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Responsible Integration of Digital Wellness into Technical Engineering Curricula

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Responsible Integration of Digital Wellness into Technical Engineering Curricula

Abstract

Conventional software engineering curricula often prioritizes digital proficiency, while neglecting the broader impacts of digital technologies on individuals mental and physical wellbeing. This educational gap may be long reaching, and may even contribute to software development that is functionally sound but inadvertently contributing to a range of wellness issues. Lack of awareness of digital wellness practices, and the broader impacts of digital technology use, is a pressing issue in our modern world. By incorporating digital wellness education into the engineering curriculum, educators can equip students with the tools required to create more ethically minded and user-centric technologies. This study explores data collection surrounding the implementation and integration of digital wellness content in undergraduate engineering education at the University of Calgary's Schulich School of Engineering. Multiple methods were used to determine average daily digital technology use and digital wellness perceptions in students and educators. The results suggest that students and educators spend a significant amount of time using technological devices yet showed low engagement with digital wellness material. Furthermore, digital wellness was perceived as less valuable than other technical topics, especially by students. Integrating digital wellness education into the core technical curriculum ensures students are trained to be not just technical experts, but also ethical leaders in the digital age.

Keywords: digital wellness, health promotion, moral and ethical responsibilities, technology-life balance, undergraduate engineering.

Background

In a world where technology increasingly shapes our interactions, decisions, and even our identities, the moral imperative to prioritize healthy technology use has never been more clear. As digital technologies become more ubiquitous, Canadians are increasingly incorporating new digital tools into their everyday lives. Recent data reports that Canadians spend an average of 6 hours and 18 minutes per day using digital technology [1]. Additionally, as the use of digital technologies becomes more pervasive and multifaceted, it blurs the boundaries between individuals' personal, academic, and professional lives. This convergence makes it increasingly difficult to disconnect and decompress, which may perpetuate a cycle of digital dependency [2].

These patterns of high digital engagement raise important questions about how individuals relate to technology in their daily lives, and whether those relationships are sustainable. In response to these challenges, the concept of digital wellness has emerged as a framework for navigating the complexities of modern digital life in a healthy way. Digital wellness can be defined as "the pursuit of an intentional and healthy relationship with technology and digital media" [3], or more

broadly as "the impact of digital engagement on human wellbeing" [4]. As a rapidly growing field of research, digital wellness seeks to foster a more mindful, balanced, and reflective use of digital technologies. Burr et al., [4] emphasizes that digital wellness is not a standalone concept, but is one deeply intertwined with overall wellbeing, particularly as the boundaries between online and offline life become increasingly blurred. Themelis [5] explores the idea that individuals are not just users of technology but active participants, or digital citizens, in a digital society. This citizenship brings with it the responsibility to understand how our digital experiences influence both our own wellbeing and that of other digital citizens. As Themelis [5] emphasizes, digital wellness is not merely a personal concern, but a societal responsibility. Drawing on work by Peters [6], they call for a more responsible approach to technology design, one that incorporates both ethical analysis and wellbeing assessments.

Within higher education, particularly in programs that require heavy technology usage such as engineering, the integration of digital technologies has dramatically transformed the educational landscape. As learning environments become increasingly digitized [7], students are expected to arrive at post-secondary intuitions with a high level of digital literacy. Yet, despite the growing relevance of digital literacy and wellness, many secondary school curriculums, including Alberta's, only briefly address these topics [8]. Consequently, the responsibility to educate students on how to mindfully navigate a digital environment falls onto post-secondary educators. Addressing this gap requires not only institutional reform. but also, a shift in how student's exiting digital habits and experiences are acknowledged and valued within academic settings. Hansson and Sjöberg [9] argue that students enter higher education with years of personal digital experience and established habits, yet these are rarely acknowledged or utilized within formal educational settings. If higher education is to be effective at promoting digital literacy and wellness, it must incorporate students' existing digital behaviors.

In response, Canadian universities have begun implementing digital literacy initiatives [10]. However, these efforts tend to focus narrowly on technical skills, often neglecting the psychological, ethical, and wellness-related implications of digital technology use. This imbalance in digital education has previously gone unnoticed but rising rates of mental illness within the study body have demonstrated the need for change [11].

More globally, in 2019 'The Digital Wellbeing Educators Project' was developed to increase educators' capacity to promote digital wellness in post-secondary settings [12]. However, even with such resources, only a fraction of educators feel confident in teaching the digital skills needed to support wellbeing [13]. This gap becomes increasingly critical as emerging technology-based teaching methods continue to reshape the post-secondary learning experience, especially within first-year at the Schulich School of Engineering [14]. Technology-based teaching methods bring both benefits and new risks. Adomaitiene and Volungeviciene [15] note that while such methods can increase student engagement and improve technology access, they also raise important questions about how to balance the advantages of technology with its potential harm to wellbeing.

Engineering and software development programs, in particular, must grapple with the ethical implications of the technologies they teach students to build. In recent years, there has been a growing emphasis on the moral and ethical responsibility of engineering institutions to teach digital wellness and ethics alongside technical concepts. Within software engineering, it is critical that software developers consider the impact of their technologies on both themselves and their intended users. Without effective education, software engineers have the potential to create technologies that, while functionally sound, may inadvertently contribute to a plethora of wellness issues. By incorporating digital wellness education into the engineering curriculum, educators can help to equip students with the tools to create more ethically minded and user-centric technologies. The need for digital wellness education is analogous to teaching proper safety protocols when introducing potentially dangerous power tools. Just as educators prioritize physical safety in laboratories, instructing students on the responsible use and development of digital technologies is imperative.

The successful integration of digital wellness in higher education must be both systematic and student-centered; grounded in psychology, informed by research, and responsive to the lived digital experiences of learners.

Methods

To date, our efforts have focused on integrating digital wellness into the core first-year curriculum; in this paper, we explore the effectiveness of that integration and make the case for extending digital wellness education into the broader technical curriculum.

At the Schulich School of Engineering, all incoming undergraduate students are enrolled in a common core first-year program. As part of their first-year curriculum, students participate in a weekly seminar series covering topics that support academic, professional, and personal success, as well as techniques for fostering emotional well-being and leadership. Through the seminar series, students cultivate the professional skills necessary to excel as a professional engineer while building self-awareness, resilience, and grit. In Summer 2023, research-informed educational content on digital wellness was developed, with a pilot implementation following in Fall 2023 [3]. Digital wellness content has continued to be included in the seminar series since 2023, with minor changes being made annually to adapt to the ever-changing technological landscape and student needs. Multiple methods have been used to assess the digital wellness knowledge and practices of individuals at the Schulich School of Engineering following the contents inclusion in seminar during Fall 2023. In this paper, we will look at three key methods including generalized student surveys with digital usage questions, in depth interviews focusing on digital technologies, and digital wellness module specific student surveys.

To gather data about students' average technology usage for educational purposes, a comprehensive survey was administered via Qualtrics after the completion of a first-year

introductory programming course. In the first-year curriculum, students take a mandatory foundational computer programming course that introduces students to programming using Python. The survey given at the end of the course included questions on course delivery, content, workload, and AI usage. To facilitate research on digital wellness, a question prompting students to consider their average daily digital technology usage was included. Students were asked: "On average, how many hours did you spend per week using technology for this course (ex. taking notes on a tablet, completing course work on a computer, etc.)?" Students were provided with a scale ranging from 0 to 20 hours. The question was included in both Fall 2023 and Fall 2024 versions of the survey.

To gain a more complete understanding of digital wellness literacy at the Schulich School of Engineering, the research team also conducted hour-long semi-structured interviews with individuals across various roles within the engineering department. Interviews were conducted via Zoom, recorded, and transcribed to allow for qualitative analysis. The interview protocol included questions related to engineering culture, stress and well-being, learning pedagogies, and digital literacy. The interviews provided individuals an opportunity to reflect on their own digital practices and offer broader insights into the digital habits and wellbeing of students. For example, participants may have been asked "In your view, does teaching technology-life balance align with the professional and ethical responsibility of an engineer outlined by the Canadian Engineering Accreditation Board."

To assess students' specific perceptions of the digital wellness module included in the First Year Seminar Series, a survey was distributed in April 2025 to all students currently enrolled in the First Year Seminar Series. This followed the inclusion of new digital wellness material. The survey prompted students to assess the usefulness/applicability of each seminar module as well as their level of engagement during the seminar. In addition, students were asked to reflect on the most positive aspects of the seminar series, one change they would like to see made, and provide any additional feedback for the teaching team. Demographic information was collected for analysis purposes.

Results

In 2023, 111 students participated in the introductory programming course survey. Of those participants, 94 responded to the question about their average weekly technology use for the course. The average number of hours per week that students spent using technology was 7.45 (min = 1, max = 20). In 2024, 67 students participated in the same introductory programming course survey. Of those participants, 58 responded to the question about their average weekly technology use for the course. The average number of hours per week that students spent using technology was 6.55 (min = 1, max = 18).

7 participants were interviewed regarding their digital wellness literacy. Interview findings suggest that individuals at the Schulich School of Engineering have a fundamental understanding

of digital wellness but are unable to easily define the concept. Furthermore, they were typically unaware of the large array of possible consequences excessive technology usage can pose to their mental and physical health. While participants were aware of common digital wellness practices, for example not using digital technology immediately before sleep, they only had a minimal understanding of the importance of these practices. Opinions about the addition of digital wellness content into the core curriculum varied, with most participants indicating it would be a beneficial addition, but some indicating that it would not be well received by students as digital wellness is not traditional technical content and would therefore not be a beneficial addition to the curriculum.

Of the 873 students enrolled in the First Year Seminar Series in Winter 2025 when the digital wellness module was delivered, only 9 students chose to share their opinions. Students indicated that the module, which was combined with additional mental health information, was moderately engaging and useful. When prompted to offer additional feedback, no responses mentioned or referred to the digital wellness module.

Discussion

The technology usage survey results from both 2023 and 2024 suggest that first-year engineering students spend an average of 7 hours per week using digital technology for one course. With most first-year students enrolled in 5 engineering courses, students may be spending upwards of 35 hours per week for technology-mediated educational activities. Furthermore, it is crucial to note that research has indicated that young adults tend to significantly underestimate the amount of time they spend on digital technology [16]. This finding raises questions about the accuracy of this data and suggests that numbers may be significantly higher than what is being self-reported. Concerns arise when considerations about additional digital technology use are made, including time spent using technology for social media, video games, communication, professional requirements, or other purposes.

The results of the interviews indicate that while digital wellness may be a more well-known term in today's world, guidelines surrounding best technological practices as well as the potential consequences of technology overuse are still unknown to students and educators alike. This gap in knowledge indicates a clear need for more comprehensive education on digital wellness. However, divergent opinions on the integration of digital wellness content into the core curriculum continue to reflect a traditional emphasis on technical skills "only" in engineering education.

The findings regarding the first-year seminar series suggest a generally neutral reception to the current digital wellness content. This is perhaps expected as the desire for students to receive more technical skills training aligns with traditional expectations of engineering education. It also suggests there may be an opportunity to encourage students to consider the non-technical aspects of their education if framed within the profession of engineering. Thus, the potential

future integration of digital wellness education into core technical courses is imperative to have students fully engage with the content. However, due to a limited sample size, these results may not be generalizable.

The results raise an interesting question; how might students', and educators', perception and understanding of digital wellness change if the content is re-framed as a critical professional skill rather than a "soft" skill?

Conclusion

It is imperative that engineers are equipped with the proper tools to develop safe digital technologies. The integration of digital wellness education into core engineering curricula is essential for students to be able to develop ethically minded, human-centric technologies. The continual improvement process employed by the research team to determine the best possible way to deliver digital wellness content to students is part of a broader effort to equip future engineers to not just be technical experts, but also ethical leaders in the digital age. A holistic approach to engineering education is needed to lead to the creation of technologies that enhance, rather than detract from, human flourishing and therefore align technological progress with societal wellbeing. The teaching of digital wellness in software engineering and related fields is not just an add-on, but a fundamental ethical responsibility.

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