Research on the Reform and Practice of Computer Professional English Teaching Driven by the OBE Concept

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Abstract

This paper investigates the application of the Outcome-Based Education (OBE) concept in reforming computer professional English instruction. The research is student-output oriented, with the aim of improving students' professional English proficiency by clarifying course objectives and learning outcomes, carefully selecting teaching content and resources, and designing a variety of teaching activities and methods. At the course design level, it delineates the professional English skills that students should acquire and establishes corresponding evaluation standards. At the course implementation level, through case analysis, project practice, and other activities, it fosters students' interest in learning, enhances their practical abilities, integrates ideological and political education into the course, and promotes students' comprehensive development. At the course evaluation level, a diversified evaluation system is established, combining formative and summative evaluations, with a focus on students' self-reflection and continuous improvement. Furthermore, this paper analyzes how to stimulate students' intrinsic learning motivation under the OBE educational concept and discusses the role transformation of teachers as emotional laborers. The ultimate goal is to optimize the computer professional English curriculum system through these reform practices, providing valuable references for the cultivation of IT talents in applied universities.

Keywords: computer specialty English, OBE concept, practical application

1. Introduction

In computer science English courses, students frequently encounter significant challenges such as a limited vocabulary, weak listening and speaking skills, and an excessively exam-centric learning attitude. These limitations hinder their ability to use English effectively in real-world communication and professional settings. Concurrently, they also grapple with comprehending abstract professional terminology and adapting to the language patterns of technical literature. Teachers, too, confront issues related to the lack of interactivity and practicality in their instructional approach. Traditional teaching methods, which primarily focus on knowledge dissemination and exam preparation, result in reduced classroom interaction, low student engagement, and difficulty in effectively enhancing listening and speaking skills[1]. Furthermore, these teaching methods are relatively rigid, making it challenging to adaptively meet the individual learning needs of students, particularly in fostering critical thinking and cross-cultural communication skills. These issues collectively impact the enhancement of students' comprehensive English abilities.

The OBE teaching concept offers a robust solution to the challenges encountered by students and educators in computer professional English courses[2-3]. This approach prioritizes student learning outcomes, not merely focusing on vocabulary acquisition but also emphasizing the development of listening and speaking skills. By engaging in practical activities that mimic real-world communication and work environments, students can enhance their English proficiency in practical applications. Concurrently, OBE teaching underscores classroom interaction, prompting students to actively participate in discussions and collaboration. Through a variety of teaching activities, such as group discussions and role-playing, students gain a deeper understanding of abstract professional terminology and adapt to the language patterns of technical literature. Moreover, OBE teaching

advocates for flexible and diverse teaching methods to cater to the individualized learning needs of students, foster their critical thinking and cross-cultural communication skills, thereby holistically improving their overall English abilities. This liberates them from the constraints of exam-oriented education and truly embodies the principle of "learning for practical use." Srivastava[4] examines contemporary pedagogical approaches, with a particular focus on the OBE paradigm. OBE prioritizes student learning outcomes, enhancing both teaching quality and students' competencies through the establishment of explicit learning objectives and evaluation criteria. The research further underscores the significance of feedback mechanisms in the educational process, fostering dialogue between educators and learners. Consequently, it offers innovative perspectives and pragmatic recommendations for educational reform. Syeed[5] focuses on the implementation and practice of OBE in engineering education. It defines the central concept of OBE, emphasizing the enhancement of students' practical abilities through precise learning objectives and evaluation standards. The paper also explores the effective amalgamation of teaching design, curriculum development, and evaluation mechanisms to ensure that the quality of education aligns with industry requirements for the cultivation of engineering professionals. Asim[6] evaluates the impact of OBE and its various determinants on the learning outcomes of higher education students. The study delves into the influence of curriculum design, pedagogical approaches, and assessment mechanisms on student learning outcomes, underscoring the pivotal role of teachers, students, and environmental factors in shaping these outcomes. The research offers valuable insights and actionable recommendations to enhance the quality of higher education.

This paper examines the application of OBE in reforming computer professional English teaching. It aims to enhance students' proficiency by defining clear objectives, selecting appropriate content, and employing varied teaching methods. The reform involves setting evaluation standards, incorporating practical activities like case studies and projects, and integrating ideological education to promote holistic development. A diverse evaluation system encourages self-reflection and continuous improvement. The paper also explores stimulating intrinsic motivation and the evolving role of teachers. The goal is to optimize the curriculum and support the development of IT professionals in applied universities.

2. Implementation of Reforms and Practices

The content, objectives, and key issues to be addressed in the reform and practical research of computer professional English teaching driven by the OBE concept are shown in Figure 1.
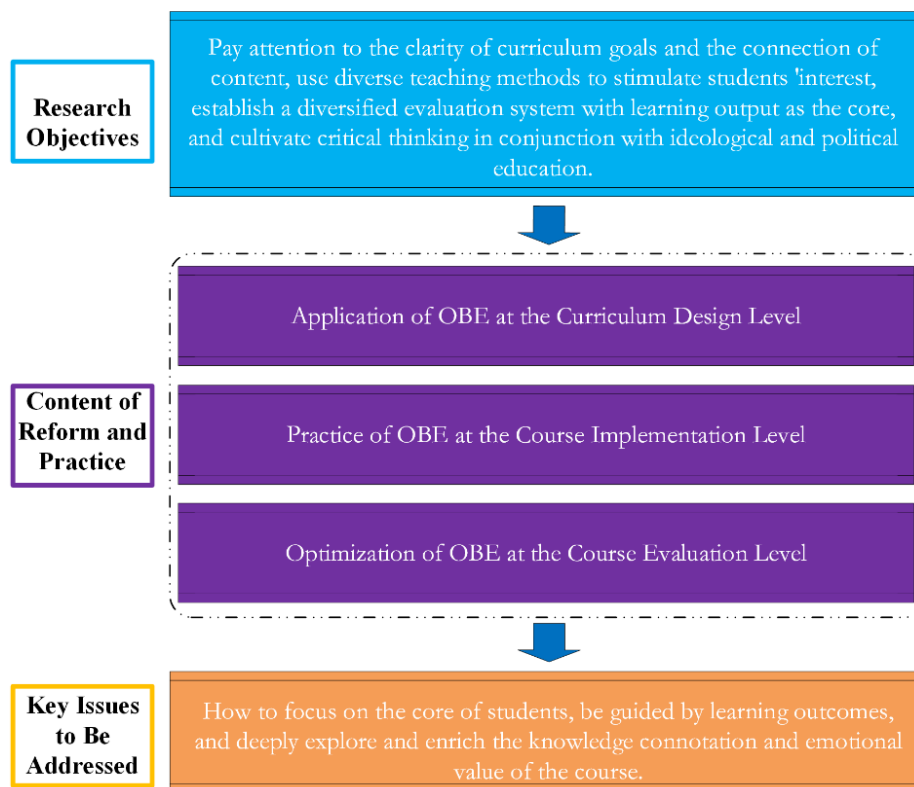

Figure 1. Implementation of Reforms and Practices

2.1 Research Objectives

This research focuses on exploring the practical application of the Outcome-Based Education (OBE) philosophy in curriculum design, with particular emphasis on integrating the "learner-centered" approach into the development of both cognitive and emotional values in education. The study adheres to the principle of outcome-driven learning, ensuring that the entire process--from curriculum design and implementation to evaluation--is closely aligned with student learning outcomes. The ultimate goal is to ensure that students achieve meaningful progress and growth throughout their learning journey.

In terms of curriculum design, the study highlights the importance of clearly defining course objectives, ensuring that every aspect of the curriculum directly supports the achievement of these goals. This approach maximizes the cognitive value of the course content. The objectives encompass not only professional knowledge and skills but also critical thinking, creativity, and a sense of social responsibility. The selection and organization of course content must align with these goals to ensure that students meet the desired learning outcomes by the end of the course.

During the implementation phase, the research advocates for innovative teaching methods, encouraging educators to adopt diverse approaches such as case studies, project-based learning, and teamwork. These strategies aim to foster student engagement and active participation in the learning process. Through these hands-on activities, students deepen their understanding of the material, develop problem-solving skills, and enhance their ability to collaborate within teams. Additionally, the role of the teacher evolves from a traditional knowledge provider to a facilitator and mentor, guiding students as they explore and build their knowledge base.

Regarding evaluation, the study proposes the establishment of an outcome-centered assessment system, incorporating both formative and summative assessments to comprehensively evaluate student performance. This approach not only accurately reflects student progress but also encourages active involvement in the learning process, promoting self-reflection and continuous improvement.

Student feedback plays a crucial role in both the design and implementation of the curriculum. The study advocates for the active consideration of student input to promptly adjust teaching strategies, ensuring ongoing optimization of the curriculum. By responding positively to student feedback, the quality of the course and the effectiveness of teaching can be significantly enhanced.

Moreover, the research places special emphasis on the emotional development of students by integrating ideological and political education into professional courses. This approach aims to stimulate student motivation and cultivate a sense of social responsibility. By doing so, students are not only more engaged in their studies but also develop sound values and perspectives on society.

Ultimately, the findings of this research will be applied to the training of IT professionals, with practical trials conducted in specialized courses. These trials will not only validate the effectiveness of the curriculum design and research outcomes but also provide valuable insights for OBE reform in applied universities. Overall, this study aims to contribute to the enhancement of higher education quality through systematic reform practices, helping to nurture well-rounded talents with comprehensive abilities to meet societal needs.

2.2 Content of Reform and Practice

2.2.1 Application of OBE at the Curriculum Design Level

• Clearly Define Course Objectives and Learning Outcomes

Clearly defining course objectives and learning outcomes is fundamental to the success of any educational program. For a Computer Science English course, the primary task is to establish the key vocabulary, grammar structures, reading comprehension, and writing skills students need to master. This includes not only teaching basic language skills but also enabling students to understand and use the specific terminology and expressions of the computer science and technology fields. For example, students should be able to read and comprehend technical documents, research papers, user manuals, and software code comments.

The course objectives should be specific, measurable, and closely aligned with the students' future career paths. For instance, if a student aims to work in software development, they need to master technical terms like "algorithm", "data structure" and "API", and be able to describe these concepts in English. Moreover, the course should cultivate students' ability to write technical reports, documentation, and emails, which are common tasks they will face in their professional lives.

To ensure students have clear direction and goals throughout the learning process, a detailed set of assessment criteria should be established. These criteria might include requirements for vocabulary range, grammatical

accuracy, reading comprehension speed and depth, and the logical and clear presentation of writing. For instance, students should be able to read and summarize a technical article in English within a given timeframe or write a concise technical report that describes a simple programming problem and its solution.

The course design should also fully consider the students' future professional needs. This means integrating course content with real-world scenarios relevant to the computer science field, allowing students to apply their knowledge in simulated or actual projects. For example, small projects could be designed where students write user manuals, draft software requirement specifications, or prepare technical presentations in English. Through such experiences, students not only reinforce the knowledge gained in class but also get a head start in adapting to the workplace environment, enhancing their employability.

- Select Teaching Content and Resources

Choosing appropriate and effective teaching content and resources is critical for a Computer Science English course. The content should closely revolve around relevant computer science knowledge, covering areas such as computer systems, programming languages, networking technologies, and software engineering. The selection of teaching resources is equally important as it directly impacts students' learning experience and outcomes.

The teaching content for a Computer Science English course should include, but not be limited to, the fundamental principles of computer system architecture, the operating mechanisms of operating systems, methods for using database management systems, the syntax and semantics of programming languages, and the standards and implementations of network protocols. This content not only helps students build a solid theoretical foundation but also equips them with practical knowledge that allows them to communicate effectively in English in their future work.

To improve students' professional English proficiency, the course should introduce a wide range of vocabulary and expressions closely related to the field of computer science. For example, specialized vocabulary lists could be designed to help students become familiar with common technical terms such as "binary code," "network topology," and "encryption algorithm." Additionally, practice activities could be organized to allow students to use these terms in both spoken and written communication.

Modern information technology offers limitless possibilities for diversifying teaching resources. Instructors can use online platforms, educational videos, and multimedia teaching software to create a more dynamic and enriching learning experience for students. Online platforms can provide ample self-study materials that students can explore in their own time. Educational videos, with both visual and auditory stimuli, can help students better absorb knowledge, while multimedia teaching software can offer interactive exercises to boost student engagement.

- Design Teaching Activities and Methods

Designing effective teaching activities and methods is a key step to ensuring that students can apply the knowledge they've learned in real-world scenarios. In a Computer Science English course, practice-based elements such as case studies and project work can allow students to experience firsthand how to solve real problems using English.

Case studies are an excellent teaching method, allowing students to apply their knowledge in simulated real-world environments. For example, a case involving software development project management could be introduced, requiring students to discuss in English the various phases of the project, such as requirements analysis, design, implementation, and testing. This approach deepens students' understanding of professional knowledge while honing their communication and teamwork skills.

Project work is another vital component of practice-based learning. It could involve small-scale software development projects or research initiatives. Throughout these projects, students would need to use English to draft requirement documents, design documents, code comments, and final project reports. Such exercises not only enhance students' writing skills but also give them a sense of the full project lifecycle.

Furthermore, research-based teaching methods are instrumental in fostering students' ability to learn independently and collaborate effectively. Teachers can encourage active participation in class activities such as group discussions and role-playing. Group discussions can revolve around specific technical topics, allowing students to express their views in English and listen to others' opinions. Role-playing, on the other hand, can simulate different professional roles, such as project managers, software engineers, or technical support staff, giving students the opportunity to practice their English communication skills in a simulated work environment.

2.2.2 Practice of OBE at the Course Implementation Level

• Outcome-Based Teaching Design

Outcome-based teaching design is a core element of the OBE (Outcome-Based Education) philosophy. In a Computer Science English course, students should acquire a range of essential skills, including technical vocabulary, grammatical structures, reading comprehension, and professional writing abilities. These skills are not only the foundation for their studies in computer science but also indispensable tools for their future careers.

To ensure students develop the necessary proficiency in professional English, the curriculum must closely integrate real-world applications in the computer science field. For example, the course can cover the latest technological trends, enabling students to familiarize themselves with current industry tools and technologies such as cloud computing, artificial intelligence, and big data processing. Additionally, real-world case studies can be introduced to help students understand how these technologies are applied in actual projects. For instance, by analyzing a well-known company's product development process, students can grasp the requirements for writing technical documents, such as user manuals and technical specifications.

Understanding and creating software documentation is also a vital component of the course. Students must be able to read and write software installation guides, user manuals, and API documentation. By learning these skills, students not only acquire relevant technical knowledge but also improve their reading comprehension and writing abilities.

To further enhance students' overall capabilities, the course should encourage participation in professional competitions, applying for patents, and writing research papers in English. These activities not only provide students with practical experience but also inspire their creativity. For instance, participating in coding competitions helps students solve complex problems under time constraints, while writing research papers in English hones their research and writing skills. An example of this is seen in the Internet of Things (IoT) program at Guangdong University of Science and Technology, where students, under the guidance of their teachers, published two EI-indexed English papers as first authors during OBE-based curriculum reform[7-8].

Additionally, the curriculum design should emphasize the integration of ideological and political elements (known as "thought and politics" elements). These elements refer to content that cultivates students' correct worldview, values, and life perspectives. Instructors should seamlessly incorporate such content into professional courses through case studies, discussions, and other forms of interaction. This allows students to not only gain professional knowledge but also develop strong moral character. For example, discussing ethical issues in technology can help students understand the social impact of technological advancements, fostering a sense of social responsibility.

• Diverse Teaching Methods and Strategies

Diverse teaching methods and strategies are essential for sparking students' interest and increasing classroom engagement. Traditional lecture-based teaching often falls short of meeting the needs of modern education, making the introduction of interactive learning methods a necessary approach.

Group discussions are an effective form of interactive learning. By organizing discussions, students can delve into specific technical topics, sharing their perspectives and insights. This not only improves their language skills but also fosters teamwork. For example, students could discuss the features of a particular software development framework, using English to express their opinions and complement each other's ideas.

Role-playing exercises allow students to simulate different professional roles, such as project managers, software developers, or technical support personnel. This method enables students to practice their English communication skills in a simulated work environment, enhancing their practical abilities. For instance, a scenario could be created where students take on different roles and discuss the progress of a software project, presenting their updates in English.

Case analysis is another commonly used interactive teaching method. Instructors can provide real-world technical cases, asking students to analyze the problems and propose solutions. This approach deepens their understanding of the material and develops critical thinking skills. For example, analyzing a cybersecurity incident could lead to a discussion on how to prevent similar attacks, followed by students writing an English report on their findings.

Assigning specific learning tasks is also an effective way to enhance student outcomes. For example, students could be tasked with drafting professional documents such as software requirement specifications or user manuals. Completing these tasks not only consolidates their knowledge but also improves their practical skills. Translating technical documentation is another valuable exercise, allowing students to learn how to accurately convey technical information.

Finally, guiding students to participate in real-world projects is an excellent way to enhance their professional English skills. Schools can provide specialized labs and development tools where students use English to communicate during projects. For instance, organizing a software development project that requires students to collaborate in English when discussing project progress and technical issues helps strengthen their comprehensive skills.

By employing these diverse teaching methods and strategies, students can not only improve their professional English proficiency but also develop good study habits and teamwork skills, laying a solid foundation for their future careers.

2.2.3 Optimization of OBE at the Course Evaluation Level

• Implementing Diverse Assessment Methods

Diverse assessment methods aim to comprehensively reflect students' learning process and outcomes through various means, rather than relying solely on traditional summative assessments. In a Computer Science English course, in addition to the traditional final exam, multiple forms of formative assessment should be introduced to ensure a holistic evaluation of students.

Formative assessments can include pre-class preparation checks, class participation, homework completion, and group discussion involvement. Pre-class preparation checks ensure that students are familiar with the material before the lesson, enhancing classroom efficiency. Class participation can assess students' engagement and willingness to ask questions, reflecting their proactive learning attitudes. Homework completion is an important indicator of how seriously students approach their tasks, while participation in group discussions reveals their teamwork and collaboration skills.

To further motivate students, participation in professional competitions and the submission of English research papers can be used as extra credit. This approach not only boosts students' competitive spirit but also encourages them to delve deeper into their field of study. For example, participating in international programming competitions or writing and publishing English academic papers allows students to gain a sense of accomplishment and continuously improve their professional skills in practice.

Encouraging self-assessment is also crucial. Through self-evaluation, students can reflect on their learning process, identify strengths and weaknesses, and develop improvement plans. Self-assessment can take the form of journals or learning logs, where students record their thoughts and challenges during their studies.

Peer evaluation is another effective assessment method. It not only fosters a sense of cooperation but also helps develop critical thinking skills. By evaluating each other's work, students learn how to objectively assess both their peers and themselves, a valuable skill for their future careers. For instance, after completing a group project, members can anonymously evaluate each other's performance and provide constructive feedback.

Teacher assessment plays a key role in the overall evaluation system, as professional guidance and feedback are essential for student improvement. Teachers can offer targeted guidance through regular one-on-one sessions and group feedback, helping students overcome learning challenges.

• Combining Quantitative and Qualitative Assessment

A combination of quantitative and qualitative assessment methods provides a more comprehensive evaluation of students' learning outcomes. Quantitative assessment uses specific numbers and data, such as vocabulary test scores or reading comprehension accuracy, to reflect students' mastery of particular skills. This data offers a clear view of students' proficiency in specific areas, helping teachers quickly identify strengths and weaknesses.

Qualitative assessment, on the other hand, focuses on the learning process, attitude, and innovative thinking. Through observing student work, listening to presentations, and participating in classroom discussions, teachers can gain a deeper understanding of students' thought processes and individual characteristics. For example, students' contributions during discussions can reflect their critical thinking and ability to creatively solve problems.

By combining these two methods, teachers can obtain a fuller picture of students' learning progress. Quantitative assessments provide an objective standard, while qualitative assessments add personalized insights into students' subjective learning experiences. Together, they produce a more accurate and holistic evaluation.

• Timely Feedback and Continuous Improvement

Timely feedback and continuous improvement are crucial components of the assessment system. Regular evaluations help both teachers and students identify issues early and make necessary adjustments. For example,

weekly homework checks and monthly unit tests can be used as routine assessments to help students track their progress.

After each evaluation, feedback and suggestions should be promptly provided to students. Immediate feedback helps students understand their current performance and take action to improve. For instance, if a student performs poorly in a reading comprehension test, the teacher can point out specific areas of weakness and offer tailored guidance.

Regular collection and analysis of assessment data is another key step. Through data analysis, trends in student learning and progress can be identified. For example, tracking the average grades over time can reveal which teaching methods or resources are most effective. Additionally, comparing data across different classes may highlight areas where certain groups excel, allowing successful practices to be shared.

Data analysis can also reveal strengths and weaknesses in the assessment system itself, guiding future improvements. For instance, if students consistently score low on a particular metric, adjustments to teaching methods or additional training may be necessary. Through continuous feedback and refinement, the assessment system can be optimized to better serve the overall teaching objectives.

2.3 Key Issues to be Addressed

This research focuses on the development and implementation of a Computer Science English course guided by the principles of Outcome-Based Education (OBE), emphasizing a student-centered approach and learning outcome-driven objectives. The aim is to deeply explore and enrich the course's cognitive content and emotional value. The study examines reform strategies and methods across the stages of curriculum design, implementation, and assessment. It also investigates the sources of student motivation, analyzes the intrinsic factors that enhance students' learning interest, and explores the competencies teachers need as emotional laborers. Additionally, it discusses how to integrate ideological and political elements into the curriculum to enhance its emotional value.

3. Achievements And Practical Application

This project aims to enhance students' professional English proficiency and overall competencies through the reform of the Computer Science English curriculum, driven by the principles of Outcome-Based Education (OBE). First, we will develop a comprehensive course system that clearly outlines course objectives, teaching content, and assessment standards, ensuring alignment with the core tenets of OBE. Additionally, the project will revise lesson plans, design case studies, and create supplementary teaching materials such as courseware, enabling instructors to more effectively implement the new teaching strategies. Simultaneously, we plan to build an online learning environment using the LearningPass platform, offering students convenient access to learning resources and support services, further improving learning outcomes. Based on these initiatives, we will compile a research report and publish academic papers on curriculum reform, summarizing and sharing our experiences to provide valuable insights for future research and practice.

The initial implementation will be carried out in the 2023 cohort of the Internet of Things undergraduate program at the School of Computer Science, focusing on the Computer Science English course. By pioneering these reform measures in this program, we aim to gather valuable experience that can later be applied to other core courses within the School of Computer Science. Once significant results are achieved within the school, we plan to expand the reforms across the university, enabling students from various disciplines to benefit from these innovations.

The scope of this project primarily targets higher education institutions, especially those that prioritize both computer science education and English proficiency development. The direct beneficiaries will be students in the School of Computer Science. Through the reformed curriculum, students will increase their enthusiasm for learning, broaden their knowledge base, and strengthen their understanding of key concepts. They will also develop skills in professional reading, technical communication, programming, documentation, logical reasoning, and critical thinking. These improvements will significantly enhance their competitiveness in the job market, giving them an edge in their career pursuits.

For businesses, the influx of graduates with strong professional English skills will provide a pool of highly qualified workers. These employees will not only possess solid technical skills but also exhibit strong cross-cultural communication abilities, making them well-equipped to thrive in a globalized work environment and contributing to local economic development.

For the university, this exploration and innovation in teaching methods will stimulate creativity among both faculty and students, driving the institution's educational reform efforts and improving its academic and operational standards. The research and practice from this project will help establish a sustainable educational model, providing valuable lessons for future educational reforms.

For society, the outcomes of this project will contribute rich practical experience to the field of educational innovation, promoting the improvement of the education system. By cultivating talent with an international perspective and professional English proficiency, the project will help strengthen the nation's cultural soft power and international competitiveness, fostering a sense of cultural confidence within the nation.

4. Conclusions

This research focuses on the application of Outcome-Based Education (OBE) principles to reform the Computer Science English curriculum. By emphasizing a student-centered approach and learning outcome-driven objectives, the study aims to enhance students' professional English proficiency and overall capabilities. The curriculum reform includes clearly defining course objectives, carefully selecting relevant content, and implementing diverse teaching methods such as case studies and project-based learning. Additionally, it integrates ideological and political elements to foster both cognitive and emotional development. The research also explores innovative assessment strategies by combining formative and summative evaluations, promoting student self-reflection, and providing timely feedback to ensure continuous improvement. By examining how to motivate students intrinsically and how teachers can shift their roles toward emotional labor, the study aims to optimize the curriculum and offer valuable insights for IT talent development in applied universities. Ultimately, this reform seeks to enrich the educational experience, preparing students with both technical expertise and soft skills necessary for future professional success.

Acknowledgements

References

[1] Harismayanti, I., Putra, I. N. A. J., & Santosa, M. H. (2020). *Gamification in English teaching and learning.* Nilacakra.

[2] He, Y., & Liu, S. (2024). Research and practice of curriculum intrinsic value development method based on OBE concept. *Curriculum and Teaching Methodology, 7*(2), 135–142. https://doi.org/10.23977/curtm.2024.070221

[3] Rao, N. J. (2020). Outcome-based education: An outline. *Higher Education for the Future, 7*(1), 5–21. https://doi.org/10.1177/2347631119886418

[4] Srivastava, S. K., & Agnihotri, K. (2022). A study on modern teaching pedagogy with special reference to outcome-based education system. *International Journal of Business Excellence, 26*(1), 95–114. https://doi.org/10.1504/IJBEX.2022.121586

[5] Syeed, M. M. M., Shihavuddin, A. S. M., Uddin, M. F., & Others. (2022). Outcome-based education (OBE): Defining the process and practice for engineering education. *IEEE Access, 10*, 119170–119192. https://doi.org/10.1109/ACCESS.2022.3219477

[6] Asim, H. M., Vaz, A., Ahmed, A., & Others. (2021). A review on outcome-based education and factors that impact student learning outcomes in tertiary education system. *International Education Studies, 14*(2), 1–11. https://doi.org/10.5539/ies.v14n2p1

[7] Guo, Y., He, Y., Wang, C., & Others. (2024). Design of IoT platform for elderly care utilizing LSTM fall detection algorithm. In Proceedings of the 2024 Guangdong-Hong Kong-Macao Greater Bay Area International Conference on Digital Economy and Artificial Intelligence (pp. 978–981). https://doi.org/10.1145/3675417.3675580

[8] Chunkai, W., Yantao, H., Yufan, G., Suping, L., Yifan, L., Zhigang, L., & Qian, W. (2024). Fault detection system for stepping motors based on K-means clustering. In Proceedings of SPIE (Vol. 13251, p. 132512D).