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Design and assessment of a web-based educational electronic system for non-practical nursing skills development among nursing students

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Abstract

Background Despite the importance of non-practical nursing activities, there is currently a lack of a suitable framework for their use among nurses and nursing students in Iran. This study aimed to design, implement, and evaluate a web-based educational electronic system for developing non-practical nursing skills (ESNPNSD).

Methods This sequential methodological study was conducted in three phases: (1) identifying the Minimum Data Set (MDS) elements, (2) designing, developing, and implementing the system, and (3) evaluating the ESNPNSD. The system was assessed by 72 nursing students from two academic semesters, selected through convenience sampling. Following validation by experts during a Delphi phase, the ESNPNSD was developed and evaluated using the User Experience Questionnaire (UEQ). The UEQ scores ranged from − 3 to + 3 and included categories of normal, positive, and negative evaluations. Data were analyzed using SPSS version 18. Ethical considerations were fully observed.

Results In the first phase, 136 items were identified across 12 categories. After formal and content validity checks, 68% and 55% of the items achieved content validity coefficients of 1 and 0.87, respectively, qualifying them for inclusion in the system. The Cronbach's alpha score for all items in the system was 0.95. The ESNPNSD system scored averages of 1.75 for attractiveness, 1.46 for dependability, 1.58 for efficiency, 1.74 for novelty, and 1.23 for stimulation.

Conclusion The ESNPNSD has the potential to support the development of non-practical nursing skills and facilitate patient safety by providing structured educational resources and interactive learning experiences. However, further studies with objective assessments of learning outcomes are needed to validate its impact comprehensively.

Clinical trial number not applicable.

Keywords Nursing documentation, Non-practical nursing skills, Nursing internship, Web-based system, Clinical education applications, Electronic educational systems, E-learning

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Introduction

The advancement of technology in education has led to the emergence of innovative teaching methods, with electronic education (e-learning) replacing traditional approaches. These changes align with constructivist learning theories, which emphasize active student engagement and self-directed learning in digital environments [1, 2]. The integration of e-learning in nursing education plays a crucial role in enhancing knowledge acquisition by facilitating access to updated information and supporting interactive learning experiences [3, 4].

E-learning is widely recognized as an effective method for delivering educational content, leveraging electronic media and the Internet to overcome geographical and temporal barriers. According to cognitive load theory, well-structured digital platforms can optimize learning by reducing extraneous cognitive load and improving information retention among nursing students. By presenting information in a structured and interactive manner, these systems provide opportunities for students to develop both theoretical and applied competencies, ensuring they remain updated with the latest professional advancements [5–7].

Beyond practical skills, nursing students are also required to develop non-practical competencies, such as documenting nursing reports, conducting initial patient assessments, verifying doctor's orders, entering patient medications into Kardex systems, and adhering to triage protocols [8, 9]. These competencies align with experiential learning theory, which suggests that hands-on exposure to tasks in a structured digital environment enhances students' ability to internalize and apply knowledge in real-world settings [10]. However, time constraints during internships and the legal responsibilities of nurses often limit students' ability to adequately learn and practice these non-practical skills [11].

Despite the critical importance of these competencies, a structured framework for their systematic learning is lacking. Previous studies underscore the need for electronic solutions that facilitate the acquisition of non-practical nursing skills [12–14]. In Iran, these activities are still predominantly documented on paper, which hinders efficiency and increases the risk of errors [14–16]. The transition to an electronic system for managing these tasks can create a structured and reliable database for decision-making in patient care, thereby improving interdisciplinary communication, minimizing errors (e.g., drug interactions, incorrect prescriptions, and billing issues), and serving as legal documentation when necessary [17, 18].

Grounded in constructivist, cognitive load, and experiential learning theories, an educational electronic system for non-practical nursing skills offers a valuable opportunity to enhance nursing students' performance while increasing the visibility of nursing care components in clinical education [19–21]. Therefore, this study aims to design, develop, and evaluate a web-based system specifically tailored to improve nursing students' acquisition of non-practical skills within a structured theoretical framework.

Method

Study design

This study employed a sequential methodological approach conducted in three phases.

In the first phase, the process of determining the minimum data set (MDS) was carried out in two stages. Initially, a comprehensive review was conducted to identify the data requirements and technical capabilities of the system. The findings were compiled into a researcher-developed questionnaire. Subsequently, opinions from key stakeholders in the education field—including directors, vice presidents of education, group managers, and professors—were gathered. This was achieved using the Delphi method to validate the questionnaire's face validity and assess its content validity index (CVI). The final outcome of this phase was the identification of the system's core information requirements.

The second phase involved the design of a web-based system, employing a modular and layered architecture, based on the MDS established in the previous phase.

In the third phase, the developed system was evaluated to ensure it met the necessary functional and technical requirements.

First phase

Literature review

In the initial stage, a comprehensive literature review was conducted to identify relevant data requirements and technical capabilities. The sources included guidelines from the Ministry of Health, library materials, and internet resources. Information from databases such as PubMed, Scopus, UpToDate, ScienceDirect, and Web of Science was also reviewed. The keywords used for the search included "Clinical education applications," "Web-based system," "Nursing Internship," "Nursing documentation," "Electronic educational systems," "E-learning," and "Non-practical nursing skills." The focus was on materials related to non-practical nursing skills. Inclusion criteria for the search were the availability of full-text journal articles, language (English or Persian), and publication date (2012 onwards). The results of this literature review are summarized in Fig. 1, and the detailed search strategy is provided in Box a.

Questionnaire development

Based on the findings of the literature review, a comprehensive questionnaire was developed to gather expert

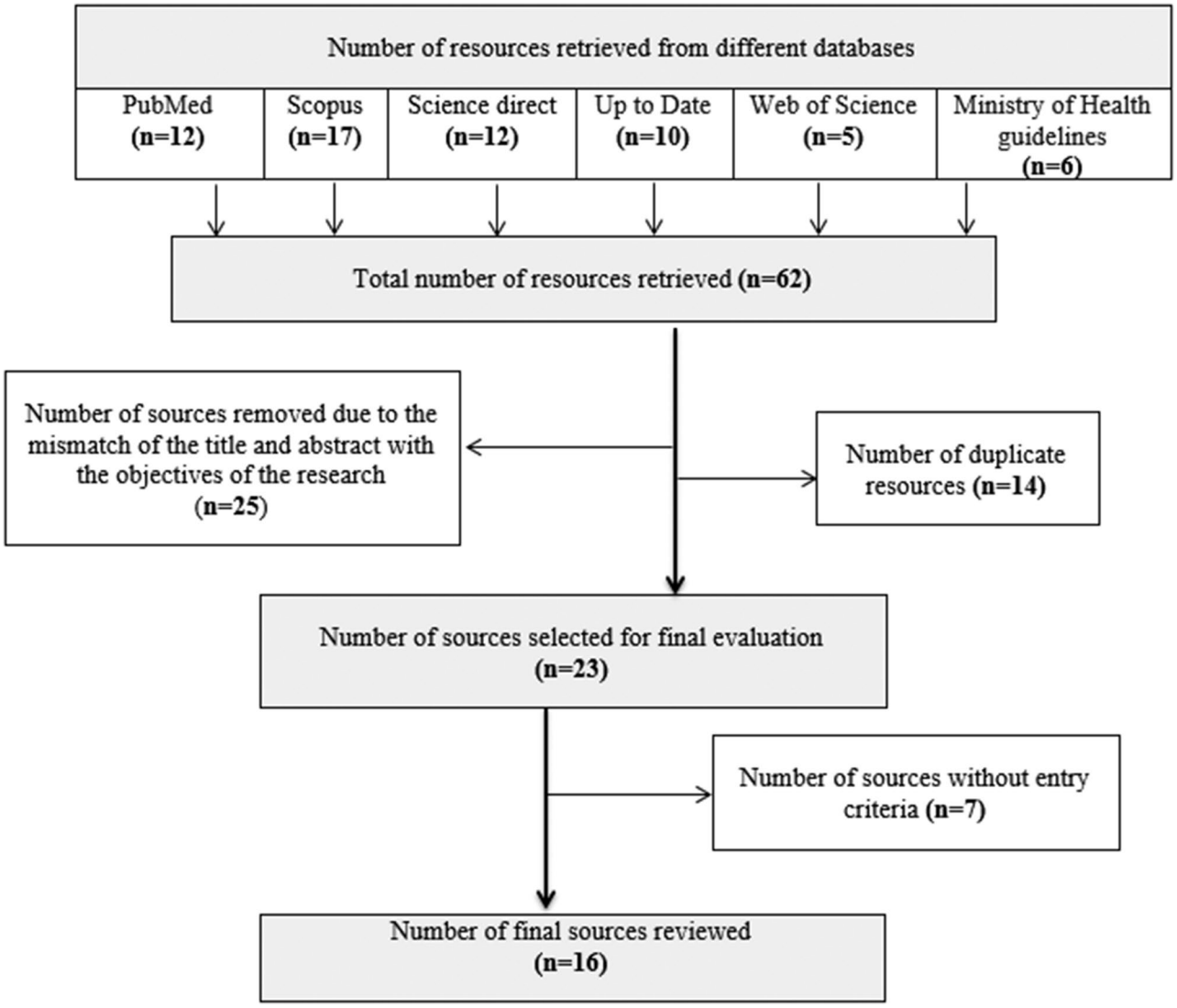

Fig. 1 PRISMA flow diagram of the study selection process

A: Electronic educational systems OR protocol OR algorithm OR tool OR indicator OR System
B: Web-based system OR Clinical education applications
C: Nursing Internship OR Non-practical nursing skills OR Nursing documentation
D: A AND B AND C

Box 1 The search study

opinions on the critical components necessary for the Electronic System for Nursing Practice in Non-Practical Skills Development (ESNPNSD). The questionnaire comprised 136 items categorized into 12 sections: demographic information, triage, history and clinical examination (initial evaluation form), checking doctors' orders by nursing students, nursing process, nursing reports, Kardex, vital signs chart, student evaluation by professors, educational files, homework, and recording useful experiences. This structured tool was designed to identify and prioritize the key elements required for the effective implementation of the ESNPNSD system.

Delphi validation

The content validation of the non-practical skills development questionnaire was conducted using the Delphi

technique in two stages. In the first stage, targeted sampling was used to select participants from nursing and health informatics faculties at North Khorasan University of Medical Sciences, Sabzevar University of Medical Sciences, and Esfarayen Faculty of Medical Sciences. These participants were responsible for validating the minimum data set elements. At the second stage, 10 experts assessed the face validity of the questionnaire, while the remaining items were reviewed by 15 experts to determine the content validity index (CVI). Participants rated the importance of each item in the questionnaire on a three-point Likert scale: "Yes" for high importance, "No" for low importance, and "Certain" for very high importance. An additional row was included at the end of the questionnaire for experts to suggest necessary information.

The CVI was calculated to quantify the content validity of the questionnaire, both at the item level (I-CVI) and scale level (S-CVI) [22, 23]. Items with a kappa coefficient between 0.40 and 0.59 were removed as weak, coefficients between 0.60 and 0.74 were considered good, and coefficients above 0.74 were deemed excellent [22]. Additionally, the reliability of the questionnaire was assessed using the Test-retest method [24]. This process ensured a robust and validated tool for evaluating the required elements of the system.

Second phase

Design and implementing wed- based educational system

The agile design model was employed for the development of the web-based educational system, encompassing five stages: analysis, design, development, implementation, and evaluation. This system, intended for future widespread use to enhance nursing education quality, was developed using the VUE.JS framework alongside MVC ASP.NET with the C# language within the Dot Net 6 framework. The MS SQL Server was utilized for database creation and management.

Given the healthcare industry's stringent security requirements and the sensitive nature of the data stored, the ASP.NET Identity framework was integrated for robust user authentication and management. This framework incorporates advanced security features such as two-step authentication (via SMS sent to a registered mobile phone number), account locking, and account verification to ensure data safety.

To test the system's initial performance, sensors were employed to transfer clinical data into the system for analysis. Any detected issues were promptly resolved. Once functional, the system was deployed to the domain https://balini.esfrums.ac.ir/ for evaluation by four health informatics experts. After obtaining satisfactory feedback and receiving a passing score, the system advanced to the subsequent development stages.

Technical validation

The system underwent initial performance testing conducted by health informatics experts. The technical validation metrics included response time, scalability, and error rates. Response time was measured in seconds for key system functionalities under typical user loads. Scalability testing simulated increased user demand to assess the system's ability to handle higher volumes of traffic. Error rates were monitored to evaluate system stability under various conditions, ensuring the system's robustness and reliability.

Third phase

Participants

In this stage, the department manager and nursing professors were registered in the system at the beginning of the academic semester. An orientation meeting was then held for both students and professors, during which the ESNPNSD educational system was introduced. The system was evaluated by three groups of nursing students: Group A (2020 cohort, 27 students), Group B (2021 cohort, 24 students), and Group C (2022 cohort, 21 students). These groups, selected through an accessible sampling method, were assessed across two different academic semesters.

System evaluation

A validated Persian version of the 26-item User Experience Questionnaire (UEQ), which has been widely used in previous studies, was employed in this research [25]. The original English version of the UEQ, also validated and published, is available for reference [26]. The data items in the questionnaire are scaled from − 3 to + 3, and the evaluation is interpreted based on the average values of the data. According to the standard guidelines:

Values between − 0.8 and 0.8 are considered neutral evaluations.

Values above 0.8 indicate a positive evaluation.

Values below − 0.8 indicate a negative evaluation.

The 26 items of the UEQ assess six key dimensions: attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty, each providing insight into different aspects of user experience. Previous studies have demonstrated the high validity and reliability of this questionnaire [27, 28]. The UEQ was integrated into the system, allowing students to complete it after using the system, thus enabling the direct assessment of user experience within the context of the system's functionality. Additionally, a supplementary file containing the full UEQ instrument has been included for reference (Supplementary material 1).

How to work with the system

As part of their internship responsibilities, students were asked by their assigned professor to provide information about the patient they were caring for after completing their duties. In their free time, after reviewing the guide files placed in each section of the ESNPNSD educational system, students entered the patient's information based on the data provided. Professors monitored their students' documents through the system and provided feedback. For verification, students uploaded information about the same patient, which had been approved by the professor during the internship, into the system. After using the system, both students and professors completed the UEQ embedded within the web-based system. Finally, the data were extracted from the system into Excel for analysis.

Validation process

The validation process involved two groups of participants: health informatics experts and nursing students. Below are the details of each group:

Experts' Panel:

Sample Selection: A total of 10 health informatics experts were recruited using purposive sampling. Participants were required to meet predefined inclusion criteria, which included at least 5 years of professional experience in health informatics and prior involvement in technology development or evaluation projects.

Reference for Expert Number: The number of experts was determined based on Lynn's (1986) recommendation, which suggests 8–10 experts as optimal for content validity studies [23].

Nursing Students:

Sample Calculation: A sample size of 60 students was determined using Cochran's formula, considering a confidence level of 95%, a margin of error of 5%, and an anticipated response distribution of 50%.

Characterization: The participants were final-year nursing students enrolled in clinical internships.

Student interaction and educational context

The ESNPNSD system was integrated into nursing education through self-directed learning and instructor-led sessions. Students engaged with interactive modules, including patient assessment, triage, and documentation, receiving real-time feedback and automated assessments. Scenario-based simulations reinforced decision-making, while collaborative tools facilitated peer discussions. Usage data and surveys were collected to evaluate engagement and effectiveness.

Statistical analysis

Data were analyzed using SPSS 18 software (Chicago, USA). This software was used to summarize the respondents' profiles and present the details. The internal reliability of the questionnaire items was assessed using Cronbach's alpha for each construct, which is a measure of how well a set of items measures a single latent variable. Additionally, the mean, standard deviation, and percentage of responses for each item were calculated.

To assess the efficacy of the system as evaluated by users, the 26-item User Experience Questionnaire (UEQ) was utilized. The evaluation results based on the UEQ included the average scores of the questionnaire items according to the responses of the relevant groups. The mean and standard deviation of the responses for each item were calculated, along with the Cronbach's alpha values for the questionnaire items.

Result

Phase 1: literature review

Based on a comprehensive review of scientific texts in databases and guidelines from the Ministry of Health, following the PRISMA standard, 62 articles were retrieved from 2010 to 2021. After excluding irrelevant and duplicate articles and reviewing the remaining ones, 23 articles were selected. Of these, seven did not meet the inclusion criteria. Ultimately, 16 articles were analyzed, and the findings were extracted. Based on these findings, 136 items were identified (Fig. 1).

Questionnaire development

Following a comprehensive review in the first stage of phase one, a total of 136 items were initially collected and categorized into 12 domains, covering various aspects of the proposed technology. After performing face validity, 6 items were removed due to redundancy or irrelevance, and 3 new items were added based on expert feedback. This process resulted in a final total of 133 items, all of which achieved an acceptable Content Validity Index (CVI) for inclusion in the system.

However, 12 items did not meet the required CVI score of 0.8 during the validation process. These items were carefully reviewed and revised based on suggestions from the expert panel. Of these, 9 items were modified through rewording or restructuring for clarity and specificity, while 3 items were removed due to redundancy with other items. For example, the item related to "triage evaluation" was modified to focus specifically on "patient prioritization criteria" to better align with clinical practices.

To enhance usability and address redundancy identified by health informatics experts, overlapping items were consolidated. The final ESNPNSD system was structured into three primary components, each representing key functionalities of the developed technology:

Patient-related processes: Including modules for primary assessment, triage, order checking, charting drugs in Kardex, and nursing report generation.

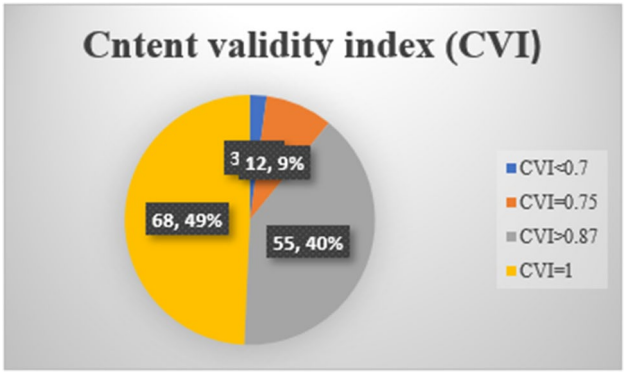

Fig. 2 Distribution of items based on content validity index (CVI) scores ranging from 0.7 to 1

Table 1 Cronbach's alpha values of questionnaire items

Attractiveness	**0.086**
perspicuity	**0.89**
efficiency	**0.78**
dependability	**0.75**
stimulation	**0.82**
novelty	**0.76**
Total	**0.95**

Useful experiences: Documenting and sharing practical insights gained during patient care.

Educational files and content: Providing curated educational resources to support nursing staff development.

Additionally, the system was developed as a user-friendly software platform to facilitate real-world application (Fig. 2).

User experience assessment

The evaluation of the system using the User Experience Questionnaire (UEQ) revealed positive average scores across all key dimensions, including attractiveness, dependability, efficiency, novelty, perspicuity, and stimulation. These results suggest a generally favorable reception of the system by the students, indicating its effectiveness in providing a satisfactory user experience. The positive feedback highlights the potential of the system to enhance educational engagement through its user-friendly and innovative design.

Reliability of the questionnaire

All items of the UEQ demonstrated an acceptable value, indicating the reliability of these items. The overall Cronbach's alpha score for the entire questionnaire was 0.95 (Table 1).

Web-based system assessment

The average scores for the items on attractiveness, dependability, efficiency, novelty, perspicuity, and stimulation from the UEQ, after participants used the ESNPNSD educational system, are provided in Table 2. Additionally, the average scores for these dimensions in groups A, B, and C are presented in Table 3, showing that there were no significant differences across the three groups (Table 4).

Discussion

The findings of this study highlight the educational potential of the ESNPNSD system in enhancing non-practical nursing skills. The system provides an interactive electronic platform where nursing students can practice critical documentation and assessment tasks,

Table 2 Average, standard deviation, percentage of responses for each item

	Students		**Nursing professors**		**Health Informatics**		**Total**	
Items	Mean	ST deviation	Mean	ST deviation	Mean	ST deviation	Mean	ST deviation
Attractiveness	1.76	1.04	1.88	0.81	1.71	0.64	1.75	1.07
dependability	1.37	1.16	2.19	0.74	2.17	0.46	1.46	1.10
efficiency	1.50	1.18	2.27	0.76	2.50	0.67	1.58	1.07
Novelty	1.54	1.12	1.97	0.88	2.11	0.77	1.59	1.10
perspicuity	1.70	1.13	2.08	0.90	2.07	0.73	1.74	1.11
Stimulation	1.21	0.99	2.84	1.88	2.04	0.38	1.23	0.98

Table 3 Average, standard deviation, percentage of responses for each items in three student groups

	Group A		**Group B**		**Group C**		***P*-value**
	Mean	**ST deviation**	**Mean**	**ST deviation**	**Mean**	**ST deviation**	
Attractiveness	1.87	0.99	1.38	1.16	2.02	1.01	0.10
Dependability	1.06	0.96	0.63	0.86	1.04	0.70	0.90
Efficiency	0.04	0.69	0.84	0.76	1.11	0.69	0.42
Novelty	1.21	0.58	0.82	0.83	1.04	0.80	0.16
Perspicuity	1.08	0.68	1.08	0.78	1.26	0.82	0.66
Stimulation	1.39	0.95	0.9	0.08	1.34	0.91	0.16

Table 4 Comparison items with benchmark

Item	Mean	Comparison to benchmark	interpretation
Attractiveness	1.75	Excellent	In the range of the 10% best results
Dependability	1.46	Good	10% of results better, 75% of results worse
Efficiency	1.58	Good	10% of results better, 75% of results worse
Novelty	1.59	Excellent	In the range of the 10% best results
Perspicuity	1.74	Excellent	In the range of the 10% best results
Stimulation	1.23	Excellent	In the range of the 10% best results

such as patient evaluation, triage using the Emergency Severity Index, and risk assessments with tools like the Braden and Morse scales. By offering a structured and guided learning experience, the ESNPNSD system enhances students' preparedness for real-world clinical settings. These findings align with prior studies that emphasize the role of digital tools in bridging the gap between theoretical knowledge and clinical application [29–34]. For example, Mazloum et al. (2014) reported high student satisfaction with electronic nursing systems, underscoring their effectiveness in improving learning engagement [35]. Similarly, Cook and Triola (2014) highlighted the benefits of simulation-based digital learning environments in enhancing skill acquisition [36].

Beyond assessment tasks, the ESNPNSD system strengthens nursing documentation training, which is essential for patient safety and legal compliance. By incorporating real-time feedback into documentation processes—such as report writing and Kardex management—the system helps minimize errors before students enter clinical practice. This finding is consistent with Ranjbar et al. (2021), who demonstrated that electronic documentation enhances accuracy, completeness, and standardization, leading to improved student learning outcomes [14]. Likewise, Bloomfield and Jones (2013) noted that e-learning interventions boost student confidence and precision in documentation tasks [37].

Another key advantage of the ESNPNSD system is its role in standardizing patient information management, which promotes better decision-making and patient care quality. This aspect aligns with findings from Shafiei et al. (2022), who emphasized that electronic documentation systems improve legal compliance and professional accountability [13]. Similarly, Heloisa et al. (2010) found that digital documentation reduces errors, enhances organization, and supports more effective prioritization of patient needs, reinforcing the benefits of electronic systems over traditional paper-based approaches [38].

Despite these strengths, the cultural and institutional context in which the study was conducted may influence its generalizability. Nursing education systems and healthcare infrastructures vary globally, impacting the implementation and acceptance of digital learning tools. Future studies should examine how the ESNPNSD system can be adapted to different educational and cultural settings, as highlighted by Kononowicz et al. (2019) [39]. For example, Salminen et al. (2016) showed that cultural differences between Finland and Sweden influenced the adoption of e-learning in nursing curricula, emphasizing the need for localized instructional strategies [40–42].

Additionally, while this study demonstrates the immediate benefits of the ESNPNSD system, a direct comparison with traditional educational methods was not conducted. Future research should explore the relative advantages of digital platforms in enhancing learning outcomes, skill development, and error reduction. Studies such as Wang, Zhang, and Yu (2017) suggest that electronic nursing systems improve work efficiency and reduce documentation errors, reinforcing the importance of comparative analyses [43]. Longitudinal research could further assess the impact of the ESNPNSD system on long-term skill retention and professional performance, addressing the limitations of this study's cross-sectional design.

Finally, the study did not evaluate psychological and cognitive factors that influence students' engagement with e-learning systems. Prior research suggests that motivation, cognitive load, and digital literacy play significant roles in determining the effectiveness of online learning in healthcare education [44, 45]. Future investigations should incorporate these variables to develop a more comprehensive understanding of student engagement and learning effectiveness.

Study limitations and future directions

First, the study lacks a direct comparison with traditional nursing education methods, making it difficult to establish the relative superiority of the ESNPNSD system. Including such comparisons in future studies could provide a more comprehensive understanding of its effectiveness. Additionally, measures of effect size, such as Cohen's d, were not reported in this study. Including these measures would enhance the understanding of the practical significance of the observed differences or relationships, complementing the statistical significance results.

Second, the absence of a control group is a key limitation of this study. Without a control group, it is challenging to determine whether the observed outcomes are specifically attributable to the ESNPNSD system or other external factors. Future studies should incorporate a control group using traditional educational methods

to provide a more rigorous assessment of the system's impact.

Third, the study's cross-sectional design restricts its capacity to evaluate the long-term impact of the system on skill retention and professional performance. While the findings demonstrate the immediate benefits of the ESNPNSD system, they do not offer evidence regarding how well the acquired skills are retained over time or their influence on real-world clinical practice. Longitudinal studies are recommended to assess the durability of the skills and their impact in clinical settings.

Fourth, the evaluation primarily focuses on user experience metrics such as attractiveness, dependability, and efficiency, without directly assessing learning outcomes or error reduction in nursing documentation. Although these user experience metrics provide valuable insights into the usability of the system, they do not comprehensively evaluate its effectiveness in practical skill enhancement or documentation error minimization. Future studies should include additional metrics, such as pre- and post-intervention skill assessments, error rate analysis in nursing documentation, and multivariate analyses (e.g., factor analysis or correlation matrices) to explore interactions among dimensions like attractiveness, efficiency, and stimulation. These approaches will offer a more holistic understanding of the system's educational and practical impacts.

Fifth, the use of accessible sampling methods, while practical, may introduce bias, as it does not necessarily represent the broader population. This potential bias limits the generalizability of the study findings. To address this limitation, future studies could employ random sampling or other more robust sampling techniques to ensure a more representative sample. Additionally, there is limited discussion of potential ethical concerns, particularly regarding data privacy. We recognize the importance of safeguarding participants' personal information, and future studies should address this concern by implementing strong data protection measures, ensuring compliance with ethical standards, and transparently discussing data privacy protocols.

Clinical practice application

The findings of this study have significant implications for clinical practice. The ESNPNSD system can serve as an effective tool to enhance nursing students' preparedness for clinical environments by improving their documentation skills, critical thinking, and decision-making abilities. By integrating real-time feedback mechanisms, this system helps reduce documentation errors, ensuring compliance with professional and legal standards. Moreover, accurate and standardized documentation leads to better communication among healthcare teams, ultimately improving patient safety and care quality. The transition from paper-based to electronic nursing records, as supported by this system, facilitates data-driven decision-making, minimizes medication errors, and enhances workflow efficiency in clinical settings.

Conclusion

One of the key advantages of the ESNPNSD system is its ability to digitize educational processes, reducing reliance on paper-based materials and streamlining nursing students' engagement with essential non-practical skills. The system provides structured educational resources and interactive learning tools that may enhance students' understanding of documentation, patient assessment, and other critical competencies. While the user experience evaluation suggests positive engagement with the system, further research, including pre- and post-intervention assessments, is necessary to objectively measure improvements in learning outcomes.

By incorporating the ESNPNSD system into educational curricula, nursing students and professionals can potentially benefit from a more structured and accessible approach to developing their non-practical skills. Future studies should focus on evaluating the system's direct impact on competency acquisition and clinical performance through objective methodologies.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12909-025-07024-x.

Supplementary Material 1

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Author contributions

Study concept and design, A. A., and A. S., and M.H.; Analysis and interpretation of data, A. A., and H.S.; Drafting of the manuscript, A. A., and R.R., F.K and MN.

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Data availability

The datasets generated in the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The current research project was approved by the National Center for Strategic Research in Medical Education (Nasr) (project code: 984811; date: 01/12/2018). Ethical considerations were thoroughly addressed throughout the study. All participants were required to sign a confidentiality agreement and provide informed consent before participating. Informed consent forms

clearly outlined the purpose of the study, the procedures involved, and the voluntary nature of participation. Participants were made fully aware that their involvement was entirely voluntary and that they could withdraw from the study at any time without any negative consequences. Regarding data privacy, participants were assured that all personal information and responses would be kept confidential and securely stored. Identifiable data were not linked to the participants' responses to maintain anonymity. Furthermore, all data collected were used solely for the purposes of this research and would not be shared with third parties without the explicit consent of the participants. Ethical oversight was ensured by adhering to institutional guidelines, and all data handling procedures complied with applicable laws and regulations related to data protection and privacy. Additionally, participants were informed about the absence of cultural conflicts and the proper handling of any copyrighted materials used in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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