Exploration on the Integration of OBE Concept into Computer Foundation Courses

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Abstract. With the continuous development of educational concepts and teaching models, the "Outcome-Based Education (OBE)" model has been widely applied worldwide. This article first elaborates on the definition of the OBE educational concept and its core issues, emphasizing that this model promotes the reform of teaching content, teaching methods, and assessment systems by clearly setting learning outcomes as the goal, especially in university computer foundation courses. The article explores how to integrate the OBE concept into the teaching system design of this course, including adjusting teaching objectives, optimizing classroom teaching methods, and improving assessment methods, to comprehensively enhance students' computer literacy and the effectiveness of course teaching. Through this practice, students' participation and enthusiasm have increased, and the teaching quality of the computer foundation course has improved.

Keywords: OBE Educational Concept; Computer Basics; Teaching Design

1. Introduction

Computer fundamentals courses are essential in information technology majors at higher education institutions.As technology advances, traditional teaching methods no longer meet students' evolving needs. The Outcome-Based Education (OBE) framework has emerged as a solution. OBE focuses on designing teaching content and methods around specific learning outcomes, prioritizing practical skills development. Widely adopted in fields like engineering and medicine, OBE has also proven effective in computer fundamentals instruction.

In regions such as Europe, the U.S., and developing countries, OBE is increasingly implemented in higher and vocational education. In the U.S., the model has evolved through various stages and is used to assess learning outcomes, improving educational quality and students' competitiveness. Countries like Australia and Canada utilize OBE to structure courses and assessments, ensuring students gain essential competencies by course completion.

As educational reforms progress, the implementation of OBE in China has gradually gained prominence, particularly in higher education, where it is viewed as a key approach to improving education quality and fostering innovative talent. Many Chinese universities have begun to adopt the OBE model from international contexts and tailor it to local needs. In some application-oriented, engineering, and science-based colleges, OBE has been widely applied in curriculum design, teaching method improvements, and student assessments. Recently, many higher education institutions and scholars in China have begun exploring the applicability of OBE within the Chinese education system and investigating how to combine OBE with local educational characteristics.

OBE's application in China, though starting later, has made significant progress and is now central to the Ministry of Education's higher education reforms. It has also been gradually adopted in vocational and adult education.

2.Theoretical Basis and Development of the OBE Model

2.1 Definition of the OBE Model. OBE (Outcome-Based Education), proposed by Spady et al. in 1981, quickly became a key focus of educational reform in Europe, America, and other regions. It emphasizes students as the central focus, with learning outcomes guiding the process, highlighting the achievements students should attain through this approach. The OBE model centers on "learning outcomes," ensuring that the design and evaluation of education align with students' learning

achievements. The core concept of the OBE model is to start from students' ultimate abilities, determine teaching objectives and content, and ensure that each student can achieve the predetermined learning outcomes. Compared with traditional teaching models, the OBE model pays more attention to individual differences among students and emphasizes their ability for autonomous learning and solving practical problems [1].

2.2 Characteristics of the OBE Model. Clearly Defined Learning Objectives: Each course and educational activity must precisely outline the knowledge and skills students are expected to acquire. These objectives encompass not only subject-specific knowledge but also abilities, attitudes, and practical competencies. Hence, educators must ensure that each activity has a distinct purpose and that students attain specified outcomes upon course completion.Alignment of Instruction with Learning Objectives: The planning of educational activities must be tailored to achieve the stated learning objectives. Course content, teaching methodologies, and resources should be closely aligned with these predefined objectives. Educators must organize content, select suitable teaching methods, and employ effective resources based on the learning objectives to guarantee that the instructional process effectively supports student achievement [2].

Ongoing Assessment and Feedback: In the Outcomes-Based Education (OBE) framework, assessment is an ongoing practice throughout the instructional period, rather than solely at term's end. Educators should provide frequent feedback to students through diverse assessment methods, such as class participation, group discussions, assignments, project presentations, and peer evaluations. This continuous assessment verifies students' attainment of the expected learning objectives, aiming to provide timely insights to assist students in adjusting their learning strategies, refining their methods, and ultimately enhancing their learning effectiveness.

The OBE model emphasizes a student-centered approach, where teachers shift from knowledge transmitters to facilitators. By creating interactive activities, providing support, and guiding problem-solving, educators inspire students' interest and initiative, helping them explore, reflect, and apply what they've learned.

2.3 Global Development of the OBE Model. The OBE model, developed in the United States in the 1960s, gained global traction through educational reforms and became central to higher education worldwide in the 21st century, driven by globalization and informatization. Both developed countries in Europe and North America and developing nations in Asia have integrated OBE across various fields with significant success. Introduced by Spady and colleagues in 1981, OBE laid the foundation for professional accreditation in engineering education. Its philosophy emphasizes designing courses around students' learning outcomes, using a reverse-engineering approach to define training goals, which then shape the curriculum and teaching plans.

3. Application of the OBE Model in Computer Basics Teaching

As society's demand for talent continues to grow, the traditional rigid, injection-style teaching methods have become inadequate for meeting contemporary societal requirements. Currently, society expects graduates not only to possess strong practical application skills and innovative capabilities but also to excel in certain proficiency tests, such as the CET-4, CET-6, and National Computer Rank Examination (NCRE) Level 2. In response to this evolving demand, the OBE concept has emerged. The OBE concept prioritizes students as the central focus, tailoring teaching goals to their needs and using them as the starting point. It adheres to the principle of backward design, which entails setting training objectives based on societal demands to ensure alignment between educational goals and outcomes. Guided by the OBE educational philosophy, the teaching of university computer fundamentals courses can be better aligned with societal and professional requirements. Through thoughtful course design and teaching implementation, students can not only acquire fundamental computer skills but also develop practical application abilities and innovative thinking. Specifically, in proficiency tests like the NCRE, course instruction can be centered around the exam content to bolster students' test-taking abilities and ensure their successful completion of these certification exams, thereby equipping them with relevant professional qualifications.

3.1 University Computer Basics Course and Its Importance. The University Computer Basics

course plays a vital role in students' academic and career growth, providing essential computer knowledge for all fields, particularly for non-computer majors. Taken in the first year, it covers fundamental concepts, computational thinking, and problem-solving, laying the foundation for future research and technological advancements.

The course emphasizes practical skills, incorporating competition projects and multimedia modules such as digital image processing, audio/video processing, animation design, and micro-course creation. These modules align with students' interests, encouraging creativity and preparation for competitions. For teacher education students, the focus is on "micro-course design" to address career needs.

In the second semester, computer programming is introduced to enhance coding abilities and computational thinking. Educational reforms aim to improve theoretical instruction, practical experience, and assessment methods, fostering active learning and boosting career readiness. Ongoing innovation in content and teaching approaches is essential for achieving these objectives.

3.2 University Computer Basics Course Design Based on OBE Thinking. When designing the University Computer Basics course, aligning with the four core principles of Outcome-Based Education (OBE) is crucial for clear goals and effective teaching. First, teaching objectives should define the skills students need to acquire, focusing on computer knowledge, computational thinking, innovation, and practical application [3]. These objectives should be challenging yet achievable, guiding students toward continuous improvement.The course content should meet students' needs by highlighting its relevance to future studies and careers. As students from different majors have varied demands, the course should be flexible, tailoring content for engineering, management, or liberal arts students to support their professional development.

Successful course implementation requires diverse teaching methods that blend theory and practice. Project-based learning, experiments, and competitions encourage students to apply knowledge and develop practical skills, fostering independent thinking and problem-solving.Effective evaluation is key to enhancing teaching quality. A mix of assessments written tests, practical evaluations, and peer feedback tracks both academic performance and practical skills, while focusing on overall qualities like teamwork, communication, and critical thinking to prepare students for the workforce.

3.3 Hierarchical teaching system structure. A hierarchical teaching system is established based on students' needs and training goals, as shown in Fig. 1. It consists of basic, multimedia, and applied courses [4]. Basic courses focus on computer theory and practical skills to develop students' computational thinking and literacy. Multimedia courses, centered around competition content, allow students to choose based on their interests, stimulating enthusiasm and enhancing practical application. Through competition participation, students progress from understanding to mastery, achieving a leap in skill level.Applied courses are electives tailored to the needs of various majors, such as data analysis, computer-aided teaching design, and e-commerce. Their goal is to serve specific disciplines.

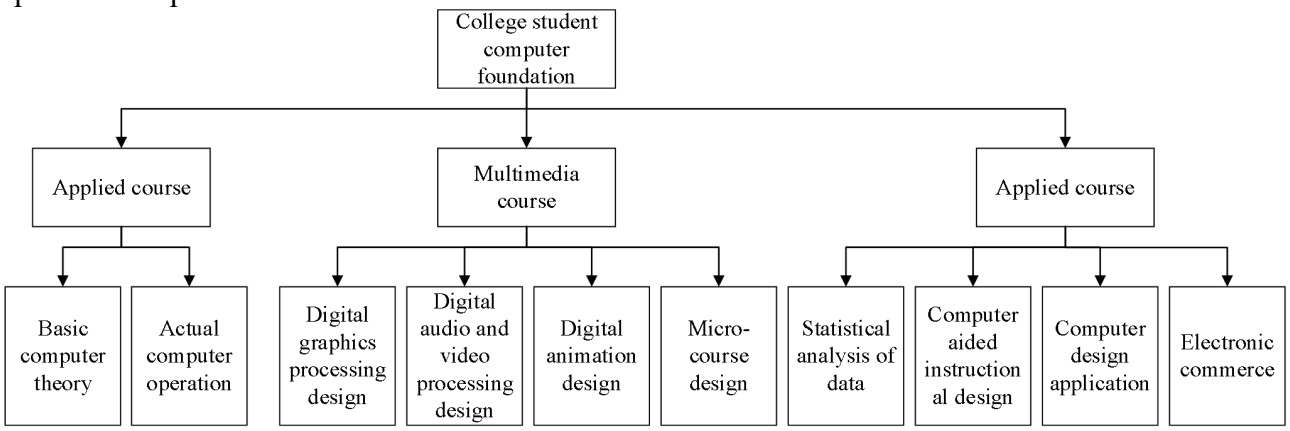

Figure 1. Hierarchical teaching system

3.4 Differentiated teaching according to students. High school students often face significant

academic burdens and considerable stress, coupled with limited computer course hours, resulting in many students having a weak grasp of computer skills. Consequently, these students may struggle with computer learning during their college years, perceive computers as difficult to master, and gradually lose their confidence and interest in studying them. To address this issue, when introducing the OBE (Outcome-Based Education) teaching concept into the teaching of computer basics courses in colleges and universities, educators can classify students into distinct groups based on their individual circumstances and skill levels. For instance, universities can conduct a computer proficiency test upon the arrival of freshmen and subsequently divide them into three classes: A, B, and C, according to their scores, for differentiated instruction. As illustrated in Fig. 2, students with excellent scores or strong computer foundations can be placed in Class A, for which a customized syllabus and teaching plan are devised, and small-class management is implemented. Students with average scores are assigned to Class B, while those with weaker computer skills are grouped into Class C. Appropriate teaching activities are conducted for each class according to the regular teaching plan, and distinct teaching achievement exhibition activities are established for them. This targeted and differentiated teaching approach not only effectively stimulates students' learning motivation and enthusiasm but also significantly enhances the course's teaching effectiveness.

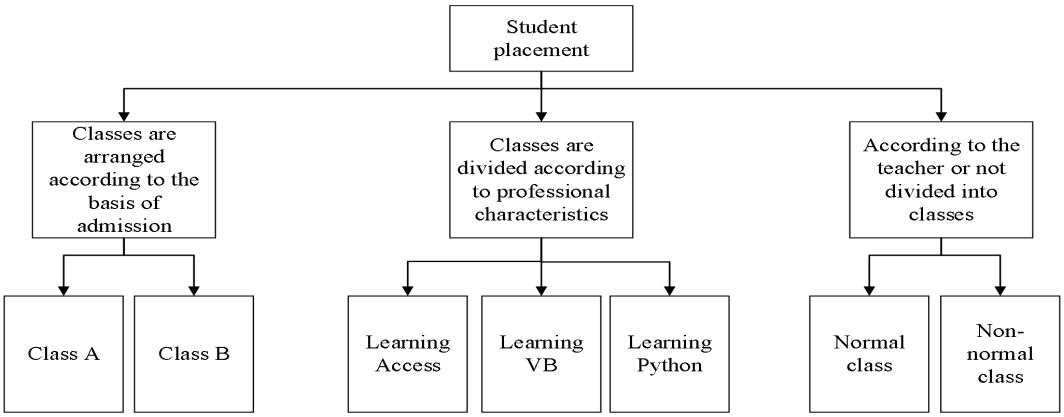

Figure 2. Students are divided into classes

3.5 Personalized teaching according to major. The college computer basics course is a key component of general education, essential for both non-computer and computer majors. However, due to varying needs across disciplines, the teaching focus must be differentiated. In implementing the OBE (Outcomes-Based Education) concept, teachers should tailor their approach to the specific learning requirements of each major, ensuring that the course supports students' professional learning and career development.

For example, finance majors require strong Excel skills for financial data analysis. Teachers should focus on building students' data analysis abilities, starting with basic Excel functions and gradually introducing more complex ones, such as financial, logical functions, and data analysis tools. By using real-world financial case studies, students can apply Excel to solve professional problems, deepening their knowledge and skills.

Additionally, universities can offer computer language courses like Visual Basic, Access, Python, and C, based on students' professional needs. For liberal arts majors, such as business administration and business English, Access courses can be offered to teach database management and simple programming. For engineering, computer science, and related fields, Python courses can be introduced to develop programming skills in data processing and engineering applications.

Through such differentiated curriculum design, students can acquire relevant knowledge and skills tailored to their major, meeting their learning needs and laying a solid foundation for their future careers. The OBE-based teaching approach ensures a student-centered, achievement-oriented education that supports both academic growth and professional development.

3.6 Case-based operation instruction teaching. In teaching fundamental computer courses, case-based instruction plays a key role in enhancing students' understanding of core concepts.

Within the OBE (Outcomes-Based Education) framework, incorporating real-world cases can improve teaching efficiency, education quality, and students' hands-on skills. For example, when teaching Office software, instructors can use graduate thesis examples to demonstrate Word formatting techniques, such as font settings, table of contents creation, and page design. This allows students to directly engage with the software and gain practical experience in formatting their own thesis, reinforcing both Word skills and operational competence.

Similarly, PPT creation is a crucial skill, especially for thesis defenses. Instructors can use professional defense PPTs as case studies to teach design templates, animation effects, and custom fonts. These practical cases help students create polished presentations and acquire the necessary skills for future academic and professional use [5]. This case-based approach aligns with the OBE philosophy, focusing on practical tasks to help students achieve their learning goals and effectively apply their knowledge in real-world situations.

4. Challenges and countermeasures of OBE teaching mode

4.1 OBE challenge of OBE teaching mode. Under the OBE (Outcomes-Based Education) model, the role of teachers shifts from "knowledge imparting" to that of "learning guide" and "supporter." Teachers must design clear learning objectives and adjust their methods to encourage active learning and independent exploration. However, for teachers accustomed to traditional methods, this transition can be challenging. They may struggle with one-way knowledge transfer, lack awareness of students' individual needs, and find it difficult to engage students through inquiry and interaction.

Curriculum design under the OBE model focuses on clear, measurable learning outcomes. However, traditional courses often emphasize theoretical knowledge over practical skills, making it hard to connect content with specific learning achievements[6]. Objectives are typically vague, and the curriculum does not adequately address students' practical application needs, limiting the development of critical skills like practical operations and innovation.

The evaluation system also needs to evolve. OBE requires assessments based on students' learning outcomes, yet traditional methods like exams fail to fully measure students' abilities, particularly in areas like critical thinking and innovation. Traditional systems often over-rely on final exams, neglecting continuous evaluation and a comprehensive assessment of students' abilities. OBE requires more diverse evaluation methods, such as project presentations, group work, and peer reviews, to assess students' achievements more comprehensively.

A key challenge in OBE implementation is the lack of resources and technological support, particularly in underserved areas. Many schools face outdated infrastructure and limited access to educational technology, hindering full adoption of the OBE model. Blended learning, which combines online and offline methods, requires strong tech support, but many institutions lack the necessary resources, and both teachers and students may have limited tech skills.

In conclusion, OBE implementation faces obstacles in transforming teaching roles, redesigning curricula, revamping evaluation systems, and securing necessary resources. To overcome these challenges, schools and educators must continuously adapt teaching methods, refine curricula, and improve technological resources to better meet OBE demands.

4.2 countermeasures of OBE teaching mode. Provide teachers with ongoing training on the OBE concept, curriculum design, and assessment methods to deepen their understanding and improve teaching strategies. Encourage active involvement in teaching research, innovation, and interdisciplinary collaboration to enhance their skills and adaptability. Additionally, offer support systems like instructional templates, online platforms, and feedback mechanisms to help teachers refine their methods and boost effectiveness.

Innovate curriculum design and teaching methodologies: Clearly articulate learning objectives in curriculum design, integrating practical applications and skills training seamlessly. By aligning course goals, content, and activities, ensure students attain the requisite core competencies upon course completion. Implement project-based learning (PBL), case studies, experiments, and practical exercises to bolster students' practical skills and problem-solving abilities. Furthermore,

promote Blended Learning, leveraging online resources for independent study and online classrooms for discussions, teamwork, and performance assessments, thereby seamlessly blending online and offline learning experiences [7].

Develop a diversified assessment framework: Within the OBE paradigm, the assessment system should holistically encompass students' abilities, spanning knowledge retention, skill application, critical thinking, and innovation. Employ diverse assessment techniques, such as daily assignments, group discussions, project presentations, peer evaluations, and self-assessments, to ensure a comprehensive and varied assessment process [8]. Establish clear evaluation criteria and quantify learning outcomes to uphold assessment objectivity and fairness. Merge process and outcome assessments to comprehensively reflect students' learning efficacy, emphasizing feedback for sustainable development. Timely provide feedback on students' learning progress through regular quizzes, homework, and project evaluations, enabling them to adjust their learning approaches and strategies.

Reinforce technical support and educational resource development: Schools should augment investments and optimizations in educational technology infrastructure, furnishing efficient online learning platforms and resource repositories to cater to students' personalized learning trajectories. Leverage big data and artificial intelligence for learning progress tracking and personalized recommendations, assisting students in tailoring their learning to individual needs. Offer an array of digital learning resources, including online courses, virtual labs, and e-textbooks, to enhance learning flexibility and interaction. Furthermore, conduct information technology training to elevate teachers' and students' digital literacy, empowering them to proficiently utilize various instructional tools and platforms, thereby optimizing the overall learning outcome.

5. Summary

The incorporation of the OBE (Outcome-Based Education) concept into college computer basics courses not only disrupts the traditional teaching paradigm but also fosters students' learning enthusiasm by establishing clear learning objectives and achievement-oriented goals. Unlike traditional teaching methods, OBE emphasizes the tangible demonstration of students' learning outcomes and prioritizes the cultivation of practical skills and comprehensive qualities. Hence, after adopting the OBE concept, the focus of computer basics courses shifts from teacher-centered knowledge transmission to student-centered ability enhancement and practical skill development [9]. In computer basics courses, the OBE concept ignites students' interest in computer science and encourages more active learning. This transformation significantly enhances students' mastery of course content, aids in acquiring core computer science skills, and ultimately fulfills the intended teaching objectives.

To achieve the ability-oriented and achievement-oriented goals within the OBE framework in computer courses, teachers must attend to the thoughtful design of course content and the refinement of teaching methods. Specifically, they should organize course content in a modular and hierarchical fashion, catering to students' diverse backgrounds and needs. This enables personalized and targeted instruction tailored to students' knowledge levels, learning capabilities, and interests. For instance, students with weaker foundations can commence with fundamental computer operations and programming languages, while those with stronger backgrounds can delve into more intricate topics such as computer system principles, data structures, and algorithms, ensuring that each student experiences maximum growth based on their individual standing.

Furthermore, teachers should tailor the emphasis of teaching content to the peculiarities of different majors. For example, computer science and technology majors should concentrate on technical knowledge like programming and computer system architecture, whereas information management and information system majors should prioritize more applied content such as database management and network security [10]. Through this personalized and specialized teaching arrangement, students' learning needs are better met, and more targeted support is provided for their future career advancement.

In teaching design, teachers can integrate theory with practice by introducing real-world cases,

allowing students to improve computer skills through programming projects or software development tasks. Case-based teaching deepens understanding and fosters innovation and problem-solving abilities. Teachers can also use experiments and teamwork assignments to enhance collaboration and practical skills.Guided by the OBE concept, students' comprehensive abilities are improved, and teaching effectiveness is enhanced, better preparing them for future careers and societal demands.

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