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Interest-driven Teaching in College Geography Courses: An Example from the Seismology Chapter

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Abstract: Interest-driven teaching can stimulate students' interest in learning, thus improving their learning efficiency and ability to flexibly use knowledge throughout the learning process. The purpose of this paper was to discuss the interest-driven teaching method in college geography lessons. In the geography lessons in colleges, interest-driven teaching is an important means to stimulate students' interest in learning to improve teaching effects. Seismology, an important chapter in geography, is an important part of subject knowledge, which is also a powerful teaching course to arouse students' interest. Taking a chapter of seismology as an example, this paper discussed how to improve students' interest and participation in geography through interest-driven teaching approaches. The study showed that interest-driven teaching helped to stimulate students' active learning and exploratory passion, to improve learning effects.

Keywords: Higher education; Interest-driven teaching; Geography; Seismology

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1. Introduction

Interest-driven teaching plays a crucial role in geography education. It helps stimulate students' interest in geography, enhances disciplinary understanding, and cultivates practical skills [1]. The benefits of this approach can be demonstrated as follows: (1) Geography includes both natural and anthropogenic phenomena occurring on the Earth's surface, which can be presented in an interesting manner to stimulate students' interest; (2) Teaching with interest can facilitate a comprehension of the concepts and principles of geography. By incorporating cases and examples that are related to real-life, the abstract geographical concepts can be realized easily; (3) The subject of geography involves vary fields, including geology, meteorology, and human geography, etc. Through interest-driven teaching approaches,

geography can be integrated with other subjects to facilitate interdisciplinary learning, which empowers students with a comprehensive understanding of the Earth system [2,3]; (4) The study of geography requires students to possess the capability to observe, investigate and analyze in the field. This can be achieved by organizing practical activities, such as field trips [4] and geographic information system (GIS) applications [5]. Through these approaches, the practical skills of students can be cultivated, enabling them to apply pieces of knowledge in solving real-world problems [6]; (5) Teaching with interest helps encourage students to participate more passionately in learning, enhancing their motivation to study in depth [7,8].

Seismology plays an important role in geography education, involving the study of the Earth's internal structure and its movements. Therefore, seismology affords a crucial scientific foundation for comprehending the formation of the Earth's surface, the evolution of the Earth's crust, and natural disasters [9,10]. Through learning earthquake-related knowledge, students will be capable of attaining a comprehensive comprehension of the Earth system. This, in turn, will enhance their interest in geography.

Therefore, this study will analyze the combination of interest-driven teaching approaches and earthquake-related knowledge, explore how to stimulate students' learning interest, and put forward the corresponding teaching strategies.

2. Fundamental knowledge of earthquakes

2.1. Definition and causes of an earthquake

An earthquake refers to the release of energy originating from the deep Earth, which leads to the vibration of the Earth's surface. This release of energy is usually caused by tectonic movements, which result in fluctuations in the Earth's surface and cause the ground to shake. The causes of earthquakes are mainly twofold, including natural and anthropogenic [11,12]. Natural earthquakes can be primarily classified into tectonic and volcanic earthquakes, with the former being predominant. Anthropogenic earthquake is caused by human activities, including underground explosions, water storage in reservoirs, and drilling operations etc. [12]

Earthquake propagates within the Earth in the form of seismic waves, including push wave and shear wave, which are usually called P wave and S wave, respectively [12]. These waves propagate inside the Earth and ultimately reach the surface, causing the ground to vibrate and shake. The intensity of an earthquake is usually measured in terms of seismic magnitude, which can be classified into 9 levels [13]. It is generally considered that the earthquakes with a magnitude ≤ 3 are non-sensory, those with a magnitude of 5 are destructive, and those with a magnitude ≥ 7 are extremely destructive [12]. Therefore, an earthquake is a natural phenomenon that may cause disasters.

2.2. Impacts and disasters caused by earthquakes

Earthquakes can bring about multiple impacts and disasters. Among the impacts and disasters caused by earthquakes, the most typical are surface ruptures and landslides, infrastructure damages, loss of life, fires, and radiation, all accompanied by significant socio-economic impacts. The extent of these impacts varies according to several factors, such as the magnitude and depth of the earthquake, and the distance from the epicenter, etc. [14]. For example, the

earthquake that occurred in Wenchuan, Sichuan province, in 2008 is the most devastating earthquake in China since its founding. It recorded the largest total number of casualties and the most serious economic losses. This earthquake killed 69,227 people, left 96,544 injured, and direct economic losses amounted to 845.2 billion RMB, accounting for over 90% of the total losses in Sichuan province in 2008 [15].

Therefore, earthquakes are a typical natural disaster, prompting extensive international research and response in the areas of early warning and seismic-resistant structures. The alleviation of potential impacts from earthquakes can be achieved through scientific forecasting, earthquake-resistant structures, and emergency rescue strategies [12].

3. Status and problems of earthquake education

The traditional approach of earthquake education has many drawbacks, such as being difficult to understand, a lack of practicality and integration across disciplines, which results in a challenge of generating students' interest in seismology. These shortcomings may have an impact on students' comprehension of seismology concepts [16]. Seismology is characterized by a high degree of practicality. However, earthquakes are inherently unpredictable, which leads to the fact that traditional teaching methodologies may not afford ample opportunities for observation. Besides, some of the concepts and theories involved in seismology may be abstract to students. Moreover, traditional teaching methods often rely on formulas and theories, making it difficult for students to deeply understand the practical applications of seismology. All the shortcomings discussed above will pose a challenge for students in applying theoretical knowledge to real-world problems [17,18]. Therefore, the alteration of teaching methodologies plays a significant role in enhancing students' interest.

4. Application of interest-driven teaching approaches

4.1. Multimedia education

Aiming to stimulate students' interest by utilizing multimedia materials such as photos and videos of earthquakes, multimedia teaching has gradually become one of the primary teaching approaches nowadays [19,20]. These photos and videos are capable of furnishing students with intuitive visual impressions, which can enhance their comprehension of the process, impacts, and practical applications of earthquakes. Besides, abstract seismological concepts can be rendered more tangible by presenting scenes of earthquake-related damage and landform changes.

Furthermore, multimedia resources can create a sense of realism about earthquakes to stimulate the interest of students. Through the implementation of case studies that demonstrate seismic activities in different regions of the Earth, and the research work of scientists, students are stimulated to be curious about seismology. This enables students to acquire a more profound comprehension of the practical applications of seismology and to connect the theoretical knowledge to the real world.

4.2. Practice and investigation

Practice and investigation can be organized through visits to earthquake research institutes and field trips, to provide

students with hands-on experience in the application of seismology. Practice and investigation can be carried out in various forms, including observation of facilities, professional lectures, expert exchanges, field simulations, participation in research projects, and field trips to the areas affected by earthquakes [6,21]. Guiding students to visit laboratories, instrumentation, seismic monitoring equipment in seismic research institutes, listening to professional lectures, and interacting with experts will help students to gain in-depth knowledge of seismology. This will assist students in recognizing the deficiencies and challenges of seismic research. Besides, through organizing a field trip to the areas affected by earthquakes, students can witness the impacts of earthquakes on the Earth's surface and human society by themselves. Consequently, students can acquire a profound comprehension of the actual effects of earthquake, and the pressing urgency of earthquake research.

4.3. Experimental education

The primary objective of experimental education is to simulate earthquakes by designing simple experimental activities, enabling students to engage actively and investigate the principles and consequences of earthquakes. There are several classic experiments, such as spring simulation, stratigraphic simulation, seismic design of buildings, and seismic wave velocity measurement [22,23]. Spring simulation effectively simulates the propagation of seismic waves. This simulation involves fixing a spring on a horizontal surface and placing a ball on top of the spring. Then, lead the student to push the ball and observe the vibrational movement of the spring.

Stratigraphic simulation can be conducted by placing layers of sand of varying colors in a transparent container, where each layer represents a distinct geological stratum within the Earth. The purpose of this simulation is to assist students in observing the displacement of the sand by applying a slight vibration, thus facilitating an understanding of the propagation of seismic waves through the respective strata.

Seismic design of buildings is carried out by guiding students to design and construct small cardboard buildings, which are subsequently positioned on a vibrating platform. The stability of the building can be observed by incrementally enhancing the intensity of the vibrations on the platform. This aids students in comprehending the fundamentals of seismic design and the methodologies to alleviate the impact of earthquakes on buildings.

Seismic wave velocity measurement can be achieved by laying a spring horizontally and placing a ball at one end. Students can use a timer to measure the time it takes for the ball to slide from one end to the other. By this means, the velocity of the seismic wave propagating through the spring can be calculated. Furthermore, multiple experiments can be performed by modifying the tension of the spring and comparing the results.

5. Conclusion

From the discussions above, it is believed that the interest-driven teaching approach has a significant improvement in the teaching effectiveness of geography, and the main conclusions are as follows:

(1) Multimedia teaching offers abundant teaching resources for seismology, which can stimulate students' interest, deepen their comprehension of seismological knowledge, and enhance the attractiveness of the subject.

(2) Through practical activities, students not only acquire theoretical knowledge within the classroom but also

experience the practical application of seismology, which can stimulate students' interest in this field. This hands-on learning experience will assist students in enhancing their understanding and practical skills in seismology.

(3) During the experimental activities, teachers can guide students to observe the phenomena, pose questions, conduct discussions and summarize the results of the experiments. This sort of hands-on learning approach can enable students to gain a more profound understanding of the basic principles and effects of earthquakes, and cultivate their practical and scientific thinking abilities.

As what has been discussed above, we can get the conclusion that in geography education, interest-driven teaching not only enables students to better understand and apply geographic knowledge, but also stimulates their interest in the subject. This lays a solid foundation for their prospective research endeavors and professional career development. This particular student-centered teaching approach, which focuses on stimulating students' interests, holds significant positive implications for the cultivation of lifelong learners and geography professionals equipped with innovative thinking.

Disclosure statement

The author declares no conflict of interest.

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