

Empowering medical students: navigating the digital frontier in education

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Abstract

Background: Prensky's concept of the "digital native," though flawed, has taken hold in the popular psyche especially in the United States. Medical schools especially subscribe to this notion, overlooking the digital divides of access and competencies. Orientation programs can be an appropriate time to provide training for students in technology skills. However, orientation sessions often fail to adequately offer training in the skills in technology that medical students will need to succeed. To address this, we introduced a digital skills session as a part of medical school orientation to bridge the digital skills divide. **Methods:** This study examines students' perceptions of the digital skills session and their confidence in utilizing digital tools. Anonymous pre- and post-surveys were administered to assess students' confidence using various digital tools. The quantitative and qualitative data obtained through the pre- and post-surveys were analyzed. **Results:** 475 students participated in the workshop over three years. Evaluations showed significant improvement in

confidence with various digital tools, especially those that were less familiar. Fifty-eight percent found training on unfamiliar tools and practical tips valuable, and half of the group saw no need for improvement. The digital skills workshop revealed diverse digital competencies and highlighted that the assumption that students are digital natives, inherently proficient with technology, is flawed. **Discussion:** This study suggests that a digital divide exists within the group, digital native. Furthermore, the participants desired workshops that respected their status as adult learners, emphasizing choice and relevance to their needs, including immediate practical application of skills. These findings point to the importance of structuring orientation workshops that not only equip students with digital skills, but also align with their developmental needs and real-world applications, thereby promoting digital equity in medical education.

Keywords: digital skills workshop, medical school orientation, technology skills gap, digital divide in medical education, student confidence in digital tools

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Introduction

Variations in digital literacy, access, and enthusiasm among students¹ have challenged the assumption made by Marc Prensky and others that students born after the 1990s inherently know how to use technology, and that digital natives are "young and expert users of digital technologies."^{2,3,4} Medical students, although frequently assumed to be digitally competent, have been shown to exhibit diverse levels of confidence and proficiency with digital tools essential for their education.^{5,6,7}

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Recognizing this disparity, some higher education institutions have integrated digital skills sessions into orientation programs, which traditionally aim to facilitate students' transition by introducing institutional resources and expectations.^{8,9} However, these sessions often remain narrow, focusing primarily on basic institutional technologies such as email or security protocols. A lack of training in such technologies could be problematic for medical students who must navigate a dense curriculum, starting from the first year.

We introduced a digital skills session as a part of medical school orientation to bridge the digital skills divide and ensure that all incoming medical students are well-prepared for the digital demands of their education. This study investigates medical students' perceptions of these digital skills sessions and evaluates their impact on student confidence and proficiency.

Methods

Study Setting

Uniformed Services University of the Health Sciences is a medical school in the Northeast United States. Each medical class cohort comprises approximately 150 students. The educational journey for matriculated students begins with a three-week orientation that incorporates activities such as academic support and wellness services, student organizations, career development services, library services, and technology skills such as setting up email accounts, accessing institutional electronic resources, and configuring systems for wireless connectivity. For incoming students in 2020, a new digital skills orientation workshop was added to prepare them for the virtual learning environment they were entering during the socially distanced COVID-19 lockdown period.

Workshop description

The digital skills workshop was crafted as a 90-minute, immersive, and interactive workshop. Students were introduced to essential digital proficiencies custom-tailored to their first year in medical school at Uniformed Services University of the Health Sciences. This instructional experience was designed to foster active student engagement, offering them opportunities to familiarize themselves with these digital tools but also to actively practice their utilization. The workshop encompassed a comprehensive range of topics, including an orientation to the university's Learning Management System (LMS) and the suite of Google tools that comprise the university's digital

ecosystem. Beyond showing students how to use the technologies, this workshop focused on providing suggestions for the effective integration of technology to enhance learning.

Data collection

Anonymous pre- and post-surveys were administered to assess students' confidence using various digital tools. For each tool, students rated their confidence on a 5-point Likert scale from Not at all confident (1) to Extremely confident (5). The post-survey also included questions about the design of the workshop. Six Likert scale questions assessed how students felt about the workshop (from Strongly Disagree (1) to Strongly Agree (5)) and three open-ended questions. The data collected from three cohorts of medical students, 2020, 2021, and 2022, are utilized in this study. This study was deemed as not requiring Institutional Review Board (IRB) review (Protocol DBS.2023.639).

Data analysis

The quantitative and qualitative data obtained through the pre- and post-surveys were analyzed. Descriptive statistics on the overall differences between pre- and post-orientation scores were calculated. Due to the anonymous nature of the collected data, a paired or repeated measures t-test was not feasible. The independent samples t-test was used to compare the means of the pre- and post-surveys. This helped identify statistically significant differences between the two data sets. The open-ended survey questions on the feedback forms were collated and thematically analyzed. Since this topic is understudied, existing theories or models could not inform data analysis.

Results

Across the three years, approximately 475 students participated in the digital skills workshops. Table 1 provides a breakdown of respondents for the pre- and post-surveys and the open-ended questions in

Table 1: Responses received from the pre- and post-workshop surveys

Year	Pre	Post	Free text responses
2020	149	107	77
2021	152	118	50
2022	131	70	37
Total	432	295	164

the post survey. There were 432 responses for the pre-survey and 295 for the post-survey in total.

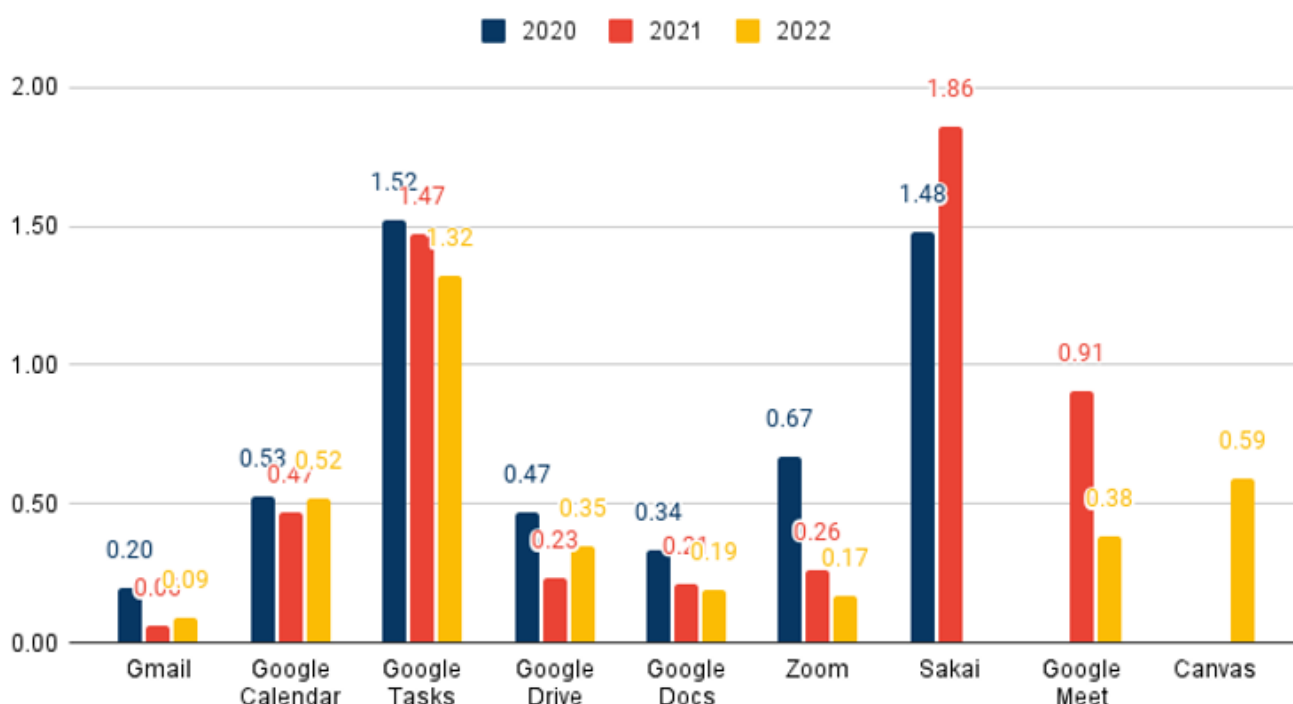
Response to specific digital tools

The largest gains in confidence were associated with less common digital tools and tools that students might not have had access to. Therefore, Google Tasks and Sakai (LMS) showed the largest gains in

2020 and 2021. In 2022 the university transitioned to Canvas, a learning management system that students had more familiarity with, and students' confidence coming in was high. Gmail was the one tool that students came in with a high degree of confidence, and there was not much gain at the end of the workshop. There was about a 0.5-point gain in confidence for the use of Google Calendar.

Figure 1: Difference in confidence level for the digital tools pre- and post-workshop

Difference between pre- and post- scores over time



Between 2021 and 2022, the gain in confidence for Google Meet dropped dramatically from 0.91 to 0.38. (See Figure 1.)

An independent samples t-test comparing participants' technology confidence levels pre- and post-workshop showed significant differences in confidence levels for all technologies between the two groups. Additionally, Levene's test indicated a significant difference in variances ($p < .05$), suggesting that the assumption of equal variances was not met. See Table 2.

Levene's test for each technology confidence level between pre- and post- workshop revealed that Levene's test was significant for all technologies, with p-values less than .001, suggesting a

substantial violation of the assumption of equal variances between the two groups. (See Table 3.)

Response to workshop

Three Likert-scale questions were asked to gauge student satisfaction with the session. After the first year, a fourth question, "This workshop was the right length," was added to the survey. Across all three years, most students Agreed or Strongly Agreed that the workshop activities contributed to their learning and were satisfied with the workshop. The satisfaction score dropped from 93% in 2020 to 76% in 2022. Only 77% of the respondents in 2022 agreed that *the workshop was the right length*.

Table 2: Independent samples t-test

		t	df	p	Mean difference	SE difference		Effect Size
Google Meet	Student's t	-8.39 ^a	654	<.001	-0.681	0.0812	Cohen's d	-0.725
Gmail	Student's t	-2.58 ^a	759	0.010	-0.122	0.0474	Cohen's d	-0.192
Google calendar	Student's t	-6.73 ^a	758	<.001	-0.476	0.0708	Cohen's d	-0.501
Google tasks	Student's t	-16.41 ^a	759	<.001	-1.420	0.0865	Cohen's d	-1.222
Google drive	Student's t	-5.46 ^a	759	<.001	-0.352	0.0645	Cohen's d	-0.406
Google docs	Student's t	-4.31 ^a	757	<.001	-0.258	0.0599	Cohen's d	-0.322
Sakai	Student's t	-18.30 ^a	540	<.001	-1.666	0.0910	Cohen's d	-1.596
Canvas	Student's t	-4.63 ^a	216	<.001	-0.703	0.1519	Cohen's d	-0.673
Zoom	Student's t	-3.05 ^a	593	0.002	-0.167	0.0546	Cohen's d	-0.250

Note. $H_a \mu_{\text{Pre-Orientation}} \neq \mu_{\text{Post-Orientation}}$

^a Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Table 3: Homogeneity of Variances Test (Levene's)

	F	df	df2	p
Google Meet	18.5	1	654	<.001
Gmail	16.8	1	759	<.001
Google calendar	30.8	1	758	<.001
Google tasks	63.7	1	759	<.001
Google drive	21.2	1	759	<.001
Google docs	34.9	1	757	<.001
Sakai	47.7	1	540	<.001
Canvas	27.0	1	216	<.001
Zoom	17.4	1	593	<.001

Note. A low p-value suggests a violation of the assumption of equal variances

Textual data analysis

The three open-ended questions provided space for students to give free responses to what they found most useful and least useful about the workshops and elicited suggestions on how to improve the workshop. Topics and the teaching process were identified as being the most useful aspects of the workshops. Training on Canvas was found to be useful by 17% of respondents and “*tips and tricks*” were identified as useful by 11%. Thirty percent of respondents found all aspects of the workshop to be useful, and 17% of respondents commented that the workshops covered topics with which they were already familiar. Fifty percent of respondents did not have any suggestions for change.

Three themes emerged from thematic analysis of open-ended responses: familiarity, and unfamiliarity with technology tools; and applicability of the workshop content. (See Table 4 for themes and quotations.) When discussing familiar technology tools, participants liked learning new things, and disliked working through tools they were already familiar with. This led to the suggestion that these tools be eliminated from the workshop. For unfamiliar tools, however, participants were dissatisfied that not enough time had been spent on them, and suggested setting aside more time for these tools. Finally, applicability of the content to learning was noted by participants;

Table 4: Thematic analysis of open-ended responses

Survey Question	Themes	Exemplar Quotations
Like Most	Familiar tools	<ul style="list-style-type: none"> • Learned new things about sites that I have used regularly • Helped me know how I can better use tools • Learning some new tools for apps that I have used before
	Unfamiliar Tools	<ul style="list-style-type: none"> • I liked the Sakai tutorial • Learning tips and tricks so I don't have to try and fumble through these resources on my own • Learning new tools despite being <u>pretty well-versed</u> in these applications
	Applicability	<ul style="list-style-type: none"> • Interactive and applicable • All was useful—particularly linking the tools together • That will be very pertinent to our learning.
Like Least	Familiar Tools	<ul style="list-style-type: none"> • Zoom, but just because I already knew how to use it • The Google tutorials (but that's only because I'm already very well-versed)
	Unfamiliar Tools	<ul style="list-style-type: none"> • Not enough time on Sakai • Would have liked more assistance regarding using Sakai since it is such a new platform for me
	Length of session	<ul style="list-style-type: none"> • Long session • Could have been shorter • Google Hangouts wasn't talked about enough
Suggestions	Familiar Tools	<ul style="list-style-type: none"> • Cut the material on Google Chat and Google Drive. • Some of these are very basic functions
	Unfamiliar Tools	<ul style="list-style-type: none"> • Spend more time on Sakai • A bit more time spent on Sakai on how to submit assignments and such.... • Focus more on the unfamiliar stuff, for example, none of us have ever used Sakai
	Length of session	<ul style="list-style-type: none"> • Shorter length. • It could be shortened • Make it optional

time spent on tools they were already familiar with was considered redundant.

Discussion

The findings from this study on student perceptions of a digital skills workshop highlight the diversity in digital skills of medical students and the need for an andragogical approach to designing the workshops. The study revealed a range of self-confidence in technological proficiency among learners, demonstrating the existence of a digital divide in digital skill sets. The disparity in confidence across different digital tools and participants' self-declared lack of digital competency questions the common assumption that current students are digital natives "who speak and breathe the language of computers and the culture of the web in which they were born".¹⁰ These assumptions about the digital competencies of digital natives may overlook the reality that digital exposure does not equate to digital competencies.¹

As adult learners, students wanted more agency over the workshop in terms of flexibility in attendance and choice of topics.¹¹ They did not want to spend time on "unnecessary information" when they knew "pretty much all of it." When the information presented fell below their zone of proximal development (ZPD), students lost interest.¹² However, when the session aligned with the students' ZPD, they were appreciative of the "small tips and tricks even for 'veteran' users." As one respondent noted, "I learned things which surprised me because I'm pretty tech savvy." Some participants also asked for scaffolding materials such as "[a]n FAQ sheet that is organized by topic" or "[a] shared document of tips and tricks" which they noted would be helpful.

Students also commented on the immediate applicability of the skills they were learning. They wanted "more time spent on Sakai (LSM) on how to submit assignments," but appreciated "[b]eing able to immediately apply/practice the methods being taught." Applicability and relevance to practice motivated participants to engage with the workshop.

Limitations and future research

We acknowledge that this study has some limitations. One challenge was in the reduced number of participants completing the post-test which may introduce bias in the estimation of gains

due to the workshop. Furthermore, the pre- and post-workshop surveys were anonymous, limiting the analysis that could be conducted on the data. It was not possible to identify race/socioeconomic patterns from this data. We plan to modify the survey instrument to collect demographic information to allow for a more nuanced data analysis. While respondents reported high satisfaction with the workshop's contribution to their learning, we would like to explore how this initial boost in digital skills impacts their subsequent academic experiences.

Conclusion

This study suggests that assumptions about medical students' inherent digital competencies are not universally valid. The significant variability in student confidence and skill highlights the necessity for tailored digital skills orientation workshops. New technologies adopted by medical schools to enhance the learning experiences of their students may require adjustment of workshop content. Without training programs for these new technologies the existing digital divide may become wider.¹³ Importantly, this study underscores the value of an andragogical approach, advocating for personalized learning experiences that respect adult learners' diverse prior knowledge and immediate application needs. Future orientation programs should focus not only on introducing digital tools but also on contextualizing their use within medical education and practice in order to bridge the digital divide and foster digital equity. Incorporating continuous, scaffolded digital skills training throughout medical education could further ensure that technological competencies are sustainably developed *and* aligned with evolving clinical environments.

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