

Hybrid Teaching Reform of Education and Rehabilitation Major's "Human Anatomy" Course Based on the OBE Framework

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Abstract: This study investigates the efficacy of a blended teaching approach implemented in the "Human Anatomy" course within the Education and Rehabilitation major, utilizing the Outcome-Based Education (OBE) framework. Employing teaching reform and a questionnaire survey as methodological tools, the study focused on a cohort of 28 students enrolled in the 2022 Education and Rehabilitation class, spanning 16 weeks and total 64 instructional hours. The teaching reform entailed multifaceted enhancements encompassing the redefinition of instructional objectives, optimization of the syllabus and establishment of a comprehensive learning resource platform. A questionnaire survey was administered to students across academic years 2020 to 2022 within the Education and Rehabilitation major, evaluating regular grades, final grades, teaching appraisals, and self-assessments. Analytical scrutiny was conducted employing intergroup one-way analysis of variance or non-parametric tests, with a significance level set at 0.05. The findings revealed statistically significant disparities in both grades and teaching evaluation scores among the different class cohorts ($p=0.021$, $p=0.043$, $p=0.039$). Moreover, significant variations were evident in teaching assessment scores across ten dimensions between distinct classes, including practical application ($p=0.031$), applied knowledge ($p=0.039$), utilization of online platforms ($p=0.043$), and collaborative communication ($p=0.046$). It concludes that students from the 2022 class exhibited heightened acceptance in teaching evaluations and self-assessments. Furthermore, they acknowledged that the teaching reforms aligned with the OBE framework positively impacted their practical aptitude, utilization of online platforms, and collaborative communication skills.

1. Introduction

The development of the Education and Rehabilitation profession and the changes in public health needs require that Education and Rehabilitation talents have diversified abilities to continuously improve job competency. Outcome-based education (OBE) is an educational theory that bases each part of an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences^[1]. It emphasizes that in the process of education and teaching, learners should be the center, and the organization and collection of diversified teaching resources should be strengthened. In addition, students should be guided to gain learning experience to better help them succeed^[2]. The shift from teacher-centered to student-centered, the implementation of core quality and personality development, is the entry point of OBE and also the implementation point of evaluating students' learning outcomes. With the continuous deepening of school-level and college-level education reforms, based on the OBE framework, it is essential to carry out teaching reforms with the goal of job competency around the knowledge, abilities, and quality requirements that practitioners in the Education and Rehabilitation profession must possess^[3].

Human Anatomy is a basic medical course that studies the normal morphological structure of the human body^[4]. It is not only a compulsory course for the Education and Rehabilitation major, but also a basic subject for students in this major to learn other professional courses, cultivate professional literacy, and improve practical ability^[5]. The Human Anatomy course in this major is aimed at freshmen and is offered in the fall semester of the first year. The theoretical and practical courses total 64 hours/4 credits, making it one of the subjects with a relatively heavy credit weight in professional basic courses. The course usually includes theoretical explanations and practical anatomy. Especially in practical courses, practical teaching contents such as gross anatomy, neuroanatomy, and imaging anatomy are offered^[6]. Practical teaching is more hands-on, time-consuming, and knowledge-intensive, and revolves around real gross anatomy specimens in groups^[7]. After the theoretical knowledge of each chapter is learned, the practical course teaching follows closely. However, the practical learning of this course is still mainly based on observing specimen models, and students complete experimental reports independently^[8].

Education and Rehabilitation is a new discipline established based on the current development needs of special education in China. It aids in the implementation of the reform policy of "medical education integration" in special education and the establishment of a school-based rehabilitation training model. After graduation, students in this major will primarily focus on the teaching and rehabilitation of special needs children. The teaching emphasis of Human Anatomy should not strictly adhere to the traditional anatomy outline, but should be adjusted and reinforced according to the professional characteristics.

Regardless of whether it is the curriculum setting of medical majors or medical-related majors, based on the development of the Internet + digital industry, traditional anatomy teaching methods can no longer meet the needs of students' learning and practice^[9]. Anatomy teaching is knowledge-intensive, with many difficult points, especially as the foundation of subsequent practical subjects such as "Human Kinematics" and "Evaluation and Correction of Movement Disorders"^[10]. The combination of theoretical knowledge and practical application will continuously improve the requirements for students' learning outcomes and the teaching outcomes of this course^[11].

Therefore, based on further strengthening the implementation of the OBE framework in the compulsory course of Human Anatomy in the Education and Rehabilitation major, the full application of the blended teaching method is promoted. This encourages the organic combination of Human Anatomy theory and practice, carries out teaching reforms and innovations, explores new ideas for cultivating applied talents in Education and Rehabilitation, and provides a reference basis for subsequent course teaching reforms.

2. Methods

2.1. Participants

A total of 65 students majoring in education and rehabilitation from 2020 to 2022, including 25 students in 2020, 19 students in 2021, and 21 students in 2022.

2.2. Teaching Reconstruction Strategy and Procedures

The teaching reconstruction strategy was applied to the teaching of "Human Anatomy" for 16 weeks for undergraduate students majoring in education and rehabilitation in 2022, and the results of usual scores, final scores, and academic evaluations were collected.

2.2.1. Refactoring the teaching objectives

The setting of teaching objectives can be understood as a result-oriented setting in the OBE teaching model^[12-13]. Based on the OBE framework, the teaching objectives of this course are set in six aspects (Table 1).

Table 1: Refactoring the teaching objectives

The original teaching objectives	Teaching objective strategy reconstruction based on the OBE
Knowledge: Students are required to master the normal position and morphology of various system organs and structures firmly and proficiently through learning, analyze their interactions, and correctly apply anatomical terminology to describe them.	Based on the characteristics of the education rehabilitation major, the main objects of students' future education and rehabilitation are special children. Therefore, the teaching arrangement of the musculoskeletal system, respiratory system, nervous system, as well as the oral, visual, and vestibular systems should be emphasized according to the anatomical physiology and developmental characteristics of special children.
Application: Students are able to apply basic theoretical knowledge of anatomy, and can fully combine various systems and organs from the perspective of morphology and structure, and clearly indicate the functions of each system and organ.	Emphasis is placed on mastering the composition of the musculoskeletal system, and being able to accurately combine bones, joints, and muscles; clearly indicating the composition of the oral cavity and the relationship between the respiratory system.
Integration: Students are able to integrate knowledge from different systems, analyze the principles of human life activities, and think about the anatomical characteristics of special children in combination with other professional knowledge.	Students are able to integrate knowledge of the musculoskeletal and nervous systems, analyze the causes of movement disorders; observe specific diseases in special children and analyze them from multiple systems and dimensions.

2.2.2. Optimize the teaching outline and teaching content

In the reform of teaching content, the integration of the Outcome-Based Education (OBE) framework with the mutual connection and integration of this course and subsequent courses such as "Human Kinematics" and "Evaluation and Correction of Movement Disorders" is crucial. This

approach helps to determine the corresponding relationship between the knowledge points of this course and the professional characteristics, and reach a consensus on the key explanation of important chapters and knowledge points^[14].

Supplementary teaching links such as "Basic Human Movement Patterns and Movement Skill Patterns" and "Analysis of Common Movement Disorder Structures and Functions" are set up for core chapters. This strengthens the horizontal connection between education-rehabilitation^[15], structure-function-application, supplements clinical anatomy knowledge, and penetrates ideological and political education^[16]. The correspondence between the expected learning outcomes of each chapter and the course objectives has been restructured, the proportion of practical teaching time has been increased, and practical teaching follows closely after the theoretical teaching of each chapter.

In conclusion, the reform of teaching content based on the OBE framework not only enhances the teaching quality but also significantly improves the students' learning experience and outcomes. It provides a valuable reference for future teaching reforms in the field of Education and Rehabilitation.

2.2.3. Construct a diversified teaching and learning resource platform

With the rapid advancement of online course teaching resources, students' access to knowledge should not be confined to classroom teaching. Learning content and tasks are published, exercise banks and comprehensive homework banks are established, and students' autonomous learning situation is monitored through the online teaching platform. This allows for the evaluation of learning outcomes, monitoring of teaching quality, and provision of teaching feedback and suggestions.

Furthermore, students are encouraged to take the Chinese university MOOC quality course "Human Anatomy" (China Medical University). These resources assist students in clarifying the logical thinking of the course knowledge outside of class, cultivating students' ability to learn independently, exploring learning, and flexibly applying knowledge to solve profession-related problems.

In addition, by using application software such as "3D Body Anatomy" and "Visible Body", students have the opportunity to simulate the dissection of the human body. This not only increases the enjoyment of learning anatomy knowledge but also enhances the three-dimensional visualization education of human anatomy knowledge, leading to positive teaching results.

2.2.4. Construct the hybrid teaching strategy

In the past, this course was more teacher- and classroom-centered, focusing on knowledge impartation, which led to students developing rote memorization, lazy thinking, and negative attitudes towards learning. Therefore, it is essential to further strengthen thinking guidance and teacher-student interaction in the teaching process, as well as mechanisms for cultivating students' critical thinking and independent learning abilities^[17].

Moreover, this course should fully utilize pre-class teaching (Rain Classroom software is used to publish course learning tasks and reflection questions in advance, students use online course resources for previewing and self-study, and complete learning tasks) - classroom teaching (pre-class testing of preview content, diversified teaching design) - after-class teaching (conducting post-class learning guidance or problem discussion, chapter testing and homework review, feedback on course teaching and process assessment through teaching platforms) - offline midterm and final exams.

In addition, it is crucial to timely grasp students' daily learning situation, learning outcomes, and ability output through the online teaching platform, complete teaching reflection, and continuously improve teaching design. This approach underscores the importance of leveraging technology and online resources in modern education to foster a more engaging and effective learning environment.

2.3. Questionnaire Survey

This study conducted a questionnaire survey on the teaching effect evaluation of "Human Anatomy" for undergraduate students majoring in education and rehabilitation in three grades. The questionnaire was divided into ten dimensions: teaching methods, professional knowledge, practical operation, knowledge application, classroom atmosphere, online platform application, communication and cooperation, after-class reflection, and the influence on subsequent courses and internships. Each dimension had three questions, and each question was assigned a score of 5, 4, 3, 2, or 1 according to the options of "completely agree", "relatively agree", "general", "relatively disagree", and "completely disagree". The questionnaire was distributed for 80, and 65 questionnaires were collected, with an effective rate of 81.25%.

2.4. Mathematical Statistics and Analysis

This study utilized Microsoft Excel and SPSS26.0 software for data organization and statistical analysis. The data results were normal, and they were described with the mean \pm standard deviation. One-way ANOVA (Analysis of Variance) was employed to compare the inter-group differences, and the LSD test was used for paired tests. Since the questionnaire data did not conform to normality, the statistics were described by the median (P25, P75), and non-parametric tests were used to compare the differences in the results of the three grades with a significance level set at 0.05.

3. Results

3.1. Comparison of Academic Scores and Academic Evaluations of Students in Different Grades

Table 2: Comparison of academic scores and academic evaluations of students in different grades

	2022 (n=21)	2021 (n=19)	2020 (n=25)	p
Usual score	85.92 \pm 13.10	83.69 \pm 16.11	80.38 \pm 18.25	0.021*
Final score	83.40 \pm 14.25	77.15 \pm 15.75	78.36 \pm 15.10	0.043*
Academic evaluation	94.25 \pm 2.23	92.13 \pm 4.35	92.45 \pm 3.87	0.039*

* p<0.05 ** p<0.01

The differences in scores and academic evaluation scores between different grades are statistically significant (p=0.021, p=0.043, p=0.039). (Table 2.)

3.2. Self-evaluation of Students in Different Grades on the Teaching of "Human Anatomy" Course

Table 3: Self-evaluation of students in different grades on the teaching of "Human Anatomy" course

	Grades M(P ₂₅ ,P ₇₅)			Kruskal-Wallis <i>H</i>	<i>p</i>
	2022 (<i>n</i> =21)	2021 (<i>n</i> =19)	2020 (<i>n</i> =25)		
teaching methods	14.000(13.0,15.0)	15.000(13.0,15.0)	15.000(13.5,15.0)	1.972	0.373
professional Knowledge	13.000(11.0,15.0)	13.000(11.0,15.0)	12.000(11.0,15.0)	0.318	0.853
Practical operation	13.000(12.0,15.0)	15.000(12.0,15.0)	14.000(12.5,15.0)	2.310	0.031*
Knowledge application	12.000(11.0,14.5)	12.000(10.0,13.0)	12.000(11.5,13.0)	1.842	0.039*
Classroom atmosphere	12.000(11.0,13.0)	12.000(11.0,13.0)	12.000(10.5,13.0)	0.400	0.819
Online platform application	12.000(10.0,15.0)	12.000(12.0,14.0)	13.000(12.0,15.0)	5.231	0.043*
Communication and cooperation	10.000(8.0,10.0)	9.000(8.0,10.0)	10.000(8.0,10.0)	3.065	0.046*
After-class reflection	5.000(5.0,6.0)	5.000(5.0,6.0)	5.000(5.0,6.0)	0.259	0.879
subsequent courses	12.000(12.0,14.5)	12.000(12.0,14.0)	14.000(12.0,14.5)	0.809	0.667
Internship	12.000(11.5,14.5)	12.000(12.0,13.0)	12.000(11.0,14.0)	0.356	0.837
Total score	122.000(107.5,130.5)	120.000(112.0,131.0)	122.000(114.5,131.5)	0.791	0.673

* $p < 0.05$ ** $p < 0.01$

From the table above, it can be seen that using non-parametric tests to study the differences in the scores of teaching evaluations across 10 dimensions between different grades, the results of practical operations ($p=0.031$), knowledge application ($p=0.039$), online platform application ($p=0.043$), and communication and cooperation ($p=0.046$) have statistical significance (Table 3).

4. Discussion

After undergoing a semester of reform in the teaching of Human Anatomy, undergraduate students majoring in Education and Rehabilitation in 2022 have demonstrated significant improvements in their knowledge application level, practical ability, communication skills, and other aspects compared to students from 2020 and 2021. Non-parametric tests conducted to study the differences in the scores of teaching evaluations across 10 dimensions between different grades indicate that the scores of practical operations ($p=0.031$), knowledge application ($p=0.039$), online platform application ($p=0.043$), and communication and cooperation ($p=0.046$) have statistical significance.

These enhancements in the students' performance can be attributed to the reforms implemented in the teaching of Human Anatomy. These reforms were aimed at optimizing the teaching mode and creating a high-quality classroom atmosphere^[18]. By stimulating students' enthusiasm through practical activities, and respecting and encouraging their learning, teachers have been able to elevate

the quality of teaching. The reforms also introduced innovative teaching models and strategies that have optimized the learning experience and improved teaching quality. The augmentation in the students' knowledge application level, practical ability, communication skills, and other aspects is a positive development that will have a significant impact on their future careers. The enhancement in these areas will enable them to become more effective professionals and contribute to the overall development of the country and society ^[19].

In conclusion, the reforms implemented in the teaching of Human Anatomy have had a positive impact on the performance of undergraduate students majoring in Education and Rehabilitation in 2022. The improvement in their knowledge application level, practical ability, communication skills, and other aspects is a testament to the effectiveness of the reforms and the dedication of the teachers involved in the process. This study underscores the importance of continuous innovation in teaching methods and strategies, and the need for an ongoing commitment to improving the quality of education. It also highlights the potential of the OBE framework as a powerful tool for enhancing student learning outcomes and preparing them for successful careers in their chosen fields.

5. Conclusions

1) The students of the 2022 class have a greater acceptance of teaching evaluations and self-evaluations.

2) The 2022 class students believe that teaching reconstruction based on the OBE framework can improve students' practical skills, online platform application, and communication and cooperation abilities.

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