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An experimental study: An integrative strategy of PBL combined with an organ-systems-based curriculum to improve academic achievement and career maturity

Cheng Yao[1]
Yu Yang[2]
Siliang Yu[3]

(✉ Corresponding Author)

[1,3]*Faculty of Education, Nakhon Phanom University, Muang Nakhon Phanom, NKP 48000, Thailand.*
[1]*Email: slevenyaocheng@163.com*
[3]*Email: yusiliang910630@163.com*
[2]*Department of General Surgery, the First People's Hospital of Mianyang City, Mianyang, 621000, China.*
[2]*Email: yangyu0908@163.com*

Abstract

This study aims to investigate the impact of integrating Problem-Based Learning (PBL) and Organ System-Based Curriculum (OSBC) on medical students' academic achievement and career maturity within the context of medical education. An experimental design was employed, involving students from a medical school in China. Participants were randomly assigned to either a control group with a traditional curriculum or an experimental group receiving an integrated PBL and OSBC curriculum focused on cardiovascular system diseases. The intervention spanned four weeks. The results indicate that the experimental group demonstrated significantly higher academic achievement immediately after the intervention compared to the control group. This improvement persisted in a follow-up test conducted one month later. Career maturity also improved in the experimental group, albeit with a less sustained effect. The study underscores the potential of integrated teaching strategies in medical education for enhancing critical thinking and practical skills. However, long-term improvements in career maturity may necessitate further refinement of teaching methods. These findings contribute to the ongoing discourse on effective medical education strategies and emphasize the importance of a comprehensive approach to prepare students for academic excellence and clinical competence. Future research with larger sample sizes and consideration of additional influencing factors is recommended to gain deeper insights into the dynamics of medical education.

Keywords: Academic achievement, Career maturity, Medical education, OSBC, PBL.

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Contents

Contribution of this paper to the literature
This study's original contribution lies in its comprehensive examination of the combined impact of Problem-Based Learning (PBL) and Organ System-Based Curriculum (OSBC) on medical students' academic achievement and career maturity. By integrating these pedagogical approaches and assessing their long-term effects, this research provides a novel perspective on enhancing medical education outcomes.

1. Introduction

As an integral constituent of the societal healthcare framework, medical education bears the imperative mission of nurturing prospective professionals in the field of medicine (Bulger, 1992). The amalgamation of Problem-Based Learning (PBL) and the Organ-Systems-Based Curriculum (OSBC) has evolved into a proven pedagogical paradigm, proffering a prospective avenue for enhancing medical students' scholarly accomplishments and vocational maturity. This empirical inquiry aspires to unveil the synergistic potency inherent in the confluence of PBL with OSBC, with the aim of comprehensively elevating medical students' academic achievement and vocational maturity.

Traditional medical pedagogy is delineated by educators' unidirectional impartation of knowledge, with theoretical content from textbooks and classroom environments occupying the epicenter of pedagogy (Urkin, Fram, Jotkowitz, & Naimer, 2017). This underscores the preeminent role of educators, thereby embodying a "teacher-centered" approach (Schug, 2003). For content, conventional medical pedagogy prioritizes the dissemination of textbook-derived knowledge (Tudor Car et al., 2019) Tudor albeit often constraining the scope of knowledge imparted by the confines of the instructional materials themselves, thus rendering it inadequate in catering to the holistic knowledge requisites of students. Concerning the teacher-student dynamics, conventional medical curricular paradigms may inadvertently culminate in the ascendancy of educator authority, thereby engendering a hierarchical teacher-pupil schema (De Oliveira et al., 2018). In the long run, this may prove counterproductive to cultivating robust teacher-student relationships. Furthermore, the progress of science and technology has propelled the evolution of the medical discipline. However, with the emergence of innovative new media and technologies in the modern era, traditional teaching methods have imposed limitations on the avenues through which medical students access knowledge, falling short of meeting the sustained developmental demands of medical scholars (Lin, Chen, & Liu, 2017). From the vantage point of participants, traditional medical pedagogy encompasses both educators and students; however, Felder and Henriques (1995) suggested that once students harbor disillusionment towards the instructive faculty, they may readily forsake the pursuit of education within the given course. Medical students, recognized as pivotal preparatory agents for healthcare professionals, must be imbued with a heightened capacity for adaptability and learning, enabling them to contend with the perpetually evolving medical domain effectively. Given the incessant innovation in medical technology and the escalating intricacies within medical practice, the conventional methodologies employed in medical pedagogy may necessitate revitalization and augmentation.

In this milieu of continual advancement and flux, educators must proactively seek innovative modalities to engender medical professionals capacitated to navigate the exigencies posed by future healthcare challenges. Problem-Based Learning (PBL) is a structured pedagogical modality that amalgamates sundry teaching strategies to augment student-centered learning outcomes, with the focus extending beyond the mere acquisition of knowledge (Choon-Eng Gwee, 2008). Through the implementation of PBL, students cease to function as passive recipients of knowledge and instead emerge as active participants in the exploration of bona fide clinical cases, thereby cultivating acumen in critical thinking (Nargundkar, Samaddar, & Mukhopadhyay, 2014), teamwork (Bernstein, Tipping, Bercovitz, & Skinner, 1995), and self-directed learning (Malan, Ndlovu, & Engelbrecht, 2014). This methodology substantively enhances the capability of medical students to acquire the proficiencies and attributes indispensable for their subsequent clinical practice. Concomitantly, the incorporation of OSBC underscores the integrative and comprehensive facets of medical knowledge (Obi et al., 2022; Villalobos, Kruczek, & Bobulescu, 2023) The division of clinical curricular systems along the axis of organ systems, facilitating both vertical and horizontal interconnectivity within the pedagogical framework, facilitates the enhanced comprehension of the mutual interdependencies and influences between diverse organs. This allows medical students to enhance their scholarly achievements and vocational maturity.

This empirical inquiry endeavors to explore the potential of the pedagogical model that synthesizes PBL with OSBC, with the aim of elevating the academic accomplishments and vocational maturity of medical students. Through the rigors of scientific research design and data analysis, we envisage unveiling the efficacy and ramifications of this integrated pedagogical model within medical education, thereby furnishing robust empirical substantiation to fortify the trajectory of ongoing innovation and development within medical pedagogy. The further explication of the significance of this research within the domain of medical education, coupled with the contemplation of its objectives and inquiries, augments the impetus for the continued evolution of medical pedagogy.

2. Literature Review

PBL is fundamentally a student-centered educational approach adopted by numerous medical schools worldwide for nearly half a century (Cowan et al., 2010; Kwan, 2017). According to Yu et al. (2009) PBL has made significant strides in educational reform since its introduction into medical education in 1969. Other research has shown that the incorporation of PBL in medical education can enhance students' holistic abilities and the effectiveness of medical education, including critical thinking, collaborative learning, communication skills, problem-solving abilities, and self-directed learning (Latif, Mumtaz, Mumtaz, & Hussain, 2018; Manuaba, -No, & Wu, 2022; Sahoo & Mohammed, 2018). However, a systematic review questioned whether PBL in medical curricula leads students toward specific career paths (Tsigarides, Wingfield, & Kulendran, 2017). It was based on most research investigations suggesting that PBL does not tend to bias students toward particular professions. Still, the article points out that various confounding factors may influence professional preferences, necessitating further research to clarify these results. Shrivastava and Shrivastava (2020) define OSBC as an integrative instructional format that has been particularly effective in deepening medical knowledge and fostering a comprehensive understanding of various organ systems. This curriculum is centered around organ systems (Liang, Zhang, & Wang, 2022) and facilitates the interconnectedness of anatomy, physiology, pathology, and clinical knowledge relevant to each system. Worldwide, some medical schools, such as those in the United States (Pfeifer, 2018), have shifted teaching units to an organ-system-based approach, where students learn one organ system's anatomy, physiology, and pathology before moving on to the next. Combining PBL and OSBC is based on their complementary nature in educational philosophies, learning strategies, and knowledge integration. PBL emphasizes students' active exploration and problem-solving abilities, cultivating self-directed learning and independent thinking skills. When students face clinical scenarios, they must gather and integrate knowledge from various domains to address complex issues through discussion and collaboration. However, Tsou et al. (2009) proposed that PBL's limitation lies in its potential inability to comprehensively cover the breadth and depth of clinical knowledge, particularly the detailed understanding of different organ systems' structures and functions. In contrast, previous studies (Chang et al., 2015; Hankin et al., 2017; Shrivastava & Shrivastava, 2020) have shown that OSBC focuses on an in-depth exploration of specific organ systems' anatomy, physiology, and pathology, constructing a systematic knowledge framework. This approach gives students a more comprehensive understanding of human anatomy and function but may need more problem-solving abilities in clinical situations.

The integration of both strategies creates a more comprehensive and realistic learning experience. Through systematic divisions guided by PBL-oriented teaching principles, instructors outline the objectives and potential pathologies of the organ system before the class. Students then seek solutions using innovative media tools or other resources and finally engage in interactive face-to-face discussions with peers and instructors during the teaching phase. Taking the cardiovascular system as an example, instructors can guide students to explore factors affecting fluid balance and their impact on the cardiovascular system before class. During actual teaching, the cardiovascular system is systematically explained and linked to anatomy, physiology, clinical cases, internal medicine, surgery, skills, and other layers to teach the mechanisms and treatment of cardiovascular diseases comprehensively. Such in-depth integration greatly enriches learning resources, allowing students to deeply understand each system's knowledge while providing a channel to access cutting-edge medical information. This approach stimulates students' self-driven cognition and thirst for knowledge in medical learning and has achieved some success in practical teaching (Si et al., 2021).

3. Method

3.1. Experimental Design

This study adopted an experimental design to investigate the impact of the integration of PBL and OSBC strategies on students' academic achievement and career maturity. Participants in this study were recruited from the senior class of a medical school in Guizhou Province, China. They were randomly assigned to either the control group, which received a traditional curriculum, or the experimental group, which underwent an integrated curriculum comprising PBL and OSBC. The participants, aged between 21 and 23, majored in clinical medicine. Detailed information about the research purpose and procedures was provided to participants, and informed consent was obtained.

3.2. Intervention Measures

The experimental group received an integrated teaching strategy, while the control group followed a traditional chalkboard-based teaching method, emphasizing lecture-based instruction. The traditional teaching model was based on standard courses, with instructors primarily employing didactic teaching methods and strict boundaries for reviewing basic medical knowledge. The intervention program was structured around PBL and OSBC. The intervention theme focused on cardiovascular system diseases and spanned four weeks, with eight sessions, each lasting 45 minutes. Before the course commenced, all participants underwent a pre-test to assess their academic levels and career maturity. articipants in the experimental group engaged in the integrated PBL and OSBC strategy. Before the course, trained instructors designed relevant questions and potential pathologies to introduce key challenges to studying the cardiovascular system. Students were encouraged to seek answers independently using resources such as new media tools and medical databases, fostering critical thinking and problem-solving abilities. During face-to-face instruction, students collectively discussed the course content, delving into real clinical scenarios systematically, including anatomy, physiology, case physiology, internal medicine, surgical diseases, and procedural pathways related to the cardiovascular system.

Meanwhile, the control group continued to receive traditional chalkboard-based teaching, which relied on conventional lectures and emphasized the delivery of standard course content, potentially limiting students' development in the depth and breadth of medical knowledge. After four weeks of intervention and following pre-tests, the experimental and control groups were subjected to post-tests to assess their academic achievement and career maturity. The pre-test served as baseline data, while the post-test and follow-up test helped evaluate the intervention's effectiveness and long-term impact.

3.3. Data Collection

Data collection spanned one month and was meticulously designed to ensure accurate and reliable data acquisition. This study employed multiple assessment tools to understand students' academic achievement and career maturity comprehensively. Cardiovascular system exams and cardiopulmonary resuscitation (CPR) skills assessments were used to evaluate students' academic achievement. The cardiovascular system exam consisted of 90 multiple-choice questions, each with a score of 1, resulting in a total score of 90, effectively measuring students' grasp of theoretical knowledge related to the cardiovascular system. Simultaneously, an adapted version of the "Study on scoring criteria of 2010 cardiopulmonary resuscitation skills assessment (Awang & Deji, 2013)" based on the "2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care (Field et al., 2010)", was employed to assess students' practical skills. This scoring sheet included 14 items, with a total score of 10, reflecting students' performance levels in cardiopulmonary resuscitation skills. The combination of these individual assessments constituted academic achievement, with a total score of 100.

Furthermore, the "Medical student and doctor career maturity scale," developed by Wang (2013), was utilized to gain deeper insights into students' career maturity. This scale comprised 23 items and employed a 5-point Likert scale, requiring participants to rate the degree of conformity between the questionnaire items' descriptions and their actual situations. A score of 1 indicated "completely incongruent," while five signified "completely congruent." This scale, validated with good reliability (r = 0.67) and validity (0.34), allowed participants to self-assess their career maturity. One month after completing the academic achievement and career maturity assessments, students underwent a retest to evaluate the retention benefits. Through this follow-up test, the study explored the long-term impact of the adopted methods on students' continued learning and career development, providing a comprehensive dataset for analysis.

3.4. Data Analysis

Statistical analysis of the academic achievement and self-concept scores of the experimental and control groups was conducted using IBM SPSS 27.0 (Statistical Package for the Social Sciences), which is statistical analysis software commonly used in a variety of research and business applications such as data analysis, data mining, predictive analytics, and report generation. Data collected in this study were subjected to ANOVA (analysis of variance) and T-tests to compare differences between the experimental and control groups. The significance level was set at $P < 0.05$, and effect sizes (Cohen's d) were set at Cohen's d = 0.2, 0.5, and 0.8, representing small, medium, and large effect sizes, respectively.

3.5. Ethical Approval

This study strictly adhered to the Medical School Ethics Committee guidelines to ensure the ethical principles were fully respected and protected throughout the research process. Informed consent was obtained from all participants before researching to ensure they comprehensively understood the research objectives, methods, potential risks, and benefits.

4. Results

Out of the initially randomized pool of 60 students in this study, the final sample comprised all participants (30 in the experimental group and 30 in the control group). There were no significant differences in critical demographic variables between the experimental and control groups, originating from the same school and academic program. Before data analysis, a normality test was conducted, confirming the fulfillment of all univariate and multivariate statistical assumptions (Howell, 2002). Before the experiment, ANOVA and T-tests were performed on the pre-test data of the experimental and control groups to determine any significant differences between the groups. To ensure that any observed differences are attributable to the intervention or therapy under investigation rather than pre-existing group disparities, assess the groups' equivalence or comparability before initiating a study (Thyer, 2010). Table 1 describes the performance of the experimental and control groups on pre-test academic scores and pre-test career maturity scores. For pre-test academic scores, the mean for the experimental group was 58.12, while that for the control group was 57.87. The statistical results were insignificant (P=0.898), and the magnitude of the difference was minimal (Cohen's d=0.033). Similarly, for pre-test career maturity scores, the mean for the experimental group was 91.47, and for the control group, it was 90.7. Again, the statistical results were insignificant (P=0.742), and the difference was slight (Cohen's d=0.085). There were no significant differences between the experimental and control groups for pre-test academic scores and pre-test career maturity, and the differences observed fell within a minimal range.

Table 1. ANOVA for experimental and control groups

Variable	Experimental group（N=30）		Control group（N=30）		Variance	
	Mean	SD	Mean	SD	F	P
Academic achievement						
Pre-test	58.12	7.47	57.87	7.63	0.02	0.898
Post-test	82.5	6.08	77.37	7.21	8.89	0.004**
Follow-up	73.25	7.04	65.92	7.1	16.14	0.000***
Career maturity						
Pre-test	91.47	8.77	90.7	9.18	0.11	0.742
Post-test	95.8	8.09	91.07	9.21	4.47	0.039*
Follow-up	96.03	8.31	91.3	9.22	4.36	0.041*

Note: *p<0.05, **p<0.01, ***p<0.001; indicates significant gender differences.

Analysis of variance was applied to the academic achievement and career maturity data, revealing variations between the experimental and control groups, as presented in Table 1. In the academic achievement study, the post-test data indicated that the experimental group achieved an average score of 82.5 (standard deviation, SD=6.08), while the control group averaged 77.37 (SD=7.21). The ANOVA results showed a significant difference between the two groups (F=8.89, $P<0.01$), emphasizing the significant academic advantage of the experimental group. A one-month follow-up test confirmed this trend, with the experimental group averaging 73.25 (SD=7.04) and the control group scoring 65.92 (SD = 7.1), again revealing a highly significant difference (F=16.14, $P<0.001$).

In the career maturity study, similar findings emerged. Post-test results indicated that the experimental group had a mean of 95.8 (SD=8.09), while the control group averaged 91.07 (SD=9.21), with a significant difference between the initial post-test results (F=4.47, $P<0.05$). One month later, the experimental group showed a mean of 96.03 (SD=8.31), and the control group had a mean of 91.3 (SD=9.22), again demonstrating a significant difference in the follow-up measurement (F=4.36, $P<0.05$). These results support the conclusion of a substantial enhancement in career maturity within the experimental group. To investigate the long-term impact of the interventions, T-tests were applied to compare pre-test and follow-up test results and post-test and follow-up test results. In the academic achievement study (Table 2), a significant difference was evident between the pre-test and follow-up test (t=-26.82, P<0.001, Cohen's d=4.897). Similarly, the comparison between the post-test and follow-up test, as shown in independent samples t-tests, yielded a significant difference (t=15.98, P<0.001, Cohen's d=2.918), affirming the sustained improvement in academic achievement in the experimental group.

In the career maturity study, the independent samples t-test between the pre-test and follow-up test also displayed a significant difference (t=-11.66, P<0.001, Cohen's d=2.129). However, in the comparison between the post-test and follow-up test, while there was a difference, it did not reach statistical significance (t=-1.882, P>0.05, Cohen's d=0.344). These analyses shed light on the evolving trends in academic achievement and career maturity within the experimental group, particularly in terms of their long-term impact.

Table 2. Independent Samples T-tests to Test for Long-term Effects.

Variable	Pretest		Posttest		Follow-up		Variance		
	Mean	SD	Mean	SD	Mean	SD	t	P	Cohen's d
Academic achievement	58.12	7.47	—	—	73.25	7.04	-26.82	0.000***	4.897
	—	—	82.5	6.08	73.25	7.04	15.98	0.000***	2.918
Career maturity	91.47	8.77	—	—	96.03	8.31	-11.66	0.000***	2.129
	—	—	95.8	8.09	96.03	8.31	-1.882	0.070	0.344

Note: ***p<0.001; indicates significant gender differences.

5. Discussions

The primary objective of this study is to delve into the synergistic impact of introducing PBL and OSBC strategies in medical education on academic achievement and career maturity. The research methodology encompassed the random selection of 60 students, who were subsequently divided into experimental and control groups to evaluate the efficacy of integrated teaching strategies. Before data analysis, the study ensured the equivalence of vital demographic variables between the experimental and control groups, thereby mitigating potential interference from pre-existing disparities and ensuring that observed differences primarily resulted from the research intervention or treatment rather than originating from pre-existing differences among the groups.

The research findings reveal that the significant improvement in academic achievement within the experimental group stems from the combined influence of multiple factors. The application of PBL within the experimental group has facilitated the enhancement of academic achievement. As elucidated by Stanley and Marsden (2012), the core value of PBL lies in cultivating students' autonomous thinking and problem-solving abilities, fostering critical thinking, and promoting significant progress in comprehensive skills through teamwork in addressing real-world problems. The experimental group likely nurtured a more positive academic atmosphere, encouraging students to actively pursue knowledge, thereby resulting in a substantial improvement in academic achievement. On the other hand, the introduction of OSBC in the experimental group has also positively influenced academic achievement. The focal point of this strategy is to deepen students' understanding of the structure and function of the human organ system (Papa & Harasym, 1999), aiding students in gaining a more comprehensive grasp of medical knowledge and its application in practical scenarios. The students in the experimental group may be better equipped to flexibly apply their acquired knowledge in academic activities, thereby making significant progress in their academic achievement. Furthermore, it is worth noting that the sustained improvement in academic achievement among the experimental group students highlights the long-term impact of these two teaching strategies. This enduring academic achievement may reflect students' continuous thirst for knowledge and their unwavering commitment to applying the knowledge acquired in actual academic activities. This academic consciousness and motivation for continuous learning may become evident in subsequent measurements one month later, further solidifying the positive effects of improved academic achievement among the experimental group students. This long-term impact provides reliable support for integrating PBL and OSBC in promoting academic achievement, aligning with the findings in existing literature (Si et al., 2021; Stephens, Bausch, Pock, & Merrell, 2017). Similar trends are observed in the context of career maturity. Introducing PBL cultivated a higher level of career maturity within the experimental group. PBL emphasizes teamwork, problem-solving, and independent learning, encouraging students to participate in professional practices and enhancing their professional competence. Under the guidance of PBL, students in the experimental group may become more self-aware in developing the necessary skills for adapting to medical environments, including interdisciplinary collaboration, practical problem-solving, and effective communication with patients. Secondly, the application of OSBC may also positively impact the career maturity of the experimental group students. This strategy emphasizes a comprehensive understanding of organ systems, helping students tightly integrate their acquired medical knowledge with actual clinical practice. Students in the experimental group may focus more on the application of organ systems and practical approaches during their learning process, thus nurturing their ability to demonstrate higher levels of professional competence in clinical contexts. However, it is noteworthy that although the differences in career maturity between groups have slightly diminished and did not reach statistical significance in the comparisons conducted at the post-test and one-month follow-up, an overall positive trend is still evident. This suggests that educational interventions may have specific limitations regarding their long-term impact on career maturity. To ensure the sustained improvement of career maturity, future educational programs can further optimize strategies, strengthen their alignment with professional practice, and develop students' adaptability in actual medical environments. This could include providing more clinical practice opportunities and interdisciplinary training (Berwick & Finkelstein, 2010; Revell et al., 2022). Therefore, the significant improvement in career maturity among the experimental group students results from the collaborative effect of PBL and OSBC. PBL encourages teamwork and problem-solving, while OSBC emphasizes practical application, which may collectively drive students to demonstrate higher levels of career maturity in their career development.

In medical education, the design and implementation of teaching strategies have been a subject of extensive attention in both the educational and medical communities. In today's rapidly changing and highly complex healthcare environment, cultivating adaptable medical professionals with highly diverse skill requirements has presented a longstanding challenge (World Health Organization, 2005). To address this challenge, the design of medical education strategies must consider many factors. One critical issue facing medical education is how to cultivate students' comprehensive competencies and professional readiness while imparting traditional medical knowledge. While traditional medical knowledge forms the basis of a physician's competence, in today's modern healthcare environment, the skills required of physicians extend beyond this foundation. Physicians must possess critical thinking, problem-solving, and interdisciplinary collaboration skills (Clark & Hoffman, 2019). Therefore, the construction of teaching strategies should focus on nurturing students' practical skills, teamwork, communication abilities, and ethical awareness, among other multidimensional competencies, to ensure their ability to address the diverse and complex situations encountered in actual clinical work.

Another critical issue in the design of medical education strategies is how to effectively integrate academic achievement and career maturity (Bai, 2011; Liu et al., 2014) academic achievement reflects students' academic abilities and knowledge levels (Sansgiry, Bhosle, & Sail, 2006), while career maturity encompasses various practical skills and high-level competencies required in actual clinical practice. In training medical students, it is imperative to pursue outstanding academic achievements and ensure that students can effectively apply their knowledge and skills in clinical settings to provide high-quality medical services to patients. Therefore, the essence of medical education lies in motivating students to excel academically while possessing the practical abilities required to perform effectively in natural clinical environments. To achieve this goal, medical education must thoroughly explore feasible methods and approaches. Taking into account the challenges and demands in the field of medical education, in addition to traditional teaching methods such as PBL and OSBC, other teaching strategies contribute to improving the academic achievement and career maturity of medical students. For example, clinical simulation education provides students with a safe, practical environment to practice and develop medical skills while enhancing patient safety (Aggarwal et al., 2010). However, it should be noted that this approach requires significant resource investment (Richardson, Goldsamt, Simmons, Gilmartin, & Jeffries, 2014).

Nevertheless, this study is subject to certain limitations that require full acknowledgment. First and foremost, the sample size is relatively small, comprising only 60 students, which may limit the generalizability and stability of the research results. This sample size may need to be increased to fully represent the diversity and variations within the entire population of medical students, thereby posing challenges to the external validity of the research findings. Secondly, this study focused on exploring the effects of PBL and organ system-based curriculum without considering other potential factors that could influence academic achievement and career maturity. Medical education involves multiple complex variables (White, Lewis, & McCoy, 2018), such as individual student traits, the teaching environment, and other educational methods, all of which may interact with and influence research results. Furthermore, this study primarily concentrated on academic achievement and career maturity without delving into the potential mechanisms underlying the relationship between other factors. Consequently, future research endeavors can expand the sample size, consider additional influencing factors, and conduct in-depth analyses of the mechanisms underlying the relationship between academic achievement and career maturity to understand the effectiveness and limitations of medical education strategies.

6. Conclusion

In conclusion, this study, involving 60 carefully selected students, revealed that integrating Problem-Based Learning (PBL) and Organ System-Based Curriculum (OSBC) significantly improved academic achievement in the short term, with lasting effects observed one month later. The study also demonstrated initial enhancements in career maturity, although these were less sustained over time. The findings underscore the potential of these integrated teaching strategies in medical education to foster critical thinking and practical skills. However, further refinements may be needed to ensure long-term improvements in career maturity. This research contributes to the ongoing discourse on effective medical education strategies and emphasizes the need for a multifaceted approach to preparing students for academic excellence and clinical competence. Further investigations with larger sample sizes and consideration of additional factors are recommended to gain deeper insights into medical education dynamics.

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