Salud, Ciencia y Tecnología. 2023; 3:460
doi: 10.56294/saludcyt2023460

SHORT COMMUNICATION

A Study Investigating the Application of Spiral Learning To Incorporate Informatics into the Curriculum for Undergraduate Nursing Education

Aplicación del aprendizaje en espiral para incorporar la informática al plan de estudios de la formación de pregrado en enfermería

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Cite as: Karnani R, Kumar C S, Murthy R V. A Study Investigating the Application of Spiral Learning To Incorporate Informatics into the Curriculum for Undergraduate Nursing Education. Salud, Ciencia y Tecnología. 2023;3(S1):460. https://doi.org/10.56294/saludcyt2023460

Submitted: 13-05-2023 **Revised:** 25-06-2023 **Accepted:** 05-08-2023 **Published:** 06-08-2023

Editor: Dr. William Castillo-González
Associate Editor: Fasi Ahamad Shaik

ABSTRACT

A lack of informatics proficiency among nursing students, working professionals, and academics hinders nurses' skills to use technologies to enhance sufferers' care globally. Programmed health is a field that requires investment, according to national nursing education initiatives and professional organizations' suggestions. In the United Kingdom, a Bachelor of Nursing degree incorporates health informatics, as shown in the following case study. International collaboration with a United States-United Kingdom Fulbright Expert Scholar allowed for the development and inclusion of unique training units matching crucial health informatics competencies in an educational structure focused on the spiral training approach. This method is suggested as a means of integrating information into nursing training so that students can develop into competent clinicians who can provide care in a healthcare system that is technologically enabled.

Keywords: Nursing Practice; Curriculum; Undergraduate (UG) Nursing Education; Teaching Method.

RESUMEN

La falta de dominio de la informática entre los estudiantes de enfermería, los profesionales en activo y los académicos dificulta las habilidades de las enfermeras para utilizar las tecnologías con el fin de mejorar la atención a los enfermos a nivel mundial. La salud programada es un campo que requiere inversión, según las iniciativas nacionales de educación en enfermería y las sugerencias de las organizaciones profesionales. En el Reino Unido, la licenciatura en enfermería incorpora la informática sanitaria, como se muestra en el siguiente estudio de caso. La colaboración internacional con un becario Fulbright experto de Estados Unidos y el Reino Unido permitió desarrollar e incluir unidades de formación únicas que corresponden a competencias informáticas sanitarias cruciales en una estructura educativa centrada en el enfoque de formación en espiral. Se sugiere este método como medio de integrar la informática en la formación de enfermería para que los estudiantes se conviertan en clínicos competentes capaces de prestar cuidados en un sistema sanitario tecnológicamente habilitado.

Palabras clave: Práctica De Enfermería; Plan De Estudios; Formación De Pregrado (UG) En Enfermería; Método De Enseñanza.

INTRODUCTION

Integrating informatics into healthcare is more important in today's digital age. Given the speed at which technology develops, nurses must successfully navigate and use healthcare information systems. Educational institutions are working to include informatics in the curriculum for undergraduate nursing education in response to this requirement.[1] The science of information management, known as informatics, is crucial to delivering modern healthcare. It includes gathering, storing, retrieving, and analyzing data to better decision-making, improve patient outcomes, and advance evidence-based practice. Given the increasing use of telemedicine, electronic health records, and other digital tools, nurses must be knowledgeable in informatics to deliver high-quality care.[2] There are difficulties in incorporating informatics into undergraduate nursing programs. Students might be unprepared to apply informatics principles in clinical settings using the conventional linear teaching style. There can be a gap between theory and practice if students find it difficult to understand the value and practical implications of informatics in nursing practice.[3] A possible way to close this gap is through spiral learning, an educational approach based on Jerome Bruner's theory of cognitive development. This method emphasizes recursively revisiting and expanding upon previously taught concepts. Spiral learning promotes repeated cycles of knowledge rather than linear advancement, reinforcing and increasing information over time.[4] By presenting fundamental ideas early in the curriculum and revisiting them over succeeding semesters, spiral learning would be applied to informatics education, gradually escalating complexity and integrating clinical practice. Students can recognize the importance of informatics in real-world nursing scenarios and gain a deeper knowledge of its practical application by fusing informatics instruction with clinical experiences.[5] The spiral learning method's repeating nature helps students remember what they have learned. At certain points in the nursing program, going over informatics ideas again helps students understand the material better and keep it for longer. Students can easily incorporate informatics into their clinical practice by gradually increasing the complexity of informatics training. Future nurses will develop informatics abilities naturally because of this integration.[6] Application to Clinical Practice: Spiral learning makes it easier to use informatics in actual clinical settings for nurses. Students can learn how to use technology to assist evidence-based practice, data analysis, and patient care by connecting informatics theory to clinical experiences. Spiral learning's iterative structure encourages a lifelong learning philosophy. Graduates will be more able to adjust to changing informatics technology, guaranteeing they will stay knowledgeable and current throughout their nursingcareers.[7]

Considering existing literature evaluations, conduct a systematic study to assess and analyze the data about the benefits of simulation-based instruction for UG and pre-licensure nursing students. Over 700 main studies from 25 evaluations of simulated studies in nursing education were combined for one overarching review. The main comparator for determining overall outcomes across reviews must be the analytical comparison of perceptible findings (impact size). When simulation-based education is incorporated into pre-licensure nursing programs, it helps students learn in a variety of ways.[8] The impact of using vSIM for Nursing as a different teaching approach on undergraduate students' performance in a Foundations of Nursing course. A controlled, randomized post-test method was used. The experimental and control groups each contained 28 undergraduate students.

10 virtual cases were added to the standard course material for the experimental group. Only the standard course procedure was given to the students in the control group.[9] To investigate how nursing students view the pandemic's impact on their studies and desire to become nurses. The findings emphasized the necessity for new collaborative collaborations between educational institutions and clinical partners and disaster preparedness plans targeting studentwell-being.[10] To assess the efficacy of end-of-life care recreations with standardized patients in enhancing knowledge, skill performance, and confidence in oneself UG nursing learners. Nursing trainees, who have little opportunity to practice end-of-life care, could benefit from training using end-of-life care simulation using standardizedpatients.[11] To offer an in-depth analysis of the literature already in existence on the application of blended education in undergraduate nursing training. To confirm the many definitions of educational terminology to the inclusive notion of blended learning. This scoping study clarifies the extent to which hybrid learning is discussed in the literature on nursing education. It broadens the scope of hybrid learning to include the terms used to describe distributed, decentralized, mixed, and adaptable education. Blended learning methodologies are now used in nursing practice to teach a variety of nursing materials and skills. These methodologies are numerous, diverse, and growing.[12] This study sought to ascertain the stress, contentment, and academic performance of undergraduate nursing students enrolled in online courses. The academic success and pleasure of first-year nursing students are severely impacted by stress.

According to this study, specific actions should be taken to lessen stress and enhance online teaching and learning throughout the COVID-19 outbreak.[13] Concerning curriculum design, Examining attrition among undergraduate nursing students is the main objective of the study. Five electronic resources were adopted: PsycINFO, CINAHL, Medline, Cochrane Library, and British Nurses Index. Search terms including "student nurse," "undergraduate program," "curriculum design," and "attrition" were found using PICO Model. The identified research papers' methodological quality was assessed using mixed-method appraisal tools.[14] To comprehend

the flipped classroom experience's effects on students' learning dispositions and how students evaluated their flipped classroom experiences. The flipped classroom paradigm offers promising prospects for assisting students' transition from pedagogical and andragogical learning to pedagogical learning.[15,16]

The goal of this project is to look into how spiral learning might be used as a teaching strategy to smoothly incorporate informatics ideas into the nursing curriculum.

DEVELOPMENT

Examining informatics education models

Typically, competency-based education consists of recognized knowledge, and a structure that outlines the main learning results required for employment is used to organize ability types. Therefore, an assessment of internationally accepted nursing and biomedical informatics abilities was conducted to determine the essential ideas that must be covered in the curricula. First, the opportunity and norms of information technology in nursing activity published by the ANA were studied. These six unique criteria for nursing informatics are described, and they correspond to the stages of the nursing procedure. Ten more standards are also listed, including those for ethics, education, evidence-based practice, quality of course, communication, leadership, cooperation, professional practice evaluation, resource use, and environmental health. The suggestions for biomedical medical informatics training made by the Global Medical Informatics Association were then looked at. This establishes four areas of understanding development results and skills for healthcare workers, such as:

- The fundamental knowledge and abilities of health and biomedical informatics
- Biosciences, healthcare, and dentistry
- Computer Science
- Maths
- Biometry
- BHMI and Relevant Subjects Required Courses.

The third educational strategy under consideration is Technology Informatics Guiding Education Reform., which suggests fundamental computer skills, information literacy, and information management as the three primary areas of nursing informatics proficiency. The following education criteria set was the entry-to-practice informatics competencies for registered nurses developed by the Canadian Association of Schools of Nursing (CASN). It lists as fundamental concepts "information and knowledge management," "professional and statutory accountability," and "information and communication technologies" and determines each efficiency metric. The “Australian Nursing and Midwifery Federation (ANMF)'s” (which sets out ten criteria under three key domains) global nursing informatics norms and midwives were the fifth to be evaluated. The following lists four examples of conduct for health professionals who work in informatics. Although there may be more informatics training structures, these six were picked for analysis because of their implication for nursing and the breadth of the team's expert expertise. It was believed that there was a sufficient number to derive the fundamental informatics ideas required to create new syllabi for a bachelor's degree in nursing programs. A joint competence framework was recently issued by “Health Education England (HEE) and the Royal College of Nursing (RCN)” in the UK to increase digital literacy in the field of medicine and social work. This lists five essential skills that are needed by professionals like nurses to be digitally literate rather than using a competency-based approach. This framework does not add any new fundamental informatics ideas to this case study, however, because it does not provide detailed information on what these abilities should precisely be, how to generate them, or how to use them in practice.

Syllabus design and the pedagogical structure

A new pedagogical structure for nursing information sciences was created in cooperation with plenty of academics and nurse practitioners. It is built on the spiral learning approach, which has the following components:

- During a program, students review important concepts and transferable skills.
- To increase learning and understanding, more sophisticated applications of the fundamental principles are introduced together with new knowledge and abilities added during each iteration.
- For the purpose of boosting comprehension and preventing students from becoming intimidated by the intricacy of the subject matter, this new content is connected back to what they learned in earlier spiral phases.
- Over time, until the final learning target is reached, the student's understanding and subject-matter expertise grow.

The process of teaching pupils the fundamental ideas and elements of a subject involves more than just repetition for them to steadily improve in their understanding, information, and implementation of these concepts. To help students gain a deeper comprehension of a subject and transferable knowledge and skills, more and more information is intuitively introduced as learning continues and is tied to earlier instructional

content. Creating and delivering nursing and medical education has been done using spiral curricula.

Through the US-UK Fulbright Expert initiative, specialized academic knowledge in informatics was obtained. During a four-week stay in Scotland, a nursing faculty member with an informatics background and "a Fulbright Scholar from the University of Pittsburgh" collaborated to create a spiral-growing system to facilitate the inclusion of information into a Bachelor of Nursing degree and map the frameworks for worldwide informatics education. The Fulbright Scholar also invested effort in developing new lessons, instructing, and evaluation materials to suitably complement the subjects covered in the course material. The 6 competency areas developed through the mapping process are listed in (table 1), along with what exactly kids should understand to succeed in every one of the important subject areas. This includes:

- knowledge of health services
- knowledge of information and communication technologies
- knowledge of information management
- knowledge of information systems
- Knowledge of information systems management
- Understanding of patients' and citizens' digital health.

As a result, a spiral learning framework connected to a four-year graduation course was created in figure 1. These are the fundamental information science competencies that learners will learn every semester as they progress toward becoming nursing practitioners knowledgeable in the study of and skillful in the application of digital health.

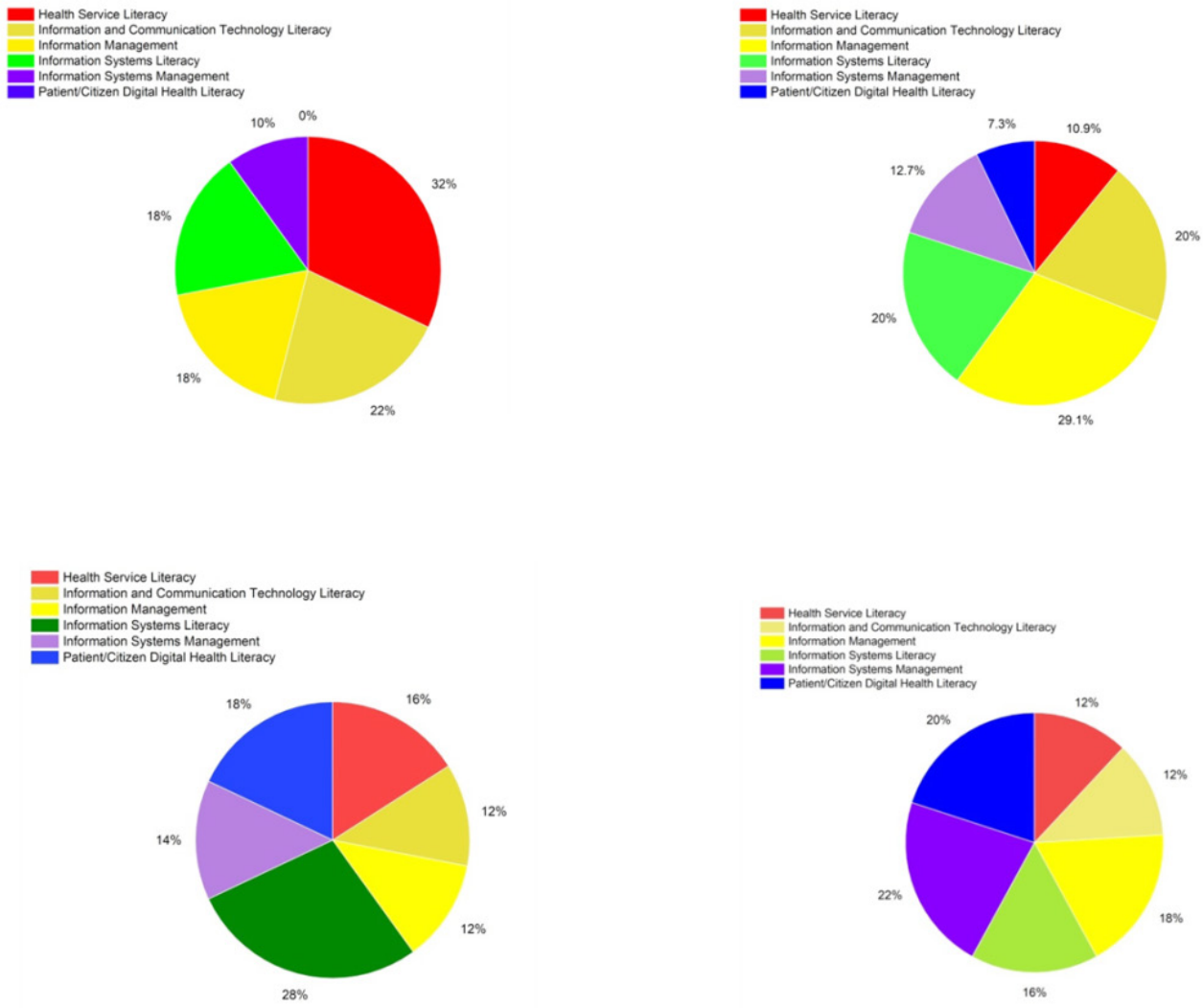

Figure 1. Spiral learning structure for fundamental informatics skills

Table 1. Essential informatics skills and learning descriptions

Competence Field	Education Descriptions
Managing Data Technologies	• Recognize the ideas and elements involved in ICT interoperability, as well as the significance of information formats and medical codes, such as “SNOMED-CT, ICD-10, HL7, and ICNP”.
	• Recognize the principles and components of ICT protection and how they support information protection and data confidentiality, including the role of legal structures and regulatory authorities.
	• Recognize the role that Information and Communication Technology play in organizing, delivering, and evaluating health services, including risk management and outcomes measurement.
	• Recognize the necessity of organizational policies and practices that facilitate Information and Communication Technology and their secure and efficient application in healthcare.
	• Distinguish between the roles played by nursing experts in data handling and in the creation, development, application, and Partnership with machine, engineering, and associated professional groups in evaluating Information and Communication Technology in medical care.
Knowledge of Data Networks	• Be aware of the fundamental subcategories of health data networks, such as managerial, medical, and public health, as well as their long-term benefits to healthcare.
	• Be aware of the advantages, dangers, and restrictions associated with telehealth and telecare systems, medical judgment systems, electronic prescription platforms, and electronic health records.
	• Recognize the influence of that context, such as "the physical, social, cultural, economic," and shared by both patients and citizens as well as by healthcare professionals.
	• Be aware of how the environment—physical or Political factors—can affect how patients, citizens, and healthcare professionals use data and communications technology in the real world.
	• Recognize new Information and Communication Technology trends, such as Big Data, AI, and automation, and the effects they will have on nurses, patients, and society.
Data Control	• Recognize the notions and elements of data quality and, in healthcare, the differences among information, data, and understanding.
	• Understand how Information and Communication Technology s are utilized for clinical and organizational information management, communication, and documentation to assist in making choices and care delivery.
	• Exhibit the ability to use various technologies to organize, interact, and utilize digital medical data.
	• Describe the ethical and legal concerns that arise when gathering, using, sharing, and discarding health information, as well as the function of data governance in the healthcare industry.
	• Recognize the impact of information and communication technologies on action, policy, and training in evidence-based healthcare.
Programmed health knowledge between sufferers and citizens	• Recognize the benefits, hazards, and restrictions of the Information and Communication Technology s that are available for these uses, as well as the reasons why patients and citizens require access to electronic medical data and digital health services.
	• Recognize the significance of patients' and citizens' access to social support and health information through online applications like social media, online communities, avatars, chatbots, etc.
	• Discover how additional Information and Communication Technology s, such as gaming technology, virtual and augmented reality, wearable technology, and supported life devices, can promote the health of patients and people while being aware of their benefits, risks, and restrictions.
Knowledge of medical facilities	• Have a fundamental understanding of the "National Health Service (NHS)," including the way it is managed, supported, and offered.
	• Understand the basic demographics and influences on people's health.
	· Differentiate the function of nursing specialists within the NHS and the ways in which they support and care for Scottish citizens' health.
Knowledge of "Information and Communication Technology (ICT)"	• Recognize the fundamental ideas and elements of "Information and Communication Technology" (ICT), such as software, hardware, electrical networks, machines, especially portable systems, and their historical development.
	• Be aware of the ways in which Information and Communication Technology s can improve health, such as through gathering, storing, processing, managing, and sharing information to aid in decision-making and the provision of various forms of care in a variety of settings.

ASSESSMENT

The 6 competency categories and Teachers correlate learning descriptions as they develop particular training modules that will be included in a bachelor's degree in nursing. In 2018, the competency area of managing information was covered by one of these training modules, which was reviewed. To enhance present nursing courses, learning, teaching, and evaluation materials were developed that centered on digital professionalism and contained information on how to use various technologies and communicate online effectively. These were created utilizing a variety of resources, including specialized literature. NMC guidelines on responsible social media use relevant investigations of recent inappropriate online networking use by nurses and videos on the subject. This was included in a professional development course for second-year undergraduate adult nurses. A second-year adult nursing group was given an online survey to complete after the professionalism course with the ethical consent of a university study ethics council. A survey was created using the online survey generator "SurveyMonkey® (https://www.surveymonkey.com/)" to assess the effectiveness of this new curriculum. It included open-ended text boxes and questions with a Likert scale to get nursing learners' opinions on the importance of learning about technological proficiency. Qualitative data analysis was used to evaluate the numerical information, while theme evaluation was utilized to code, categorize, and highlight major themes in the quality information. Only the findings from the qualitative analysis are reported here because only 5,5 % of respondents to the online survey responded.

All of the responders were female and ranged in age from 19 to 24. One recurring theme was the importance of limits, with statements like "It is useful to know digital boundaries" and "Not likely to post inappropriate information but good to know the legal boundaries" appearing after students received instruction on digital professionalism. Another focus of the discussion was the advantages of this kind of teaching for the student's upcoming nursing occupations. "I think that the material covered on Digital Professionalism will be useful in the future, as the use of social media is increasing and it is being used in various ways," said one student. "Yes, as it ensures that future nurses do not make mistakes in posting anything online about patients or their job." The use of technologies to communicate effectively arose as a 3rd theme. "The section regarding the use of social media was most useful for me, as I use several sites," said one participant. "Yes, I think it is helpful; many of the students are quite young and don't seem to realize how far social media travels," I said after completing his module's digital professionalism content. "I can now use my social media platforms more responsibly." Overall, it appeared that nursing students valued learning about this informatics topic and acquired a core understanding that could improve their professional practice.

To evaluate how successfully the new nursing informatics curriculum and pedagogical structure serve to provide learners in nursing with the abilities necessary for becoming proficient in virtual health, a more thorough evaluation of these materials is presently being conducted. Additionally, campus-wide polls, such as the IT Training in Nurse Courses Survey, will be presented to the educational faculty. To gauge their proficiency in educating nursing students about informatics.

CONCLUSION

Informatics has been recognized as a topic that nurses should learn for more than 30 years, according to nurse educators. Despite slowly gaining acceptance globally, its incorporation into UG nursing courses remains problematic. As a result of the advanced technology we now use daily, most nursing students are accustomed to it and utilize it daily in their personal life. As a result, nurse educators must invest in info systems education to make sure that graduates have the information and abilities needed to succeed when they join the healthcare industry. The research provided here could be used by nursing teachers to teach students about IT and how it can be used with patients, caregivers, and the general public to enhance health outcomes and the provision of healthcare services.

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FUNDING

No financing.

CONFLICTS OF INTEREST

None.

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