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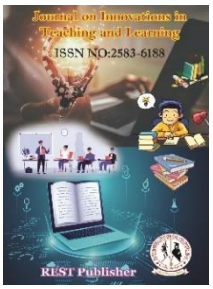

Integration of Human and Technological Capabilities in Modern Nursing Education: A Decision-Making Analysis

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Abstract: *Nursing education has undergone significant changes to address the growing demands of healthcare systems, the diversity of patient populations, and advances in educational technology. Among these, High-fidelity simulation has become an essential tool for improving learning outcomes experiences. However, its effectiveness, particularly in producing positive outcomes in nursing education, is a matter of debate. Historical approaches to simulation from role-playing and case studies to mechanical simulations such as injecting oranges or performing CPR on static manikins highlight its long-standing integration into nursing teaching. Research is valuable for its light various aspects of human knowledge and its application to real-world challenges. In fields as diverse as education, nursing, technology, and decision-making, research serves as the foundation for innovation, evidence-based practice, and informed policymaking. Each of the 50 chapters offers unique insights into their respective domains, providing data, critical analysis, and proposed improvements. Alternatives: Personality Features (C1), Human Skills (C2), Conceptual Skills (C3), Technical Skills (C4), Rules and Regulations (C5). Evaluation Parameters: Equal importance, A little more importance, importance, Absolute importance, More importance. The results show that Human Skills (C2) received the highest ranking, whereas Personality Features (C1) received the lowest ranking. According to the WSM method, Human Skills (C2) ranks highest in terms of its value for Nursing education in Data Set.*

Key words: *Simulation, Nursing, Education, Learning, Practice*

1. INTRODUCTION

High-fidelity simulation has become increasingly popular as a teaching method resource in nursing education in recent years. But Is simulation truly an innovative method? Does it lead to positive learning outcomes? Is there evidence-based research to confirm its effectiveness, particularly in nursing education? This discussion examines a variety of studies that aim to answer these questions. As Webster notes(2003), "simulation" means "to see or act as if." Broadly defined, simulation includes not only mechanical simulators but also role-playing, situational learning, and case studies. By this definition, simulation has been an integral part of nursing education for some time. Examples include giving intramuscular and subcutaneous injections on oranges and practicing CPR on mannequins. manikins, inserting Foley catheters in laboratory settings, or role-playing scenarios to develop communication skills and understanding mental disorders. These activities share a common purpose: they provide a controlled and simulated environment in which students or staff can safely gain experience and prepare for real-world clinical practice.[2] The quality of nursing education should be assessed through local, national and international networks. Nursing curricula should be more comprehensive, with clear definitions of content, learning strategies and means of assessing learning outcomes. Fostering a student-centered learning culture is essential for progress. Opportunities for student and academic mobility should be significantly expanded, emphasizing the importance of cultural understanding and engagement with diverse communities. Nurse educators should have a combination of clinical expertise, teaching skills, research skills and the ability to apply research findings in practice.[3] Critical thinking has become increasingly important in the field of nursing. Its importance was emphasized by the National League for Nursing (USA), which mandated that nursing

programs assess critical thinking as an important requirement for accreditation, Critical thinking is widely acknowledged as a key skill in nursing education professional development. However, attempts to define and apply this concept in the nursing profession have led to some confusion and uncertainty.[4] Online nursing education provides applied knowledge in an interactive, human-centered environment. Because the information learned is applied to real-life situations involving people, it is inherently unpredictable and It demands that students use their critical thinking skills. Nursing, as a high-demand field with unique and specific needs, presents challenges that differ significantly from other fields. As a result, online delivery methods must be adapted to address these unique needs. A thorough understanding of the issues in the nursing domain will help make online nursing education more effective and impactful.[5] In addition, reference lists of relevant research articles were reviewed to identify further evidence potential sources. The author emphasized the need for Further investigation into the relationship between critical thinking(CT) and its components to establish strong evidence. This suggests that the concept The role of critical thinking in nursing education continues to develop and advance. As nursing trends and educational systems continue to evolve, the concept of CT is likely to become more refined and comprehensive over time. Turner (2005) suggested defining clear boundaries to enhance the maturity of the concept, establish a universal definition, and reduce confusion.[6] The landscape of higher education is undergoing significant changes, affecting how Nursing education aims to prepare the future generation of nurses. Compared to other healthcare professions, nursing is considered a pioneer in adopting innovations in education. Nurse educators have worked diligently to adapt curricula and incorporate various educational technologies to enhance learning experiences. However, nursing schools are faced challenges in addressing the needs of multiple generations of students and selecting the most effective teaching strategies to accommodate these diverse groups.[7] The primary objective of this the This study aims to comprehensively analyze the An analysis of academic studies on Global nursing education and student experiences from 2003 to 2010. It discusses current issues, including cultural awareness and globalization in nursing education, along with trends and developments over time. Key issues raised in previous reviews include challenges related to authorship in Publications from International nursing educational exchanges highlight the benefits of global collaborations and contextual understanding of terms like "immersion", “partnership.” to define reciprocity and authentic international exchange experiences, are explored.[8] Nursing education and training in Spain have been shaped by changes in the healthcare sector. Key health-related factors affecting healthcare include demographic changes such as the aging population; cultural diversity, driven by immigration; advances in technology; economic and sociopolitical globalization; greater involvement of patient knowledge and decision-making; increased complexity in care; policies focused on maintaining Improving healthcare costs and quality of life, incorporating evidence-based practices into medicine, and improving health and nursing science. [9] This historical-social study examines the rituals embedded in theoretical and practical teaching methods in Portugal and Brazil. Its objectives are to emphasize the teaching rituals associated with basic nursing practices, to analyze the impact of these rituals, and to explore their significance in the context of contemporary teaching and practice. [10] It was first adopted by medical doctors. It was adopted by the nursing profession in the 1970s, followed by adoption in the late 1990s.Originally developed to improve patient outcomes in response to adverse and unsanitary conditions, it has since emerged as a core principle adopted by nursing to ensure safe and effective care. In addition, it plays a key role in enabling nurse educators to provide essential knowledge to undergraduate and graduate nursing students. [11] To understand the urgent When discussing the need for transcultural nursing, many of the Global factors anticipated in the mid-1950s are now having an impactits development. These factors include: (a) the increasing mobility (b) The increasing number of individuals worldwide of immigrants, refugees, and displaced persons; (c) the growing importance of cultural identities, as individuals seek recognition and respect for their values, beliefs, and lifestyles; (d) the creation of gender roles; (e) the widespread use of advanced technologies, electronic communication, and high-speed transportation; (f) the increasing incidence of cultural conflict, racism, and resistance in human services, particularly in health care; and (g) the growing need for health professionals to move beyond the traditional “mind-body” medical model and adopt a holistic, multicultural approach to care. These factors, along with considerations of spirituality, economics, politics, and relationships, are important in a variety of contexts. [12] Resilience As nursing students, it is important in nursing education and educators face ongoing challenges. In current research on nursing education, resilience is viewed as an innate trait or a dynamic process. In addition, various protective factors linked to resilience have been linked to the fact that strengthening these factors can promote its development. [13] Over the past two to three decades, (SDL) has received significant Pay attention nursing education. Many nurse educators are attracted to the SDL approach because of its humanistic focus and connection to professional autonomy. Embracing a The self-directed learning approach enhances nursing students' confidence in their abilities, while also enhancing their ability to learn in unfamiliar situations.14] Students expressed concern about how the disruption to nursing education would impact the future careers of registered nurses. Many were in their final years of medical training, nearing the end of their program, while others were one or two courses are less than enough to complete a bachelor's degree in nursing. They were concerned

about the potential loss of their current clinical placements and their ability to progress through the remainder of their program. At the time of the decision, we did not have all the answers or solutions, and we are continuing to address immediate safety concerns and the impact on future clinical placements. [15] A comprehensive review of the Primary research literature was collected through various electronic search tools in three main domains: pre-service nursing education, pre-service Midwifery education and computer-based educational technology were explored with online databases such as CINAHL, MEDLINE, OVID, ProQuest Central, Pub Med, ERIC, and Science direct included in the search.[16] Clinical experience is considered a fundamental aspect of nursing education. High-quality clinical placements in a variety of settings are essential to developing competent and confident professionals. However, both empirical and anecdotal evidence show that medical students frequently face challenges during their clinical placements. These challenges are persistent and complex. For many students, clinical placements are marked by feelings of alienation and lack of connection.[17] These gaps in teaching and learning can be addressed by focusing on 'culture' and 'anti-racism' within undergraduate nursing courses, which can better support students in understanding the complexities of cross-cultural care. With a view to informing A comprehensive a literature review was conducted on undergraduate nursing teaching and learning students on the topics of culture and anti-racism conducted to evaluate the existing empirical research evidence.

2. MATERIALS AND METHODS

The Weighted Sum Method (WSM) is one of the most straightforward and widely adopted Multi-Criteria Decision-Making (MCDM) techniques, and it has significant potential for application in the nursing field. Nursing, as a critical component of healthcare, involves numerous decisions that must balance multiple competing criteria, such as patient care quality, staff performance, resource availability, and institutional priorities. WSM provides a structured and objective framework for evaluating alternatives based on these criteria, making it a valuable tool for improving decision-making in nursing management and practice.

In nursing, the use of WSM can be particularly effective in scenarios such as evaluating nursing staff performance, selecting appropriate care interventions, determining optimal nurse shift schedules, and allocating limited healthcare resources. For instance, when assessing nursing staff, decision-makers may consider various criteria like clinical expertise, communication skills, attendance record, adherence to protocols, and patient feedback. Each of these criteria can be assigned a weight based on its relative importance, and individual nurses can be scored accordingly. The WSM then calculates a weighted total score for each nurse, allowing for a fair and objective comparison that supports transparent personnel decisions. Similarly, in selecting nursing interventions or patient care strategies, WSM helps identify the most effective options by comparing factors such as expected outcomes, risk levels, implementation ease, and cost. For example, when deciding on a wound care protocol, nursing administrators can evaluate different treatments based on healing time, patient comfort, infection prevention, and cost-effectiveness. Each criterion is weighted, and WSM provides a composite score for each intervention, aiding in the selection of the most suitable approach.

The WSM's simplicity makes it particularly suitable for nursing environments, where time and clarity are essential. It does not require complex mathematical computations, which enhances its usability among healthcare professionals. Additionally, it supports evidence-based practice by encouraging structured analysis rather than relying solely on intuition or past experience. However, WSM does have limitations, particularly when criteria are expressed in different units or involve both qualitative and quantitative measures. To address this, normalization techniques are often employed before applying the method. Despite these challenges, WSM remains a powerful tool in nursing decision-making due to its adaptability, ease of use, and ability to incorporate diverse evaluation criteria.

3. ANALYSIS AND DISCUSSION

TABLE 1. Nursing education in Data Set

	Equal importance	A little more importance	importance	Absolute importance	More importance
Personality Features (C1)	21.080	169.530	25.150	23.150	22.050
Human Skills (C2)	67.120	152.970	36.690	67.690	27.300
Conceptual Skills (C3)	34.080	162.580	25.180	56.180	23.100
Technical Skills (C4)	29.170	188.280	26.600	45.600	17.590
Rules and Regulations (C5)	37.330	146.410	29.960	34.960	18.890

Table 1 presents a data set that evaluates various aspects of nursing education using the Weighted Sum Model (WSM) method, assigning different levels of importance to five categories: personality traits (C1), human skills (C2), conceptual skills (C3), technical skills (C4), and rules and regulations (C5). For each category, the table lists values under five importance levels ranging from "equal importance" to "full importance," with intermediate levels indicating different degrees of perceived importance. For example, personality traits (C1) have a value of 169.530 under the "slightly more important" category, while human skills (C2) have a value of "equal importance" of 67.120. These numerical values reflect how different skills are weighted according to their importance in nursing education. The WSM method uses these weights to prioritize which attributes are most important for improving nursing education, ultimately supporting decisions for areas of focus in curriculum design and training.

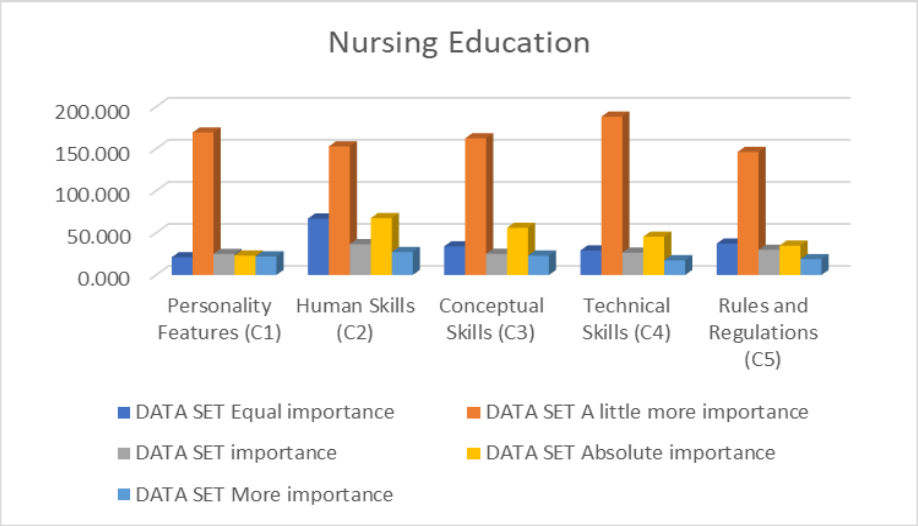

FIGURE 1. Nursing education in Data Set

Figure 1 shows a data set using the WSM method for evaluating nursing education, with five categories: Personality Features (C1), Human Skills (C2), Conceptual Skills (C3), Technical Skills (C4), and Rules and Regulations (C5). Each category is assigned numerical values based on varying levels of importance, ranging from "Equal importance" to "Absolute importance." These values indicate the weighted significance of each attribute in the context of nursing education.

TABLE 2. Nursing education in Normalized Data

Normalized				
0.31406	0.90041	0.68547	1.00000	0.79773
1.00000	0.81246	1.00000	0.68547	0.64432
0.50775	0.86350	0.68629	0.99881	0.76147
0.43459	1.00000	0.72499	0.94549	1.00000
0.55617	0.77762	0.81657	0.83945	0.93118

Table 2 presents the normalized values for the nursing education assessment using the WSM method. These normalized values represent the relative importance of various attributes in nursing education, adjusted to a common scale from 0 to 1. Each row corresponds to a different category or level of importance, with the columns representing the various criteria. For example, the first row shows values such as 0.31406, 0.90041, 0.68547, 1.00000, and 0.79773, which represent the normalized scores for different attributes under the defined key categories.The normalization

process allows for a clear comparison of the importance of each criterion across all categories, eliminating potential biases due to different scales. This approach facilitates a balanced and standardized assessment, ensuring that each attribute is appropriately considered in the decision-making process, and helping to prioritize the areas of nursing education that are most important based on the assessment.

Table 3. Nursing education in Weight age

Weight				
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25

Table 3 shows the weight distribution used in the assessment of nursing education using the WSM method. The weights are assigned uniformly, with each criterion or category receiving an equal weight of 0.25 across all levels of importance. This equal weighting approach ensures that all criteria are treated with the same level of importance in the assessment process, which promotes a balanced assessment. A uniform distribution reflects an unbiased structure where no one criterion is given priority over the others. This approach is most useful when the relative importance of the criteria is unknown or equal. By using equal weights, the analysis focuses on the normalized values of the attributes to determine their contribution to the overall assessment, as seen in the previous table. This method facilitates a straightforward interpretation and ensures fairness in the assessment of nursing education attributes.

Table 4. Nursing education in a Weighted Normalized Decision Matrix

Weighted normalized decision matrix				
0.07852	0.22510	0.17137	0.25000	0.19943
0.25000	0.20312	0.25000	0.17137	0.16108
0.12694	0.21588	0.17157	0.24970	0.19037
0.10865	0.25000	0.18125	0.23637	0.25000
0.13904	0.19440	0.20414	0.20986	0.23280

Table 4 presents a weighted normalized decision matrix for evaluating nursing education using the WSM method. Each entry in the matrix represents the weighted contribution of a criterion, reflecting its relative importance in the evaluation after normalization and weight assignment.For example, the first row contains values such as 0.07852, 0.22510, and 0.25000, which show the weighted normalized scores for different criteria in a particular category. These scores are obtained by multiplying the normalized values from Table 2 by the equal weights from Table 3 (each 0.25).The matrix allows for a detailed comparison of criteria by combining their normalized values and weights. Higher values in the matrix indicate higher importance in the overall evaluation. This approach provides a structured and measurable way to analyze nursing education characteristics, helping decision makers identify which areas contribute the most to the overall evaluation and require attention or priority.

Table 5. Nursing education in Preference Score

	Preference Score
Personality Features (C1)	0.92442
Human Skills (C2)	1.03556
Conceptual Skills (C3)	0.95445
Technical Skills (C4)	1.02627
Rules and Regulations (C5)	0.98025

Table 5 presents the preference scores for various attributes of nursing education assessed using the WSM method. Each score reflects the overall weight and normalized importance of a particular attribute in the decision-making process. For example, human skills (C2) have the highest preference score of 1.03556, indicating its importance among the assessed criteria. Technical skills (C4) follow closely with a score of 1.02627, highlighting its strong contribution to nursing education. Other attributes, such as personality traits (C1) (0.92442) and rules and regulations (C5) (0.98025), have slightly lower scores but still have significant importance. These preference scores enable a ranking comparison of attributes and provide a clear understanding of their relative importance. Decision-makers can use this information to prioritize areas such as technical and human skills development in nursing education programs, while also specifying other attributes to ensure a balanced and comprehensive curriculum.

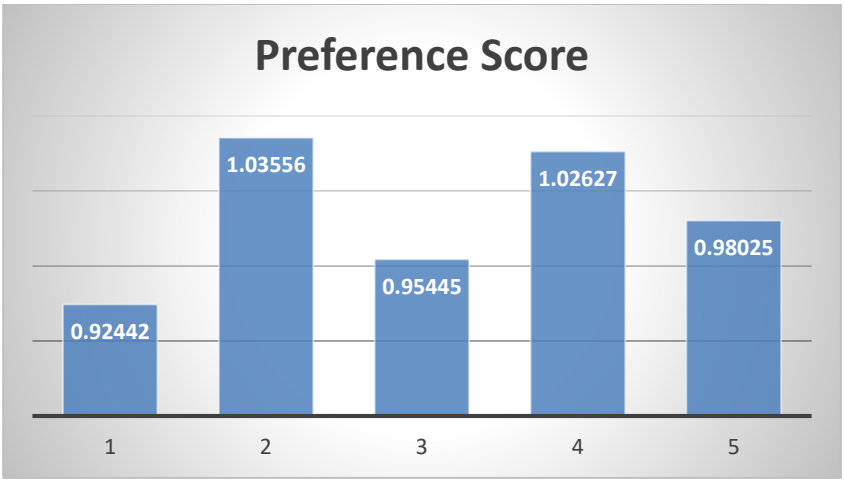

FIGURE 2. Nursing education in Preference Score

Figure 2 shows the priority scores for nursing education criteria using the WSM method. Human skills (C2) received the highest score of 1.03556, emphasizing its critical importance, followed by technical skills (C4) at 1.02627. Personality traits (C1) scored the lowest at 0.92442, indicating a relatively low priority among the assessed attributes.

TABLE 6. Nursing education in Rank

Rank	
Personality Features (C1)	5
Human Skills (C2)	1
Conceptual Skills (C3)	4
Technical Skills (C4)	2
Rules and Regulations (C5)	3

Table 6 presents the rankings of nursing education attributes assessed using the WSM method based on their preference scores. The rankings reflect the relative importance of each criterion in the context of nursing education. Human skills (C2) are ranked 1st, underscoring its critical importance in the overall assessment. Technical skills (C4) follow closely at 2nd, highlighting its significant role in nursing education. Rules and regulations (C5) and conceptual skills (C3) are ranked 3rd and 4th, respectively, indicating their moderate priority. Finally, personality traits (C1) is ranked lowest out of 5, suggesting a relatively low impact on the assessed criteria.This ranking provides a clear hierarchy for prioritizing nursing education programs. Emphasis should be placed on developing human and technical skills, while addressing other areas to ensure a well-rounded and effective curriculum that meets the demands of the profession.

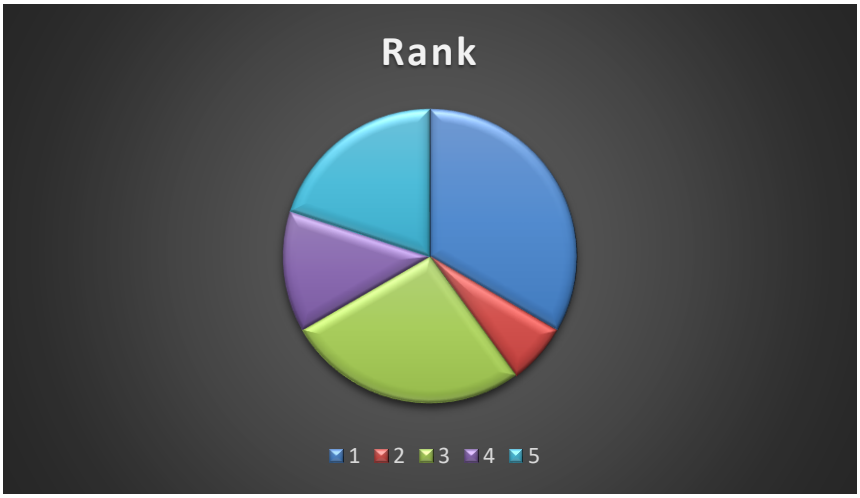

FIGURE 3. Nursing education in Rank

Figure 3 illustrates the rankings of nursing education criteria using the WSM method. Human skills (C2) ranks first, indicating its top priority, followed by technical skills (C4) in second place. Rules and regulations (C5) and conceptual skills (C3) rank third and fourth, while personality traits (C1) ranks fifth, indicating its lowest priority.

4. CONCLUSION

Nursing education is undergoing significant change, driven by advances in educational tools, globalization, and evolving healthcare needs. High-fidelity simulation has become an important discovery that bridges the gap between theoretical learning and practical application. Simulation has long been a part of nursing education, with modern iterations providing dynamic, immersive experiences that enhance Analytical thinking, clinical skills, and decision-making skills abilities. The integration of evidence-based practices ensures that nursing curricula are aligned with contemporary healthcare needs, fostering better patient outcomes and professional competence. Critical thinking is increasingly recognized as a cornerstone of nursing education, reflecting its importance in accreditation standards and professional practice. However, its conceptual ambiguity requires continued research and refinement. This skill, combined with self-directed learning methods, empowers nursing students to effectively navigate the unpredictable and complex nature of real-world healthcare scenarios. Online nursing education, while promising, requires approaches that are tailored to accommodate individual demands, such as developing interpersonal communication and clinical skills. Globalization and cultural diversity underscore the importance of culturally responsive nursing education. Preparing nurses to provide holistic, culturally sensitive care in a world marked by demographic changes, technological advances, and increased mobility is essential. Emphasizing anti-racism and cultural awareness within nursing curricula addresses gaps in understanding and equips future nurses to manage cross-cultural issues. Resilience and adaptability are important attributes for nursing students and educators, especially in the face of challenges such as disruptions to clinical placements and rapid changes in educational delivery systems. These characteristics, when fostered, not only support academic success but also prepare students for the emotional and professional rigors of nursing practice. The use of methodologies such as the Weighted Sum Model (WSM) in decision-making highlights the interdisciplinary potential of nursing education. These models, used in areas such as clinical placement optimization and technology integration, highlight the growing intersection of nursing with data-driven, analytical approaches. In conclusion, the evolution of nursing education reflects a broader trend toward innovation, inclusion, and evidence-based practice. By embracing simulation, fostering critical thinking, prioritizing cultural competence, and leveraging technological advances, nursing education is preparing a workforce capable of meeting current challenges and delivering high-quality, patient-centered care in diverse and dynamic healthcare environments. Continued research and collaboration across global networks are essential to ensure the adaptability and impact of nursing education.

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