Kashihara, A. et al. (Eds.) (2024). Proceedings of the 32nd International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Sociotechnical Challenges of Older Educators in Delivering Medical Education Online

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Abstract: This study explores the sociotechnical challenges faced by silver teachers in teaching medicine, focusing on integrating technology in educational settings from the perspective of older educators in the field of medicine. Utilizing the Sociotechnical System (STS) theory, the research highlights the interplay between social and technical elements in education, emphasizing the need for solutions beyond technology to equip older educators with the necessary skillset in teaching medicine online. Key challenges identified include the fluidity of technology, achieving a digital social presence, and siloed technology training, particularly pronounced in low-resource settings. The study utilized thematic analysis based on the results of interviews with twelve older adult educators in the Philippines who teach medicine. The findings underscore the barriers to adopting LMS, e-learning, and other technological methods of delivering medical education due to unfamiliarity with emerging technologies and resistance to changing traditional teaching methods.

Keywords: Older adults, sociotechnical systems theory, online teaching, medical education

1. Introduction

The rapid advancement of digital tools and platforms has revolutionized medical education by introducing innovative teaching methods and enhancing learning experiences to cater to the dynamic needs of students and educators, thereby becoming crucial in training future medical professionals. Computer-based learning, simulations, virtual reality, and other educational technologies are vital in improving medical education engagement by facilitating the interactive and transformative acquisition and sharing of knowledge, which is paramount in the ever-adapting medical landscape (Alselaiti, 2023). There is a favorable perception of online learning tools that enhance medical education despite identified challenges like technological difficulties and the need for hands-on experience (Rahimi et al., 2024). The implementation of e-learning and telehealth has demonstrated increased enhancement in educational outcomes in the delivery of medical education; however, issues regarding their long-term impact on healthcare delivery persist (Michalik et al., 2024).

With the increasing age of faculty members teaching medicine, it is essential to comprehend and cater to the requirements and apprehensions of these mature medical educators to harness their expertise amidst resource constraints effectively. Teaching medicine using technology might pose challenges for older educators due to obstacles like age-related issues, insufficient computer skills, and potential unfamiliarity with advanced technological tools. While older educators might face hurdles in adapting to new technologies, innovative teaching methods such as e-learning suites and simulations have been shown to boost student learning outcomes. The significant benefits of incorporating technology in teaching medicine overcome the initial challenges (Tariq et al., 2020).

The Sociotechnical Systems (STS) Theory, initially used to boost industrial productivity and worker satisfaction, is a framework that emphasizes the mutual optimization of social and technical subsystems within an organization to improve performance. It has found modern applications in diverse fields like healthcare, software engineering, and AI adoption in workplaces (Geary et al., 2022). In the context of aging populations, STS theory has been leveraged to study older adults' interaction with technology, underscoring the need for sociotechnical learning designs that boost technology acceptance and usage among the elderly, thereby enhancing their quality of life. The concept of sociotechnical systems, applicable to diverse healthcare aspects, including the fusion of technology and social elements in medical education, can be beneficial for senior medical educators to refine their teaching techniques and keep abreast of field advancements.

In this study, we explore the application of sociotechnical systems theory in teaching medicine among aging educators. This paper contributes to the body of knowledge by providing a perspective on how older educators, including physicians and doctors, face the challenges and embrace the benefits of integrating technological systems and innovations in delivering medical education.

2. Literature Review

Social Media has become a platform where students interact. However, research have shown that it has also become a source of stress.As applied in education, the Sociotechnical System (STS) theory is a cross-disciplinary method that merges technical and social aspects to improve learning methods and results. STS is highlighted by the interplay of technological systems and societal elements to create educational settings that are both efficient and adaptable to real-world scenarios. The use of STS in education is diverse, with one key aspect being its role in fostering skills for utilizing and designing technological systems.

Technological systems, as sociotechnical entities, integrate societal and technical elements, are managed by system builders and organizations, span local to global networks, evolve uniquely within various contexts, and exhibit interdependence, creating a complex web across time and space (Hallström & Kaijser, 2022). STS can be applied in education by integrating social and technical elements. The social system includes interactions between educators and students, while the technological system encompasses the tools, methodologies, and knowledge used for instruction, both on-site and remote. Adopting a sociotechnical strategy in education could aid in optimizing work arrangements, boosting productivity, and enhancing organizational efficiency by fostering a supportive relationship between social and technical systems for improved results (Terziev, 2018).

Applying STS theory in education faces barriers, particularly with Learning Management Systems (LMS) and other educational tech tools. Successful adoption requires integrating social and technical aspects, but challenges include unfamiliarity with emerging technologies and the complexity of adapting traditional teaching methods to digital platforms. Moreover, social contradictions like cultural opposition to change and user hesitance further hinder the adoption of LMS, as these systems frequently conflict with entrenched educational practices and anticipations (Ali et al., 2024). Insufficient understanding and integration of social structures often hinder the incorporation of sociotechnical systems in education. Many systems are designed without adequately considering social dynamics, leading to suboptimal deployment and use (Lombardo et al., 2021). There is an emphasis on the need for a strong research foundation in health informatics, advocating for clear sociotechnical concepts, theories, and values in educational and research literature to thoroughly investigate and implement sociotechnical strategies in complex healthcare settings. The STS theory in education provides a structure for comprehending and augmenting educational prospects by merging technical and social elements. The methodology is deemed necessary in technology-augmented learning settings, which involve an interplay between individuals and technology.

3. Methodology

A total of 12 educators who are older adults based in the Philippines participated in the study. The retirement age in the Philippines is 60, and 9 out of 12 participants are full-time, tenured faculty members in higher education. All participants were selected based on their experience in traditional teaching (at least ten years) and online class delivery (full, blended). All participants provided their informed consent, and all identifying information was anonymized.

Semi-structured interviews were conducted using an interview guide covering teaching experience, the platform used, and perceptions and experiences using technology platforms to deliver their classes. All interview sessions were transcribed and analyzed using thematic analysis. Given the multidisciplinary approach of this study, we used a set of preliminary codes extracted from the literature in the fields of technology, education, and gerontology.

Data analysis involved extracting meaningful statements and assigning codes using qualitative analysis software called Dedoose. To uncover themes, we first used the code co-occurrence feature of Dedoose and identified frequently occurring codes in a statement from the participant as code pairs (Talanquer, 2014). Statements representing these code pairs were then arranged in a data set to allow us further contextualization in renaming our codes, connecting relationships, and eventually forming our themes using consensus decision-making. Our analysis guided us by the trustworthiness criteria in qualitative studies (Nowell et al., 2017; Taylor et al., 2016).

4. Results

Our data analysis revealed three themes with nine corresponding codes, as shown in Table 1 – Sociotechnical Challenges. We identified the participants with these codes and explained our themes in the next section. Likewise, we lifted specific lines in the interview transcripts as exemplars to provide context to our findings.

Table 1. *Sociotechnical Challenges*

THEME	CODES	PARTICIPANTS
Technology fluidity	Learning challenges	P1, P2, P3, P5, P7, P8, P12
	Lack of access	P1, P3, P5, P8, P9, P10, P11, P12
	Rapid technology advances	P2, P3, P4, P6, P7, P8, P9, P12
Digital social presence	Non-interactive audience	P1, P2, P4, P7, P8, P9, P10,P11
	Lack of knowledge	P1, P2, P3, P5, P6, P7, P8, P10, P12
Siloed technology training	General approach to training	P1, P4, P7, P8, P9, P10, P11, P12
	Weak technology governance	P1, P3, P4, P5, P6, P7, P8, P9, P11

4.1 Technology Fluidity

Our first theme is keeping up with technology fluidity, which covers codes such as learning challenges, lack of access, and keeping up with recent technological advances. Recent phenomena such as COVID-19 and generative AIs have accelerated how medical students learn in the classroom and laboratory settings (Dhar et al., 2021; Sauder et al., 2024). As such, teachers are also constantly pursuing learning new technologies but experience more challenges brought about by aging (Camaya, 2022). Compared to other fields, peer learning is more applied in healthcare, where medical interns learn within clinical settings. In contrast,

it is usual for medical consultants to teach in hospitals with actual patients. This results in learning to be highly dependent on the teaching style of the consultant, technology familiarity, and, to some extent, the institution's policy. In late life, challenges to keep up with technology are exponential.

In our interviews, participants shared challenges in aligning their pedagogy with job requirements. Many feel pressured to embrace technology and doubt their ability to deliver online courses with the same quality as physical classrooms. A 63-year-old pharmacology instructor (P12) and a college of medicine administrator from the province (P3) expressed these concerns:

> *"I have no problem delivering my lectures online, but sometimes there are new features that suddenly comes out and I have no idea how to use it. It takes time for me to learn new things especially that the systems we use for teaching gets updated frequently."* – (P12, Learning Challenges and Rapid Technology Advances)

> *"Our university supports the transition to online learning to supplement learning. Younger lecturers tend to embrace technology faster than older adults. Because our resources are limited, we prioritize investing in technology devices for younger lecturers as our retiring professors require more training and are mostly resistant to online learning."* – (P3, Lack of Access and Learning Challenges)

4.2 Digital Social Presence

Our second theme, achieving online interaction, refers to medical educators' difficulty in replicating clinical pedagogy in the online environment. Offline, clinical instructors are known to present medical cases with live demonstrations, patient interactions, and interactive discussions (De Felice et al., 2023; Maia et al., 2023). Due to the lack of advanced technologies to supplant the absence of these class activities, educators feel that social presence is absent when they teach their classes. For example, using videoconferencing platforms to deliver their lectures becomes one-way, and students are uncomfortable opening their videos. Likewise, beyond teacher and student interactions, social presence is also achieved through intimacy and peer-to-peer interactions, which are difficult to achieve in digital spaces. In aging studies, intimacy, and social interactions are essential ingredients in living well, and these are also the same challenges lamented by educators who are older adults in teaching online (Bong et al., 2018; Embarak et al., 2020).

Recent advances in educational technologies highlight the importance of social presence in online learning. In medical education, augmented reality and AI complement online lectures. A 60-year-old female participant (P8) handling ophthalmology residency training lamented her unawareness of these technologies, preferring lecture slides. Similarly, an internal medicine lecturer (P2) noted that students rarely open their cameras during online sessions, making them monotonous:

> *"For me, online sessions with my residents are convenient but I feel that they are bored. They are not as interactive compared to our sessions in the classrooms and in hospitals. Technology support office encourages us to use tools they provide but I am not aware of such."* – (P8, Lack of knowledge and Non-interactive audience)

> *"I have to ask my students to open their cams so I can see them but some would just simply make excuses. Q and A sessions are very minimal. I heard about some games to improve online interactions but I don't know how to use them."* – (P9, Lack of knowledge and Non-interactive audience)

4.3 Siloed Technical Training

Our last theme is the siloed technology training, which reflects the general approach to faculty development in the use of technology. The theme reflects prior studies that training or

educating older adults should be personalized as they have different needs due to physical deterioration and cognitive decline (Pappas et al., 2019). Other studies have also referred to healthcare technology governance as fragmented, and implementation is usually compartmentalized, leading to difficulty in technology governance (Bygstad et al., 2015; Øvrelid, 2024). In technology training to adopt online learning technologies, our participants are usually with other trainees and have difficulty keeping up with younger colleagues.

Various systems, platforms, and policies hinder our participants from improving their online teaching. Senior medical lecturers often work at multiple universities with differing technology governance policies. For example, a female faculty member teaching medical ethics (P1) uses different LMS and video conferencing tools at three universities. Another lecturer (P11) teaching public health lamented the lack of standardized online learning policies, making it difficult to switch platforms for her classes:

> *"There is too much technologies and policies that I need to be aware of. Trainings are not much of a help because it does not consider our advance age. In classroom teaching, I just need to be there physically and start my lecture."* – (P1, General Approach to Training and Weak Technology Governance)

> *"Our infrastructure lacks a cohesive plan. This is translated to the way we implement educational technologies and the way the college trains us in its use" (P1, General Approach to Training and Weak Technology Governance."* – (P11, General Approach to Training and Weak Technology Governance).

5. Conclusion

Using qualitative inquiry through the sociotechnical lens, our study identified key challenges of older adults in teaching medicine: keeping up with technology fluidity, achieving digital social presence, and siloed technology training. Interpreting the findings of this study necessitates the incorporation of its limitations in future research. First, our sampling design excluded older adults teaching allied professions in healthcare education, such as medical technology and nursing. Capturing their perspectives will contribute to a holistic set of findings in medical education. Second, our participants are from a developing economy, resulting in sociotechnical challenges that are highly contextualized to low-resource settings. Future studies may attempt to contrast our results to those in developed economies and identify the similarities and contradictions.

Our findings echo the desire of older adults to remain an essential contributor to medical education in the physical or online delivery of medical education. We emphasize the need for personalized training for these cohorts as they bring with them a wealth of experience and wisdom that should be cascaded to future physicians, even in online learning. Likewise, our study highlighted that challenges to online learning are inertly intertwined between technology and social aspects of technology adoption. Technology designers and educational administrators can bear this in mind when designing online teaching platforms and policies that will have older adults as their users.

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