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Research on Teaching Strategies for Geography Principles Course

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Abstract: Geographic principles are highly abstract and generalized representations of geographic phenomena, capable of explaining the objectivity and necessity behind the generation, appearance, development, and change of certain geographic phenomena. The key to learning geographic principles lies in resolving students' cognitive conflicts through methods such as summarizing sensory knowledge, deducing the processes behind principles, and interpreting graphical concepts. By combining geographic principles with the characteristics of the geography discipline, teachers can facilitate in-depth understanding and develop students' core literacy by following a teaching logic strategy of "exploring principles - clarifying principles - applying principles - reflecting on principles" throughout the process of teaching geographic principles.

Keywords: Geographical principles; Teaching strategies; Research

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1. Introduction

Geographical principles reflect the essential characteristics, development laws, interrelationships, and changing processes of geographical elements or geographical things [1]. The course on geographical principles refers to the process where teachers and students jointly explore the origins and development of principles, grasp the essence of geographical things, establish a logical chain of causal relationships, and use comprehensive thinking to thoroughly analyze the logical relationships between elements, as well as the formation process and development changes of geographical phenomena. In the design of the high school geography curriculum, it is required that "students gradually learn to use basic geographical principles to explore geographical processes, causes, and laws in organizing and analysis of geographical facts," and in terms of evaluation, it stipulates that students' understanding ability should be evaluated based on "the expression of concepts, principles, and theories" [2].

Exploring laws and identifying problems are the starting points of learning geographical principles.

Acquiring and clarifying these principles is essential, applying them is the core, and continuously reflecting on them leads to deeper understanding. Teachers should integrate the actual teaching content to guide students in exploring the causes of geographical principles, expressing knowledge of these principles, applying them to solve practical problems, and reflecting to learn by analogy—emphasizing that each step is interconnected rather than completely separate. Throughout the process of exploration and research, students engage in cooperative learning to discover and apply cases or problems related to migration [1].

2. Characteristics of geography principles course

2.1. True representation of subject characteristics

The discipline of geography is characterized by its comprehensiveness, regionalism, and dynamism. The exploration and application of geographical principles must revolve around these characteristics of geography. The geographical environment is a complex body composed of many geographical elements, and these elements are related, interconnected, and mutually restrictive, which is the overall nature of the geographical environment.

Under the guidance of the holistic perspective, studying each element itself, and using a comprehensive and connected view to study and analyze the mutual relationships between elements, many geographical principles can be analyzed more targeted. Simultaneously, the analysis of geographical principles cannot be separated from specific regions, both natural and human geography are based on certain regional carriers. When studying geographical principles, we must also start from a regional perspective, integrate the natural geographical elements and human geographical elements of the region, and explore the principles of geographical environmental differences. Under the guidance of the differential perspective, the geographical reasons for the characteristics of different regions are analyzed. The geographical environment also has the characteristic of dynamic change. In terms of the natural environment, the crust material is constantly cycling, and the three major types of rocks and magma are constantly transforming.

The global atmospheric circulation shows the internal circulation and renewal of the atmosphere and has an important impact on global water and heat distribution and changes. The water cycle continuously shapes the surface morphology and affects the global climate and ecological environment. Nature is not immutable either. Due to the development of the socio-economy and the progress of science and technology, human understanding of natural resources is deepening, and the breadth of resource development is continuously increasing. Things that were previously not considered natural resources, such as scenery, are now included in natural resources [2]. In human geography, for example, certain location factors within different regions may change over time, which will change the site selection of these industries.

From the perspective of cost optimization, changes in industrial layout, and the like, industrial transfer occurs. These are all manifestations of dynamic change and they contain many geographical principles. It also encourages us to interpret geographical principles from the perspective of dynamic change. In summary, in the study of geographical principles, we must pay attention to the characteristics of geography: sensibility, regionalism, and dynamism.

3. Disciplinary integration is prominent

"Disciplinary integration" refers to a teaching strategy that, on students' existing multi-disciplinary

knowledge, uses materials, contexts, analysis methods, and thinking processes from other disciplines to solve various problems in the process of geography, to improve students' geographical abilities. As a discipline that combines the characteristics of natural sciences and social sciences, the nature of geography determines that teachers must integrate other disciplines in the teaching process [4]. During the teaching of physical geography, it integrates with mathematics, physics, chemistry, and biology while during geography, it integrates with Chinese, history, and other disciplines.

For example, in physical geography, when explaining the principle of the Earth's orbit, the Earth's path around the Sun is an ellipse, with the Sun located at one of its foci. This results in aphelion and perihelion. The difference in speed between perihelion and aphelion is a challenging concept, requiring teachers to incorporate relevant knowledge from mathematics and physics. When teaching about karst landforms, it is necessary to connect with chemistry, as limestone, a soluble rock primarily composed of calcium carbonate ($CaCO_3$), interacts with water and carbon dioxide. The forward reaction explains how limestone is eroded, forming surface features such as stone buds, solution grooves, stone forests, peaks, peak forests, and solitary peaks; underground erosion results in features like underground rivers and caves.

The reverse reaction explains how limestone deposits form new rocks, such as stalactites, stalagmites, and stone pillars. By introducing chemical equations and principles, along with typical images of karst landforms, students can better understand the concept [3]. When teaching regional geography, such as the Dongting Lake wetland, it can be integrated with the traditional masterpiece Yueyang Tower, using the philosophy and literary elegance of ancient poetry to vividly explain the mutual replenishment principle of lakes and water bodies in geography, the principle of wetlands as de-pollutants, and the principle of water body regulation. This approach makes the teaching more engaging and easier for students to grasp.

4. Core competencies throughout

The core competencies of the geography discipline include regional cognition, integrated thinking, geographical practice, and the view of harmony between humans and the environment. Geographical practice is the cornerstone of the discipline, regional cognition, and integrated thinking are methods to explore principles, and the view of harmony between humans and the environment is the essence of geography. In the process of teaching geographical principles, the explanation, analysis, and application of these principles should be closely aligned with the core competencies of the discipline [4].

A geographical principle may involve one or several core competencies. Starting with a geographical event as the context, and using integrated thinking alongside geographical practice, we can uncover the logical patterns behind geographical principles and ultimately achieve harmony between humans and the environment. This approach aligns with the development pathway of things: understanding nature, transforming nature, solving problems, and achieving harmony between humans and nature. These steps correspond to the core competencies of geography: regional cognition (understanding nature), integrated thinking (transforming nature), geographical practice (solving problems), and the view of harmony between humans and the environment (achieving harmony).

The examination of geographical core competencies has become a critical part of college entrance exams. This requires educators to return to the fundamental characteristics and main content of geography in their teaching, select real-life contexts, identify relevant problems, and enable students to apply the

geographical principles they have learned to solve practical geographical issues. This process fosters and enhances students' core competencies in geography.

Concurrently, geography teachers should continuously improve their teaching skills and methods, demonstrating the ability to extract geographical knowledge from daily life and apply geographical principles to real-world situations.

5. Inquiry: identifying problems and exploring patterns

This segment marks the beginning of the cognitive process, aiming to stimulate students' thinking and initiate teaching. The purpose of identifying problems is to raise awareness of issues, spark students' motivation for learning, guide their thinking, and explore geographical principles.

(1) Utilizing life experiences: Starting from students' feelings and perceptions, connect geography with their life experiences and create problem scenarios based on their existing knowledge and observations. For example, when teaching about lunar phases, the following context and questions can be posed: "When during the month is the moon fullest?" and "When during the month can we see half of the moon?" Students often have an intuitive understanding of lunar phase changes from their life experiences but may not know the specific rules or reasons behind these changes. These relatable problems derived from daily life can effectively spark students' curiosity, encouraging them to explore and master geographical principles.

(2) Connecting with learned knowledge: Extract information from students' existing cognitive structures and create questions that challenge or conflict with their prior understanding to stimulate active thinking. For example, after teaching the principle that "anticlines form mountains and synclines form valleys," a teacher might pose a question based on field pictures: "Do anticlines always form mountains, and do synclines always form valleys?" Students, having learned about geological structures and structural landforms, are aware that rocks are influenced by external forces. By analyzing field pictures of folded rock layers, they may infer cases where anticlines form valleys and synclines form ridges, actively exploring the reasons behind these exceptions.

Such problems, closely related to students' prior knowledge, establish a meaningful connection between existing knowledge and new challenges, providing students with the motivation for deeper exploration [5].

6. Enlightenment: attain principles and clarify true knowledge

This segment serves as the foundation of principle teaching, acting as a bridge between prior knowledge and new concepts. It represents the process through which students acquire geographical principles, fostering geographical thinking and enhancing subject-specific abilities. In this stage, teachers should fully utilize the inductive method, deductive method, and abductive reasoning in geographical teaching. These three methods are distinct yet interconnected and can be applied independently or in combination.

6.1. From phenomena to characteristics: the inductive method

The inductive method, also known as inductive reasoning, involves deriving general conclusions from specific observations. In this context, teachers guide students to focus on interpreting texts and images, extracting useful information to organize and summarize geographical characteristics. Phenomena can be

presented through texts, images, models, animations, experiments, or the use of virtual reality (VR) and augmented reality (AR) technologies, which integrate the virtual world with the real environment to address abstract geographical problems. For example, when teaching the principle of "changes in day and night length," animations can visually illustrate these changes across the four seasons, followed by a discussion to summarize the patterns. Similarly, VR technology can allow students to observe the daily changes in shadow length and direction while studying "daily changes in shadows." For "agricultural location factors," materials about rice cultivation in China's monsoon region can be provided, enabling students to identify the natural and socio-economic factors influencing agricultural location [6].

6.2. From characteristics to causality: the deductive method

The deductive method involves drawing conclusions based on established knowledge and materials. In geography teaching, teachers encourage students to analyze appearances and characteristics to deduce causal relationships. This process emphasizes reasoning and allows students to develop their geographical thinking skills by exploring principles through questioning, group discussions, and cooperative inquiry. For instance, when teaching the formation of "thermal circulation," students can deduce that uneven heating of the Earth's surface is the fundamental cause. This uneven heating results in vertical air movements, which create horizontal pressure differences in the atmosphere. These pressure differences drive horizontal air movement, first at higher altitudes, then at the surface, forming a complete thermal circulation system. Similarly, when discussing "river depositional landforms," teachers might present an image of an alluvial fan at the base of a mountain and pose the question: "How is an alluvial fan formed?" Students can explore the sequence of external forces—erosion, transportation, and deposition—along with the spatial progression from the mountainous area to the mountain outlet [7].

6.3. From causality to phenomenon: the abductive method

The abductive method involves applying existing knowledge to understand specific phenomena in the real world. This approach requires students to fully grasp the concepts underlying a principle and connect them to geographical reality. For example, when teaching the impact of "pressure belts and wind belts on climate," students learn that atmospheric circulation influences climate types, which in turn determine vegetation and soil distribution. For instance, the Mediterranean climate, influenced by the alternating effects of the subtropical high-pressure belt and the prevailing westerlies, is typically found on the west coasts of continents between 30° and 40°. Once students master this principle, they can analyze anomalies, such as the Mediterranean climate found in northern Mediterranean regions and near the Black Sea around 45°N, which deviates from the expected pattern. By applying the abductive method, students can deepen their understanding of geographical principles and further refine their geographical thinking skills [8].

7. Using rationality: knowledge transfer in practice and decision-making

This section focuses on the practical application of geographical principles, serving as the core of principle teaching. It represents the stage of internalization, where students' abilities are better reflected. By closely linking theory with practice, students discover the logical relationships between thinking methods and inquiry practices. The goal is to apply geographical principles to analyze and solve real-world problems,

fostering deep learning. Teachers can enhance students' understanding and application of learned principles by integrating them into relevant life contexts. If acquiring geographical principles represents the process of knowledge formation, applying them signifies the transformation of knowledge into ability. Specific strategies include knowledge transfer, practice, and decision-making.

7.1. Knowledge transfer

After introducing the principle of thermal circulation, teachers should explain its specific applications, such as sea breezes (land and sea winds), mountain-valley winds (mountain winds and valley winds), and urban winds. These examples should include real-life phenomena and geographical poetry references to help students transfer their understanding of thermal circulation into concrete examples. This allows students to connect the formation principle of thermal circulation with its observable effects in the geographical environment [9].

7.2. Practice

When teaching the "change in the solar altitude at noon," students can engage in hands-on activities such as determining the minimum building spacing in a specific location, observing shadows, or solving sundial placement problems. These practical exercises are closely tied to everyday life and are of appropriate difficulty, enabling students to deepen their understanding of the solar altitude principle and improve their ability to apply it to solve real-life problems.

7.3. Decision-making

The study of geographical principles is not only about mastering the formation process of geographical phenomena but also about applying these principles to make informed, scientific decisions. For example, when teaching "disaster prevention measures for natural disasters," students first learn about the formation and characteristics of natural disasters. Based on this knowledge, they can then propose preventive and remedial measures to address disasters before, during, and after their occurrence. This approach encourages students to apply their understanding in practical and impactful ways [10].

By integrating knowledge transfer, practical exercises, and decision-making, this section bridges the gap between theoretical understanding and real-world application. It transforms students' understanding of geographical principles into actionable skills, cultivating their critical thinking and problem-solving abilities.

8. Conclusion and reflection

Teaching principles is challenging and requires a lot of thought. Throughout the process of teaching principles, teachers should continuously reflect on various aspects to understand and enhance their teaching. For example, they can consider innovations in teaching methods, new knowledge points, strategies for organizing lessons, addressing misunderstandings of practical applications, assessing the appropriateness of guidance, and ensuring thorough training. Additionally, teachers should fully acknowledge and affirm the unique insights that students contribute in class. This not only promotes students' innovative methods and ideas but also serves as encouragement for their continued engagement [11]. By employing critical thinking, students can analyze problems from different perspectives, understand the relationship between geographical environments and human activities, and develop a well-rounded worldview and values.

Disclosure statement

The author declares no conflict of interest.

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