The Route Design of Study Travel in Wudalianchi UNESCO Global Geopark, China

ZHANG Xiangge1, ZHANG Xujiao1,*, LIU Xinlan1, LIU Chao1, WANG Lulin1 and WANG He2

1 School of the Earth Sciences and Resources, China University of Geosciences, Beijing 100083, China
2 Heilongjiang General Institute of Ecologic Geological Survey and Research, Harbin 150030, Heilongjiang, China


Abstract: The study travel is a kind of practical study to aim at learning by travel, entertainment, and research for the primary and middle school students, which was initiated by the State Council in 2013, and implemented by the Ministry of Education in primary and middle schools in 2016. Geoscience study travel is one of the two new tasks added by the Geological Society of China in the next three years, as well as one of the main ways of study travel, providing new opportunities and challenges for geotourism. A well-designed study travel route is an important prerequisite and guarantee for the smooth development and the final expected achievement of the study travel. However, there are few professionals engaged in the design of geoscience study routes, so that the concept and connotation of the design of the study route are not very clear as yet. Most of the current design routes feature only on the sightseeing, which has affected the promotion and popularization of study travel to a certain extent. Wudalianchi UNESCO Global Geopark is one of the first eight global geoparks in China. It is famous for its rich volcanic geotourism and is a rare place for geoscience study travel. This paper studies on the ways of route design and then discuss the concept, principle, and method of geoscience study travel, taking the Laoheishan area as the camp, the volcanic geotourism as the study object, and the volcanic eruption process as the study content. Through the research, the following understandings and achievements were obtained: (1) Three routes with different geological phenomena, and the subjects and the training objectives of study travel were designed, based on the types and distribution, in accordance with the existing knowledge structure, and cognitive characteristics of middle school students and the most typical volcanic geotourism in the area, which overall goal is to help students understand the temporal and spatial changes of the volcanic eruption process and make the study travel gradually transition to a higher level of scientific research. The first study route is designed to recognize the spatial disparities between the lava landform and effusive mass during the same volcanic eruption at different locations from the crater of Laoheishan volcano to the colorful beach, choosing the volcanic edifice and solid ejecta as the principal line. Firstly, let participants observe the landform characteristics of the crater, secondly observe the traits and changes of the volcanic eruption along the way and finally, analyze their formation process. Down to the colorful beach, the theme activity of “looking for volcanic bombs” is held. Volcanic bombs are one of the important signs of an explosive eruption, which various shapes and sizes are preserved at different locations on the southern slope of the Laoheishan volcano. After learning the detailed explanation about the characteristics of the volcanic bombs from the tutor, the students begin to look for volcanic bombs in groups, and finally, identify and discuss the volcanic bombs found by each group in order that all students gain senses of participation and individual accomplishment. The second route is from the western entrance of Laoheishan volcano to the colorful beach, which is designed to observe the difference of lava landform erupted from the old to the new time in order to deepen the students' understanding of the volcanic periodic eruption cycle, and initially establish the concept of the geological era. Because the early lava formed by the volcanic effusive eruption flowed a long distance and became the flat lava platform, on which the Bun-shaped lava, rope-shaped lava, raft-shaped lava, etc were formed. The eruption was relatively early, so the weathering was comparatively intense on the surface, and then suffered from volcanic eruption and earthquake, which caused a partly large-scale collapse of the lava channel and the surface lava. The latest eruption lava covered the early lava platform and formed reptile-shaped lava, which surface was obviously different from and fresh due to weak weathering. Through the observation and discussion of this route, students can learn how to summarize and draw conclusions by comparison and analysis of geological phenomena. The third design route is from the crater of Laoheishan to Huoshaoshan, taking the peculiar lava landscapes as the main study contents to let students observe the parasitic volcano, aa lava, hornitos in proper order, deeply in order to understand their formation mechanism and scientific value and discuss the genesis of aa lava. The parasitic volcano was a small volcano erupting with a little of magma from the crack along the side of the main volcanic, indicating that the Laoheishan and Huoshaoshan volcanic had a fissure eruption in 1719-1721 CE. The hornitos formed when the basic lava with volatile met the wet ground to generate vapor. The small magma ejected or overflowed from the surface rupture with the mixed gas formed a fumarolic cone by the heap-up pancake lava. When there was less vapor, the lava overflows from the crack of the consolidated lava shaped a fumarolic saucer. The development area of the hornitos is generally the boundary of the lava flow formed by the volcanic eruption. There are many hypotheses about the origin of the aa lava. Based on the observation of whether the lava has a
flow structure, the fragmentation feature of the lava breccias and the distribution range, the students should to express their views on the genesis of the aa lava and think independently to make their own judgments. Through the implementation of this route, students can further understand the important scientific value of geoheritage while enjoying the rare lava landscape in Wudalianchi UNESCO Global Geopark. (2) Through research on the design of the study route in Laoheishan Area, the designing concept of the geoscience study travel will be formed and proposed which can help students grasp the methods of field observation and logical inference about geoscience research and establish the concept of spatio-temporal variation in geological events. Because the study of all geological processes emphasizes the spatio-temporal differences, the training on the concept of spatio-temporal for geological events should be paid attention to during the geoscience study travel, which is one of the goals of study travel. (3) The basic principles and methods of the route design of geoscience study travel have been summarized to promote the all-round development of students, which are taking geopark as the study camp, featuring geoheritage as the study contents, theme activities as the study ways, detailed elaboration and independent observation as the study procedure, professional team as the professional security of study. Geoscience study travel cannot only enhance students’ understanding of earth science but also increase their love of the earth to protect the earth voluntarily. The route design is the basis for the study travel, which is an important guarantee for the implementation of study travel’s promotion plan of the Ministry of Education. The study on Wudalianchi UNESCO Global Geopark can be referred to other geoparks study travel.

**Keywords:** study travel, route design, geoheritage, geotourism, Global Geopark, Laoheishan, Wudalianchi

**Acknowledgements:** This study was granted by the Project of Important Geoheritage Protection for Wudalianchi Global Geopark (2015).

**References**


**About the first author**

ZHANG Xiangge, female, born in 1997 in Anyang City, Henan Province; Master student, Major in Quaternary geology, China University of Geosciences (Beijing); She is now interested in the study on Geopark and Geo-tourism. Email:1178732451@qq.com; phone: 13520379518.

**About the corresponding author**

ZHANG Xujiao, Male; born in 1964 in Lianyuan City, Hunan Province; Ph. D., graduated from China University of Geosciences (Beijing), associate professor of School of the Earth Sciences and Resources, China University of Geosciences (Beijing); He is now interested in the study on Geomorphology and Geopark. Email:zhangxj@cugb.edu.cn; phone: 010-82322082, 13651103369.