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Study on the Current Situation and Development Countermeasures of Marine Ecological Civilization Literacy Education in China

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Abstract

Marine ecological civilization education is the core pathway to advancing sustainable marine development and achieving the goal of "harmony between humans and the sea." As global marine governance issues become increasingly complex—such as climate change and marine pollution—and China's "maritime power" strategy deepens, raising public awareness of marine ecological civilization has become a critical component of the national strategy. Currently, despite the initial formation of China's marine education system, it still encounters numerous challenges in both theory and practice, including regional disparities in educational resources, inadequate interdisciplinary integration, and a lack of international discourse power. This study aims to systematically explore the current status, problems, and optimization paths of marine ecological civilization education in China through literature analysis, empirical research, and policy evaluation, with the hope of contributing Chinese wisdom to global marine education. The ocean is the largest ecosystem on Earth, covering approximately 71% of the planet's surface. It not only provides abundant natural resources for humanity but also plays a crucial role in regulating climate, maintaining biodiversity, and fostering economic development. However, with the intensification of human activities, marine ecosystems are facing numerous challenges, such as marine pollution, loss of marine biodiversity, and over-exploitation of marine resources. These issues not only threaten the health and sustainable development of marine ecosystems but also severely endanger the survival and development of humanity. Against this backdrop, the construction of marine ecological civilization has become a global focal point. President Xi Jinping stated: "The construction of marine ecological civilization is an important part of ecological civilization construction and a crucial component in building a beautiful China." This significant statement offers theoretical guidance and action plans for China's marine ecological civilization construction. The construction of marine ecological civilization requires not only policy support and institutional guarantees but also broad participation and active engagement from all citizens. Marine ecological literacy education is a vital approach to enhancing public awareness of marine ecological civilization and encouraging widespread involvement in its construction.

Keywords

Marine ecology, civilization quality, educational status, development countermeasures.

1. Introduction

The connotation of marine ecological civilization education is rich, covering multiple aspects such as marine cognitive literacy, marine emotional literacy, marine moral literacy, marine willpower and character, and marine behavioral literacy. Marine cognitive literacy refers to the extent of knowledge people have about marine ecosystems, marine resources, and marine environments; marine emotional literacy refers to peoples emotional experiences and attitudes

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towards the ocean, such as love and reverence for it; marine moral literacy refers to the ethical norms and behavioral standards people should follow in marine activities; marine willpower and character refer to the firm beliefs and perseverance people demonstrate in the construction of marine ecological civilization; marine behavioral literacy refers to specific behaviors exhibited by people in marine activities, such as protecting the marine environment and using marine resources reasonably. Through marine ecological civilization literacy education, the publics understanding of marine ecological civilization can be improved, enhancing their awareness and sense of responsibility for marine protection, and promoting active participation in the construction of marine ecological civilization.

2. Analysis of the Current Situation of Marine Ecological Civilization Literacy Education in China

2.1. Policy support and system construction

In recent years, the Chinese government has placed great emphasis on the construction of marine ecological civilization and issued a series of policy documents to promote the development of marine ecological civilization education. For example, the "National Oceanic Administrations Implementation Plan for Marine Ecological Civilization Construction (2015-2020)" clearly states that marine ecological civilization construction should be integrated into all aspects and processes of marine development, aiming to basically improve the institutional framework for marine ecological civilization. Additionally, the policy emphasizes the importance of public education and participation, aiming to create a favorable social atmosphere for marine ecological civilization construction. However, there are still some challenges in implementing these policies. Although policy documents provide macro guidance for marine ecological civilization education, coordination mechanisms between different regions and departments remain underdeveloped, leading to variations in policy implementation effectiveness.

2.2. Education system and curriculum

The education system for marine ecological civilization in China is gradually being established and improved. According to Professor Ma Yongs research, the goals of cultivating marine literacy in our country should include five aspects: marine cognitive literacy, marine emotional literacy, marine moral literacy, marine willpower quality, and marine behavioral literacy. In terms of the educational system, marine education in primary and secondary schools, universities, and the general public is shifting towards marine literacy education. For example, marine education in primary and secondary schools focuses on developing students basic marine literacy, while universities emphasize cultivating professional marine literacy for students in marine-related disciplines and basic marine literacy for those not in marine-related fields. However, there are still some issues with the current educational system. At the primary and secondary school level, the curriculum design for marine ecological civilization education is not systematic enough, and teaching content mainly focuses on popularizing marine knowledge, lacking the cultivation of marine emotional, moral, and behavioral literacy. In universities, although some marine-related courses incorporate the concept of marine ecological civilization, the overall curriculum system still needs further optimization to better meet the demands of the national strategy for a strong maritime nation.

2.3. Public awareness and participation

The publics level of awareness and participation in marine ecological civilization is a crucial indicator of the effectiveness of education on marine ecological literacy. In recent years, with the advancement of the national strategy for a strong maritime nation, public attention to the ocean has increased, but overall awareness remains low. According to relevant studies, public

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understanding of marine ecological civilization often stays at the surface level, lacking in-depth knowledge about marine ecosystems and sustainable use of marine resources. Moreover, channels for public participation in the construction of marine ecological civilization are limited, leading to low engagement. Although some regions have launched volunteer activities for marine protection, these activities are mostly short-term and scattered, lacking long-term mechanisms and broad social mobilization.

2.4. Education base and facility construction

Marine education bases play a crucial role in the cultivation of marine ecological civilization literacy. Currently, China has established several marine museums, science popularization centers, and marine protected areas as educational bases. For example, the Xishuangbanna Tropical Botanical Garden of the Chinese Academy of Sciences and the Yunnan Branch of the Institute of Medicinal Plant Development under the Chinese Academy of Medical Sciences provide students with "immersive" and "experiential" education. However, there are still shortcomings in the construction of these educational bases. On one hand, their distribution is uneven, mainly concentrated in coastal developed regions, while inland areas and economically underdeveloped regions have fewer such bases. On the other hand, some educational bases lack clear functional positioning, with relatively monotonous forms of educational activities that lack interactivity and appeal, making it difficult to attract widespread public participation.

3. Research Methods and Empirical Analysis

3.1. Research design

Use mixed research methods: Quantitative analysis: 3,000 primary and middle school students in 10 coastal and inland provinces were surveyed to assess their knowledge of Marine knowledge and ecological behavior tendency; Qualitative research: In-depth interviews were conducted on six typical cases, such as Shenzhen Ocean University and Weihai Marine Economic Development Demonstration Zone, to analyze the innovation of education model and the effect of policy implementation.

Table 1. Survey results on the current situation of marine ecological civilization literacy education

Project	Foreland	Boo-ay	National average
Ocean course coverage (%)	85	32	58.5
The proportion of teaching using VR/AR technology (%)	25	15	20
Indigenous Marine knowledge courses accounted for (%)	4	1	2.5
Volunteer participation rate for Marine conservation (%)	40	10	25

3.2. Empirical results

1. Current characteristics:

Significant policy support: 85% of coastal schools have opened Marine courses, but only 32% in inland areas;

Lack of technology empowerment: Only 20% of schools use VR/AR technology for immersive teaching;

Weak cultural inheritance: the proportion of indigenous Marine knowledge in the curriculum is less than 5%, and traditional fishing communities are facing a crisis of "knowledge gap".

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2. Core issues:

Uneven distribution of resources: high-quality educational resources are concentrated in the eastern coastal areas (such as Shenzhen Ocean University);

Disciplinary barriers are prominent: the proportion of interdisciplinary courses between marine science and other disciplines (such as information technology, social sciences) is less than 15%; insufficient investment in educational base construction has led to lower facility standards and service capabilities at some bases. For example, infrastructure development in some marine protected areas lags behind, lacking essential educational facilities and exhibition platforms, which affects the educational outcomes of these bases. Moreover, inadequate operating funds for educational bases restrict the conduct of educational activities, making it difficult to meet the publics demand for education on marine ecological civilization.

Table 2. Comparison of the proportion of interdisciplinary courses between coastal and inland areas

Question	Foreland	Boo-ay	National average
The proportion of uneven resource allocation (%)	70	90	80
The proportion of interdisciplinary courses is (%)	12	8	10
International cooperation participation rate (%)	15	5	10

International collaboration is limited: Only 12% of universities are involved in the United Nations Decade of the Oceans program, and global cooperation is not deep enough.

4. Chapter four Development strategies and path optimization

4.1. Building a multi-level education system

Popularization of basic education: Marine ecological civilization courses will be included in the national compulsory education syllabus, and modular textbooks (such as "Marine ecological protection" experimental course) will be developed;

Table 3. Optimization Path of Multi level Education System

Metric	In 2025	In 2030	In 2035
Ocean course coverage (%)	70	85	95
The proportion of interdisciplinary courses is (%)	15	25	35
International cooperation participation rate (%)	20	30	40
Volunteer participation rate for Marine conservation (%)	30	40	50

Internationalization of higher education: promote the establishment of joint laboratories between Shenzhen Ocean University and MIT, University of Sydney, focusing on deep-sea technology and ecological restoration technology;

Diversification of social education: "Ocean Culture Festival" is carried out in science and technology museums and ocean parks to strengthen public participation (such as the "Beach cleaning Action" volunteer program).

Further refine and implement national policies and documents on Marine ecological civilization construction, such as the Implementation Plan for Marine Ecological Civilization Construction of the State Oceanic Administration (2015-2020), and clarify the responsibilities and tasks of governments at all levels and relevant departments in Marine ecological civilization literacy education.

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Table 4. Prediction of Future Development Indicators for Marine Ecological Civilization Literacy Education

Educational level	Promote measures	Expected goal
basic education	Incorporate it into the curriculum and develop modular textbooks	Increase the coverage of Marine courses to more than 80%
higher education	Establish joint laboratories and carry out international cooperation projects	Increase the proportion of interdisciplinary courses to more than 20%
social education	We will carry out a "Marine Culture Festival" to strengthen public participation	Increase the participation rate of Marine conservation volunteers to more than 30%

Establish and improve the policy support system for Marine ecological civilization literacy education, and incorporate Marine ecological civilization literacy education into national and local education development plans to ensure the consistency and operability of policies

4.2. Strengthen the integration of science and technology and education

Intelligent education platform: build a national "Marine Science popularization cloud platform", integrating deep-sea exploration data, virtual laboratory and online courses.

Application of immersive technology: VR is used to restore the ecology of coral reefs in the South China Sea, and students ecological responsibility is enhanced through interactive experience.

4.3. Promote interdisciplinary and international cooperation

Interdisciplinary innovation: set up interdisciplinary majors such as "Ocean + Big Data" and "Ocean + Law" to cultivate compound talents;

Global governance participation: Leading the Belt and Road Marine Education Alliance, sharing polar research results and mangrove conservation experience.

Based on the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) plan, we will collaborate with international teams to develop open-source educational tools (such as the Global Marine Pollution Monitoring Map) and promote cross-border sharing of educational resources- Leading the development of international standards for marine science and technology education, transforming China's technological advantages in deep-sea exploration, ecological restoration, and other fields into educational discourse power.

4.4. Policy support and community empowerment

Legislative support: Formulate the Law on Promoting Marine Ecological Civilization Education to clarify the responsibility boundary between government, enterprises and communities;

Community-driven: "Marine Culture Inheritance Centers" will be set up in indigenous areas such as the Tanka fishing village in Hainan, encouraging older people and young people to "pair up" to teach traditional ecological knowledge.

The deep integration of technology and education is the key path to solving the bottleneck of marine ecological civilization literacy education in China. Through the construction of intelligent platforms, immersive technology applications, and interdisciplinary innovation, it is possible to effectively bridge regional gaps, activate the value of traditional knowledge, and cultivate marine talents with global competitiveness. In the future, it is necessary to further explore the application of artificial intelligence personalized teaching and brain computer

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interface technology in marine cognitive science, and promote a qualitative change in educational models from "knowledge transmission" to "ecological value shaping". Only with technology as a lever can we leverage the comprehensive upgrade of marine ecological civilization literacy education and contribute Chinese solutions to global ocean governance.

5. Summary

The theoretical significance of this study lies in enriching the theoretical framework of marine ecological civilization construction and providing new perspectives and methods for research on marine ecological civilization literacy education. Its practical significance is to offer reference for government departments in formulating relevant policies, provide guidance for educational institutions in optimizing their curriculum systems, and serve as an action guide for public participation in marine ecological civilization construction. By enhancing the public's awareness of marine ecological civilization, it can promote the effective implementation of marine ecological civilization construction, drive the sustainable development of the marine economy, and achieve harmonious coexistence between humans and the ocean.

Future research can further deepen the theoretical study of marine ecological civilization education, exploring the educational needs of different stages and groups, and developing more targeted courses and activities. At the same time, enhancing international cooperation and exchange, drawing on advanced international experiences, to boost China's international influence in marine ecological civilization education. Additionally, it is recommended to conduct long-term tracking studies to evaluate the implementation effects of policies and educational measures, providing a scientific basis for continuous improvement in marine ecological civilization education.

China's marine ecological civilization education is at a critical stage of transitioning from "scale expansion" to "quality improvement." Through policy innovation, technological empowerment, and international collaboration, it can gradually achieve educational equity, interdisciplinary integration, and global governance. Future research needs to further quantify the long-term ecological benefits of educational interventions and explore the potential of artificial intelligence in personalized marine education.

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