

Distance Learning via E-Learning in Emergency Medicine

COVID-19 forced traditional, in-person residency and clerkship education throughout the country to become distance learning courses, but [EM Coach](#) is well-suited to meet the changing demands because it was borne out of evidence-based educational practices for e-learning.¹ The key is reimagining central aspects of teaching through a lens that makes the most of the electronic interface (Table 1),² rather than relying on methods designed for in-person education--methods that simply do not transfer well. The ideal e-learning course requires attention to the **organization, approach, and activities**.^{3,4}

E-Learning Course Aspect	Description	EM Coach Example
Organization		
Blended Learning	Use different activities to achieve each objective	Foundations of EM pre-conference activities using EM Coach's textbook, lectures, and questions followed by FoEM case discussions
Concept Mapping	Literally <i>drawing</i> connections between concepts from different activities	All FoEM pre-conference activities connected in a single EM Coach assignment
Ground Rules	Regulating the e-learning environment to ensure proper behaviors	Built-in timers and reports for assignments
Approach		
Guide on the Side	Faculty support individual learning; don't talk at learners from podium	Use the practice test instructor view to foster discussion of answer explanations
Structure	Differentially create structure based on aptitude and personality (i.e., if higher aptitude, give less structure; if lower aptitude, give more structure)	Sort learners by engagement and aptitude in the Individual Statistics table for instructors to create the most appropriate assignments
Mobile Learning	E-learning on a mobile device	Residents and students can read, watch and do test material on-the-go

Activities		
Knowledge Objectives	Best with discussion sessions and longer courses (>1 week)	Utilize EM Coach's 1,000+ memory aids, tables, and pictures to foster deeper topic discussion
Skills Objectives	Best with interactivity, practice exercises, and peer discussion activities	Procedural questions emphasize practical aspects of skills
Assessment	Combination of formative assessment as a learning tool and summative assessment to ensure everyone meets objectives	Artificial intelligence option maximizes formative assessments with prescriptive didactic content to supplement question explanations

Table 1. Best Practices for E-learning Education.

ORGANIZATION

There are three essential components of e-learning organizational structure that must be emphasized and adjusted in this new frontier of education: *blended learning*, *concept mapping*, and *ground rules* (Figure 1). Although these aspects certainly exist in traditional educational contexts, they have different impacts on e-learning.

Blended learning is essential to e-learning, which is not entirely surprising since it is helpful in traditional contexts as well.⁵ However, blended learning is especially important in e-learning as a way of encouraging engagement with the material. A course composed entirely of online video lectures quickly becomes boring, disengaging, and unfruitful.⁶ The use of blended learning also requires a strong focus on concept mapping.⁴

Concept mapping is the visual representation of information, and in the context of e-learning, it is fundamental to orienting learners (be they residents, students, or faculty) to the activities. When various activities are all done at the same time in person in a single room, explicit concept mapping may not be considered as important. But e-learning courses will often draw activities and materials from various sources and locations, so it is vital to orient learners to the ways in which those different activities and sources connect to achieve the course objectives. Whether learners develop the concept map with faculty guidance or it is provided to them by faculty to study, the connections between the blended components need to be explicit.

Another important part of the organization of e-learning courses that must be explicitly conveyed to learners is the *ground rules*. E-learning is changing rapidly, as is all interaction with technology, and although students and residents have grown up in an in-person educational system in which ground rules are generally understood (e.g., raise your hand if you have a question), the e-learning rules are inconsistent and often unclear in the context of changing

technology. Expectations for level of learner engagement, how learners will engage, how decisions will be made, and how questions will be addressed are a few of the important issues to address upfront.

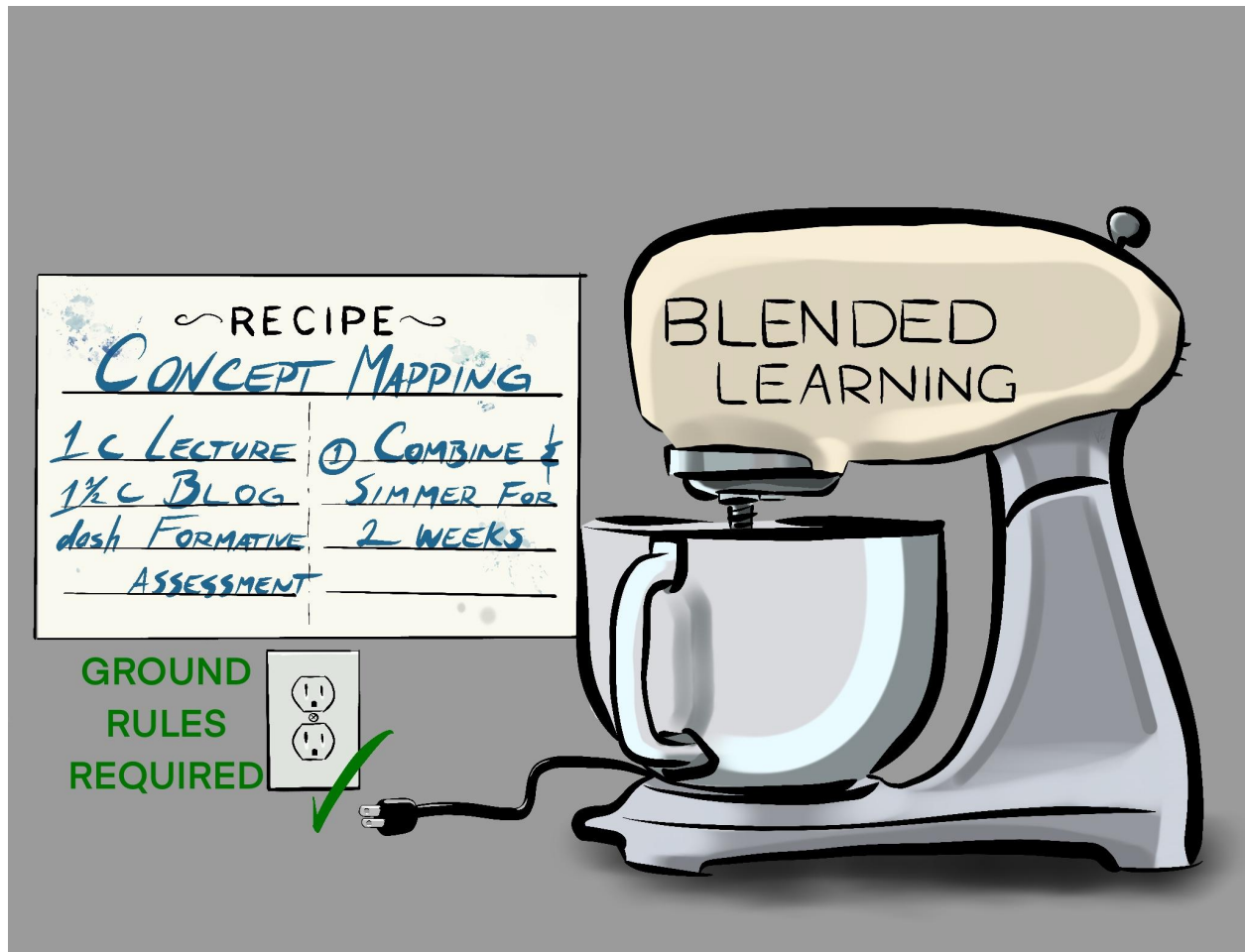


Figure 1. The most important organizational components of an e-learning course are concept mapping, blended learning, and ground rules.

APPROACH

Although it might be tempting to utilize e-learning as a recyclable and efficient delivery system, education via e-learning must still be approached with a mindset of fostering personal discovery. A hands-off series of recorded or even live lectures is not ideal. The “sage on the stage” will appear even more boring over a recorded lecture than in person; rather, the instructor as the “guide on the side” allows students and residents to grapple with the material to learn it in their own ways.

Similar to the concept of avoiding spoon feeding, adjusting course structure for learners is especially important in e-learning. Recent studies support the concept that adjusting educational structure for learner aptitude and personality can improve outcomes; self-starters with high aptitude can garner more from an educational tool by being given less structure, whereas those

who need more prompting and have lower aptitude can garner more from the tool by being given more structure.⁷ An e-learning environment is ideal for these adjustments since self-directed learning is a cornerstone of distance learning, especially asynchronous learning.

The last consideration to the approach to e-learning is flexibility in platforms. Mobile learning (m-learning) is simply an example of a venue for e-learning, and its use is growing dramatically.^{8,9}

ACTIVITIES

As mentioned above, simply moving in-person lectures to giant and long webinar sessions is not ideal, even if lectures are adjusted to be as effective as possible in a webinar setting.¹⁰

Fortunately, the best evidence available addresses which activities work best, and that depends on the objectives. The common thread is active learning—no surprise there.¹¹

Knowledge Objectives

Knowledge objectives are best achieved in an e-learning environment with discussions and longer courses (>1 week). Interestingly, interactivity, practical exercises, and repetition did not improve e-learning knowledge outcomes.¹²

Skills Objectives

In contrast, skills objectives are best achieved in an e-learning environment with interactivity, practice exercises, and peer discussion activities.¹²

Assessment

Another important activity is providing formative and summative assessments. The formative component is especially helpful for residents and students who do best with minimal structure, but it is also helpful as an educational intervention. Indeed, extensive cognitive psychology research shows that item recall results in better learning outcomes than even concept mapping, the previous gold standard for learning complex ideas.^{13–15}

The summative component is important to ensure that—even while physically apart—students and residents are meeting the course objectives. (A “course” can be a module as large as the cardiology unit or as small as a single topic such as cardiac valve disorders. Whatever the chunk size, it should be clearly conveyed to the learners.)⁴

IN PRACTICE

Putting these recommendations into practice is easier than it may at first seem, especially when using EM Coach, because a lot of the structure for the concept mapping has already been done for you. In addition, the site is designed to facilitate group discussions and provides materials including illustrations and tables to help faculty engage as the guide on the side. Here are a few practical examples:

- 1) Foundations of Emergency Medicine pre-discussion activities can be easily assigned in EM Coach. They can be done as a small group together, such as watching a short

lecture (all of the topics are <20 minutes long in EM Coach) and talking about it together or in an asynchronous manner. Associated questions with extensive explanations provide quick and topical formative assessments before case-based discussion learning with cases provided by Foundations. These assignments require just a few clicks and automatically package the related content so that it is clear how the materials are connected.

- 2) The Instructor View in EM Coach allows faculty to review exam results, including the distribution of answers from the learners, and to employ the multimedia explanations as part of the group discussion on questions. Part of a course may include a lecture or reading followed by an asynchronous formative assessment and group discussion, all centered on the course objectives.
- 3) Serial assignments provide the longevity that improves e-learning outcomes. EM Coach readings, lectures, and questions can provide an extension of the group discussions or presentations from asynchronous activity to the topics of the next week.

CONCLUSIONS

The recipe for the most successful e-learning course requires blending multimodal active learning with a clear set of ground rules and expectations. E-learning resources that offer a variety of tools can help make the transition from traditional formats to e-learning rapidly and effectively.

Andrew W. Phillips, MD, MEd
Founder and Editor-in-Chief, EM Coach
On behalf of the [EM Coach Research Team](#)
APhillips@EMCoach.org

References

1. Pan J, Sheu J, Massimo L, Scott KR, Phillips AW. Learning Experience Design in Health Professions Education: A Conceptual Review of Evidence for Educators. *Aem Educ Train*. Published online 2020. doi:10.1002/aet2.10505
2. Pan J, Scott KR, Phillips AW. Using Learning Experience Design to Optimize Digital Instruction During COVID-19 and Beyond. *Acad Med*. 2020; Publish Ahead of Print. doi:10.1097/acm.0000000000003889
3. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. *Med Teach*. 2009;30(5):455-473. doi:10.1080/01421590802108331
4. Masters K, Ellaway R. e-Learning in medical education Guide 32 Part 2: Technology, management and design. *Medical Teacher*. 2008;30(5):474-489. doi:10.1080/01421590802108349
5. Basheer A. Are we ready for blended learning in medical education? *Australas Medical J*. 2016;9(10). doi:10.21767/amj.2016.2789
6. Weber W, Ahn J. COVID-19 Conferences: Resident Perceptions of Online Synchronous

- Learning Environments. *West J Emerg Medicine Integrating Emerg Care Popul Heal*. 2021;22(1):115-118. doi:10.5811/westjem.2020.11.49125
7. Pashler H, McDaniel M, Rohrer D, Bjork R. Learning Styles: Concepts and Evidence. *Psychological Science in the Public Interest*. 2009;9(3):105-119. doi:10.1111/j.1539-6053.2009.01038.x
8. Orr G. A Review of Literature in Mobile Learning: Affordances and Constraints. *2010 6th IEEE Int Conf Wirel Mob Ubiquitous Technologies Educ*. Published online 2010:107-111. doi:10.1109/wmute.2010.20
9. Georgiev T, Georgieva E. M-learning-a New Stage of E-Learning. *International conference on* Published online 2004.
10. Seymour-Walsh AE, Weber A, Bell A. Pedagogical foundations to online lectures in health professions education. *Rural Remote Health*. 2020;20(2):6038. doi:10.22605/rrh6038
11. Phillips JM. Strategies for Active Learning in Online Continuing Education. *J Continuing Educ Nurs*. 2005;36(2):77-83. doi:10.3928/0022-0124-20050301-08
12. Cook DA, Levinson AJ, Garside S, Dupras DM. Internet-based learning in the health professions: a meta-analysis. *JAMA*. Published online 2008.
13. Karpicke JD, Blunt JR. Retrieval practice produces more learning than elaborative studying with concept mapping. *Science (New York, NY)*. 2011;331(6018):772-775. doi:10.1126/science.1199327
14. Storm BC, Bjork RA, Storm JC. Optimizing retrieval as a learning event: when and why expanding retrieval practice enhances long-term retention. *Memory & cognition*. 2010;38(2):244-253. doi:10.3758/mc.38.2.244
15. Roediger HL, Butler AC. The critical role of retrieval practice in long-term retention. *Trends in cognitive sciences*. 2011;15(1):20-27. doi:10.1016/j.tics.2010.09.003