Five Steps for Success in Building Your Own Educational Web Site

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AS MILLENNIAL LEARNERS enter the medical field, they note a lag in innovation of medical education curricula, compared with peers in other fields.[1] Whereas physician trainees conduct most of their self-directed learning using online and mobile resources, formalized medical education tends to be in lecture format. Most physician trainees use smartphones to query information and use electronic tablets to improve daily workflow in patient care and learning.[2,3]

Millennial physician trainees also prefer educational engagement beyond textbooks and journals, including multimedia and hands-on practice.[4] Furthermore, learning spread across multiple modalities might enhance memory transfer and retention.[5] Medical educators might be ill-prepared to adapt to the emerging digital shift in content creation, distribution, and consumption.[6] Today's educators must respond to the needs of our learners and move toward developing educational tools, such as Web sites, that allow for live and asynchronous learning.[7]

SETTING THE STAGE

When developing an educational Web site, it is important to consider the setting of the intervention. Cincinnati Children's Hospital Medical Center (CCHMC) is a large pediatric academic medical center. The Division of Hospital Medicine provides clinical service to 5 general pediatric inpatient teams, consisting of an attending, fellow, residents, and medical students.

For pediatric hospitalists, family-centered rounds (FCR) is the primary setting for team-based clinical work and is a platform for interactive learning.[8] Adult learning theory supports using real-life experience to enhance learning, making FCR an ideal setting for trainee teaching. However, FCR are often time-intensive, potentially leading to unrecognized teaching opportunities and inconsistent use of rounds as an educational platform, and the opportunity for hands-on learning of core skills like the physical exam (PE) is often overlooked.[8–10]

Our team considered several formats to create a resource that would foster the use of technology and multimodal learning. Whereas files uploaded and shared via a cloud service or Web site links might serve the purpose of electronically sharing educational material, these options lack visual appeal. Mobile applications address aesthetics but require approvals from app stores. Web site creation allows for maximum dissemination with greater control. Therefore, in an effort to improve the learning experience during FCR, we built an educational Web site focused on PE skills—The PEToolkit (www.physicalexamtoolkit.com). We used instructional design and educational theory to guide our development process. In this report, we present 5 key steps to developing an educational Web site.

PLAN AHEAD

DEVELOP AN OVERALL GOAL

In preparation for educational Web site development, the global aim should be considered. At CCHMC, we sought to modernize teaching on FCR to engage trainees with diverse learning preferences, while also addressing organizational missions to use innovation in education.

ASSEMBLE THE TEAM

Involving experts with formal medical education training can be useful in the development of educational interventions. In addition, it is vital to seek technology mentorship when creating a Web site. Options include clinicians who have experience in information technology (IT), nonmedical personnel within a hospital's IT department, or online resources.

For our Web site, our primary team included a lead member with interest in educational technology, 2 content mentors with formal training in medical education, and a technology mentor with experience in educational Web site design.

EXPLORE PREVIOUS EFFORTS AND DETERMINE IF THEY MEET LOCAL NEEDS

A thorough review of the literature and Internet resources can guide initial Web site development. It is helpful to review articles that address a spectrum of issues, ranging from changing trends to attempts at incorporating devices into daily workflow and teaching.[1–3,6] For example, one study noted >80% of physicians and trainees use smartphones, and another reported that 40% of respondents use tablets; these percentages are expected to increase, making incorporation of technology into education inevitable.[2,3] Millennial trainees are "digital natives" and are using electronic resources for their daily education, which compels educators to adjust to this culture change.[6,11] Commentaries from educational experts can guide potential interventions, whereas publications regarding curriculum implementation highlight successes and obstacles. MedEdPortal is a useful resource, where academicians share educational materials, which might eliminate the need to create a new program locally.[12]

Examining educational Web sites from other institutions might provide inspiration for design or content, and reviewing mobile applications might also be useful for considering structure and navigability.

From these building blocks, our team gained a sense of existing resources, none of which fully addressed our local gap but did inform the building of our PEToolkit Web site. Although the literature showed most trainees use electronic devices for patient care, there were few articles discussing their use in bedside teaching.[2,3,6] Additionally, although several educational institutions have proprietary Web sites demonstrating PE skills, most focused on adult patients, had limited examples of abnormal findings, or were not publicly accessible.[13,14] Our aim was to create a Web site highlighting normal and abnormal pediatric PE findings that is freely available to learners.

ASSESS THE NEEDS OF THE TARGET AUDIENCE

Before committing the considerable time and resources required to launch a successful online educational platform, it is imperative to identify the needs of the target audience. As highlighted by Kern et al in their 6-step approach to curriculum development, comparing current and ideal educational approaches can identify gaps and inform interventions.[15]

A targeted needs assessment provides information about the audience for the intervention. This assessment can be conducted through a variety of mechanisms including surveys, which are convenient for obtaining information regarding participants' knowledge, skills, and attitudes toward a topic, and focus groups, which allow for exploration of barriers to how teachers and learners interact with their educational environment.[16]

At CCHMC, a targeted needs assessment of our residents identified a desire for multimodal bedside teaching. Residents preferred to learn by seeing, hearing, and doing; they rarely saw PE teaching on FCR, but perceived using multimedia to learn PE would likely be useful. They overall were comfortable with using technology to learn.

A survey and focus group with attending physicians revealed general discomfort with, but interest in, using resources to provide technology-based teaching. Whereas half of respondents had been practicing for <5 years, nearly one-third had never used technology to teach on FCR. Although there was some comfort with general teaching on FCR, there was lower self-perceived skill for teaching using multiple modalities or technology. Multiple factors affected teaching on FCR, included time constraints, learner volume and level, trainee and personal comfort, and logistical complications. These factors encouraged our Web site team to design an online educational platform that would be readily accessible and navigable.

IDENTIFY A FOCUS

Bedside PE teaching is often underused despite the examination's contribution toward accuracy in diagnosis and potential reduction in unnecessary diagnostic testing.[17] Teaching of these skills is declining in residency.[18] Anecdotally, there is more focus on adult medicine during medical school; hence the pediatric PE might be an under-represented area of clinical focus. This made the focus on pediatric PE especially important to our Web site team, because FCR are an ideal setting for teaching these skills, with the patient as a real-life example and multimedia as a complement to demonstrate the spectrum of illness.

We prioritized the cardiac, respiratory, and abdominal examinations, because most pediatric illnesses that present in the inpatient setting involve these 3 body systems. As these pages become more refined, other body systems will be added to increase content for our users.

BEGIN CREATING THE WEB SITE

A key component of planning is budgeting time to choose a topic, upload content, test, and maintain long-term. Arrange regular meetings with core team members to confer about Web site content and design.

Also consider where your Web site will be located. Many institutions have mechanisms to develop Web pages on their internal network with the help of their IT department. Unfortunately, many hospital intranets have limited ability to handle multimedia and might not display accurately on phones or tablets; they can also be expensive to build and require approval.

Alternatively, a site developed and hosted using external resources can be affordable and available to users across institutions. For approximately $100 per year, a domain name can be purchased from a Web site domain host to serve as the site address and provide server space to store content (Figure). There is also Web site-building software available online, often free of cost; these packages contain background themes, fonts, and formatting codes that configure search bars, side panels, and other layout features (Figure). A physician without previous coding experience

Web Site Type	Pros	Cons	Examples
Hospital Intranet	• Experienced hospital personnel build and maintain your site • Easily accessible by staff • Leverages hospital security information technologies	• Cost might be higher • Logistics of institutional approval can be daunting • IT personnel are busy • Limited accessibility outside institution and on mobile devices • Layout and design must match institutional parameters	Varies according to institution
Blog Hosting	• Preexisting high-bandwidth framework • Free or low cost • Very user friendly	• Fewer options for customizability • Content is public by default	Blogger Tumblr WordPress
External Web site	• Endlessly customizable with compatible software • Hosting providers have customer support, reliable uptime, and security features • Robust tracking of site usage by visitors	• Cost (≥$100–$150 per year) • More complex to build • Time-intensive to maintain • Content stored on server or cloud	Smaller hosts: • GoogleSites Larger hosts: • DreamHost • Hostgator • GoDaddy Design Software: • WordPress • Weebly • Squarespace

Figure. *Resources for Web site creation. IT indicates information technology.*

can purchase a domain name, access Web site-building software, and share content online. A technology mentor can help navigate the various options and refine site design. Our team chose to use DreamHost as the site domain and WordPress to design the layout, because they were affordable and offer many user-friendly options for design and layout.[19,20]

Finding content for a Web site can be a time-consuming process, taking up to several weeks to compile. Our group gathered publicly accessible pictures, audio clips, and video files from the Internet. Video can portray complex concepts that might be difficult to explain in words.[21] Although there are countless videos available online, the educator should screen them carefully to ensure they are brief, high-quality, and convey the appropriate message to learners.

Another important consideration is copyright law, which gives exclusive rights of content to original authors, although some exceptions exist for fair use in education.[21] Content on MedEdPortal is available for public use if the original author is credited.[12] Another excellent source of public media content is Creative Commons, a designation given to more than 1 billion multimedia files that allows the content to be used freely for research and education.[22] Some resources might require additional permissions, necessitating review of the original source site when borrowed content is used.

Creating original content by filming or photographing your own multimedia is possible, but might take more time than mining the Internet and requires obtaining information releases from each subject. Balancing these priorities can be daunting; however, an end product that inspires attendings to teach with technology and engages learners in multiple modes can be very rewarding.

IMPLEMENTATION, EVALUATION, AND MAINTENANCE

Before a Web site is publicized for teaching, it should be evaluated to ensure usability. Beta-testing involves evaluation of a system by a specific group of users before implementation to assess navigability.[23] There are several validated usability scales available online; one example is the Standardized Usability Scale, a 10-item survey of Likert scale questions used to gauge a site's ease of use.[23] A score of ≥70 is considered acceptable.[23]

Our approach to beta-testing involved voluntary participation of attending physicians, chief residents, and fellows. Twelve beta-testers used an electronic tablet to navigate the PEToolkit Web site outside of as well as during FCR and then completed the survey. The average score was 82, which deemed the Web site usable. Feedback from beta-testing informed modifications to the Web site to further improve usability. After this appraisal, we disseminated the Web site to our hospitalists for use in teaching. To ensure maximal and effective use, end users were oriented in a hands-on fashion, and explicit guidance was given about various settings in which the Web site should be used, including at the bedside, between patient rooms, and in educational sessions after FCR. Medical students and residents were also encouraged to use the Web site for self-directed learning.

A functional Web site is never complete; maintenance is critical to ensure long-term use. Regular review should be

conducted to ensure videos and links operate as intended. Moreover, updating and adding new relevant content allows a Web site to remain useful and engaging to learners.

CONCLUSIONS

Developing an educational Web site like the PEToolkit can help address the education gap between current teaching methods and millennial learner needs. Our methods helped us better understand the needs of learners and educators during FCR. A systematic approach that included mentor recruitment, targeted needs assessment, narrow topic choice, platform selection, and beta-testing before dissemination—comparable with Kern's Six Steps for Curriculum Development—led to an educational product that is functional and focused (Supplementary Appendix).[15] Using an external domain permits open access to learners across institutions and has great potential for collaboration. Educational Web sites are tools that anyone can develop and can not only address millennial learner needs but also advance medical education into the digital age.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at http://dx.doi.org/10.1016/j.acap.2017.03.004.

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