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Undergraduate Nursing Students' Training Needs in Nursing Skills: An Interview Study Based on the Open Laboratory

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Abstract: *"Basic Nursing" is fundamental in nursing education. Due to limited lab hours, the open laboratory model enhances skill development. This study explores nursing students' needs in this setting through semi-structured interviews with 10 students, analyzed via Colaizzi's method. In terms of laboratory management, nursing undergraduates had the needs of optimizing personnel arrangement, increasing opening hours, timely updating and supplementing equipment and materials, and information management. In terms of skill practice, there is a need for standardization, improving simulation authenticity and providing technical guidance; In terms of feedback, there is a need for post-practice feedback and communication channels. The needs of nursing undergraduates for open laboratory personnel, opening hours, use management, high simulation models and technical support, feedback and communication channels, and auxiliary teaching platforms need to be further met. It is suggested to start from the aspects of optimizing the laboratory management system, developing information management, optimizing instruments and equipment, and actively meet their skill practice needs to help them improve their professional skills.*

Keywords: *Nursing; Open Laboratory; Practice; Needs; Interview*

1. Introduction

"Basic Nursing" is a cornerstone course in nursing education, providing the essential foundation for nursing students to begin their clinical practice. The "Action Plan for Further Improvement of Nursing Services (2023–2025)" (Document No. 16 [2023] issued by Chinese National Health Commission) underscores the importance of continually advancing the technical skills within the nursing profession to foster high-quality development. Despite the fact that basic nursing procedures are numerous and time-intensive, laboratory class hours are limited [1-2]. Consequently, students need to utilize time outside of class to practice their skills in the laboratory. The open laboratory model has emerged as an innovative approach in nursing education, addressing the limitations of in-class practice while maximizing the use of laboratory resources and equipment [3]. This model, often termed the "second classroom" for nursing students [4], plays a vital role in skill development [5-6]. Educators should embrace a student-centered teaching philosophy that emphasizes student needs, guiding and motivating students to identify challenges within the laboratory, articulate their needs, and explore effective solutions for laboratory management and skill enhancement [7]. However, there is a notable lack of research on the specific needs of nursing students regarding open laboratories. This study employs semi-structured interviews with undergraduate nursing students at a comprehensive university to thoroughly investigate their needs for basic nursing skill training in an open laboratory setting, aiming to provide insights for enhancing nursing education effectiveness.

2. Materials and Methods

2.1 Research Subjects

A purposive sampling method was used to select ten second-year undergraduate nursing students (labeled N1–N10) from a comprehensive university in June 2023. The inclusion criteria were as follows: (1) second-year undergraduate nursing students; (2) students who had practiced basic nursing skills in an open laboratory; (3) students capable of clearly articulating their experiences; and (4)

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students who voluntarily agreed to participate in this study. Exclusion criteria included: (1) students on academic or medical leave. The sample size was determined based on data saturation; after interviewing the eighth participant, no new information emerged, and two additional interviews were conducted to confirm data saturation. At this point, the interview process concluded.

2.2 Methods

2.2.1 Development of the Interview Outline

An initial interview outline was drafted based on a review of relevant literature, followed by expert consultation and pre-interviews to refine the outline. The finalized outline focused on students' expectations and experiences, as well as the gaps between them. The main topics included: (1) What are your objectives for practicing in the open laboratory? (2) How does the current open laboratory compare with your expectations? (3) What discrepancies do you observe between the knowledge and skills acquired in the open laboratory and your expectations? (4) What solutions do you suggest to address these gaps? (5) What are your views and suggestions regarding practice support platforms?

2.2.2 Data Collection Methods

Semi-structured interviews were conducted following the final exam for the Fundamentals of Nursing course. These interviews took place in a quiet classroom environment, lasting between 25 and 50 minutes each. Prior to each interview, participants were informed about the study's purpose, their rights, and the assurance of privacy protection, and informed consent was obtained. The interviews were audio-recorded, and detailed notes were taken throughout.

2.2.3 Data Analysis Methods

The recorded interviews were promptly transcribed into text, and the data were analyzed using Colaizzi's seven-step method: (1) Thoroughly and repeatedly read all textual data; (2) Identify significant statements; (3) Code recurring viewpoints; (4) Categorize the coded viewpoints into themes; (5) Provide a detailed description of the themes; (6) Refine the thematic concepts to develop a basic structure; (7) Return to participants for verification. Two researchers independently analyzed and coded the original data. Through repeated comparison, analysis, and discussion with the research team, final codes and themes were established.

3. Results

A total of 173 nodes emerged from the text coding process, leading to the identification of four themes: the need for optimizing laboratory management, model optimization and technical support, feedback and communication channels, and enhancing auxiliary platforms.

3.1 Optimization of Laboratory Management

3.1.1 Need for Enhanced Student Management

While the open laboratory model offers students greater convenience, it also requires them to exercise self-discipline. Respondents reported frequent instances of laboratory rule violations due to insufficient oversight, such as failing to organize materials after use. A key area of concern was the need for clear laboratory regulations and enhanced supervision. N6 stated, "The biggest issue is when students practice intravenous infusions, they sometimes leave the needle uncapped, which is dangerous and shows a lack of responsibility. I think there should be a rule that if a student is found not cleaning up after practice, they should be temporarily barred from the laboratory." N7 added, "Leaving needles uncapped is irresponsible and unsafe... Perhaps a teacher could help supervise this, or we could appoint a group leader or have classmates take on this responsibility."

Additionally, due to overlapping free time caused by other courses and exams, students from the same grade often end up crowding the laboratory at the same time. This highlighted a need for staggered practice schedules. N1 suggested, "To manage the flow of students, maybe practice times could be divided by class, perhaps with only half of the grade or a few classes using the lab at a time." N10 proposed, "For example, each class could have a representative who collects lab cards and coordinates, so specific days could be assigned to particular classes or groups of students."

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3.1.2 Need for Extended Laboratory Hours

The current laboratory hours are insufficient to meet student needs, as the lab is only open at the end of the term, by which time some skills have already been forgotten. Respondents expressed a desire for extended hours and increased availability of laboratory sessions. N6 remarked, "The timing should be as close as possible to the week following our lab class, when the material is freshest in our minds. Practicing then yields the best results." N8 suggested, "Although it's understandable that the lab isn't open on weekends, extending the daytime hours could be more conducive to our practice." N9 added, "The lab closes at 3:00 p.m., but some of our classes end at 2:55 p.m. We often want to practice more, but our schedules are too tight… Could the lab hours be extended a bit further, within feasible limits?"

3.1.3 Need for Improved Equipment Management

The laboratory currently lacks sufficient equipment, materials, and beds, and the majority of disposable items are consumables, making them difficult to reuse and negatively affecting practice outcomes. Respondents emphasized the need for regular updates and restocking of laboratory supplies, as well as an increase in the availability of beds and equipment. N1 noted, "For instance, scalp vein sets and infusion bags for intravenous practice may have been used by others, although I understand it may be challenging to provide new ones each time... Items like the Murphy dropper should ideally start empty and be filled during practice. If I use one that's already been used, I can't practice that step fully... It might be necessary to open more labs or provide additional beds, equipment, and materials." N7 stated, "There aren't enough instruments... we often have to wait for a long time." N9 added, "Expelling air from an IV line is a crucial step, but since we practice with equipment that has already been used, most of us never fully master it. Only the first group gets fresh equipment; afterward, no one else can practice it properly... If possible, it would be beneficial to update the equipment more frequently."

3.1.4 Need for Information Management

Respondents frequently highlighted the need for information-based laboratory management, including features like online reservations for laboratory beds. N2 suggested, "It would be more convenient if the system were digitalized, allowing us to reserve beds online instead of relying on paper registration." N5 added, "Laboratory management could incorporate smarter features, such as using facial recognition or swipe cards to open the lab door, which would allow for better tracking. For accessing supplies, a locker system where we swipe a card to retrieve materials would eliminate the need to always ask the teacher."

3.2 Needs for Model Optimization and Technical Support

3.2.1 Enhancing Model Realism and Simulation Authenticity

Respondents reported that skill practice in open laboratories is hindered by the low realism of models, which makes it challenging to fully immerse in the nursing role. They expressed a desire for models equipped with feedback features to enhance simulation authenticity. N2 suggested, "It would be helpful if the models could provide feedback on whether we're performing a procedure correctly—for instance, with catheter insertion, fluid might come out or there could be a sound once the correct depth is reached." N6 noted, "The mannequins lack realism... it's hard to fully step into the nurse's role." N9 added, "It would be better if the models were as lifelike as real patients."

3.2.2 Guidance in Skill Practice

Beyond the need for resources and time management, respondents also expressed a strong desire for guidance during skill practice. They suggested that standardized instructional materials, such as videos, and support from teachers, senior students, or peers who have passed assessments would be beneficial in the open laboratory. N5 remarked, "There should be a standardized video because the teachers who instruct us aren't always the ones who assess us, and sometimes their operational requirements vary." N8 added, "A standardized demonstration, not just written, but a video combining audio and visuals, would leave a more lasting impression." N6 proposed, "If teachers are too busy, proficient seniors or peers could offer guidance and share insights in the lab." N9 further suggested, "It would be helpful if experienced students, teachers, or others skilled in certain techniques could be available at specific times, so we could practice under their supervision and have them point out errors. Learning could then continue beyond the classroom setting."

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3.3 Needs for Feedback and Communication Channels

Respondents highlighted the lack of convenient feedback mechanisms, such as ways to report laboratory supply shortages. They felt that objective peer feedback and experience-sharing were crucial, and they expressed a need for enhanced feedback and communication platforms. N7 stated, "There should be a method for timely feedback. We know where things fall short, but we don't know who to report it to—there's no effective communication channel." N1 suggested, "After using the open lab, each student could write down tips or important things to remember, not just reflections, but specific key points." N9 added, "We could upload areas of confusion to a platform, ideally anonymously, or take a video and post it. Then, if a teacher or senior sees it, they could respond. That would be really helpful." N6 noted, "Both online platforms and offline methods, like writing notes to inform teachers, are viable solutions."

3.4 Needs for Enhancing Auxiliary Platforms

Respondents mentioned that existing auxiliary teaching tools, such as the "NordSkills" mini-program, were somewhat useful but still required optimization to resolve issues like app crashes. They also suggested additional features, such as remark and discussion functionalities in the peer practice section. N2 pointed out, "The Nord mini-program has issues, like being unable to deduct points or crashing." N1 added, "It would be useful to have a feature that allows us to add remarks, like where someone didn't perform well. If I want to deduct a point, but forget why, a note like 'didn't verify the patient's name' could help when reviewing errors later. Additionally, we could create a new section for 'Experience Sharing or Reflection,' functioning as a discussion area." N7 suggested, "The operational procedures could be more detailed."

4. Discussion

To address issues in laboratory management and improve the efficiency of laboratory exercises, it is necessary to further optimize the laboratory management system, strengthen the informatization of open laboratories, and enhance models and equipment.

4.1 Optimization of the Laboratory Management System

Optimizing the laboratory management system is a critical component in meeting students' needs for open laboratories and addressing existing management issues. Administrators should refine the regulations and management protocols for open laboratories to ensure that all management practices are well-documented and enforceable. Course coordinators, laboratory center instructors, and other relevant management personnel should perform their respective duties and manage collaboratively to ensure the orderly operation of open laboratories.

1) Regarding open hours, this study found that current laboratory open hours do not meet students' needs due to their high curiosity. Previous research by Luo Hui [5] and Yao Qiuli [8] also indicated that some students desire more flexible and free open hours to increase their practice time and opportunities. Many students expressed a strong need for timely post-class practice, with most hoping to have opportunities for practice within a week to consolidate the knowledge and skills they have learned. Therefore, all stakeholders should reach a consensus, plan collectively, and reasonably arrange laboratory open hours.

Regarding student management, student representatives could be mobilized to autonomously manage laboratory supplies and the environment, from preparing materials to closing the open laboratory. Students would manage these aspects independently, and any lost or damaged items should be compensated for according to regulations. This approach not only enhances students' hands-on abilities but also cultivates their sense of responsibility [9-10].

3) Regarding supplies management, teachers or laboratory management personnel should promptly address student feedback, replenish and inspect laboratory supplies and equipment in a timely manner [10]. For safety reasons, even with student self-management, a teacher should be on duty. In case of situations that student representatives cannot handle, or in emergencies or dangerous situations, the teacher on duty should intervene promptly and reliably. A certain nursing school adopted a management model where the laboratory center handled overall planning, student representatives managed autonomously, and teachers provided on-demand guidance to enhance laboratory utilization

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and increase post-class practice opportunities, yielding positive outcomes [9]. This management model could serve as a reference for other institutions.

4.2 Strengthening Informatization of Open Laboratories

According to this study, there is a widespread demand for informatization in terms of supplies, personnel, time management, and resource provision. This demand likely stems from the convenience and efficiency that informatized laboratories can provide. Yao Qiuli [8] found that students' needs mainly focus on adding bulletin board sections, posting learning materials, and increasing mobile reservation options, consistent with this study's findings. Therefore, efforts should be made to enhance the informatization of laboratories in these areas.

1) Building an online reservation platform: The use of an open laboratory reservation platform is a crucial aspect of managing nursing laboratories [8]. The demand for reservation functionality likely arises due to limitations in space and equipment. Advance reservations can help prevent overcrowding, save time, and improve efficiency.

2) Establishing an online communication and feedback platform: The demand for message boards and feedback functions may be due to varying interpretations of assessment standards during basic nursing skills practice. Peer sharing and communication could better facilitate understanding of operational details. Students can record and submit any questions during independent practice on the message board for teachers to address. They can also record operation videos, compare them with standard videos for self-assessment, or submit them to teachers for evaluation to improve practice quality.

3) Using online platforms to strengthen standardization: Standardized videos and related materials can be published on the platform for students to access at any time. This enables them to review and fill in knowledge gaps during their practice. Researchers could develop a comprehensive laboratory management platform integrating all these functions, or add functional modules to existing practice support platforms to meet student needs. A certain university developed a multifunctional WeChat public account for laboratory management, information dissemination, competition registration, online teaching, and interaction, which has been applied to nursing laboratory management. This platform, characterized by convenience, efficiency, and diverse services, received high satisfaction from students and improved laboratory resource utilization [8]. However, there is still room for further optimization of current informatized laboratory platforms. More attention should be given to meeting students' autonomous and personalized needs, providing them with more efficient and convenient services [8]. Additionally, the construction of nursing laboratories in universities is constrained by factors such as funding, space, and product updates. The implementation of informatized laboratories should fully consider these factors and be carried out in accordance with the specific circumstances of each institution [11].

4.3 Optimization of Models and Equipment, and Provision of Virtual Simulation Experiments as Alternative Methods

This study shows that students have a high demand for the equipment and models in open laboratories, both in terms of quantity and quality. Laboratory instruments and equipment are the material foundation for nursing skills training. High-quality nursing simulation models and equipment are essential for cultivating students' solid clinical nursing skills [10]. Therefore, timely updates of models and equipment are crucial to improving the quality of students' skill practice. Some universities have invested substantial funds in optimizing nursing open laboratory facilities and equipment. They also analyze equipment and consumable usage and wear in real-time through intelligent management platforms, adjusting and optimizing procurement plans accordingly, resulting in improved management levels and increased satisfaction with open laboratories among both faculty and students [12].

For universities, increasing investment in laboratory teaching funds to purchase equipment and models is necessary. However, a lack of funding has long been a challenge for laboratory construction[13], and financial constraints often delay the timely updating of equipment and models. In cases of limited resources, institutions might consider introducing virtual simulation experiments in basic nursing skills as an alternative for post-class practice. The widespread application of virtual simulation technology in higher education in recent years has brought about a new transformation in experimental teaching. By creating virtual simulation laboratories that replicate physical ones on a 1:1 scale, the limitations of time and space can be overcome. This approach also helps students immerse

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themselves in and master operational skills to a certain extent [14].

For students, it is essential to take care of models and use equipment correctly during laboratory use, avoiding intentional damage, and being well-prepared before entering the open laboratory for practice. For teachers, innovation in experimental teaching content and teaching systems is crucial to help students enhance their role-playing ability and the realism of simulations during practice from a subjective perspective.

5. Conclusion

Open laboratories are essential spaces for nursing students to practice fundamental skills, and their construction and management significantly influence the effectiveness and quality of skill development. Addressing students' needs is therefore crucial to the construction and management of these labs. Optimizing and enhancing open laboratories to align with student needs is essential. Key areas of focus include personnel management, lab hours, supply management, high-fidelity models, technical support, feedback and communication channels, and supplementary teaching platforms. To better meet these needs, it is recommended to start by optimizing the laboratory management system, advancing digitalized management processes, and upgrading instruments and equipment. These improvements would provide students with increased practice opportunities and an enhanced practice environment. As a result, laboratory utilization rates would improve, helping nursing students develop the professional skills necessary to adapt to nursing roles in their future careers, thus becoming competent and capable nursing professionals [6].

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