10.70711/neet.v2i9.5667

Research on Teaching Strategies of Middle School Geography Principle Courses: Taking "The Heating Process of the Atmosphere" as an Example

Dong Wang

High School Affiliated to Southwest University, Chongqing 400700

Abstract: Geographical principles are highly abstract and generalized summaries of geographical phenomena, which are universal, fundamental laws that can serve as the basis for other laws or have universal significance. The key to learning geographical principles is to resolve students' cognitive conflicts through methods such as inducting perceptual knowledge, deducing the principle process, and interpreting image concepts. Combining geographical principles with the characteristics of the geographical discipline, teachers can obtain in-depth understanding and research and develop geographical core competencies through the teaching logic strategy of "exploring principles - understanding principles - applying principles - reflecting on principles" in the teaching process of geographical principle courses according to the corresponding course types.

Keywords: Geographical principle; Teaching strategy; Research

1. The Concept of Geographical Principle Courses

In the term "principle", "原" means original or fundamental, and "理" means order or truth. A "principle" is a universal and fundamental truth obtained through summarization, induction, and generalization based on extensive observation, cognition, and practice. It is a basic law with universal significance in natural and social sciences. Principles can guide practice and must also be tested by practice. Their correctness is determined by practice and they can serve as the basis for other laws. Starting from principles, various specific theorems and propositions can be deduced, thus guiding further practice.

Geographical principles can reflect the essential characteristics, development laws, interrelationships, and change processes of geographical elements or geographical things. Geographical principles are highly abstract and generalized summaries of geographical phenomena, which can explain the objectivity and inevitability of the emergence, appearance, development, and change of certain geographical phenomena. Geographical principles are universal, fundamental laws that can serve as the basis for other laws or have universal significance.

Geographical principle courses refer to the process in which teachers and students jointly explore the origin and development of principles, grasp the essence of geographical things, establish a causal thinking logic chain, use comprehensive thinking to thoroughly analyze the logical relationships between elements, and analyze the formation and development and change processes of geographical phenomena. In the curriculum design of high school geography courses, it is required that "students gradually learn to use basic geographical principles to explore geographical processes, causes, and laws on the basis of sorting out and analyzing geographical facts", and in the evaluation, it is stipulated to evaluate students' understanding ability from "students' expressions of geographical concepts, principles, and theories". It can be seen that geographical principles are important knowledge that students must master in geography learning. By analyzing geographical principles and using them to solve practical geographical problems, students' geographical learning ability is cultivated and their interest in learning geography is enhanced.

Geographical principle courses not only enable students to acquire geographical knowledge but also help cultivate students' geographical core competencies. Geographical principles reflect the essential characteristics, development laws, interrelationships, and change processes of geographical things, which implies the cultivation of students' comprehensive thinking process. Some geographical principles need to be based on the geographical phenomena and human-land relationships in specific regions, which promotes the cultivation of students' regional cognitive and human-land coordination concept competencies. Some geographical principles require students to conduct research-based learning through the use of geographical information technology or through observation, experiment, and investigation, which reflects the implementation of geographical practical ability.

2. The Types of Geographical Principle Courses

From various perspectives, geographical principle course types can be classified in many ways. The following shows several common classifications.

2.1 Classification by Geographical Knowledge Attributes into Physical Geography Principles, Human Geography Principles, and Regional Geography Principles

Middle school geographical knowledge is generally divided into physical geography, human geography, and regional geography, all of which involve principle teaching. Physical geography principles refer to principle issues in the category of middle school physical geography. For example, the principles of the existence of life phenomena on Earth, geological processes, ecological balance, water cycle and water balance, weather and climate, the causes and effects of ocean currents, soil formation, the integrity of the geographical environment, natural disasters, the integrity of the geographical environment, and the differences in the geographical environment in the People's Education Press high school geography textbook 1. Human geography principles refer to principle issues in the category of middle school human geography. For example, the principles of population growth and migration, agricultural layout, industrial layout, transportation layout, settlement layout, evaluation of tourism resource development conditions, transportation layout, commercial layout, and human-land relationship in the People's Education Press high school geography textbook 2. Regional geography principles refer to principle issues in the category of middle school regional geography. Of course, many principles are still discussed based on natural and human principles with regions as the carrier. For example, "comprehensive management of ecologically fragile areas", "ecological protection and national security", and "global climate change and national security" in the People's Education Press high school geography selective compulsory textbooks 2 and 3. Due to the nature of physical geography itself, there are relatively more and more difficult geographical principles, and some principles are relatively abstract and have significant interdisciplinary characteristics. Human geography and regional geography are more oriented towards the development of real society on the basis of physical geography and attach great importance to solving practical problems, so the principles they show are closer to life.

2.2 Classification by Scale Principle into Large-Scale Principles, Medium-Scale Principles, and Small-Scale Principles

The effect of thermal differences can occur at different geographical scales, showing different scale geographical principles. For example, at the same time, due to the difference in the amount of solar radiation received between different latitudes, there is a temperature difference on the earth's surface. This leads to the vertical and horizontal movements of the atmosphere and ultimately forms a large-scale global atmospheric circulation, which is an important principle in the People's Education Press high school geography selective compulsory textbook 1. On a medium scale, due to the different specific heat capacities of the ocean and the land, there will be a temperature difference between the ocean and the land at the same latitude, forming sea breezes or land breezes, and different wind directions will form at different times, and the properties of sea breezes and land breezes are opposite. Once the wind blows from the ocean to the land, the water vapor transport brings the water vapor over the ocean to the land, forming precipitation, and then reaches the ocean with the runoff, which is the water cycle, an important principle in the People's Education Press high school geography compulsory textbook 1. It can be seen that thermal differences play a key role in the formation of atmospheric circulation and the water cycle. In small-scale mountain valleys, considering thermal differences, valley winds and mountain winds are formed during the day and night. This is the principle of mountain-valley winds in the thermal circulation section of the People's Education Press high school geography compulsory textbook 1.

2.3 Classification by Action Mechanism into Process Principles and Causal Principles

In high school geography teaching, there are often examination questions about the process analysis of the formation of a certain geographical phenomenon and related causes, processes, results, and measures. Therefore, the teaching of process knowledge is very important in high school geography teaching. Through process analysis, students can deeply master geographical principles. For example, when teaching the principle of fold formation, it should be emphasized that the rock layers are generally horizontal when they are formed. Under the action of crustal movement, the rock layers are bent upward or downward due to the influence of horizontal compressive forces, and the rock layers undergo a series of wavy bending deformations. For example, when teaching the principle of the water cycle, the whole process of the water cycle can be shown with a video animation while describing and marking each link of the whole process. This not only teaches knowledge but also shows the interrelationships between the links, reflecting the process of geographical principles.

High school physical geography often needs to pay attention to the spatio-temporal variation laws of geographical things and phenomena, as well as analyze the causes of their formation, their impacts, which belong to causal principles. For example, when teaching the chapter on climate in high school geography, first, on the basis of the global atmospheric circulation (three-cell circulation and monsoon circulation), combined with relevant geographical elements, the climate of a certain region is formed, and the formation of this climate condition will have specific manifestations of temperature and precipitation. The characteristics of the climate will in turn affect the zonal vegetation and soil in

this area, which will also affect the formation and development of the local natural zone. In the whole process, the causal relationships in geographical principles are shown many times. The previous process is the direct cause of the latter process, and the causes and results are closely linked, reflecting the logical and comprehensive characteristics of the geographical discipline.

3. Taking the Geographical Principle Course "The Heating Process of the Atmosphere" as an Example

The key to learning geographical principles is to resolve students' cognitive conflicts through methods such as inducting perceptual knowledge, deducing the principle process, and interpreting image concepts. Combining geographical principles with the characteristics of the geographical discipline, teachers can adopt the teaching logic of "exploring principles - understanding principles - applying principles - reflecting on principles" in the teaching process of geographical principle courses. It should be noted that the teaching logic of geographical principle courses is a non-linear structure, and it is a process of mutual influence. Among them, exploring laws and discovering problems is the starting point of learning geographical principles, obtaining and clarifying geographical principles is the key, applying geographical principles is the core, and constantly reflecting on geographical principles is the sublimation.

3.1 Design Concept and Ideas

Taking the teaching design of "The Heating Process of the Atmosphere" as a case, analyze the teaching strategies of geographical principle courses. This case is selected from Chapter 2 of the People's Education Press high school geography textbook 1. The curriculum standard requirement is "1.6 Use diagrams and other means to explain the principle of the heating process of the atmosphere and explain related phenomena." The teaching resources selected for this lesson are mainly various types of charts, and the principle of the heating process of the atmosphere is explained with them as the carrier. The analysis of the principle of the heating process of the atmosphere should include three aspects, namely the heat source of the atmosphere, the weakening effect of the atmosphere on solar radiation, and the heat preservation effect of the atmosphere on the ground. The ultimate goal is for students to be able to describe the entire heating process of the atmosphere and use the above principles to explain some related phenomena in life. From the perspective of the textbook layout, "The Heating Process of the Atmosphere" mainly plays a connecting role. It is a continuation because the thermal state of the atmosphere also involves the previously learned solar radiation and the vertical stratification of the atmosphere, and it is a prelude because it is the prerequisite for understanding atmospheric motion. In the study of the heating process of the atmosphere, some physical knowledge is involved, which reflects the requirement of interdisciplinary knowledge integration in the new curriculum standard. When explaining the weakening effect and heat preservation effect of the atmosphere on solar radiation, starting from the actual situation in life, learning geographical content that is useful in life.

According to the curriculum standard requirements and combined with relevant materials as the context, this lesson is designed with the form of a tweet sent by the lunar rover "Yutu" as the clue throughout the lesson, and the comparison of the day and night temperature differences between the moon and the earth as the main line, analyzing the relationships between solar radiation, ground radiation, and atmospheric radiation. Use the principles such as the weakening effect of the atmosphere on solar radiation and the heat preservation effect of the atmosphere on the ground to explain and illustrate some geographical phenomena in life. Through the understanding of the heating process of the atmosphere, students can correctly understand common natural phenomena, stimulate their interest in exploring and learning geography, and thus establish a scientific world view. Let students experience that geography learning comes from life and that life contains the mysteries of geographical knowledge. Understand the significance of the atmosphere for the earth and establish the awareness of protecting the atmosphere. It is because of the atmosphere that our homeland, the earth, is more beautiful than the moon.

Teaching Design

Teaching Steps	Teaching Activities		Design Intentions
	Teacher Activities	Student Activities	
Introduction	The lunar probe Yutu landed on the moon and sent tweets in a personified way. Tweet 1: The surface of the moon is so hot. Fortunately, my coat can prevent sunburn and radiation. Otherwise, I would get heatstroke. Tweet 2: The temperature at night is actually -100°C. I'm freezing to death.	What characteristics of the natural geographical environment of the moon can be read from these two tweets? Why?	Introduce the new lesson in the form of tweets, which is novel and unique and can fully arouse students' enthusiasm for learning and thirst for knowledge.
Knowledge Review Concept Explanation	Explain the concepts of air temperature, ground temperature, and lunar temperature. The fundamental energy source of heat is solar radiation.	Review solar radiation, display the solar radiation spectrum diagram, and summarize the relationship between the temperature of an object and the wavelength of electromagnetic waves.	There is a lot of physical knowledge involved. Teachers mainly sort out, summarize, and interpret relevant concepts.

Teaching Steps	Teaching Activities		Design Intentions
	Teacher Activities	Student Activities	
Comparison between the Earth and the Moon Analysis and Induction	Solar radiation directly reaches the lunar surface. Solar radiation passes through the atmosphere before reaching the earth's surface. Transition: What is the atmosphere of the earth like? Yutu's tweet 3: Admire the atmosphere of the earth (with pictures). From the tweet, the clouds are white. Since the clouds do not emit light themselves, why do we see them as white? (Reflection of sunlight) Part of the solar radiation is reflected by the clouds, and the reflection has no selectivity, weakening the energy of the solar radiation reaching the earth's surface. Yutu's tweet 4: Pictures of the earth's surface during the day and the lunar surface during the day. The lunar surface is black during the day. The clear day on the earth is blue. Thus, introduce the atmospheric scattering and its characteristics. Provide a data package on the absorption effect of the atmosphere, and students discuss in combination with real life. Yutu's tweet 5: Pictures of the earth seen from the lunar surface and pictures of the moon seen from the earth's surface. Since neither of them emits light, why are they bright? Because part of the solar short-wave radiation is reflected by the earth's surface and the lunar surface after the solar radiation reaches them, and the rest is absorbed by the earth and the moon. The lunar surface absorbs more solar radiation. Thus, deduce the similarities and differences between lunar surface radiation and ground radiation. Introduce the concepts and principles of atmospheric radiation and atmospheric counter-radiation.	1. Learn useful geography in life. Discuss ① the temperature difference between a clear day and a cloudy day. ② Problems of scattering in life. ③ Temperature changes and reasons in the troposphere and stratosphere. ④ Temperature difference between a cloudy night and a clear night. 2. Summarize the weakening effect of the atmosphere on solar radiation and the heat preservation effect of the atmosphere on the ground. 3. Conduct extended thinking in combination with the comparison between the earth and the moon	Clarify the principle of the heating process of the atmosphere through the comparison between the earth and the moon
Knowledge Summary	Let's go back to Yutu's first tweet. Discussion: Why is the day and night temperature difference on the lunar surface so large? While the day and night temperature difference on the earth's surface is smaller?	After the students answer, further ask which of the weakening effect and heat preservation effect of the atmosphere is continuous during the day? Which one is intermittent?	Students summarize and sort out the knowledge of the whole lesson. Let students obtain the problem of the day and night temperature difference between the earth and the moon based on the principle of the heating process of the atmosphere.
Emotional Sublimation	Yutu's tweet 6: After working on the moon for a few days, I miss home and my friends. The earth is Yutu's home and hometown. Hometown is beautiful. Now, in combination with the content of the atmosphere learned in this lesson, give the students two minutes to discuss in what aspects the earth is more beautiful than the moon?	Students discuss that the earth is more beautiful than the moon in the following aspects: small day and night temperature difference, the atmosphere blocks harmful cosmic rays for living things, and there are gases suitable for human survival in the atmosphere, etc.	There are problems such as global warming and ozone hole in the atmosphere. We should think about how to protect the atmosphere and how to protect the beautiful homeland that Yutu misses.

3.2 Case Interpretation

The central issue of this lesson is the "principle of the heating process of the atmosphere", and the decomposition process is the weakening effect of the atmosphere on solar radiation and the heat preservation effect of the atmosphere on the ground. The following will interpret the teaching process of this lesson in different steps:

3.2.1 Explore geographical principles in combination with geography in life

Geographical education advocates "learning geography that is useful in life and learning geography that is useful for lifelong development". In the process of geographical teaching in this lesson, the teacher starts from the familiar life experiences of students, makes selections, reorganizations, and extensions of the teaching materials, and always focuses on the geographical content that is useful in life. "The large day and night temperature difference on the moon", "the blue sky on a clear day", "the color of traffic lights", "the temperature comparison between a cloudy day and a clear day, and between a cloudy night and a clear night", "the lower the altitude, the lower the temperature". These problems rely on the principle of the heating process of the atmosphere, are close to life, and are closely related to real life. The teacher creates a life-oriented teaching situation and selects typical life cases. This not only stimulates students' enthusiasm for active learning but also guides students to combine theory with practice and cultivates their ability to analyze and solve geographical problems.

3.2.2 Explore geographical principles using the comparative analysis method

Geographical learning is a process of geographical information transmission. Its essence is to directly and indirectly transmit a large amount of geographical information to students. It is difficult for students to master and be able to draw inferences about other cases. Therefore, teachers should adopt different methods to solve these problems according to different course types or knowledge attributes. Using comparative learning in this lesson is a very good attempt. This lesson unfolds with the comparison between the earth and the moon as the thread, discussing the temperatures and differences between the day and night of the earth and the moon, and the differences in the landscapes of the moon seen from the earth and the earth seen from the moon. Thus, the impact of having an atmosphere and not having an atmosphere on temperature is obtained, and the principle of the entire heating process of the atmosphere is mastered, revealing the internal laws of some geographical phenomena and enabling students to better master some geographical phenomena in life.

3.2.3 Explore Geographical Principles by Creating a Hot Topic Situation

When I was teaching this lesson on the principle of the heating process of the atmosphere, it coincided with the successful launch of China's independently developed lunar probe Chang'e-3 in Xichang, China. Four hours before Chang'e-3 flew to the moon, the "@ lunar rover Yutu" account officially logged in to Sina Weibo. Before and after the lunar landing, the lunar rover Yutu successively posted many tweets about the moon, which attracted strong attention from all sectors of society. Therefore, in this lesson, it was carried out in the form of tweets. I used six vividly illustrated tweets of the lunar rover Yutu to create a geographical problem situation. Guide students to explore the principle of the heating process of the atmosphere from the shallower to the deeper, from the concrete to the abstract, and from the phenomenon to the essence, stimulate students' interest in geographical learning and the good habit of learning in problems.

4. Conclusion

In short, in the teaching process, teachers should combine the actual teaching content to enable students to explore the reasons from the geographical principles - express the knowledge principles - apply the principles to solve practical problems - reflect and draw inferences from one instance. It should be clear that each step is not completely separated. In the whole exploration and research process, students conduct cooperative learning to discover and transfer and apply the cases or problems, and finally obtain a deep understanding and develop geographical core competencies.

References

[1] Chen Cheng Geographical representations, concepts, principles, and their hierarchical relationships [J] Geography Teaching, 2000 (4): 10.

[2] Wei Zhirong, Zhu Xiang Interpretation of the Geography Curriculum Standards for Ordinary High Schools (2017 Edition) [M]. Beijing: Higher Education Press, 2018.

[3] Chu Yaping, Cao Qi Middle School Geography Teaching Method (Second Edition) [M]. Beijing: Higher Education Press, 1985.

[4] Liang Jinshe The Fourteen Principles of Geography [D]. Geographic Science, 2009.

[5] Liu Xuemei Teaching Strategies of Natural Geography Principles in High School from the Perspective of Core Literacy [J]. Geography Teaching, 2019 (12): 16-20.