On the Exploration of the "Trinity" Practical Teaching Model in Marine Biology

Huang,Ying

Department of Marine Biology, College of Oceanography, Hohai University, Nanjing, Jiangsu, 210098, China

Abstract: Practical courses serve as pivotal components within marine biology education, and the cultivation of an efficient and judicious training model stands as imperative for advancing students' prowess in innovative practical skills. Building upon a comprehensive review of practical teaching experiences, this paper advocates the construction of a "Trinity" teaching paradigm, harmonizing foundational instruction, inventive practical training, and specialized development. Moreover, the article posits reformative strategies, delineated through the lens of cultivating diverse pedagogical methodologies and orchestrating the nuanced application of varied evaluative modalities. The overarching objective of these reforms and innovations in practical teaching is to nurture a cadre of high-caliber individuals characterized by a bedrock of substantive knowledge, robust manual dexterity, and elevated composite aptitudes.

Keywords: Marine biology; Practical Instruction; Trinity; Pedagogical advancement

DOI: 10.62639/sspjiess09.20240101

1. Introduction

Practical instruction constitutes a linchpin in the higher education milieu, serving as a pivotal conduit for instilling practical acumen and fostering innovative capacities among students. It entails the dissemination of theoretical knowledge, concomitantly nurturing students' practical aptitudes and problem-solving competencies, thereby engendering an enhancement in their comprehensive proficiency. Consequently, the tactical implementation of practical teaching necessitates alignment with predetermined instructional objectives, coupled with a tailored responsiveness to societal requisites to yield pedagogical outcomes characterized by individualized and pragmatic applications. Effectively steering students towards the amalgamation of theoretical constructs with practical applications, and optimizing the potential afforded by laboratories and scientific research repositories for experiential learning, underscores a formidable challenge. Drawing upon a half-decade of pedagogical praxis and exploratory endeavors, this study proffers the conceptualization of a "Trinity" teaching system—integrating foundational instruction, inventive practical training, and specialized development—commensurate with the idiosyncrasies of marine biology courses and distinctive attributes of our university's marine science curriculum. It staunchly advocates for a panoply of pedagogical methodologies and the judicious utilization of a spectrum of evaluative modalities, encapsulating a purposive endeavor to reform and innovate marine biology practical instruction.

2. Establishment of the "Trinity" Teaching System: Foundational Teaching, Innovative Practical Training, and Professional Development

(1) Foundational teaching development

Marine biology, characterized by its expansive scope and robust applicability, demands a curriculum design and

(Manuscript NO.: JIESS-24-1-F004)

instructional methodology reflective of successful experiences and content from extant marine biology courses in coastal institutions. Aligned with the distinctive features of our institution's professional development and training program, our pedagogical approach places emphasis on designing and delivering courses that underscore practical applications and manifest vocational relevance. The instructional strategy prioritizes the amalgamation of theoretical and practical knowledge, with a focal point on enhancing students' fundamental practical skills through targeted emphasis on laboratory experiments and internships within core courses. The reformed marine biology curriculum primarily acquaints students with foundational theoretical knowledge of marine organisms and methodologies for basic investigation, assessment, and sustainable development of marine resources. Additionally, the curriculum introduces advanced technologies and cutting-edge research in relevant fields, cultivating students' foundational theories, experimental methods, and practical skills for the sustainable development and utilization of marine biological resources [1].

(2) Development of innovative practical training

Practical teaching serves as the practical embodiment of theoretical content, encompassing both laboratory experiments and internships. Laboratory experiments involve practical instruction in areas such as the identification and dissection of marine organisms, classification and analysis of marine biological resources, and analysis and monitoring of seawater quality. Internship teaching, conducted predominantly in field settings, comprises specialized cognitive internships and comprehensive internships. Specialized cognitive internships typically span about one week and occur shortly after students commence their study of marine biology. These involve targeted practical instruction through visits, interviews, and on-site investigations of enterprises, research institutions, and marine biodiversity conservation zones. Comprehensive internships, lasting approximately two weeks, are conducted in practical teaching bases, collaborative teaching bases, and other settings. These internships aim to provide students with insights into the scientific approaches to the development, protection, and management of marine biological resources. Students gain a comprehensive understanding of various practical methods related to marine biological resources, progressing from observation, sample collection, and data analysis to practical application. This immersive approach enhances students' perceptual understanding of marine biology and the environment, refining and elevating their investigative, scientific, and problem-solving abilities, thereby achieving a seamless integration of theoretical knowledge and practical application.

(3) Advancement of professional development

Encouraging students to engage in research practices based on their personal interests and development directions is paramount. Faculty members in the marine biology department can guide students in participating in relevant research projects, organizing teams to formulate topics of interest, and applying for undergraduate entrepreneurial and innovative projects. Faculty guidance extends to advising students on their graduation theses in marine biology-related areas. Students, during their free time, collaborate with faculty and graduate students in laboratories for scientific research and professional training. This integrated professional training system, encompassing knowledge, skills, quality education, and innovation, not only aids students in gaining a deeper understanding of research methodologies and cutting-edge developments in the field of marine biology but also facilitates a comprehensive grasp of knowledge in related domains. Moreover, it effectively stimulates students' initiative for independent learning, innovatively nurtures their applied professional skills, and underscores their role in autonomous management.

(4) Integration and interpenetration of foundational teaching, innovative practical training, and professional development

In foundational teaching, students are guided to explore the feasibility of applying theoretical knowledge to practical scenarios through the paradigm of "identifying problems, analyzing problems, and solving problems." During classroom instruction on foundational knowledge in marine biology, students are prompted with specific

queries to ponder, leading to the formulation of research hypotheses. Through group and collective discussions, students propose experimental plans, validate these plans during practical teaching, and subsequently engage in discussions to assess the validity of research hypotheses. Ultimately, this approach achieves the goal of reinforcing foundational teaching through the application of innovative practical training and professional development.

3. Establishment of Diversified Practical Teaching Approaches

(1) Guided teaching approach

In the process of foundational teaching, instructors employ a questioning-guided teaching methodology, strategically designing scenarios to prompt student reflection. This approach stimulates critical thinking, unleashing the student's cognitive agency. For instance, when elucidating the classification and evolutionary dynamics of marine organisms, posing questions such as "What constitutes marine life?" or "Can you enumerate various marine organisms?" serves to capture students' attention, heighten learning interest, and guide them in analytical thinking. The quest for answers becomes not only an exercise in cognitive skill development but also a process deepening the students' comprehension of marine biology [2].

(2) Heuristic teaching approach

When introducing the latest research developments and scientific hotspots in marine biology, encouraging students' subjective initiative is paramount. In this context, teachers disseminate foundational content while motivating students to create and present marine biology-related knowledge displays as an expansion and deepening of course content. For instance, when introducing cutting-edge advancements in marine biology, students are tasked with researching literature, summarizing key points in groups, creating display boards, presenting findings in class, and engaging in subsequent question-and-answer sessions. This method is instrumental in cultivating students' ability to research literature, organize information, summarize, and think independently. Importantly, it fosters interest in marine biology courses, enhancing students' autonomy and enthusiasm for learning [2].

(3) Thematic teaching approach

Tailored to the foundational teaching needs of marine biology courses, select modules are chosen, topics are devised, and students are divided into groups. Post-lecture, students engage in researching materials, preparing speeches, creating multimedia presentations, presenting topics, fielding questions, and culminating in a written reflection on their chosen thematic modules. This method ensures that students acquire knowledge through inquiry, resulting in a profound and enduring understanding of key concepts. Crucially, it broadens students' knowledge base and enhances their analytical problem-solving abilities [2].

4. Utilization of Various Assessment Methods

To enhance student engagement and teaching effectiveness, alongside innovative teaching approaches, a robust and distinctive assessment methodology is essential. Typically, the assessment at Hohai University's College of Oceanography combines 30% continuous assessment with 70% final examination scores, a simplistic yet potentially flawed evaluation system. Continuous assessment heavily relies on routine homework completion, susceptible to issues such as plagiarism and low authenticity, thereby compromising the intended pedagogical outcomes. Thus, adopting a weighted assessment model, encompassing factors such as attendance, classroom participation, PPT presentations, and final exam scores, with respective weightings of 5%, 20%, 25%, and 50%, has been proposed [3]. Classroom attendance and participation in discussions, both randomized, help ensure attendance rates and

offer insights into students' engagement. This weighted assessment approach encourages independent learning, benefiting diligent and outstanding students, and underscores the importance of understanding not just the form of assessment but also strengthening students' capabilities in analyzing and discussing results, thereby nurturing creativity and innovation.

5. Conclusion

Reforms in practical teaching play a pivotal role in elevating the quality of higher education. This paper, through the construction of marine biology practical courses, has outlined an effective teaching approach applicable to marine biology undergraduate students in College of Oceanography, Hohai University. By establishing a "Trinity" practical teaching system that integrates foundational teaching, innovative practical training, and professional development, and by employing various teaching methods and assessment approaches, this approach enhances the efficacy of marine biology courses. It cultivates students' interest in marine science, elevates their learning autonomy, and enhances their innovative and comprehensive capabilities.

References

[1] Zou Keshu, Liu Li. A Preliminary Exploration of the Teaching Construction of Marine Biology Resource Courses at South China Agricultural University[J]. Modern Education, 2019, 6(85): 174-175.
[2] Fu Feng, Liu Quanyou. Research and Practice of Inquiry-Based Teaching Model in Marine Biotechnology Courses under the Background of New Agricultural Sciences[J]. China Educational Technology Equipment, 2023(20): 64-66.
[3] Huang Ying, Shi Yan, Zhao Zhe. Reform and Exploration of Experimental Teaching in Marine Zoology[J]. Progress: Teaching and Research, 2023(20): 111-113.

Funding

Undergraduate Practical Teaching Reform Research Project at Hohai University for the years 2022 and 2023; Small-Scale Teaching Management Research Project at Hohai University for the year 2022 (Project ID: 2022ZD10); Ideological and Political Demonstration Course Construction Project of Hohai University for Postgraduates in 2022; Ideological and Political Demonstration Course Construction Project of Hohai University for the year of 2021 (Project ID: 2021B17).

About the Author

Huang,Ying (1989-), female, native of Huai'an, Jiangsu, Ph.D., Associate Professor. Her research focuses on the innate immunity of marine animals.