A review on resources of Yuntaishan Geopark for physical geography field trips of middle schools

Yi Ren, Min Wang

Faculty of Geographical Science, Beijing Normal University, Beijing 100875.

Abstract: At present, the geographical education focuses on providing the best geography teaching to different learners, and encourages the geography teachers to spend time and resources on studies of teaching outside the classrooms for which the field trip is an important method. This paper takes Yuntaishan Geopark as an example to describe its natural geographical features and review its resources for physical geography field trips of middle schools. Yuntaishan Geopark has become a major destination for middle school physical geography field trips because of the abundant and typical natural landscape. It provides favorable conditions and diverse options for the field trips which are conducive to increase the practical ability and geographical attainments of middle school students. The course of physical geography field trip in the Qinglong Valley Park meets the students' need of exploring the nature and understanding the social environment, tests the results of studying in classrooms and their ability of applying geographic knowledge, helps to improve the students' capabilities of practice and research, and also cultivates geographical attainments essential to contemporary middle school students.

Keywords: Yuntaishan Geopark, middle school, physical geography, field trip, curriculum resources

1 Introduction

Geography, with attributes of natural science and social science, is a field of science devoted to the study of the geographical environment and the relationship between human activities and geographical environment, which is essential in the modern scientific system and plays an important role in solving the problems of contemporary population, resources, environment and development (Ministry of Education of People's Republic of China, 2003). The geographical environment is the stage for history. The perspective of geography is essential to appreciate both the various natural landscape on the earth and the culture and society based on the geographical environment. From the perspective of geography and through the geographical thinking, we would
understand the contemporary challenges thoroughly, such as peace and development, wars and disasters, exploitation and utilization of natural resources, global climate change, population and urbanization, and regional and global sustainable development. It could help us to cultivate the sound value, outlook on life and world view, and develop a harmonious relationship between humankind and the nature, so as to ensure the sustainable development of our society. Therefore, for people living in the world closely connected in 21 Century, geography is not only an important field of science and resources, but also an integral part of civil education. Geographical education is crucial for cultivating the responsible and active citizens at present and in the future. (Commission on Geographical Education, 2016)

At present, the geographical education focuses on providing the best teaching to different learners, and encourages the policy makers and geography teachers to spend time and resources on studies outside the classroom and do meaningful and continuous researches on theories and application (Commission on Geographical Education, 2016). The geography field trip is an important method of experience-based learning. Higgitt (1996) spoke highly of the experience-based learning. He strongly intimated its critical role and pressed further the notion to expand or move toward deep learning where students focus on what is important, distinguishing argument from fact, and the genuine intention to learn. Therefore, many countries have attached great importance to the geography field trip. In China, the Outline of National Medium- and Long-Term Program for Education Reform and Development (2010-2020) was released in July of 2010, which specified that education should focus on improving the abilities of practice and innovation and pass on knowledge, skills, principles of living and capabilities for adapting to the society to students. In September of 2016, the Ministry of Education released the Curriculum Standards of Geography for Senior High School (Exposure Draft) which stated that "the goal of geographical curriculum in senior high schools is cultivating students' core geographic attainments". It said that the geographical practical ability is one of the essential geographic attainments to middle school students, and determined that the field trip is a unique method of geographical education to senior high schools. On November 30, 2016, the Ministry of Education along with other 11 departments released the Opinions on Promoting Educational Excursions for Students of Primary and Middle Schools which emphasized that such trips for students of primary and middle schools should focus on practicing, present regional characteristics according to local conditions, and encourage students out of the campus to broaden visions, acquire knowledge, understand the society, close to the nature and experience the world. The Opinions on Promoting Educational Excursions for Students of Primary and Middle Schools provides the policy support for the geography field trip of middle school students, as well as a new opportunity for the development of geography field trip for middle school students. In the United States, school field trips have long been a feature of public education with teachers across the country occasionally taking students beyond school walls to have informal learning experiences(Whitesell, 2016). From 1970s to 1990s, the worldwide researches on the middle school field trips are mainly comparative studies on the effects of learning in schools and in informal environment mainly including the regional museums, zoos and planetariums. The general result from such studies shows that field trips could improve students' learning results and enthusiasm (DeWitt, 2008; Fuller, 2006). Geography field trips usually take two major forms: (1) those trips de-
signed as out-of-class teaching methodology, and (2) trips intended to equip students with research skills through fieldwork (Gaillard, 2014). Each form is based on the curriculum resources. The diversity and richness of the resources have an important influence on the teaching and the improvement of practical skills. Taking Yuntaishan Geopark as an example, this paper reviews its resources for geography field trips of middle schools.

2 Overview of the Yuntaishan Geopark

Yuntaishan Geopark, covering an area of 556 square kilometres, is located in Xiuwu County of Jiaozuo in Henan Province, the south of Taihang Mountain. This comprehensive geological park which is mainly characterized by rifting structures, hydrodynamic processes and geological physiognomy landscape and also featured by natural ecological and human landscapes comprises five parks: Yuntai Mountain Park, Shennong Mountain Park, Qinglong Valley Park, Fenglin Valley Park and Qingtian River Park. With the aesthetic and scientific value, Yuntaishan Geopark was listed in the first Global Geoparks by UNESCO in 2004 (Sun, 2009). With the complete infrastructure, convenient transportation, the tourist trails (Figure 1) and a large hotel and information center (Figure 2), the park not only maintains the natural landscape and

![Figure 1](tourist_tail.jpg)

**Figure 1** Tourist tail

![Figure 2](information_center.jpg)

**Figure 2** Information Center
ecosystem, but also provides a safe and comfortable environment to tourists. The abundant natural scenery and perfect infrastructure in Yuntaishan Geopark provide the superior conditions for the middle school geography field trips.

2.1 Physiographical resources

2.1.1 Geological resources

Yuntai Mountain has a wide array of strata including Archean Erathem, Proterozoic Erathem, Paleozoic Erathem, Mesozoic Erathem and Cenozoic Erathem. The main strata of Taihang Mountains are Cambrian System and Ordovician System of Paleozoic Erathem which are distributed widely (Zhao, 2010). The sedimentary base in the Geopark reveals the deposition process over 1 billion years and the sea-level change caused by transgression and regression. The sedimentary structures, lithological characteristics and preserved fossils reveal the evolution of paleogeographic environment in the North China and characteristics of paleo-marine environment of epicontinental sea in the Paleozoic Era (Sun, 2009). Geological relics in Yuntaishan Geopark include stratum relics, rock relics, tectonic relics, sedimentary relics and geological-geomorphologic relics, such as the horizontal bedding of purple mudstone of the Cambrian Period (Figure 3) and the ripple marks stone (Figure 4).

![Figure 3](horizontal-bedding-purple-mudstone-cambrian-period.png)

2.1.2 Landform resources

Yuntai Mountain is located in the transition zone from the south of Taihang Mountains to the North China Plain (Wu & Wang, 1983), and the effects of rifting resulted in the Yuntai landform which is a typical relic of Neotectonism (Sun, 2009) and shaped the landform with a group of canyons, peaks and cliffs in the park (Wang, Zhang, & Zhao, 2012). Zhuyu Peak is the summit (Figure 5) at an altitude of 1297.6 m. Hongshi Valley (Figure 6), which is known as the Bonsai Valley, contains the springs, waterfalls, streams and ponds.

2.2 Biological resources

Yuntai Mountain, possessing various landforms, is located in the south of Taihang Mountain which is a transitional zone and an important demarcation line between the
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Figure 4  Ripple marks stock

Figure 5  Zhuyu Peak

Figure 6  Hongshi Valley

south flora and north flora. Due to the unique natural conditions, Yuntai Mountain is rich in biological resources, especially the rare plants and animals.

2.2.1  Plants
The Yuntai Mountain is in deciduous broad-leaved forests in the warm temperate zone (Wu, 1980). The park possesses 1492 species of 195 families of higher plants of which 73 species of 33 families are bryophytes, 80 species of 20 families are ferns, 12 species of 4 families are gymnosperms and 1327 species of 138 families are angiosperms (Yuan, Liu, & Zhang, 2001). Trees include Pinus, Quercus, Populus, Amygdalus persica L., Prunus L. and Juglans; herbaceous plants mainly include Primula malacoides Franch., Asteraceae and Gramineae plants; scrubs mainly include Spiraea salicifolia L., Lonicera japonica Thunb., Cassia mimosoides L. var. wallichiana DC., Forsythia suspensa and Ziziphus jujuba Mill. var. spinosa (Bunge) Hu ex H. F. Chow. The distribution of plants in the vertical dimension varies with the altitude distinctly. Natural secondary forests dominated by trees standing on the brown soil at the altitude over 800–1000 m with the vegetation coverage rate of more than 85%; shrubs and herbs grow on the cinnamon soil area at the altitude less than 800–1000 m with the vegetation coverage rate of 60% (Wang, Zhang, & Zhao, 2012).
2.2.2 Animals
More than 190 species of animals inhabit Yuntai Mountain including mammals, reptiles, fishes, birds and insects (Jiang et al., 2007) among which the Panthera pardus is the first-class national protected animal, Prionailurus bengalensis, Vulpes and Macaca mulatta (Figure 8) are the second-class national protected animals, and Trogopterus xanthipes, Chaimarrornis leucocephalus and Aegithalos concinnus are the third-class national protected animals.

2.3 Hydrological resources
The basin of Yuntai Mountain covers an area of about 90 square kilometers with the
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meteoric water being the main source of water for rivers (Wang, Zhang, & Zhao, 2012). The park possesses many rivers, lakes and waterfalls, among which the Hongshi Valley, Qinglong Valley and Quanpu Valley are prominent. Zifang Lake (Figure 9) built by the reservoir is located in the core of the waterscape in Yuntaisha Geopark. The lake known for the towering valley and level lake is 200 meters wide, 4 kilometers long from north to south and averagely 50 meters deep. The waterfall of Quanpu Valley (Figure 10) with the drop of 314 meters is the most spectacular waterfall in the park and the highest waterfall in China even Asia.

![Zifang Lake](image1)
![Waterfall in Quanpu Valley](image2)

2.4 Soil resources

The soil of the Yuntai Mountain varies with the altitude. Cinnamon soil with the soil thickness of 20–30 centimeters, light texture and large content of gravel could be found in hilly areas. PH value is about 7–7.5. The parent material is slope deposits or flood deposits and some loess could be found in the lower part of the valley; brown earths with the soil thickness of 50–60 centimeters and heavy texture could be found in the northern mountain area at the altitude of 800–1000 meters. PH value is about 6.5–7. Because of the small scale vegetation coverage, the soil is eroded seriously (Wang, Zhang, & Zhao, 2012).

2.5 Meteorological phenomena

Yuntai Mountain is of continental monsoon climate in the warm temperate zone. Its four seasons are distinctive: in spring, it's dry and windy; in summer, it's hot and rainy; in autumn, it's cool and in winter it’s dry and cold. The annual sunshine duration is 2272 hours; the frost free period is less than 200 days; and the annual precipitation is 711–794 millimeters, mainly in summer, decreasing from the north to the south (Wang, Zhang, & Zhao, 2012). With a varied topography and the altitude, the climate varies with the terrain and altitude. The four distinctive seasons and special topographic and geomorphic conditions in Yuntai Mountain shape the park with diverse astronomical and climatic phenomena. Yuntaishan Geopark is rich in astronomical and climatic landscape. Standing on Zhuyu Peak, the sunrise and sunset as
well as the scenery of day alternating with night are visible; the scenery varies with seasons and the sea of clouds could be seen in the whole year (Figure 11).

Figure 11  Sunrise and sea of clouds

3 Categories of resources and course content in Yuntaishan Geopark for middle school physical geography field trips

With the abundant natural landscape, and well conserved natural environment and natural relics, Yuntaishan Geopark provides favorable conditions for the development of field trips of middle schools. The typical, representative and diversified resources of geology, biology, soil and hydrology in the park and a large amount of basic data gathered through the investigation and research for many years could be used for the middle school field trips. Table 1 shows the categories of resources and content of the course in Yuntaishan Geopark for middle school field trips.

4 The plan for a middle school physical geography field trip in Qinglong Valley Park

Taking into consideration the natural geographical characteristics, transportation and accommodation of Yuntaishan Geopark, and through the detailed analysis of the existing data and the field study of the park, the Qinglong Valley Park is selected for the field trip and the plan for middle school physical geography field trip is developed.

4.1 Overview of the Qinglong Valley Park in Yuntaishan Geopark

Qinglong Valley Park, covering an area of about 108 square kilometers, is located in the northwest of Xiuwu County, Jiaozuo of Henan province. It mainly comprises the Qinglong Canyon, Jingying Canyon, Yingsi Basin, Shuangmiao Temple, Mihou Valley, Matou Mountain and Dashannao. There are canyons, peaks, caves and waterfalls in the park which is known as the largest canyon of Yuntai Mountain.
Table 1 Categories of resources and course content in Yuntaishan Geopark for middle school physical geography field trips

<table>
<thead>
<tr>
<th>Category of Resources</th>
<th>Major Landscape Content of the Course</th>
<th>Requirements to Basic Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiographical Resources</td>
<td>Rock, canyon, Fengcong, Fenglin, profile of strata, sedimentary structure, fault (joint, fissure).</td>
<td>(1) Identify the type of rocks; (2) Collect specimens of rocks and minerals; (3) Observe the geological structure and analyze the cause; (4) Observe mountains, hills and river landform.</td>
</tr>
<tr>
<td>Biological Resources</td>
<td>Representative plants (trees, scrubs and herbs), representative animals (<em>Macaca mulatta</em>)</td>
<td>(1) Study the types of plants; (2) Collect plant specimens; (3) Measure the vegetation coverage; (4) Describe the vertical zonality of vegetation and analyze the cause; (5) Observe the animals and their habitats.</td>
</tr>
<tr>
<td>Hydrological Resources</td>
<td>River, stream, lake, waterfall</td>
<td>(1) Measure the hydrological elements of rivers and lakes; (2) Investigate the exploitation and utilization of rivers; (3) Investigate the pollution and the control measures of rivers.</td>
</tr>
<tr>
<td>Soil Resources</td>
<td>Cinnamon soil, mountain brown soil, loess</td>
<td>(1) Study the types of soil; (2) Collect the soil samples; (3) Observe the profiles of soil; (4) Investigate the land use.</td>
</tr>
<tr>
<td>Meteorological Phenomena</td>
<td>Sunrise, sunset, weather phenomena, the sea of clouds</td>
<td>(1) Observe the time and orientation of sunrise and sunset; (2) Observe the change of solar altitude in the day; (3) Measure the temperature, pressure, humidity, wind speed and wind direction; (4) Observe the weather and climatic landscape and analyze the causes.</td>
</tr>
</tbody>
</table>

The rocks in the Qinglong Valley Park are mainly sedimentary rocks, such as red quartz sandstone and limestone. With the strong Neotectonic movement, the fracture appeared, which formed the canyons, Fengzhu and Fenglin under the water erosion. With the effects of the rift and the cutting of river, Qinglong Canyon is 11.5 kilometers long and 5–20 meters wide with the narrowest is only a few meters. The maximum drop of the canyon is 600–700 meters. Qinglong River winds along the valley and forms the waterfalls, rapids and ponds because of the terrain. The caves in the cliffs of Qinglong Canyon are distinctive. The stalactites and travertine landscape could be found everywhere. There are various paleontological fossils in the strata of Qinglong Canyon, including the hornstones, trilobite fossils and stromatolites.

The ecological resources in Qinglong Valley Park are diverse. The abundant plants are mainly warm temperate plants with the forest coverage rate of more than 80%. The distribution of plants in the vertical dimension varies with the altitude distinctly with scrubs at the altitude of 700–1000 meters, deciduous broad-leaved forest at the altitude of 1000–1200 meters, the mixed conifer-broadleaf forest at the altitude of 1200–1300 meters and the alpine meadow at the altitude over 1300 meters. With various plants and deep gorges, the park is a perfect habitat for the wild animals. The animals such as Taihang *Macaca mulatta* and *Sus scrofa* are commonly seen. With value of scientific research, economy and aesthetics, Taihang *Macaca mulatta* is the second-class national protected animal which inhabits the mixed conifer-broadleaf forest, scrub and cliffs in groups.
4.2 The plan for a middle school physical geography field trip in Qinglong Valley Park

The reasons to select Qinglong Valley Park as the destination of physical geography field trip are (1) the convenient transportation, high accessibility, complete infrastructure including the ladder roads and sightseeing cable cars, and high security, which provide the safeguard for the middle school physical geography field trips; (2) abundant, diversified and typical resources of geology, biology, hydrology, soil and meteorology, which provide favorable conditions for the planning of middle school field trips. Table 2 shows the plan for a physical geography field trip of middle schools in Qinglong Valley Park.

The middle school physical geography field trips in Qinglong Valley Park could meet the students’ need of exploring the nature and understanding social environment, provide an opportunity of applying the knowledge to practice, arouse their interest of learning geography, broaden the width and depth of students’ knowledge, help to improve the students’ capabilities of practice and research, and also cultivate the geographical attainments essential to contemporary middle school students.

5 Conclusion

With the abundant and typical natural landscape, Yuntaishan Geopark has become a major destination for middle school physical geography field trips and provides favorable conditions and diverse options for the field trips. Its advantages mainly include the following aspects:

(1) With the diverse and typical natural landscape, Yuntaishan Geopark is suitable for the physical geography field trips which could help middle school students to feel the charm of nature and enhance their interest and enthusiasm in geographical learning.

(2) The resources in Yuntaishan Geopark for middle school physical geography field trips are diverse. The practice activities include identifying types of the landscape, observing the phenomena, measuring the related elements, field investigation and comprehensive evaluation, covering the skills required in the curriculum standards of geography, which are conducive to enhance students’ practical ability and geographical attainments.

(3) The convenient transportation, complete infrastructure and safety measures in Yuntaishan Geopark could ensure that the geography field trips are carried out safely and enhance the feasibility of field trips.

The plan for a middle school physical geography field trip based on the natural landscape of Qinglong Valley Park meets the students’ need of exploring the nature and understanding social environment, tests the results of studying in classrooms and their ability of applying geographic knowledge, helps to improve the students' capabilities of practice and research, and also cultivates the geographical attainments essential to contemporary middle school students.

Acknowledgement

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<table>
<thead>
<tr>
<th>Category of Resources</th>
<th>Curriculum Standards of Geography</th>
<th>Main Content of Curriculum</th>
<th>Activities of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physiographical Resources</strong></td>
<td>(1) Study 3-4 types of landforms through the observation in the field or the videos and images, in Qinglong Valley, such as quartz sandstone and limestone; (2) Use the steel tapes, current meters and other equipments to measure the velocity of flow and depth of the Qinglong River, and record the data; (3) Observe and record the characteristics of typical plants such as alpine meadow, pines and oaks (including the altitude of distribution, plant density and shape of leaves); (4) Collect water samples from the river and label them; (5) Think and discuss the relationship between Qinglong River and other rivers in groups.</td>
<td>Describe the characteristics of typical plants in Qinglong Valley, and discuss their causes in groups.</td>
<td>(1) Observe and record the characteristics of quartz sandstone and limestone, and collect the rock specimens and record; (2) Collect water samples from the river and label them; (3) Observe and record the characteristics of typical plants such as alpine meadow, pines and oaks (including the altitude of distribution, plant density and shape of leaves); (4) Collect water samples from the river and label them; (5) Think and discuss the relationship between Qinglong River and other rivers in groups.</td>
</tr>
<tr>
<td><strong>Biological Resources</strong></td>
<td>(1) Analyze the integrity and regional differentiation of natural environment using charts and examples (Ministry of Education of People’s Republic of China, 2003); (2) Combined with examples, explain the influence of different ecosystems on human activities (Ministry of Education of People’s Republic of China, 2003); (3) Observe the canyons and caves, and take photos and record the landscape features, then discuss their causes in groups.</td>
<td>Describe the characteristics of typical plants such as alpine meadow, pines and oaks (including the altitude of distribution, plant density and shape of leaves); (2) Collect and label the plant specimens; (3) Think and discuss the relationship between the typical plants in Qinglong Valley and their environment in groups and draw the vertical distribution map of the typical plants; (4) Observe the Taihang Macaca mulatta and record their habitat, and discuss the influence of natural environment on the distribution of Macaca mulatta in groups; (5) Think and discuss the influence of the forestry ecosystem on environment of Qinglong Valley.</td>
<td>(1) Observe and record the characteristics of typical plants such as alpine meadow, pines and oaks (including the altitude of distribution, plant density and shape of leaves); (2) Collect and label the plant specimens; (3) Think and discuss the relationship between the typical plants in Qinglong Valley and their environment in groups and draw the vertical distribution map of the typical plants; (4) Observe the Taihang Macaca mulatta and record their habitat, and discuss the influence of natural environment on the distribution of Macaca mulatta in groups; (5) Think and discuss the influence of the forestry ecosystem on environment of Qinglong Valley.</td>
</tr>
<tr>
<td><strong>Hydrological Resources</strong></td>
<td>(1) Organize students to observe and discuss. For example, observe a river in the hometown and describe its characteristics (Ministry of Education of People’s Republic of China, 2012). (2) Draw a sketch map to explain the relationship of various waters (Ministry of Education of People’s Republic of China, 2003). (3) Observe the canyons and caves, and take photos and record their landscape features, then discuss their causes in groups. (4) Observe the flows and falls in Qinglong Valley; (5) Observe and record the characteristics of the canyons and caves.</td>
<td>Describe the hydrological characteristics of Qinglong River; Describe the features of the erosional landform and accumulative landform of Qinglong River, and analyze the causes; Analyze the causes of the waterfalls and ponds in Qinglong Valley; Explain the relationship between Qinglong River and other water bodies, and explain the role of Qinglong River in the regional water cycle.</td>
<td>(1) Use the steel tapes, current meters and other equipments to measure the velocity of flow and depth of the Qinglong River, and record the data; (2) Collect water samples from the river and label them; (3) Observe the landform of Qinglong River, and record the features of the erosional landform and accumulative landform, then discuss their causes in groups; (4) Think and discuss the relationship between Qinglong River and other water bodies, and explain the role of Qinglong River in regional water cycle in groups.</td>
</tr>
<tr>
<td><strong>Soil Resources</strong></td>
<td>Explain the major factors for the formation of soil through observation in the field or the soil samples (Ministry of Education of People’s Republic of China, 2003).</td>
<td>(1) Describe the characteristics of mountain brown soil and cinnamon soil (such as the color and texture); (2) Draw the profile of mountain brown soil and cinnamon soil; (3) Observe and record the characteristics of mountain brown soil and cinnamon soil; (4) Observe and record the relationship between the mountain brown soil and cinnamon soil and soil's other characteristics.</td>
<td>(1) Observe and record the color, thickness and other characteristics of mountain brown soil and cinnamon soil; (2) Collect and label samples of the mountain brown soil and cinnamon soil; (3) Observe and draw the profiles of mountain brown soil and cinnamon soil; (4) Observe and think about the relationship between the mountain brown soil and cinnamon soil and the other geographical elements in groups.</td>
</tr>
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</table>

**Table 2** The Plan for a middle school physical geography field trip in Qinglong Valley Park

*Yi Ren, et al.: A review on resources of Yuntaishan geopark for physical geography field trip in Qinglong Valley Park.*
References