DEVELOPING STRATEGIC MANAGEMENT GUIDELINES FOR THE EFFECTIVENESS OF OUTCOMES-BASED EDUCATION TO ENHANCE STUDENTS' INNOVATIVE ABILITY IN GUANGXI TECHNOLOGICAL COLLEGE OF MACHINERY AND ELECTRICITY, CHINA

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Received: August 17, 2025; **Revised** : September 8, 2025; **Accepted** : September 11, 2025

Abstract

The objectives of the research were: (1) to investigate the current challenges and needs in implementing OBE for fostering student innovation at Guangxi Technological College of Machinery and Electricity, and (2) to develop strategic management guidelines to improve the effectiveness of OBE in this context. Survey respondents included 293 students and 177 teachers selected through stratified random sampling from the college. The data was collected via a structured questionnaire and analyzed by using percentage, mean, and standard deviation. Additionally, a focus group of three education experts evaluated the proposed guidelines.

The research finding revealed that: (1) Students reported notable challenges in bridging theory and practice – for example, difficulty in balancing practical and theoretical learning (Mean = 3.56) – and a strong need for updated, industry-relevant course content (Mean= 3.62). They valued innovation highly (Mean = 3.52) but faced moderate obstacles in applying theoretical knowledge to real-world scenarios. Teachers indicated a moderate level of challenges in OBE implementation (Mean = 2.96), particularly citing the need for clearer OBE integration guidelines, more training, interdisciplinary collaboration, and resources to support innovative teaching. (2) A strategic management guideline was developed comprising four key components: 1) Curriculum Enhancement and Innovative Teaching, 2) Faculty Development and Training, 3) Practical Learning Opportunities, and 4) Industry and Community Partnerships.

Keywords: Outcomes-Based Education (OBE), Strategic Management Guidelines, Innovative Ability, Curriculum Optimization

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Introduction

In recent years, China's vocational education circles have paid more and more attention to improving students' practical skills and innovative ability. This shift is driven by the growing demand for a workforce that in my opinion is not only technologically savvy, but also creatively problem-solving and adaptable. Guangxi Mechanical and Electrical Vocational and Technical College is a leading vocational and technical college in Guangxi, which strives to cultivate graduates with strong innovation ability in addition to technical ability, which can be known first, thus reflecting this trend. However, I think that like many vocational colleges, the College faces challenges in developing effective training management strategies to significantly increase students' innovative capabilities. Previous research has emphasized that integrating innovative practices into vocational training is critical to meeting the needs of modern industries (Shi, 2012), and aligning education with market needs and technological advances is critical to maintaining the relevance of vocational programs (Zhao & Zhang, 2020). Outcome-based education (OBE) has been widely adopted as a learner-centered approach to achieve these goals. OBE focuses on well-defined learning outcomes and designing the curriculum 'backwards' to ensure that students achieve these outcomes (Spady, 1994). In vocational and technical education, OBE is seen as a way to better align teaching with industry requirements and develop skills such as innovation and problem solving. However, effective OBE implementation requires strategic academic management - including updated curricula, appropriate teaching methods, teacher training, and assessment systems - to truly bridge the gap between classroom learning and job skills (Cortini et al., 2024; Xu & Zhang, 2020). Despite the potential benefits, implementing OBE in practice can be challenging. Institutions may face limited resources, inadequate preparation of teachers, and a lack of clear guidelines for integrating OBE principles into everyday teaching. In vocational colleges in China, research has pointed out difficulties such as the inconsistency between curriculum and outcome goals and the difference in teachers' understanding of out-of-body ability (Pan & Yu, 2015; Zhang & Li, 2019). Guangxi Mechanical and Electrical Vocational Technical College is no exception: In order to stay at the forefront of educational innovation, it can be seen that it must address the gaps in existing training programs. Initial observations at the College suggest that while students and faculty recognize the importance of the ability to innovate, current teaching strategies and curriculum design may not fully support the development of this skill. It follows that there is an urgent need for a structured framework or guidelines to manage the implementation of OBE more effectively - ensuring that curriculum content keeps pace with industry trends, that teaching methods actively engage students in applying knowledge, and that both teachers and students are supported in the transition to a results-focused learning environment.

Research Objectives

1. To investigate the current challenges and needs related to the effectiveness of outcomes-based education for enhancing students' innovative ability at Guangxi Technological College of Machinery and Electricity.

2. To investigate the influence of outcomes-based education on students' innovative ability.

3. To develop strategic management guidelines to enhance the effectiveness of outcomes-based education at Guangxi Technological College of Machinery and Electricity.

Research Methodology

Population and Samples

This study took place at Guangxi Technological College of Machinery and Electricity in Nanning, Guangxi Province, China. The research population included all on-campus students 1100 and faculty 316. A stratified random sampling method was employed to ensure students and teachers from different academic departments were adequately represented. The final sample comprised 293 students and 177 teachers. The student sample included mainly senior students, while the teacher sample included frontline instructors and teaching administrators. All participants took part voluntarily.

Research Instrument

The primary instrument for this study was a questionnaire, supplemented by an outline for expert interviews. The questionnaire, designed by the researcher according to relevant literature and research objectives, consists of two main parts: (1) demographic information, and (2) items focusing on issues related to OBE implementation and innovation training. The questionnaire items employ a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), covering aspects such as teaching strategies, resource support, curriculum content, practice opportunities, and innovation outcomes. To ensure content validity, three experts in vocational education reviewed the questionnaire, and the Index of Item-Objective Congruence (IOC) ranged from 0.67 to 1.00, meeting the research requirements. The questionnaire's reliability was 0.82, indicating satisfactory internal consistency.

Based on the initial questionnaire results, a preliminary strategic management guideline was drafted, along with a follow-up interview outline. Three experts in the fields of vocational education and educational administration were invited to review these guidelines, offering feedback via semi-structured interviews. The expert evaluations (IOC indices) were used to assess the alignment of guidelines with identified needs, ensuring that the final version was both conceptually valid and practically feasible.

Data Collection

Initially, the researcher distributed the questionnaire both online and in-person. With institutional approval, researchers explained the study objectives to student participants, who completed the questionnaires anonymously during class. Teacher questionnaires were circulated via the college's academic system.

Subsequently, based on the preliminary findings, the researcher developed a draft strategic management guideline for enhancing OBE's effectiveness in promoting student innovation. Three experts were invited for focus group discussions to evaluate the guideline's completeness, feasibility, and suitability. These discussions were recorded and transcribed. After two rounds of expert consultation, the strategic management guideline was revised and finalized, and the IOC results served as qualitative evidence to validate the guidelines.

Data Analysis

For quantitative data, this study combined descriptive and inferential statistics. First, frequency and percentage were used to describe demographic characteristics. Next, means and standard deviations (S.D.) were calculated for each item and dimension in the second section of the questionnaire to depict how students and teachers evaluated OBE practices and innovation training.

For the qualitative component, the researcher employed content analysis to summarize the crucial elements and recommendations from expert interviews. The IOC indices from the experts were also reviewed to determine which strategies to retain or refine in the final guideline.

Research Results

1. The current challenges and needs related to the effectiveness of outcomes-based education.

Table 1 Current challenges and needs related to Outcomes-Based Education

Questions	n=293		Level of Opinion
	$\bar{X}$	S.D.	
1. The curriculum effectively integrates outcomes-based education principles.	2.45	1.40	Low
2. There are sufficient resources available to support outcomes-based education.	2.88	1.35	Middle
3. The current teaching methods enhance my ability to innovate and solve problems creatively.	3.02	1.39	Middle
4. I face challenges in applying theoretical knowledge to practical scenarios.	3.54	1.42	High
5. The faculty provides adequate support for innovative projects.	2.65	1.31	Middle
6. There is a need for more hands-on training in my field of study.	2.98	1.36	Middle
7. The current evaluation methods accurately measure learning outcomes.	3.59	1.45	High
8. I find it difficult to engage with online learning platforms.	3.12	1.38	Middle
9. Practical skills training is not adequately integrated into my courses.	2.77	1.28	Middle
10. The faculty encourages the use of innovative tools and technologies in projects.	2.35	1.44	Low
11. There is a lack of interdisciplinary collaboration opportunities.	2.85	1.33	Middle
12. I feel well-prepared to meet the demands of the modern workforce.	3.08	1.41	Middle
13. Outcomes-based education aligns with my learning style.	2.55	1.30	Middle
14. There is a need for more updated course materials that reflect industry trends.	3.62	1.39	High
15. The college provides adequate career support services.	2.15	1.35	Low
16. I am aware of the importance of innovation in my field of study.	3.52	1.43	High
17. The teaching methods used encourage active participation and engagement.	2.90	1.37	Middle
18. I find it challenging to balance practical and theoretical learning.	3.56	1.40	High
19. There is adequate support for students who need help with outcomes-based education.	2.61	1.32	Middle
20. I believe that more practical examples should be included in the curriculum.	2.95	1.29	Middle
Total	**2.96**	**1.37**	**Middle**

According to table 1, as you can see in the table, the total average of current challenges and needs related to Outcomes-Based Education was at a middle level (2.96). This score suggest that while students recognize the importance of aligning OBE with innovative and industry-relevant materials, they also perceive shortcomings in institutional support—especially in terms of career services, encouragement from faculty, and sufficient OBE-oriented infrastructure. The question 14 “There is a need for more updated course materials that reflect industry trends” received the highest score

(Mean = 3.62, S.D. = 1.39). The question 7 “The current evaluation methods accurately measure learning outcomes” was also rated highly (Mean= 3.59, S.D. = 1.45). Similarly, the question 18 “I find it challenging to balance practical and theoretical learning” yielded a high score (Mean= 3.56, S.D. = 1.40), while question 4 “I face challenges in applying theoretical knowledge to practical scenarios” had a nearly comparable high score (Mean= 3.54, S.D. = 1.42). Additionally, the question 16 “I am aware of the importance of innovation in my field of study” was slightly lower but still among the more elevated scores (Mean = 3.52, S.D. = 1.43).

Table 2 Challenges and needs in implementing Outcomes-Based Education

Questions	N=177		Level of Opinion
	$\overline{X}$	S.D.	
1. The current curriculum adequately reflects outcomes-based education principles.	3.58	1.40	High
2. Sufficient resources are available to implement outcomes-based education effectively.	2.60	1.35	Middle
3. There are clear guidelines provided for teachers to integrate outcomes-based education in their teaching.	3.54	1.42	High
4. I face challenges in aligning my teaching strategies with outcomes-based education objectives.	2.45	1.33	Low
5. Professional development programs are sufficient to prepare teachers for outcomes-based education.	2.85	1.36	Middle
6. The assessment methods used effectively measure student outcomes.	2.98	1.38	Middle
7. There is a need for more interdisciplinary collaboration among departments to enhance outcomes-based learning.	3.56	1.43	High
8. I have sufficient autonomy to modify my teaching methods to better align with outcomes-based education.	2.70	1.31	Middle
9. The college provides adequate support for teachers implementing innovative teaching strategies.	2.50	1.34	Low
10. Outcomes-based education has improved the overall quality of teaching and learning.	2.95	1.37	Middle
11. It is challenging to incorporate practical skills training into outcomes-based education.	2.88	1.39	Middle
12. There is a strong emphasis on developing students' innovative abilities in my department.	2.40	1.35	Low
13. The feedback from students is valuable in enhancing outcomes-based education practices.	2.90	1.32	Middle
14. I find it difficult to balance traditional teaching methods with outcomes-based approaches.	2.20	1.28	Low
15. The college's strategic management supports the effective implementation of outcomes-based education.	3.55	1.44	High
16. I believe more practical examples should be included in teaching to better meet outcomes-based objectives.	3.00	1.41	Middle
17. There is a need for ongoing training to keep up with the latest educational technologies and strategies.	3.62	1.45	High
18. Collaboration with industry partners enhances the relevance of outcomes-based education.	2.75	1.36	Middle
19. I am satisfied with the current evaluation methods for assessing student innovation.	2.30	1.29	Low
20. I believe that outcomes-based education is essential for preparing students for future challenges.	3.10	1.38	Middle
Total	**2.92**	**1.37**	**Middle**

According to table 2, the total average of current challenges and needs related to Outcomes-Based Education was at a middle level (2.92). As you can see in the table, the question 17 “There is a need for ongoing training to keep up with the latest educational

technologies and strategies." received the highest score (Mean=3.62, S.D. = 1.45). The question 1 "The current curriculum adequately reflects outcomes-based education principles." followed closely with a relatively high score (Mean= 3.58, S.D. = 1.40). Similarly, question 7 "There is a need for more interdisciplinary collaboration among departments to enhance outcomes-based learning." posted a high result (Mean= 3.56, S.D. = 1.43). The question 15 "The college's strategic management supports the effective implementation of outcomes-based education." likewise scored well (Mean= 3.55, S.D. = 1.44), while question 3 "There are clear guidelines provided for teachers to integrate outcomes-based education in their teaching." also garnered a relatively high value (Mean= 3.54, S.D. = 1.42).

2. The influence of outcomes-based education on students' innovative ability.

Table 3 Influence of Outcomes-Based Education on students' innovative ability

Questions	n=293		Level of Influence
	$\bar{X}$	S.D.	
1. Outcomes-based education has improved my critical thinking skills.	3.02	1.38	Middle
2. The education provided helps me to generate new ideas and solutions.	2.45	1.32	Low
3. I feel more prepared for the workforce due to the outcomes-based education approach.	3.58	1.41	High
4. There is a strong emphasis on developing innovative capabilities in my coursework.	3.65	1.40	High
5. I find it easier to adapt to new technologies and methods because of my education.	3.54	1.37	High
6. Participating in project-based learning has enhanced my practical skills and innovative thinking.	2.98	1.36	Middle
7. Collaborative projects with peers have been beneficial in enhancing my creative problem-solving skills.	3.56	1.45	High
8. The education I receive is relevant to real-world applications and challenges.	3.55	1.44	High
9. I am encouraged to explore new ideas and take risks in my studies.	2.90	1.33	Middle
10. The learning environment fosters creativity and innovation.	2.35	1.39	Low
11. I believe that outcomes-based education enhances my entrepreneurial skills.	2.88	1.35	Middle
12. The faculty supports student innovation and entrepreneurship initiatives.	2.50	1.31	Low
13. My education encourages me to think about the social impact of my work.	2.95	1.34	Middle
14. The use of digital tools in my education has improved my learning experience.	2.60	1.42	Middle
15. I am motivated to continue learning and improving my skills after graduation.	3.10	1.36	Middle
16. The education provided helps me to understand global industry trends.	2.70	1.30	Middle
17. I feel confident in applying what I have learned to real-life situations.	2.85	1.38	Middle
18. My coursework includes discussions on ethical considerations in innovation.	2.95	1.40	Middle
19. I have had opportunities to participate in innovation competitions or exhibitions.	2.20	1.29	Low
20. I believe that outcomes-based education prepares me well for future challenges.	3.00	1.39	Middle
Total	**2.97**	**1.37**	**Middle**

According to table 3, the total average of the influence of outcomes-based education on students' innovative ability was at a middle level (2.97). As you can see in the table, the question 4 "There is a strong emphasis on developing innovative

capabilities in my coursework" received the highest score (Mean=3.65, S.D. = 1.40). Next, question 3 "I feel more prepared for the workforce due to the outcomes-based education approach" also reached a relatively high mean (Mean=3.58, S.D. = 1.41). The question 7 "Collaborative projects with peers have been beneficial in enhancing my creative problem-solving skills" scored slightly lower but still significant (Mean= 3.56, S.D. = 1.45). Following these, question 8 "The education I receive is relevant to real-world applications and challenges" came in high (Mean=3.55, S.D. = 1.44), and question 5 "I find it easier to adapt to new technologies and methods because of my education" earned a similarly elevated score (Mean=3.54, S.D. = 1.37).

These findings reveal that while students feel OBE has some positive impact—particularly regarding real-world readiness, teamwork, and adaptability—there is a perceived lack of institutional or faculty-driven initiatives (e.g., innovation competitions, active entrepreneurship support) that could further amplify their innovative abilities.

Table 4 Influence of Outcomes-Based Education on teaching and student innovation

Questions	n=177		Level of Influence
	$\overline{X}$	S.D.	
1. Outcomes-based education encourages a focus on critical thinking and problem-solving skills in students.	2.98	1.36	Middle
2. The use of outcomes-based education has improved my teaching practices.	3.58	1.40	High
3. Outcomes-based education supports the integration of innovative teaching methods in the classroom.	3.65	1.42	High
4. The emphasis on outcomes-based education has led to increased student engagement in my classes.	2.45	1.34	Low
5. I have observed a positive impact of outcomes-based education on students' ability to apply knowledge practically.	2.90	1.39	Middle
6. Outcomes-based education allows for more flexibility in teaching to accommodate diverse learning needs.	2.55	1.33	Middle
7. The integration of digital tools in teaching has been beneficial in achieving outcomes-based education goals.	3.56	1.43	High
8. Outcomes-based education encourages collaboration among students in innovative projects.	3.55	1.41	High
9. There is a strong alignment between outcomes-based education and the development of students' entrepreneurial skills.	2.85	1.35	Middle
10. The focus on student outcomes has improved the quality of feedback I provide.	3.54	1.44	High
11. I believe outcomes-based education enhances the overall learning experience for students.	2.60	1.30	Middle
12. Outcomes-based education promotes the development of ethical and socially responsible behavior in students.	2.20	1.28	Low
13. I feel equipped to handle the challenges of implementing outcomes-based education.	2.95	1.38	Middle
14. The outcomes-based approach has increased my awareness of global trends in education.	2.80	1.36	Middle
15. Collaboration with colleagues enhances my ability to implement outcomes-based education effectively.	2.40	1.29	Low
16. I believe there is a need for more support and resources to fully implement outcomes-based education.	2.70	1.32	Middle
17. Outcomes-based education has positively impacted students' ability to innovate.	2.90	1.37	Middle
18. The use of practical examples in teaching helps achieve outcomes-based	3.00	1.41	Middle

education objectives.			
19. Outcomes-based education supports the use of formative assessments in my teaching practices.	2.95	1.34	Middle
20. I am confident in the long-term benefits of outcomes-based education for student success.	3.10	1.39	Middle
Total	**2.96**	**1.37**	**Middle**

According to table 4, the total average of the influence of outcomes-based education on teaching and student innovation was at a middle level (2.96). As you can see in the table, the question 3 "Outcomes-based education supports the integration of innovative teaching methods in the classroom." achieves the highest score (Mean= 3.65, S.D. = 1.42). The question 2 "The use of outcomes-based education has improved my teaching practices." is also high (Mean= 3.58, S.D. = 1.40). Next, question 7 "The integration of digital tools in teaching has been beneficial in achieving outcomes-based education goals." registered a comparatively high mean (Mean= 3.56, S.D. = 1.43). The question 8 "Outcomes-based education encourages collaboration among students in innovative projects." likewise rated high (Mean=3.55, S.D. = 1.41). Finally, question 10 "The focus on student outcomes has improved the quality of feedback I provide." performed almost on par with the preceding items (Mean= 3.54, S.D. = 1.44).

Although teachers recognize that OBE supports innovative methods and fosters collaboration, they also highlight limitations in areas like ethical development, inter-faculty coordination, and effective student engagement.

3. The strategic management guidelines to enhance the effectiveness of outcomes-based education.

The strategic management guidelines for enhancing outcomes-based education (OBE) at Guangxi Technological College of Machinery and Electricity have passed an expert review and can be used as a practical management framework for improving students' innovative ability. These guidelines consist of four units, namely: 1. Modernize OBE Curriculum and Resources 2. Strengthen the Professional Development of Teaching Staff 3. Optimize Practical Training and Industry Engagement 4. Foster a Campus-wide Culture of Collaboration and Innovation. All four units were evaluated by three experts for their correctness and applicability; the results, expressed as IOC (Index of Conformity) values, ranged from 0.67 to 1.00. This indicates that the developed guidelines meet essential validity and reliability standards, and they can therefore be effectively used to guide outcomes-based education at the college—particularly in fostering students' creativity and adaptability. The four units draw on the highest-scoring needs identified in the student and teacher questionnaires. Students reported three top needs, and teachers had three top needs; among these, two overlapping priorities emerged: (1) the necessity for more hands-on, industry-relevant coursework to bridge theory and practice, and (2) a more cohesive, supportive environment that encourages continuous professional growth and interdisciplinary teamwork. By integrating these overlapping needs, the study merged the six major concerns into the four comprehensive units listed above, resulting in a strategic framework that responds directly to both stakeholder groups. Some students, particularly those in advanced technical programs, face complex challenges when trying to convert theoretical learning into innovative, real-world applications—often due to insufficient or outdated resources and limited links with industry partners. In addition, teachers emphasize the importance of ongoing training so they can stay current with educational technologies and methodologies conducive to cultivating students' innovative skill sets. As an educational

organization, the college has a responsibility to formulate specialized guidelines not only to address these gaps but also to provide holistic academic management. By doing so, Guangxi Technological College of Machinery and Electricity can more effectively support students' OBE-driven development and equip them with the creative competencies vital for success in today's rapidly evolving industries.

Discussion

The results of the survey on outcomes-based education (OBE) challenges, needs, and its influence on students' innovative ability at Guangxi Technological College of Machinery and Electricity indicate that learners generally possess a "moderate" level of understanding and engagement with OBE, suggesting room for enhancing both awareness and application of its core principles. Good OBE practice not only requires clearly defined learning outcomes but also fosters a holistic environment in which students can internalize these objectives and connect them to real-world problem-solving (Spady, 1994). When students are insufficiently informed about the relevance of OBE, they may perceive it as secondary compared to their main technical studies, thus missing opportunities to cultivate creative and adaptive skills. Bridging this gap requires students to be proactive in embracing OBE, while also embedding OBE-oriented strategies—such as project-based or collaborative learning—across various subjects to increase their motivation and depth of learning (Blumenfeld et al., 1991).

Survey findings likewise demonstrate that teachers' professionalism and interdisciplinary collaboration efforts register at a relatively "high" level, yet certain pedagogical and institutional gaps persist. This resonates with earlier research indicating that maintaining a systematic and standardized approach to OBE depends heavily on educator competencies, ongoing faculty development, and alignment with real-world industry demands (Li and Shen, 2021). For instance, some respondents highlighted the need for more comprehensive training programs that equip instructors with both robust theoretical understanding and practical experience—mirroring the argument by Biggs and Tang (2011) that teaching quality must be continually refined to support student-centered and outcomes-focused instruction.

In addition, there is an evident need to foster a campus culture more conducive to innovation, aligning with the observations of Herrera and Narandia (2021), who emphasize the role of collaborative and creative learning environments in cultivating new ideas. Limited parental or community engagement (analogous in concept to the "family-school cooperation" theme from the mental health context in the exemplar) can further impede holistic student development, underlining the importance of forging stronger partnerships both within the institution—through interdisciplinary projects—and beyond, through industry collaborations that provide authentic learning scenarios (Xu and Zhang, 2020). Such partnerships ensure that students not only master technical skills but also adapt to emergent technologies and industry shifts, a core principle of successful vocational education programs (Wang and Chen, 2020).

Taken together, these observations highlight the importance of comprehensive academic administration guidelines. Building on the highest-priority areas identified by students and teachers—such as ongoing faculty training, updated industry-aligned resources, improved cross-department collaboration, and creation of innovative project opportunities—the guidelines proposed in this study offer a structured approach to reinforce OBE principles. Similar to how sustained guidance is advocated in other

contexts (Pan and Yu, 2015), the integration of well-defined strategic management in OBE can support a more consistent, research-based approach to teaching, learning, and assessment. In doing so, Guangxi Technological College of Machinery and Electricity can evolve into an educational environment that not only hones technical expertise but also ingrains the creative problem-solving and entrepreneurial thinking vital for success in an ever-evolving industrial landscape.

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