is suitable to local conditions.

The use of natural resources is essential to human existence, and students may have some limited knowledge of them via personal experience. Student comprehension of the true state of China's natural resources, however, is limited due to their lack of education and life experience. The distribution of natural resources across all areas and nations was discussed in a global geography lesson from the previous grade (grade seven), but it did not go into great detail. In general, students have very basic prior knowledge of natural resources, and they have not yet fully grasped the connections between natural resources and human activities. In order to assist students to meet the learning objectives of this unit through inquiry-based learning, teachers must construct research scenarios depending on their cognitive abilities, encourage them to pose research questions, and support them in doing so.

Reorganizing Teaching Contents

The unit on China's Natural Resources is highly informative, particularly for junior secondary school students who are forming their values at this vital juncture in their lives. As a result, we not only emphasize students' mastery

of China's natural resources in lesson design and implementation but also attempt to draw their attention to actual social issues, raise their awareness of the importance and urgency of saving and protecting natural resources, and guide them to develop proper views of resources, the environment, and social development. We blended instructional materials from the four main portions of the unit and designed two learning challenges based on students' life experiences and cognitive abilities. (i) Investigating whether China is rich in natural resources or deficient in them; (ii) Making recommendations for the responsible use and preservation of natural resources. To provide students with richer subject matter for their inquiry-based learning, the lesson also included a series of hot topics of public concern, such as the carbon emission peak, carbon neutrality, renewable energy development, new energy vehicles, across-regional resource allocation, and tiered water and electricity prices.

Setting Learning Objectives for Students

- To express their understanding of the idea that "natural resources are an important prerequisite for human activities" and to summarize the two fundamental characteristics of natural resources—existing in the natural world and helping humans—using examples from real life,
- To determine whether China is a resource-rich nation by describing the fundamental characteristics of its natural resources using maps and pertinent data.
- To collect information, explain why China's national policy gives priority to the protection and preservation of natural resources as well as natural restoration, and make suggestions for how to do so by citing practical examples.

Instruction Processes

Task One: Looking for Evidence of Whether China Is Rich or Wanting in Natural Resources

- Introductory Situations

The teacher brought up the point that China has a vast land with a wide diversity and quantity of natural resources. At the same time, it has a large population and is experiencing significant economic development, which implies that natural resources are in high demand. What is the state of our resource reserves? Is China's natural resource base abundant or depleted? A variety of reading materials were distributed to students, including "A Comparison of World Rankings of China's Main Natural Resources and Its Per

Capita Quantity of Resources," "A Diagram of China's Oil Consumption and Production," "A Chart of China's Automobile Sales Growth," and "China's Coal, Oil, and Natural Gas Resources Distribution."

- Question-based Cooperative Study

Students submitted questions based on their personal experiences and attempted to complete the learning task through autonomous and collaborative inquiry.

i. Question One: "What are natural resources?"

Students made a list of as many common objects in life as they could, such as books, desks, rice, salt, lightning, air, sunlight, water, and so on, and then determined whether or not they are natural resources and explained why. Following that, group members discussed those undecided issues with one another and came up with the two basic characteristics of natural resources, which are that they exist in the natural world and benefit humans.

ii. Question Two: "Is China a naturally resource-rich country?"

The students first conducted independent research to learn more about the fundamental characteristics of China's key natural resources before formulating their own opinions on "whether China is a strong country in natural resources." They next engaged in in-group discussions to further their comprehension of how natural resources, the environment, and human activities are related.

- Group Presentation and Debate

Each group provided their reasoning for their answer to the topic of whether China is a country rich in natural resources. Following inter-group discussion and debate, students agreed that China is rich in natural resources in total quantity, but its per capita share is small; that China has an unbalanced geographical distribution of natural resources; and that China has a large gap between supply and demand for natural resources.

- Summary and Reflection

The application of inquiry-based learning requires real-world contexts and insightful questions. Students' interest in research, the development of an active learning environment, and their comprehension of the two fundamental characteristics of natural resources (natural and social attributes) could all be sparked by the classification of common resources. To gain a general understanding of China's natural resources, students conducted relevant data searches, recognized the key issues and their root causes, and learned the fundamental conditions of China's natural resources. In the interim, both the students' verbal communication skills and their capacity to extract pertinent information from texts and figures have significantly increased. Their

awareness of the value of and need to protect the environment emerged on its own.

Task Two: Proposing Suggestions for Reasonable Utilization and Preservation of Natural Resources

- Introductory Situations

As a result of its expanding population and rapid economic development, China's lack of resources has become increasingly acute, impeding the country's ability to sustainably develop its economy and society. How to protect and make judicious use of natural resources is a critical issue that requires immediate attention (Cai & Zhou, 2013).

- Question-based Cooperative Study

Students divided themselves into several groups based on the questions they were interested in exploring, and they carried out their research in groups.

i. Question One: "What is the status quo of China's natural resource utilization?"

Students gathered and studied national policies on the exploitation and utilization of natural resources to determine the importance of governmental regulation of this issue; they looked for specific cases to examine the problems in China's natural resource exploitation and utilization; and they proposed solutions for rational resource use from both the national and individual perspectives. Individual opinions were expressed in group discussions, and it was eventually agreed that both developing renewable resources and conserving conventional ones are critical to managing natural resource limitations.

ii. Question Two: "What is the water and electricity consumption of our school like?"

The study group spoke with the teacher in charge of school logistics to learn more about how much water and power the school uses and consumes. The next step was to document the phenomenon of water and electricity waste in schools by visiting all locations where water and electricity were required. Finally, a group discussion was held to generate workable ideas for conserving water and electricity in the school. The topic was "what I can do to save water and electricity on the campus."

- Group Presentation and Debate

With an emphasis on the current issues with resource use in China and potential improvement measures for resource conservation and preservation, group presentations were made to discuss the investigation's findings.

- Summary and Reflection

By collecting data on their own, students discovered the true scale of natural resource waste in China and the significance of rational usage of natural resources, which aided in the development of rational perspectives on resources, the environment, and social progress in them.

Using task-based learning, students were able to study real-world geography. By studying the school's water and electricity consumption, students were able to apply theoretical knowledge to real-world scenarios and become more aware of the resource issue on campus. In addition, the process of proposing recommendations for minimizing water and electricity waste in schools could increase students' sense of responsibility towards the school and society.

Findings of the Lesson Study

An Evaluation of Instructional Results

According to the set arrangement of chapters and parts, geography teachers often explain the fragmented knowledge points in the textbook one at a time. When taught about China's natural resources in a traditional classroom, for instance, most students struggle to explain the country's overall natural resource situation or to use examples to explain the connections between natural resources, the environment, and human activities, let alone to understand the country's current resource policies and regulations in the context of historical development. In inquiry-based learning, which is guided by learning tasks and questions, students carefully read the text and figures in the textbook and actively seek out additional material to find answers to predetermined questions and establish their own judgments on resource-related issues. To deepen their understanding of key ideas like "Natural resources are fundamental to human activities," "Exploitation, utilization, and preservation of natural resources are interconnected aspects in holistic planning," and "Developing new sources of resources and conserving reserves are both crucial to addressing natural resource shortages," students are guided to discuss hot topics of public concern in the interim. Moreover, students' favorable attitudes about resources, the environment, and human growth are greatly fostered by this inquisitive learning approach.

Observers' Comments

"Is China wealthy or impoverished in terms of natural resources?" Such difficult questions led to students properly understanding the essential topic—natural resources—and established a link between conceptual knowledge and the real world. They also piqued students' interest in geography. This class was dominated by inquiry-based learning, with students serving as the primary actors. Students do learning exercises based on research topics in an

open learning environment with extra learning materials. Students constructed a thinking route for tackling resource concerns by combining independent learning and group study, which consists of the following steps: raising questions, researching questions, and solving problems. This way of thinking is applicable in different circumstances. As a result, students' academic ability improves on its own.

Comments from the Lesson Evaluation Specialist

In this case of inquiry-based instruction on China's natural resources, students have been actively engaged in identifying and investigating topics and problems to create knowledge and solutions. Students had a relatively full comprehension of the categories of natural resources and the relationships between natural resources, the environment, and human activities as a result of the learning activity "searching for evidence to determine if China is rich or poor in natural resources." Students realized, for example, that the uneven distribution of water resources in China is related to its unbalanced precipitation in terms of time and space, and that the distribution of land resources is determined by its topography; that water resources and land resources in most regions are mismatched to varying degrees; and that the same natural resource conditions have distinct effects on the economic development of different regions in China. The "proposing suggestions for reasonable utilization and preservation of natural resources" learning task was successful in drawing students' attention to resource issues in real life and reality, motivating them to collect information via multiple media and use concrete examples to present the current state of resource exploitation and utilization, and educating them to consciously conserve resources in everyday life to align their knowledge with their behavior. The pedagogical method of inquiry-based learning has been properly implemented to achieve the learning objectives of this lesson, which are to acquire preliminary knowledge of the basic condition of China's natural resources and cultivate an initial awareness of the prudent use and preservation of natural resources.

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