

Enhancing Learning Outcomes in Vocational Nursing Education Through Low-cost Digital Resources

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Abstract: With the deepening of educational reform, clinical nursing faces increasingly higher requirements in response to societal developments. Vocational nursing students primarily study humanities and social sciences, medical foundations, preventive health care theories, nursing basics, and clinical nursing skills. These subjects are broad and abstract, necessitating the integration of theory with practice to enhance understanding and mastery. In the digital era, numerous resources, such as smartphones, the Superstar Learning Platform, WeChat communication tools, and artificial intelligence, can be utilized in teaching. This study aims to employ low-cost online resources to implement blended teaching methods in nursing education at higher vocational colleges, enriching the classroom experience, stimulating student enthusiasm, improving learning outcomes, and meeting clinical needs.

Keywords: Low-cost resources; Higher vocational nursing education; Learning outcomes; Nursing

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1. Investigation of problems in nursing education at higher vocational colleges

Several challenges persist in China's vocational education system, including incomplete system development, insufficient vocational skills training bases, lack of standardized systems, limited incentives for enterprises to participate in education, inadequate supportive policies for technical talent growth, and uneven quality in institutional performance and personnel training^[1-3].

The current nursing education management model predominantly relies on classroom teaching. Under teacher guidance, students acquire concentrated nursing knowledge systematically. Practical training typically involves imitation-based learning under supervision, emphasizing basic operational skills. However, this approach limits student initiative and creativity, reduces opportunities for self-study and discussion, and hampers the development of independent learning abilities. Moreover, course assessments remain uniform, relying solely on end-of-semester

examinations ^[4-6].

Feedback from hospitals in recent years has highlighted a mismatch between the competencies of vocational nursing graduates and the clinical needs of healthcare institutions. This gap reveals insufficient alignment between graduate qualifications and workplace demands ^[7,8].

To address these challenges, a survey was conducted using Questionnaire Star to assess the perspectives of clinical nursing professionals and managers. A total of 114 valid responses were obtained, including 81 clinical nurses (71.05%) and 31 nursing managers (27.19%). The survey findings are presented in **Table 1**.

Table 1. Problems identified in vocational nursing education and training in the hospital (*n* = 114)

Category	Issue	Frequency (Proportion)
Primary issues in cultivating nursing professionals	Theoretical knowledge disconnected from practice	89 (78.07%)
	Insufficient skill development	82 (71.93%)
	Limited emotional care ability for patients	82 (71.93%)
Areas requiring improvement	Clinical practice skills	95 (83.33%)
	Humanistic care education	93 (81.58%)
Necessary reforms	Teaching methods	90 (78.95%)
	Internship and training arrangements	86 (75.44%)
	Assessment and evaluation system	79 (69.30%)
Additional considerations	Strengthening nursing ethics education	70 (61.40%)
	Enhancing research capabilities	82 (71.93%)
	Practical training not aligned with work needs	37 (32.46%)

2. Survey results

- (1) Main problems in talent training: Disconnection between theory and practice, insufficient skill training, and inadequate development of emotional care abilities for patients.
- (2) Aspects to be strengthened in personnel training: Clinical practice ability, nursing skills, and humanistic care education.
- (3) Areas requiring reform in personnel training: Teaching methods, arrangements for practice and training, and the assessment and evaluation system.

The analysis of the survey results highlights that clinical operations and practical abilities are the most significant challenges in nursing education at higher vocational colleges. Although the sample size of the survey is limited and does not encompass all hospitals nationwide, the participants represent senior clinical nurses and nursing managers from tertiary hospitals in the district, which provides a degree of representativeness. Given that most graduates find employment locally, the survey reflects the challenges relevant to the region.

Social demand serves as both the driving force and foundation for the development of higher vocational education. By analyzing national vocational education statistics, the key issues and societal needs of nursing vocational education have been identified ^[9,10]. However, a gap persists between educational offerings and societal demands. Challenges such as integrating theory with practice, optimizing teaching duration, addressing insufficient practical training time, and managing imbalances in economic investment remain prevalent ^[11,12].

Teachers, teaching materials, and teaching methods are the three essential pillars of talent cultivation in higher vocational colleges. Teachers act as facilitators, teaching serves as the delivery mechanism, and teaching methods function as vital media for knowledge transfer^[13,14]. Therefore, questions arise about how to align nursing education with clinical requirements. Key areas for exploration include enhancing teaching methods, leveraging digital resources, and improving students' learning outcomes within existing resource constraints. Achieving these goals requires equipping instructors to become “double-qualified” teachers—capable of both theoretical and practical instruction—while enabling students to meet clinical demands effectively.

3. Use of low-cost resources to promote learning outcomes

With the advancement of digitalization, various low-cost resources can be effectively utilized in nursing education at higher vocational colleges. Resources such as smartphones, the Super Star learning platform, WeChat communication tools, AI applications, and digital libraries provide cost-efficient options for enhancing teaching methods. Practical experience has shown that leveraging these resources can significantly improve learning outcomes.

3.1. Application of mobile phone resources

In the era of smartphone ubiquity, each student effectively possesses a mobile computing device. Building upon traditional classroom teaching, mobile learning offers an additional layer of flexibility. Learners can access study materials, communicate with instructors, and engage in knowledge construction anytime and anywhere through mobile devices. The primary advantages include the convenience and personalized nature of mobile learning.

- (1) Transforming the learning system: With institutional approval, elements of the learning system have been adapted to allow vocational nursing students to integrate mobile phones into their academic activities. These adaptations include accessing the learning platform, participating in roll calls and quizzes, viewing media materials, and engaging in discussions. Students, being adept with mobile technology, show greater interest and involvement compared to traditional teacher-led methods. The flexibility to manage their own study time, location, and content, alongside diverse learning resources such as “micro-courses” and “MOOCs,” enhances their independent learning and practical skills.
- (2) Supporting practical training: During nursing practical training, students can reinforce their learning through mobile video resources. After the instructor demonstrates the necessary procedures, students work in groups to practice the operations, repeatedly viewing instructional videos for guidance. Teachers then provide feedback to help students progress from novice to proficient levels. This approach fosters vivid image-based memory of the steps, encourages self-directed learning, promotes group collaboration, and yields notable improvements in skill acquisition.
- (3) Enhancing theoretical teaching: Micro-videos serve as an effective supplement to theoretical instruction. When presenting complex or abstract topics, teachers use instructional videos to provide students with a visual and intuitive understanding of the material. This approach bridges the gap between theory and practice, enabling students to better comprehend and apply their knowledge to clinical scenarios.

Through the strategic use of smartphones and digital resources, vocational nursing education can better align with modern teaching methodologies and clinical requirements, ultimately improving both teaching efficiency and student outcomes.

3.2. Application of the Superstar Learning Platform

The Superstar Learning Platform serves as a comprehensive online and offline communication platform for teachers and students, utilizing network-based information technology. Its main functions include a mobile library, note-taking capabilities, and group socializing features. These functions enable resource sharing, interactive learning, and enhanced communication to meet the diverse educational needs of nursing students.

- (1) Downloading the Superstar Learning Platform app: The Superstar Learning Platform app supports managing teaching plans, course standards, syllabi, multimedia courseware, notices, assignments, and question banks. It allows educators to upload various teaching resources, establish a centralized learning resource bank, and conduct both online and targeted teaching activities.
- (2) Resource integration: The platform integrates offline nursing teaching materials, cases, images, and nursing body searches with digital teaching resources. This integration offers students access to richer and more diverse learning content, enhancing the breadth and depth of their studies.
- (3) Advance student preparation: The platform enables advanced curriculum notifications that include thought-provoking questions, encouraging students to cultivate a habit of previewing. By utilizing network resources, students can search for relevant knowledge and expand their learning scope prior to class.
- (4) Online learning: The Superstar Learning Platform allows students to study anytime and anywhere. Its library of teaching micro-videos helps students grasp theoretical concepts and practical operations more effectively. For instance, when studying congenital heart disease, video resources can provide practical demonstrations, such as heart murmur auscultation, which enhances students' clinical application skills.
- (5) Multimedia integration for teaching: The use of text, images, and videos offers excellent visual support, enhancing students' comprehension of abstract theoretical concepts. This approach improves their understanding of practical operations, skills, and principles, leading to better mastery of clinical knowledge.
- (6) Teacher-student interaction: The platform facilitates multi-dimensional interaction through online tests, Q&A sessions, and discussion forums. These features help address students' concerns and provide real-time solutions to their questions.
- (7) Assignments and tests: Using the platform for in-class tests, homework, and case analyses allows instructors to assess students' theoretical and practical learning progress. Identifying and addressing issues during class enhances the overall learning experience.
- (8) Data analysis: The platform enables the analysis of students' examination and learning data, providing valuable insights for teachers to make informed decisions. These insights help improve instructional strategies and guide students more effectively, ultimately enhancing the quality of teaching.

By leveraging the diverse functionalities of the Superstar Learning Platform, nursing education in vocational colleges can be made more efficient, interactive, and aligned with clinical needs.

3.3. Application of the WeChat communication platform

The WeChat platform integrates text, images, voice, and video as effective methods of information dissemination. It is widely accepted due to its characteristics of instant interaction, simplicity, convenience, and efficiency, which significantly enhance the timeliness of learning and communication.

3.3.1. Case analysis to promote integration of theory and practice

Leveraging teachers' extensive clinical experience, real cases related to classroom content and clinical practice are published on the WeChat platform. These cases are designed to encourage students' critical thinking by combining theoretical knowledge with real-world applications. The process of case analysis and problem-solving helps develop students' clinical reasoning skills and fosters the integration of theory with practice.

Additionally, ideological and political elements are embedded within the cases to inspire reflection on life values, ethics, and the moral significance of healthcare. This approach nurtures students' humanistic qualities, fostering respect for patients, a sense of responsibility, compassion, care, and ethical integrity—essential attributes for medical professionals^[15].

3.3.2. Increasing study time

Mobile learning through the WeChat platform reduces time spent on non-educational activities, such as gaming while increasing post-class study time. This strategy has demonstrated an improvement in students' learning enthusiasm and academic performance.

3.4. Artificial intelligence and knowledge graph application

The 20th National Congress of the Communist Party of China emphasized the promotion of digital education and the creation of a lifelong learning society. Artificial intelligence (AI) and knowledge graphs are integral to blended teaching, enabling personalized learning through resource recommendation, learning path planning, and knowledge point correlation analysis. These tools enhance both teaching effectiveness and student learning outcomes.

In vocational nursing education, deficiencies in knowledge organization and retention are commonly observed among students. The Super Star Learning Platform facilitates the construction of knowledge maps, including outline models, mind maps, and map models.

Knowledge graphs make theoretical knowledge more tangible, allowing students to clearly identify knowledge points and understand their interconnections. This comprehensive approach fosters active learning, innovation, and improved academic outcomes.

AI tools, combined with learning graphs, assist teachers in monitoring students' learning progress and identifying gaps. This data-driven approach allows instructors to adapt teaching strategies effectively, optimizing educational outcomes and ensuring the alignment of instructional methods with students' needs.

By utilizing AI and knowledge graphs, vocational nursing education can address individual learning deficiencies and provide tailored support, contributing to the overall improvement in teaching quality and learning results.

4. Effect analysis

A comparative analysis was conducted to evaluate the teaching effectiveness of multiple digital resources used in a vocational nursing course. This comparison involved a class of 70 students, assessing the impact of teaching strategies implemented during the last semester and the current semester. The results are presented in **Table 2**.

Table 2. Learning effect of digital resources in promoting higher vocational nursing ($n = 70$)

Evaluation project	Evaluation method	Purpose of evaluation	Last semester's situation	This semester's situation	Comparison results
Case analysis	Statistics from classroom record sheets; rate of answering questions connecting theory with practice	Assess student's ability to link theoretical knowledge with practice	20%	93%	Significant growth
Nursing operations in cases	Using WeChat to publish case studies for scenario-based teaching	Evaluate students' ability to connect theory with practice and practical operation skills	71%	92%	Significant growth
	Students analyze and practice based on patient conditions; the qualification rate of practical operations assessed				
Classroom performance: proactive question-answering rate	Statistics from classroom record sheets	Analyze students' active learning	7%	68%	Significant growth
Accuracy of on-site testing	Superstar Learning Platform calculations during class testing	Observe the effectiveness of on-site teaching in combining theory with practice	83%	95%	Significant growth
Homework analysis	Data from the Superstar Learning Platform to test clinical thinking accuracy	Assess students' clinical thinking abilities	56%	89%	Significant growth
		Conduct error analysis			
Final grade	School system: excellent rate	Comprehensive evaluation of students' comprehension	23%	65%	Significant growth
Teaching evaluation	School system: excellent rate	Assess students' evaluation of teachers	86%	95%	Significant growth

The analysis demonstrates significant improvement across various evaluation metrics. Case analysis, scenario-based teaching, and proactive engagement exhibited substantial growth in students' ability to connect theoretical knowledge with practical applications.

The accuracy of on-site testing and homework analysis showed marked improvement, reflecting enhanced clinical thinking and application skills. Classroom engagement and proactive participation improved notably, indicating greater active learning and interest in course content.

The improvement in final grades and teaching evaluation ratings highlights the effectiveness of using digital resources to optimize teaching methodologies and learning outcomes. These results affirm the value of integrating technology-driven strategies to foster better comprehension, practical application, and overall performance in vocational nursing education.

5. Conclusion

In higher vocational nursing education, understanding and aligning with societal needs are foundational to effective talent cultivation. The era of big data has accelerated the digitalization of education, providing diverse forms of digital teaching resources. This study utilized low-cost teaching tools such as smartphones, the Superstar

Learning Platform, the WeChat communication platform, and AI applications within the same class and course.

A comparison of teaching effectiveness between the last semester and the current semester was conducted, focusing on seven key aspects (refer to **Table 2**). The findings revealed significant improvements in students' ability to integrate theoretical knowledge with practical skills and in their operational competencies.

In the context of the digital era, further exploration is necessary to determine how digital teaching methods can be effectively combined with traditional teaching approaches to enhance overall teaching effectiveness.

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