




Navigating Digital Medical Education in the Current Era: Process Over Platform

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Abstract

With the dawn of advanced technological and digital resources, medical education has changed. Learners are now able to learn, share, and communicate medical knowledge through online discussion forums, blogs, videos, podcasts, infographics, virtual communities, social media platforms, and collaborative author groups. Navigating these digital education modalities can be challenging, with each platform presenting unique challenges and opportunities. Digital educators need to learn how to navigate this uncertain territory, equipped with a skillset applicable to all digital spaces. This article explores the key components of a digital educator's skillset by examining the core foundations of learning theory, creation of digital education materials, and virtual communities of practice.

Keywords

Medical education, social media, adult learning theory

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The 21st century has witnessed a rapid expansion in the availability of technological and digital resources, leading to an evolution in digital medical education. The ways in which learners access medical information have dramatically shifted, with free open access medical education growing over the past decade in its scope and reach, now spanning blogs, podcasts, infographics, games, and videos.¹ Free open access medical education is typically created by single authors or by collaborative authorship groups.²

Social media platforms, such as X (Twitter) and Instagram, are also increasingly used for acquiring and sharing medical knowledge via case-based discussions, online journal clubs, and cultivation of virtual communities.^{3,4} As social media use has grown within medicine, these public platforms have become an avenue for journals and researchers to disseminate the latest science and publications on a large scale, while simultaneously offering an opportunity for back-and-forth discourse and fostering discussion with experts.

Despite the advantages of digital medical education modalities, navigating this space carries unique challenges. Many digital platforms are inherently dynamic, constantly undergoing tweaks to their features and interface. A prominent example is the rebranding of Twitter to X in July 2023, which caused extensive changes to its algorithm and moderation under new leadership. Twitter/X modifications have led to uncertainty in the sustainability of the platform within the medical community, raising concerns about a changing user base and lack of trust in the information that is disseminated.^{5,6} While the future of any given digital platform remains unpredictable, the onus falls on the community of digital educators to navigate this inherently fluid

environment and develop a skillset that can apply across all digital spaces.

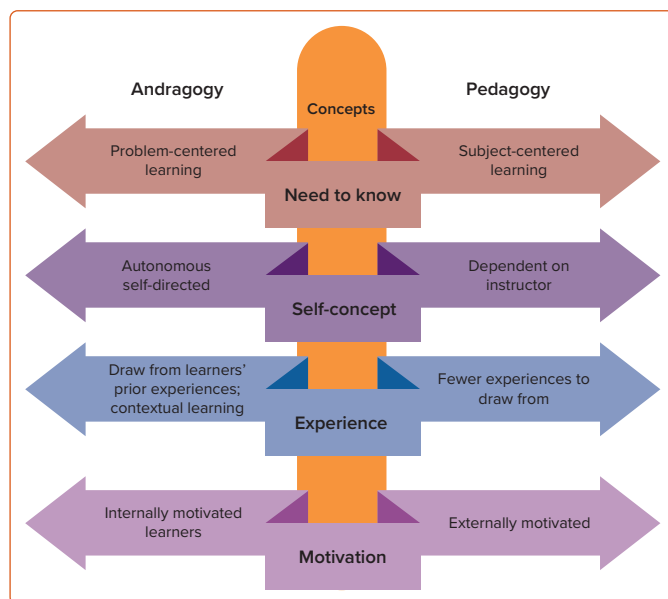
In this article, we discuss key principles of being a digital educator, including core foundations of learning theory, the process of creating digital educational products and virtual communities of practice, and assessing the current digital landscape.

Learning Theories

Digital education within medicine is anchored on the concept of adult learning theory. While several different types of adult learning theories exist and no individual theory is all-encompassing, andragogy is one that is well established.⁷ Developed by Malcolm Knowles in the 1970s, andragogy's core principles include: the learner's need to know (the why, what, and how); self-concept of the learner (autonomous and self-directed); drawing from learners' prior experiences; the learner's readiness to learn when there is a reason; learning that is problem-centered, applicable, and contextual; and internal motivation of learners.^{8,9} Many forms of digital education lend themselves well to the key concepts of andragogy; for example, medical podcasts are well suited for time-constrained adult learners, offering individual topic selection based on personal interests and curiosities.

Andragogy stands in contrast to pedagogy (*Figure 1*), in which learners are dependent on the teacher to facilitate and structure their learning, with the teacher's role being an expert who bestows knowledge and skills to the learners. Traditional forms of education within medicine rely heavily on the pedagogical approach in which senior attending physicians direct curricula for lectures and educational conferences. Both the pedagogical

Figure 1: Andragogy versus Pedagogy Learning Principles.



A comparison of andragogy and pedagogy learning principles.

traditional approach and the andragogical digital approach to education have advantages and disadvantages.

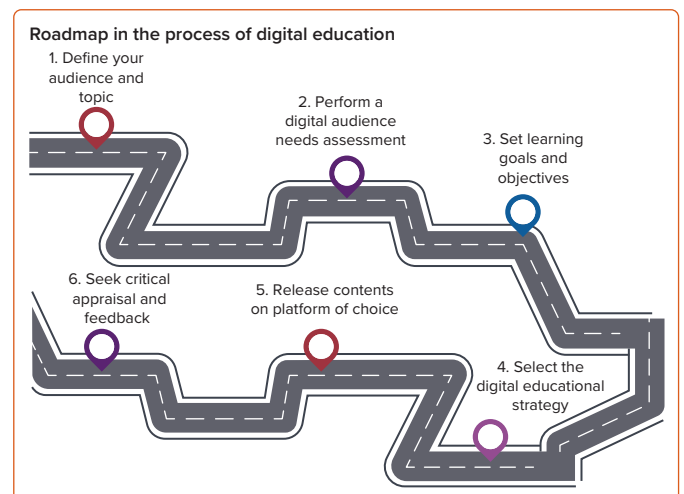
In the early stages of learning about a topic, a teacher-led pedagogical approach can provide instruction on fundamental principles. As students advance to later stages of learning, a self-guided andragogical approach can be useful to subsequently learn more nuanced details, and allow learners to follow and refine their clinical interests. With this blended approach, learners can control what they learn and when they learn it, drawing on previous experiences to add context to their learning.¹⁰ Consequently, as digital educators, it is important to understand how these two approaches work in collaboration to allow learners to develop strong foundations and still have the opportunity for in-depth exploration based on their own interests.

Another theory that applies directly to online learning is connectivism, which is based on the principle that educational systems can grow from the simple teacher-to-student transfer of expertise to the development of knowledge networks that are formed and maintained through personal connections. These knowledge networks, such as social media platforms or other online discussion forums, can promote more extensive learning and reflect our rapidly evolving understanding of a given topic, as opposed to individual knowledge, which may become outdated or forgotten more rapidly.¹¹ In a connectivist model, competence is gained through network connections, not necessarily from the network (i.e. social media platform) itself.

What is the Digital Educator Skillset? Process of Creating Digital Education Products

While there is uncertainty regarding the prospects of specific digital education platforms, there are common themes comprising a core skillset and a general road map of steps that remain the same regardless of the platform (Figure 2).¹² Here, we describe a road map of six essential steps. Similar to when designing a chalk talk, lecture, or presentation, defining the intended audience is an essential first step for creating digital education products to ensure the content is learner-centric. Many digital education platforms are populated by a wide range of learners that vary

Figure 2: Digital Education Road Map



Six steps in the digital education process.

from undergraduate medical students to deans; therefore, it is vital to recognize the audience for whom the content is intended and, consequently, tailor both the content and the digital mode of delivery to that group of people. This raises an important question: are the needs of a digital audience inherently different from those of a face-to-face audience? For example, on digital platforms, the audience is expecting short and digestible content that can be reviewed quickly (such as X), so presenting educational content that meets this expectation can increase the impact of what is presented. Our second step in the road map is performing a digital audience needs assessment, which should be based on understanding the educational concepts that are appropriate for your intended audience, and knowing how that audience expects to use digital technology to interface with those educational concepts.

The third step in designing content is to define the scope related to the chosen topic. Creating clear learning goals and objectives that are smart, measurable, achievable, relevant, and time bound will help decrease the cognitive load for learners.¹³ Additionally, key principles of learning theories, such as retrieval practice and spaced repetition, can be built into content regardless of platform; online interactive polls can serve as retrieval practice, while push notifications can allow for spaced repetition. Nevertheless, the digital curriculum is learner driven, so it may lack the intentionality of a deliberately planned curriculum using spaced repetition.

After defining the scope, the fourth step is to consider which digital strategy would best suit the type of education and content. Certain digital instruction strategies (i.e. blogs, linked posts on X, videos, podcasts, and infographics) may be better suited for specific topics, or certain aspects of a particular subject matter. Table 1 provides some examples of how certain digital modalities can be paired with a more expansive clinical topic. Digital education products can be disseminated as stand-alone material or, alternatively, be part of a more extensive curriculum that is implemented longitudinally. Prior reports of implementing longitudinal digital curricula have highlighted challenges, including competing priorities, technology overload, and sustainability.¹⁴ Ways to address these barriers include embedding digital curricula with dedicated time during in-person education.

With any form of content creation, giving adequate credit and citing resources is mandatory, as well as being cognizant of protecting private health information. One could argue that the need for educational integrity

Table 1: Examples of How Digital Modalities Can Be Used in Medicine

Digital Modality	Example Content	How to Best Use Digital Modality
Blog post	Reviewing a journal article on pulmonary hypertension	Use blogs to discuss various aspects of the article, such as methods, design, results, limitations, etc.
Linked posts on X	Right ventricular dysfunction in pulmonary hypertension: pathophysiology and evaluation	Break down the pathophysiology of right ventricular failure into bite-sized learning points using images/graphics along with text
Video	Pulmonary artery catheter waveforms and interpretation for diagnosing pulmonary hypertension	Show diagrams of hemodynamic waveforms and include audio providing explanations
Podcast	Case discussion of management of pulmonary hypertension in complex clinical situations, such as pregnancy	Audio-only format used to delve into nuances of management and considerations related to the case
Infographic	Pulmonary arterial hypertension causes, diagnostics, and initial therapies	Visual flowchart with various buckets of information related to the topic

is even more vital in online spaces. Given the lack of required peer review before publishing, digital educational products are reliant on appropriate citing of resources to support claims. Seeking review and critical appraisal on the educational product prior to publishing is of utmost importance to ensure quality and accuracy of content that will be disseminated at a large-scale level. Additionally, given the public forums in which most digital medical education content is shared, authors must ensure that patient information is protected.¹⁵

After the content is released on the platform of choice (step 5 of road map), seeking evaluation and feedback after releasing digital content is important for iterative improvement. This is similar to traditional education, in which feedback is sought after giving a chalk talk or lecture; polls, comments, forum discussions, and surveys can be used for both real-time and post-release feedback for digital education products.

Creation of digital education products is a form of scholarly work; however, there have not been well established ways of citing this work on one's curriculum vitae, and receiving recognition by academic medical centers and employers. Ongoing awareness led by the digital medical education community will be necessary to allow this work, which is often time-consuming, to be recognized for promotion criteria.

Building Virtual Communities

The scope of being a digital educator in the current era exceeds just the platform and content; rather, it includes training the next generation of medical educators in the digital space and facilitating virtual communities of practice (COP).^{16,17} Essential elements that comprise a COP include: a domain of clear boundaries that creates a common identity, a community within which learning occurs, and practice, which refers to knowledge and skills that are shared by the community.¹⁸ The COP framework can be applied to medical education, given the inherently social nature of learning that happens every day, from traditional learning in the classroom to learning within teams on hospital wards. While these COPs within medicine are often not created intentionally, virtual communities of practice have recently emerged with deliberate and planned purposes.

These virtual COPs allow for formalized pathways to gain competencies in digital medical education skills, while working collaboratively with a group of like-minded individuals.

There are numerous advantages to virtual medical education communities, including the opportunity for dialogue among individuals at all levels of training, backgrounds, and geographic locations.¹⁹ These unique perspectives may not be available in a clinician's immediate and local network, but this diversified input provided by virtual medical education communities can help physicians and trainees broaden their exposure and knowledge base, as well as develop collaboration and mentorship connections.²⁰ This horizontal approach of knowledge translation allows for a blurring of the more traditional distinctions between educator and learner, thereby providing junior physicians the opportunity to serve as educators.¹

An example of a virtual community of practice is the CardioNerds Academy, a year-long program in which medical students, residents, and fellows learn skills related to digital content creation and receive professional development relevant to the digital space.^{21,22} Similar virtual communities exist outside of cardiology, including the Nephrology Social Media Collective and the Infectious Disease Digital Institute, both of which offer a 1-year mentorship program for creation of digital education products. Another virtual community of practice model is the Clinical Problem Solvers Virtual Morning Report, which has fostered an international virtual community of trainees and physicians who convene to discuss cases from their clinical practices. Virtual communities such as these allow for more equitable sharing of knowledge, creation of a social network, and aid in professional growth.

Artificial Intelligence in Digital Education

Given the recent expansion of generative artificial intelligence (AI), modern day digital educators should consider AI tools in their repertoire, and understand how they can best be leveraged for medical education.²³ AI can be integrated in various ways, from having educators use it as a tool for content creation and curriculum design, to using AI as a support system for clinical skills or patient education. Familiarity with the capabilities and limitations of AI will be essential to ensure that these tools are assets and not roadblocks.

The Shifting Digital Landscape

With the changes in current digital and social media platforms, and the emergence of new avenues that may become mainstream in the future, digital medical educators are required to adapt their existing skillsets while weighing the advantages and pitfalls of various platforms. For example, certain platforms, such as Twitter/X, have been seen in an increasingly negative light, due to increased misinformation and less moderation.

Digital education communities have the opportunity to define their platforms, rather than having the platform define them. Digital environments and social media are the means by which the digital educator is able to teach, but these platforms must not be prioritized over the educational mission for which they are being used. The digital education community can promote its key principles of digital professionalism by creating a supportive and welcoming culture that allows communities to flourish despite the downsides of particular platforms. Advantages of digital education communities include flattening of the traditional hierarchy within medicine, the ability to exchange ideas with a diverse group, and forming a community of lifelong connections and mentors. The focus of these communities should be on a process that

stresses professional relationship building and high-quality educational products that support diversity and equity. With these focal points in mind, digital medical education can avoid becoming ‘techno-centric’ while remaining driven by core educational and community-building principles.

Conclusion

We are at an inflection point in digital medical education where commonly used platforms are changing and shifting. Nonetheless, digital medical

education remains a key cornerstone of learning for physicians and trainees alike. No matter which digital platform is leveraged, the processes highlighted in this article form the core skillset of digital educators in the modern era. This particular time in history offers an opportunity for the medical education community to define how existing platforms can be best used. Platforms will come and go, but digital educators can continue to foster inclusive, resilient, virtual learning communities that are capable of adapting to change. □

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