

10.18686/neet.v2i4.4380

# Innovative Research on Land Resource Studies Curriculum Based on the Integration of OBE and CDIO Concepts

Ran Zhu

College of Tourism and Geographical Science, Leshan Normal University, Leshan Sichuan, 614000

**Abstract:** Land Resource Studies is an interdisciplinary applied science that encompasses the study of related concepts of land resources, types of land, their characteristics and spatial distribution, quantity and quality of land, land survey and evaluation, land development and utilization, land governance and restoration, as well as land protection and management. By examining the current state and existing issues in the teaching of land resource courses, and integrating the OBE-CDIO concept, this study conducts reforms and innovations from multiple dimensions including OBE outcome-oriented educational innovation, CDIO engineering education model innovation, and the integration of ideological and political elements. The ultimate goal is to realize a student-centered, outcome-oriented, and theory-practice integrated approach in the land resource studies curriculum. This innovation aims to cultivate students' ability for systematic thinking and hands-on practice, achieving the goal of training interdisciplinary talents in the field of land resource studies.

**Keywords:** Land Resource Studies; OBE-CDIO Integration; Curriculum Ideological and Political Education; Innovation Exploration

## 1. Introduction

The OBE-CDIO concept is an educational philosophy that combines Outcome-Based Education (OBE) and the Conceive-Design-Implement-Operate (CDIO) model of engineering education<sup>[1]</sup>. This concept aims to integrate theory and practice through student-centered teaching methods to cultivate students' comprehensive engineering practice capabilities. Traditional macro-level teaching design is course-oriented, while traditional micro-level teaching design is textbook-oriented. Under the influence of traditional course-oriented education and textbook-oriented teaching, curriculum design often revolves around "selecting textbooks, teaching textbooks, and examining textbooks." However, China's "Implementation Opinions on the Construction of First-Class Undergraduate Courses" (Jiao Gao [2019] No. 8) clearly states that the curriculum is the key to talent cultivation, and the quality of the curriculum directly affects the quality of talent cultivation. Therefore, the results of teaching reforms must be reflected in curriculum construction. Land Resource Studies is one of the main courses for the land resource management major as stipulated by the Ministry of Education, and it is also a required course for the major of Human Geography and Urban and Rural Planning and Management. It is an interdisciplinary applied science that deals with various aspects of land resources, including related concepts, types of land, characteristics and spatial distribution, quantity and quality of land, land survey and evaluation, land development and utilization, land governance and restoration, as well as land protection and management. Based on the integrated OBE-CDIO concept, continuous innovation in the construction of the Land Resource Studies curriculum, while implementing the concept of ecological civilization according to the course characteristics, can fully utilize classroom teaching as the main channel. This approach aims to align the curriculum with ideological and political theory courses, creating a synergistic effect<sup>[2]</sup>.

## 2. Current Teaching Status and Existing Issues in the Land Resource Course

### 2.1 Curriculum Content and Teaching Mode

The Land Resource Studies course is offered to first-year students and serves as an integrated application of the knowledge from preceding courses such as Introduction to Environmental Science, Physical Geography, Basic Geology, Human Geography, and Remote Sensing Principles and Applications. It also provides the knowledge base and skill set necessary for subsequent specialized courses like Economic Geography and Land Economics, playing a pivotal role in connecting prior and future learning. In the teaching design of this course, the approach is still textbook-oriented, with teaching and assessment centered on "selecting textbooks, teaching from textbooks, and examining based on textbooks." The teaching process remains largely teacher-driven<sup>[3]</sup>. However, there are several issues that arise in the teaching process: ① Students have insufficient foundational knowledge and weak abilities in divergent thinking; ② The course covers many related basic concepts, making it sound monotonous, which leads to low student motivation; ③ Teachers are not aware of the students' prior learning, making it impossible to teach ac-

ording to individual needs and to fully engage students in classroom discussions; ④ The practical methods are relatively uniform. Although the flipped classroom approach can prioritize student involvement in teaching, the lack of teacher feedback and summary fails to elevate the practice, diminishing the practical significance of the flipped classroom; ⑤ There is a lack of goal orientation, with the failure to integrate textbook knowledge with professional practice and societal needs to form core professional competencies. Students are unclear about how to apply the knowledge from the course in the future and do not understand the value of these knowledge points, leading to a lack of enthusiasm for learning.

## 2.2 Practice Methods and Effect Evaluation

The Land Resource Studies course encompasses various aspects including classroom theoretical teaching, land surveys, land evaluation, project planning, and more. The current teaching approach emphasizes theory over practice, which is a problem that exists<sup>[3]</sup>. Due to site and funding limitations, few teachers are able to lead students in outdoor activities such as analyzing land use types, conducting land resource surveys, and planning land projects. The lack of practical components prevents students from integrating theory with practice and also diminishes their interest in the course<sup>[4-5]</sup>. Therefore, based on the study of theoretical knowledge in Land Resource Studies, it is imperative to reform the course by setting practical teaching objectives according to the different sections of the curriculum, arranging activities such as land survey unit division, land evaluation, and project planning, and combining theoretical knowledge with practical activities to enhance students' innovative and hands-on capabilities.

## 2.3 Integration of Ideological and Political Elements with the Curriculum

Land resources are the spatial carrier and fundamental resource for the construction of ecological civilization<sup>[6]</sup>. Land Resource Studies is an interdisciplinary applied science that delves into various aspects related to land resources, including concepts, types of land, characteristics and spatial distribution, quantity and quality of land, land survey and evaluation, land development and utilization, land governance and restoration, as well as land protection and management. It encompasses theories such as ecological civilization, sustainable development, intensive use of resources, and green economy, and holds unique academic and teaching advantages in promoting and implementing the concept of ecological civilization<sup>[6-7]</sup>. Therefore, ideological and political elements can be naturally integrated into various chapters of the Land Resource Studies curriculum. However, there has been a low degree of connection between ideological and political teaching and specialized courses in schools. In the teaching process of Land Resource Studies, teachers tend to focus more on professional theoretical knowledge and rarely deeply integrate the course with the construction of ecological civilization, neglecting this excellent opportunity to cultivate students' awareness of ecological protection. Therefore, fully integrating knowledge related to the construction of ecological civilization into the course lectures can enhance the value-leading role of the Land Resource Studies curriculum. Additionally, concepts such as farmland protection, food security, and ecological balance should not be overlooked in the teaching process. Efforts should be made to integrate at least one key ideological and political concept into each chapter.

## 3. Innovation Pathways for the Land Resource Course

Land Resource Studies is an interdisciplinary subject that closely intersects with natural sciences and technological sciences, characterized by the integration of nature, society, and technology. The course not only focuses on cultivating students' theoretical knowledge and professional skills but also emphasizes the development of professional literacy and management capabilities. Therefore, innovating the course construction based on the OBE-CDIO concept, with an outcome-oriented approach to teaching, and emphasizing the cultivation of students' practical abilities, is an important means to solidify students' theoretical foundation, enhance their hands-on abilities, cultivate their systematic thinking, and integrate multidisciplinary knowledge.

### 3.1 Innovation in OBE (Outcome-Based Education) Outcome-Oriented Education

Firstly, it is necessary to design the training objectives, which include external demands (such as the needs of the country, society, and educational development, industry and industrial development, and workplace requirements, as well as the expectations of students' parents and alumni) and internal demands (including the positioning and development goals of the school and the major, and students' development expectations), to determine the professional achievements that students can attain upon graduation (i.e., the training objectives). Secondly, it is essential to design the graduation requirements, which are based on the training objectives to determine the knowledge, abilities, and qualities that students should possess upon graduation (i.e., the graduation requirements). Finally, it is necessary to design the curriculum system, breaking down the graduation requirements into various small points and determining the curriculum system. The graduation requirements essentially construct an ability structure for graduates, and the realization of this ability structure relies on the curriculum system.

### 3.2 Innovation in CDIO Engineering Education Model

The curriculum should encourage students to actively participate in the practice between various modules of the course and connect the scattered knowledge points, in order to achieve the four-tiered goals of solidifying students' foundational knowledge, enhancing personal

abilities, cultivating teamwork skills, and constructing a comprehensive knowledge system for the course. To realize these objectives, teachers need to integrate multidisciplinary knowledge to enhance the systematic nature of the course. At the same time, the course should incorporate technologies such as ArcGIS, array software, and virtual simulation laboratories to strengthen the visualization, simulation, and informatization of teaching methods. By implementing project-based teaching under the CDIO concept, the entire process of land development, utilization, and protection is demonstrated, establishing an integrated teaching model of land evaluation, land consolidation, and land management where students actively explore and teachers provide collaborative guidance. Additionally, students can test whether their theoretical knowledge is solid, whether the curriculum system is effectively functioning, and whether talent quality is effectively improved through platforms such as teachers' research projects, undergraduate research projects, undergraduate innovation and entrepreneurship training programs, as well as competitions like the "Challenge Cup" and the "Internet Plus" College Students' Innovation and Entrepreneurship Competition.

### 3.3 Integration of Ideological and Political Elements

The comprehensive nature of the Land Resource Studies curriculum gives it a natural advantage in integrating ideological and political elements. For example, the concept of land can be combined with the 5,000-year history of Chinese land culture to inspire students' cultural confidence. Land resource surveys can start with the question "Why do we conduct land resource surveys?" to prompt students to think, transitioning into explanations of ecological space, agricultural space, and urban space, and finally explaining the important significance of China's current ecological protection red lines, permanent basic farmland, and urban development boundaries. The evaluation of land resource carrying capacity can start from the factors affecting the potential population carrying capacity of land, explain the reasons behind China's corresponding agricultural and population policies, and showcase the innovation and practice of land management systems in China's food security, inspiring students' national and institutional confidence. The content of comprehensive rural land consolidation and issues related to agriculture, rural areas, and farmers can be combined with China's more successful land consolidation cases, while also explaining the important significance of comprehensively promoting rural revitalization. Land resource protection focuses on integrating the ecological civilization concept of respecting nature, conforming to nature, and protecting nature, encouraging students to explore new models of land resource development, utilization, and management in the process of "building a beautiful China."

## 4. Conclusion

By leveraging the comprehensive nature of the Land Resource Studies curriculum, and integrating innovations in OBE (Outcome-Based Education) and CDIO engineering education models during the course design process, a student-centered approach can be adopted to organically combine theory and practice, thereby cultivating students' comprehensive engineering practice capabilities. Additionally, by implementing the concept of ecological civilization according to the characteristics of the course, classroom teaching can be fully utilized as the main channel to align the course with ideological and political theory courses, forming a synergistic effect. This enhances students' abilities in systematic thinking and hands-on practice, meeting the national requirements for the cultivation of interdisciplinary talents.

---

## References

- [1] TIAN Shuai, FENG Wanzhong, WANG Jing, HUO Jing. Research on teaching reform of Land Resource Science based on OBE concept. *Contemporary Educational Practice and Teaching Research*, 2019(1): 78-79. (In Chinese)
- [2] SUN Meiling. Discussion on training mode of agriculture-related accounting talents in North Shanxi. *Chinese Agricultural Accounting*, 2020(3): 44-46. (In Chinese)
- [3] LIAO Xingyong, XU Lihua. On Reform in Teaching Land Resource Science. *Journal of Southwest China Normal University (Natural Science Edition)*, 2016, 41(1): 201-204. (In Chinese)
- [4] LIU Yan, YIN Hongmei. The Reform of Multi-Level Teaching System of Land Resource Science Curriculum. *Guangdong Chemical Industry*, 2017, 44(14):279-280. (In Chinese)
- [5] LI Xiuzhi. Discussion on the Teaching Reform of Land Resources Based on OBE Concept. *Journal of Science and Education*, 2023(19):79-82. (In Chinese)
- [6] ZHAO Huaifu, WU Kening. Discussion on the Ideological and Political Construction Path of Land Resources Management Courses:Take Land Resources Science, the National Great Resources Sharing Course, as an Example. *CHINA AGRICULTURAL EDUCATION*, 2020, 21(03): 60-67. (In Chinese)
- [7] LIU Zhaoshun. Design and Practice of Ideological and Political Content of Land Resources Course. *Journal of Anhui Agricultural Sciences*, 2022, 50(21):276-278+282. (In Chinese)