



# Exploration on the Integration of Yellow River Culture into New Engineering Teaching Based on Bloom's Taxonomy of Educational Objectives

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**Abstract:** The teaching reform of new engineering has put forward new requirements for the education of engineers in the new era. The education of university teachers should not only be satisfied with the teaching of professional knowledge, but also cultivate engineering talents with the concept of professional responsibility and national cultural confidence. However, the existing engineering education and teaching still focus on knowledge cognition, and there are still deficiencies in the construction of the value system of talent cultivation, especially in the cultivation of engineering talents by cultural cultivation. Taking the core course of safety production technology in engineering management major as an example, this paper integrates the Yellow River culture into the professional course teaching of engineering management major according to the methodology of taxonomy of educational objective, to help engineering students establish a sense of professional responsibility and national pride in the process of learning, and provide reference for meeting the needs of engineering talent training under the situation of "new engineering".

**Keywords:** Project management; Curriculum evaluation system; Yellow River Culture

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## 1. Introduction

The spread of the covid-2019 virus has broken the original world economic and political situation. The differences in the ways countries fight against the epidemic highlight the important role of ideology during periods of major crises [1-4]. Faced with the complex international political situation, some college students' lack of self-confidence in the national system and culture reminds the majority of college educators that education should not only impart engineering professional knowledge, but also shape students' correct values through education, especially to establish students' national cultural self-confidence [5-6].

Currently, the teaching of engineering courses in higher education lacks research on the development of a curriculum system based on and oriented by cultural heritage, which can reflect the characteristics of Chinese civilization and foster national self-confidence. At the same time, there is also a lack of research on the teaching methods of engineering courses, which take the Yellow River, an important cultural symbol of the Chinese nation, as the core, can reflect major national strategies, and reflect the cultural advantages of the Yellow River Basin. According to the method of taxonomy of educational objectives, this paper integrates the Yellow River culture into the professional course teaching of the engineering management major, to help engineering students establish a sense of professional responsibility and national pride in the process of learning.

## 2. Taxonomy of Educational Objectives and its Application in the Teaching Procedures

Taxonomy of Educational Objectives is a widely used classification method of educational objectives. It is intended to provide a complete taxonomy within which any educational objective can be classified[7-9].

This teaching experiment of integrating culture into engineering education takes a course on engineering construction safety production technology as an example. This course is an important course for civil engineering and engineering management majors, focusing on the safety technology and management methods of engineering construction. The course is a typical engineering course with clear and complicated technical standards, which requires a high ability to help students master the actual problem-solving ability in the process of engineering construction. After two years of course teaching, 106 students participated in the practical process of education improvement. While learning the engineering construction technology, they learned and felt the impact of the Yellow River Basin culture on the local construction engineering

construction and the overall design of the project.

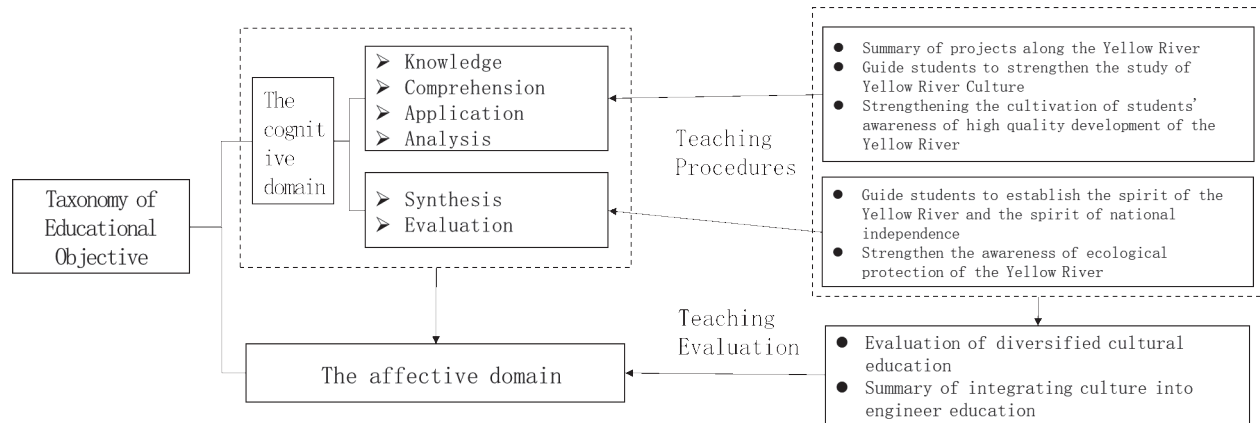


Figure 1. Taxonomy of educational objective of integrating Yellow River culture into engineer education

The teaching process is carried out in two directions. One is to seek key cases in the course. Starting with the engineering stories along the Yellow River, the course focuses on the safety management technical measures in the engineering construction process in these stories, and shows the influence of the Yellow River culture on engineering design and construction through the technology and wisdom embodied in these stories. This way can make students realize the potential impact of special regional culture on engineering construction.

The second way is for students to explore and discover projects related to the Yellow River. Let students actively explore the development process of projects along the Yellow River, and sort out the evolution process of safety management methods adopted in the construction process of these projects. In the process of sorting out the history of construction projects along the Yellow River, students have a deeper understanding of the relationship between the cultural value of the Yellow River culture and the scientific value of project construction.

The Yellow River is the birthplace of the Chinese nation, and Yellow River culture is the root and soul of the Chinese nation. Deeply exploring the historical continuity, cultural essence, and modern value of the Yellow River civilization, continuously enriching the cultural value system of the Yellow River, and continuing the Chinese spirit represented by the Yellow River, plays a very important foundational role in students' understanding of their own nation and the world.

In the course, we need to explore the influence of Yellow River culture and the role of education in the inheritance of ethnic culture, construct a mechanism for the inheritance and promotion of Yellow River culture, and explore the carrier of Yellow River culture education inheritance. The purpose of integrating Yellow River culture into engineering teaching is to enable students to fully understand the significant importance of the Yellow River national strategy, and to closely integrate the socialist core values system contained in the engineering discipline group, including craftsmanship spirit, engineering ethics, professional ethics, scientific spirit, etc., with the high-quality development of the Yellow River Basin. Cultural values are guided throughout the engineering culture values, and subject teaching is highly unified with political literacy and national will. The purpose of this education is to utilize the Yellow River culture as a guide to help students inherit and innovate the culture of the Chinese nation, nurtured by the Yellow River.

At the same time, this teaching process also implements the concept of ecological protection. The Yellow River Basin Ecological Protection Project is a millennium-long plan for the sustainable development of the Chinese nation. By incorporating environmental protection content into engineering education and discussing environmental protection concepts for the Yellow River with students, the concept of ecological protection for the Yellow River Basin can be effectively integrated into engineering courses. In addition to cultivating students' professional ethics, social responsibility, and safety awareness, the awareness of ecological protection in the Yellow River region can be continuously strengthened, and the ideological foundation of protecting, inheriting, and promoting Yellow River culture can be planted in the minds of future engineers.

The red culture in the story of the Yellow River in the new era plays a role in learning from history and educating students through political means, and is a valuable educational resource for undergraduate education in universities. Integrating the red culture from the Yellow River culture into engineering curriculum teaching, cultivating students' firm patriotism and noble beliefs through rich red stories and red spirit, and enhancing the connotation and quality of higher education. To fully stimulate and unleash innovation vitality, provide a strong talent pool for the high-quality development of the Yellow River

Basin and even China's development, cultivate students into high-quality engineers for ecological protection and high-quality development of the Yellow River Basin, and enable them to become sources of technological innovation, decision-making think tanks for engineering construction, and individuals who can contribute to the country's Yellow River strategy.

Three main teaching methods are used to complete this process:

a. Widely collect information and share it with students.

Widely collect information on projects along the Yellow River through literature collection, information extraction, literature analysis of relevant books, newspapers, magazines, archives, and other channels, and share these materials with students. Some materials are digitized, fully collecting, organizing, and analyzing digital resources of Yellow River culture and other non-textual materials, relying on digital technology to activate cultural resources, and transforming these proofs of Yellow River civilization and its modern value into classroom cases to share with students.

b. Using the SPOC teaching mode to enable students to independently search for Yellow River cultural elements in engineering construction.

Based on the teaching philosophy of "teacher-led, student-led" and the fundamental elements of Yellow River culture values, the "New Engineering" course design is carried out for the core courses of engineering cost management and safety management modules. The course plan is improved, and a SPOC flipped classroom teaching mode is constructed, in which students explain and teachers correct deviations.

Through collective lesson preparation, special lectures, educational reform projects, and teaching competitions, we aim to enhance teachers' awareness of the "New Engineering" teaching reform, encourage them to actively engage in curriculum reform teaching, improve their awareness and ability to educate students, and cultivate a conscious awareness and habit of identifying and seeking potential cultural elements in engineering. Innovative teaching methods, flipped classroom teaching methods, and guidance for students to independently explore the engineering elements of the integration of Yellow River culture and intelligent transportation.

c. Evaluate the effectiveness of learning from two different perspectives: teachers and students.

Use a combination of qualitative and quantitative analysis, job evaluation and effectiveness evaluation, and teacher self-evaluation and student evaluation to evaluate the outcomes of education. Teacher self-evaluation mainly refers to the evaluation of the achievement of course objectives and the completion of teaching effectiveness. Student evaluation is mainly based on the "moral education function" indicators and "value guidance" observation points set in the curriculum, and survey questionnaires are set up to adapt to value quantification. The teaching effectiveness of the curriculum is examined from students' ideological and moral level, professional sense of responsibility, and patriotism. Using mechanism research and strategy analysis methods, conduct a comprehensive evaluation at the end.

### **3. The Effect of Engineering Education Reform in the Cognitive Domain**

After a two-year course, 106 students participated in the course on the integration of culture and engineering technology. After a series of comprehensive evaluations, the following conclusions are drawn from the results of education from multiple dimensions.

a. Knowledge.

Students learned the definitions and descriptions involved in the projects along the Yellow River, including but not limited to the definition of water conservancy projects, the definition and methods of safety management, etc.

b. Comprehension.

Students understand that the projects along the Yellow River are not only water conservancy project construction, but also engineering design, engineering maintenance, water resources, and environmental protection engineering maintenance along the Yellow River. They have the idea of combining the initial cultural value with engineering science.

c. Application.

Students can understand the reasons why the projects along the Yellow River are designed, and how to carry out safe construction design, selection of safety measures, and maintenance after the completion of the project for projects in the same situation. They can gradually learn to design a preliminary construction scheme.

d. Analysis.

Students can carry out a simple analysis on the construction scheme and safety management method designed by themselves, and design a simple verification test based on the analysis. They can focus on the design principles and principles of their schemes.

e. Synthesis.

Based on the above study, students can design multiple construction schemes according to the specific conditions of

specific projects along the Yellow River, and choose the best scheme according to the actual situation. They can creatively complete the scheme design based on the analysis of the main elements of the design, construction, and maintenance of the projects along the Yellow River, so that the scheme can systematically support the construction of a project along the Yellow River.

f. Evaluation.

Students can evaluate the applicability of their schemes in the design process of comprehensive schemes or in the process of combining the evolution of projects along the Yellow River, to analyze the advantages and disadvantages of previous construction schemes, and evaluate their value.

#### **4. The Effect of Engineering Education Reform in the Affective Domain**

Through the analysis of specific engineering cases along the Yellow River in the course teaching, students realize the impact of the geographical location and cultural evolution of the Yellow River on engineering design, construction, and maintenance. After accepting the influence of cultural values on Engineering Science, students gradually formed the values of mutual benefit between regional special culture and science, and combined this value with the sense of professional responsibility. This kind of value is not only systematic but also highly personalized. A student pointed out in the investigation report on the projects along the Yellow River that in the process of learning, he not only consolidated his professional knowledge, but also cultivated engineering ethics and innovation consciousness. With the direction of "systematic governance" and "science and technology empowerment", he will continue to pay attention to the frontier dynamics of the Yellow River project safety, and provide professional support for the high-quality development of the Yellow River Basin.

#### **5. Conclusion**

For engineering education, without the cultural value of the nation as the basis, the students trained through this education will have no sense of professional responsibility or social responsibility. The Yellow River culture is one of the fundamental cultures in China, and its cultural value is not only crucial for cultivating students' professional ethics, but also an important support for enhancing the educational achievements of engineering education. This study integrates the cultural value of Yellow River culture into the teaching of engineering courses, using various teaching methods, especially allowing students to experience the value of Yellow River culture in engineering course learning while organizing engineering materials along the Yellow River. This teaching experiment proves that incorporating cultural values into the education of natural science majors is beneficial for improving their students' professional ethics and moral standards, thereby enhancing the cultivation value of this major.

There are still some problems to be discussed in the research on the coordinated development of regional economy in the Yellow River Basin and the integration of Yellow River culture into engineering education. It is necessary to define and enrich the research content of the Yellow River Basin culture, and determine the connotation and significance of the Yellow River culture, especially the Yellow River culture in different regions. Scholars have focused on the process of engineering education, applying a certain aspect of Yellow River culture to classroom teaching in professional courses. However, due to the unclear definition of Yellow River culture, it has not been widely integrated into engineering education, making it difficult to form a teaching system that combines Yellow River culture with engineering. Engineering majors have their own teaching objectives and development directions, and how to form a better integration of culture and engineering education is an urgent topic to explore.

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