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Research Article

Relevance of STS Concepts to The Professional Development of Nursing Students: A Case Study at The University of Saint Anthony.

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Abstract:

This paper discussed the applicability of the concepts of Science, Technology, and Society (STS) to the professional growth of nursing students at the University of Saint Anthony. The study was based on the Social Construction of Technology (SCOT) theory and investigated how the concepts of STS are perceived as reflected by the nursing students, how these concepts affect their professional values and competencies, and how the students perceive the applicability of STS to their future practice in the clinical setting. The qualitative case study design was used to collect and analyze data, where semi-structured interviews with nursing students were conducted using the thematic analysis tool. The results showed that students understand STS as a model that emphasizes the interdependence of the relationship between technological tools used in healthcare, ethical duties, and social situations. The respondents also noted that STS learning helped them to be more aware of patient-centered care, ethical responsibility, and responsible use of healthcare technologies. Even though there were students, who initially viewed the focus of STS discussions as theoretical, they ended up appreciating the importance of STS in equipping them with the knowledge of becoming technologically progressive to meet the demands of the health care settings and socially responsible nursing practice.

Keywords: Science, Technology, and Society (STS); Nursing Education; Professional Identity; Social Construction of Technology (SCOT); Healthcare Technology

1. Introduction

The practice of creating medical technologies has significantly transformed the capabilities of a medical professional and, more specifically, a nurse. Such systems like electronic health records, telemedicine, simulation-based learning and digital diagnostic tools have already turned into a main component of contemporary healthcare setting. Nurses therefore cannot be charged to gain technical skills alone but embrace the bigger picture in ethical, social and cultural consequences of technology in dealing with patients. This role of technology highlights the need to integrate the perspective of Science, Technology, and Society (STS) in nursing education that would allow students to have a critical explanation of the effect of technological systems in the manner of the healthcare practice.

The STS education focuses on interdependence of the scientific knowledge, technology, and social situations. Instead of seeing technology as an impartial tool, STS helps learners to consider the impact of technological changes in the work of any professional, healthcare system, and patient outcomes. Technology in nursing education, including simulation platforms, digital learning systems help to develop clinical skills and demand students to consider the ethical and societal impacts of healthcare technologies (Altmiller and Pepe, 2022; Gause et al., 2022)

In this way, students will be taught to understand that technology has not just efficiency and accuracy but also quality and human aspects of patient care.

The theory used in this study is called the Social Construction of Technology (SCOT) which was developed by Trevor J. Pinch and Wiebe E. Bijker. According to SCOT, social processes in addition to technical aspects shape the technologies, and these are interpreted by various social groups. One of the main ideas of the theory is that of interpretive flexibility that implies that individuals can comprehend and apply technologies in various ways based on their occupational status and social background (Volikas, 2017). As a social group, students play a significant role in nursing education because their perceptions of technologies in healthcare could define their adoption and use of such tools in practice.

Although there is an increased use of technology in healthcare education, little has been done in terms of the impact of STS perspectives on professional growth of nursing students. Most of the current research is on technological competencies or adoption variables instead of researching on how students perceive the social and ethical aspects of healthcare technologies. To cover this gap, the current paper examines the concept of STS knowledge in nursing students, the impact of these concepts on their future professional values and competencies, and the perceptions of future nursing students on the applicability of STS learning to their future clinical practice. The study will target nursing students of the University of Saint Anthony to give insights into how STS education can help in preparing reflective and socially responsible healthcare workers.

2. Research Design

The research design used in this study was a qualitative case study to investigate the perception and interpretation of nursing students on the importance of the concepts of Science, Technology and Society (STS) on their career progressions. Case study approach suits in situations when researchers need to explore complicated social phenomena in the definite context so as to have opportunity to analyze the lived experiences, perceptions and interpretations of the participants in-depth. The case study design helped the researcher to understand the meanings that the nursing students ascribe to STS concepts in the learning context of the University of Saint Anthony.

The qualitative design is in line with the interpretivist paradigm and theoretical assumptions of SCOT, which highlight the social construction of knowledge and technology. Because the research will involve the interpretation and experience of the students with the concepts of STS, qualitative approaches are worth considering since they will help to capture the detailed accounts and contextual backgrounds that cannot be properly measured using quantitative methodology.

2.1 Participants of the Study

The participants were undergraduate nursing students who are taking courses that incorporate an element of Science, Technology, and Society in the nursing curriculum at the University of Saint Anthony. Purposive sampling was employed in the study whereby participants were chosen that had either done or were undertaking coursework related to STS and capable of giving relevant information on the research phenomenon.

A sample of about 10-15 nursing students was selected to provide enough data that is also manageable to conduct qualitative analysis. The study involved participants with varying academic levels in order to have a wide range of experience and views to the practices of integrating the concepts of STS in nursing education.

2.2 Data Gathering and Analysis

The information about the current research was gathered with the help of semi-structured and in-depth interviews intended to investigate the experiences, interpretation, and reflection of the participants on the concept of Science, Technology, and Society (STS) concerning their professional growth as nursing students. The semi-structured format gave the researcher a chance to adhere to a series of ready-guided questions which also gave the participants a chance to expound on their own insight and experiences. The interview guide was designed according to the study objectives and oriented on three areas, namely, the knowledge and comprehension of STS concepts by the students, their experiences of how STS affects their professional values and competencies, as well as their perceptions about the applicability or constraints of STS learning in nursing practice. The guiding questions provoked the participants to think about their academic experiences and explain how the STS perspectives influence their perception of technology, ethics and problems in healthcare that affect society.

Individual interviews were carried out to enable the researcher to enable the respondent to express his or her views freely without external interference. Individual interviews took about 45 to 60 minutes of the participants, which allowed them enough time to tell detailed stories and recount. Informed consent was informed before the interviews and participants were assured that their answers will be kept confidential and will only be made available in the research. All the interviews were recorded to facilitate accuracy in capturing the responses of the participants, and this was done with the permission of the participants. The tapes were transcribed literally and the researcher was thus able to develop a credible dataset to be used later in analyzing and interpreting the experiences of the participants.

The analysis of the data collected through interviews was done through the application of thematic analysis according to the steps described by Braun and Clarke (2006). The reason why this approach of analysis was chosen is that it offers a systematic procedure of identifying, systematizing and interpreting patterns of meaning in qualitative information. The analysis started by familiarizing the data where the researcher took his time to read and reread the interview transcripts to create a holistic picture of what the participants said. This was preceded by initial coding, of which important statements, phrases and ideas that mattered with the research intentions were noted and tagged as meaningful units of data.

Once the transcripts had been coded, the researcher then searched the transcripts to identify themes in them, however, by bringing related codes together into wider patterns that reflected common concepts in the narrations of the participants. These new themes were then discussed and processed to achieve coherence and consistency of the dataset. After settling the themes, they were clarified and labeled to reflect the important findings on the experiences of the participants. The last step was to generate analytic report, i.e., the identified themes were interpreted concerning the aims of the study and theoretical framework used. The framework of thinking through which the findings were interpreted during the analysis was the Social Construction of Technology (SCOT), specifically, the notion of interpretive flexibility, which emphasizes the way in which technologies are shaped through various forms of meaning and interpretation by different social groups, including nursing students, in the professional and educational realms.

3. Results and Discussion

3.1 Understanding and Interpretation of Science, Technology, and Society (STS) Concepts

The discussion has shown that concepts of Science, Technology and Society (STS) are viewed by nursing students as mechanisms of explanation of the interdependence between the technological innovation, healthcare practice, and the needs of the society. The participants mentioned that STS assisted them in realizing that technology in health care is not a set of tools but a system that is influenced by social expectations, ethics and professional accountability. Most of the students reported that STS classes assisted them in becoming aware of how medical technologies including electronic health records, telemedicine platforms, and diagnostic machines affect decision-making and patient care. These reactions are the evidence that the students consider technology as a part of social and institutional conditions instead of being neutral tools.

One participant explained how STS discussions allowed them to recognize the broader meaning of healthcare technologies: *"Before taking the STS subject, I thought technology in hospitals was just equipment that nurses needed to operate. But the course made me realize that these technologies are connected to patient safety, hospital policies, and even ethical responsibilities."* (Participant 3) Another student highlighted how STS learning changed their perception of technological systems in healthcare: *"STS helped me understand that technology is not just about machines. It also involves how healthcare workers use it, how patients respond to it, and how society expects us to use it responsibly."* (Participant 7).

This observation represents the interpretation malleability in the Social Construction of Technology (SCOT) theory, which posits that the systems of technology gain meaning in the interpretation of various social groups (Pinch and Bijker, 1984). Nursing students being an emerging group of healthcare professionals form a relevant social group whose interpretation influences the way technology is viewed and used in the clinical environment. Huang et al. (2025) also reported similar findings whereby, perceptions of smart healthcare technologies by the nursing students were affected by their professional training and learning, which made them regard technology as a resource in healthcare practice, both clinical and social.

Another idea also underlined by students was that STS assisted them in becoming more critically aware of the social consequences of scientific and technological progress. The respondents said that reading on STS made them consider topics like digital privacy, technological dependency, and disparities in healthcare. One participant reflected on this realization: *"When we discussed STS topics, I started thinking about issues like data privacy and how patients' medical information is stored in digital systems. It made me realize that nurses must also protect patient rights when using technology."* (Participant 5).

These considerations are consistent with one of the studies that propose that STS-based education can enhance critical thinking regarding the overall societal implication of science and technology (Pedretti & Nazir, 2011). Such critical awareness is of special concern in the nursing education, since in many instances, nurses act as bridges between technological systems and the world of patient care. Thus, the results indicate that STS learning helps students of nursing acquire a more socially enlightened perspective on healthcare technologies.

3.2 Influence of STS Concepts on Professional Values, Competencies, and Identity

As demonstrated in the stories of the participants, the exposure to STS concepts is an important factor in the formation of their professional values and competencies as future nurses. In the view of most students, STS discussions enabled them to value ethical duties related to the use of healthcare technologies. The respondents focused on the need to ensure patient confidentiality in dealing with digital health records and to see that the technological tools are used to assist in providing compassionate care and not to substitute the human interaction.

One participant emphasized how STS influenced their ethical perspective in nursing practice: *"STS made me realize that being a nurse is not only about knowing how to operate machines. It is also about using technology responsibly and making sure that it benefits the patient."* (Participant 2). Another participant described how STS learning strengthened their awareness of professional accountability: *"When we discussed technology in healthcare, I realized that nurses must be careful because mistakes in digital systems can affect patient safety. It made me more aware of my responsibility as a future nurse."* (Participant 9).

These thoughts indicate that STS learning helps students to apply moral thinking in the decision-making process in their careers. This result corroborates the earlier studies that suggest that professional competencies of ethical responsibility and patient safety can be formed through the implementation of technology in nursing education. According to Altmiller and Pepe (2022), awareness of quality and safety in healthcare settings among nursing students can be increased with the involvement of technological tools and sociotechnical discourses in nursing curricula. On the same note, Gause et al., (2022) added that technology-aided clinical learning environments enhanced the capacity of students to relate theoretical knowledge and practical decision-making.

The participants also explained the effects of STS learning on their learning of the meaning of being a nurse in the changing healthcare environment that was technologically dynamic. Students reported that STS talks made them think of nursing as not only a clinical profession but also as a socially responsible practice that includes advocacy on behalf of patients in technology-mediated healthcare settings. One participant expressed this perspective: *"Technology can make healthcare faster and more efficient, but nurses still need to ensure that patients are treated with dignity and compassion. STS helped me understand that balance."* (Participant 4).

This definition gives us the SCOT view that the meaning and application of the technological systems are actively constructed by professional groups (Bijker et al., 2012). Based on this, nursing students are not the passive consumers of technology but the emergent players who play a role in defining how healthcare technologies can be utilized in practice. In this way, the results can

indicate that STS education facilitates the development of professional identity, which is balanced in terms of technological competence, as well as ethical and social consciousness.

3.3 Perceived Relevance of STS Concepts to Professional Development and Future Clinical Roles

The results also indicated that the majority of the participants view STS learning as an extremely relevant topic to their professional growth and future clinical practice. Students described that STS courses made them see the bigger picture in which healthcare technologies can be applied, in terms of institutional policies, ethical dilemmas, and social inequalities in healthcare access. This increased vision enabled them to learn to value the complexity of healthcare delivery within technologically developed settings.

One participant reflected on how STS prepared them for future practice: *"In the hospital setting, technology is everywhere. Learning STS helped me understand how these technologies affect not only nurses but also patients and healthcare systems."* (Participant 6). Another participant emphasized the importance of STS in adapting to technological changes in healthcare: *"Healthcare is constantly changing because of new technologies. STS helped me realize that nurses must be adaptable and understand the impact of these technologies on society."* (Participant 8).

These impressions are aligned with the studies that consider sociotechnical competence as an essential part of healthcare education. Jang and Yang (2025) discovered that the way nurses perceive digital technologies depends on their knowledge of usefulness and professional relevance of technologies. On the same note, Ramvi and Grisprud (2025) also found that in attempting to implement new technologies, healthcare professionals tend to trade technological efficiency and traditional values of patient-centered care when trying to consider the new technologies in practice.

Nevertheless, other participants also raised their concerns over the practical implementation of STS concepts in clinical training. Some of the students reported that STS conversations were valuable but they had occasional problems with applying theoretical material to specific clinical processes. One participant explained: *"Sometimes the discussions in STS feel very theoretical, and it can be hard to relate them directly to clinical skills. But they still help us think more deeply about our responsibilities as nurses."* (Participant 1).

This observation is indicative of a more general problem regarding STS education in which theoretical discussion can seem abstract in the first instance without obvious connections to practice (Pedretti & Nazir, 2011). However, the majority of the participants eventually admitted that STS learning has enlightened their minds regarding the place of technology and society in health care. In general, the results indicate that even though the students might be unsure about the practical applicability of the STS concepts in the beginning of the course, they will come to the conclusion of their significance in influencing reflective and socially responsible nursing practice.

4. Conclusion

This paper examined the ways in which nursing students in the University of Saint Anthony comprehend and interpret concepts of Science, Technology and Society (STS) and how these concepts affect their professional growth. The results show that the perception of STS by students is rather positive in the context of the importance of this framework to comprehend the complex interrelationship between healthcare technologies and ethical duties and the societal environment. The participants have shown in their reflections and experiences that STS learning assisted them to overcome their perceptions of technology as being a set of technical tools and begin to understand that technology has wider implications in all aspects of patient care, professional responsibility, as well as the healthcare systems. Based on the Social Construction of Technology (SCOT) theory, the findings point to the fact that nursing students, as a social group of people in the healthcare sector, construct meaningfully about technology that influence the ways they view the role of technology in the clinical practice.

In addition, the researchers discovered that the exposure to the concepts of STS helps in shaping the professional values, competencies, and identity of nursing students. The participants reported that STS learning enhanced their ethical responsibility, patient-centered care, and social influence of healthcare technologies awareness. Even though some students initially viewed STS discussions as being abstract, they eventually realized that such concepts are relevant in equipping them with technology-based healthcare settings. In general, the results indicate that the application of STS views to nursing education may contribute to the development of reflective, socially responsible, and technologically competent nursing professionals who will be more able to address the complexity of the modern healthcare systems.

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