



Learning Outcomes From Lecture and an Online Module in the Family Medicine Clerkship

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BACKGROUND AND OBJECTIVES: With younger generations of learners and readily available technology, medical educators are challenged to include active learning methods that may be better for student learning than traditional lecture. Some of these methods, like online modules, can also reduce the demands on clerkship faculty time. We examined how content delivered via interactive, online module compared to traditional lecture for student learning and satisfaction.

METHODS: Third-year family medicine clerkship students completed questionnaires following either an online module or lecture on orofacial pain. We conducted the study over four consecutive rotations, alternating who received the content via classroom lecture or interactive online module. Students completed a questionnaire comprised of six multiple-choice knowledge questions, five questions with a clinical vignette format to assess application of knowledge, and six questions to assess satisfaction with elements of the course. The Centers of Excellence in Pain Education developed the online module and questionnaire.

RESULTS: We found no differences in knowledge between the in-person lecture and the online module. However, students who completed the online module performed better on the application questions. Students in the lecture group reported greater satisfaction with the course than students in the online group.

CONCLUSIONS: Lecture resulted in adequate knowledge recall, but the interactive method resulted in better scores on applying knowledge to new situations. Providing an online module where students can practice applying knowledge is important for higher levels of learning, but it should be noted that satisfaction ratings may decline.

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classrooms,¹ and outcomes using flipped classrooms have been mixed.² Engaged lectures, where instructors provide minilectures followed by activities that allow students to apply the content, can also enhance learning.^{4,5} Interactive modules are another active learning method that can be successful. Residents trained by video module had higher performance scores than those trained using a traditional demonstration and practice format for inserting IUDs.⁶ Active learning methods appear to be better than traditional lecture. For our study, we examined how content delivered via interactive online module compared to lecture for student learning and satisfaction.

Methods

Third-year family medicine clerkship students completed questionnaires following either an online module or 30-minute lecture on orofacial pain over four consecutive 6-week rotations. The Centers of Excellence in Pain Education (CoEPEs) developed the online module for a comprehensive, multiunit curriculum in pain management.⁷ CoEPEs is an NIH-funded consortium of institutions collaborating to design online modules on pain management and narcotic use that are free and designed for

With younger generations of learners and readily available technology, medical educators are challenged to change how they teach and include active learning methods that engage students in the learning process. Curricular changes such as flipped

classrooms where students learn content before class and apply content in class have been implemented to promote deeper understanding and better outcomes. However, it is difficult to compare flipped classrooms to traditional lectures because of the variety of methods used in flipped

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health professions students. One of the online module coauthors (K.Z.) designed a PowerPoint lecture using the same content and graphics as the online module. The lecture consisted of an overview of the anatomy, pathophysiology, and treatment of orofacial pain syndromes. The online module used animations and voiceovers to illustrate the anatomy and pathophysiology of the disease, and students performed exercises such as matching preferred treatments to various causes of orofacial pain.

To control for students' evolving knowledge base, we alternated the lecture and module with each rotation. The first and third rotations received the online module, and the second and fourth rotations received the lecture. Students who received the lecture completed the questionnaire 3 to 4 weeks after the lecture. Students in the online module group had protected time during the clerkship, but could view the module at any time and completed the questionnaire at the end of the clerkship.

Questionnaire

The questionnaire, developed by authors of the online module, consisted of three sections. Six multiple-choice questions assessed knowledge, five questions used a clinical vignette format to assess application of knowledge, and six questions used a Likert scale to assess student satisfaction with elements of the course (1=very dissatisfied and 6=very satisfied).

Analyses

We totaled correct answers for the knowledge and application sections for each student and calculated scores for the satisfaction questions where higher scores indicated greater satisfaction. We used independent samples *t* tests to determine differences between the groups on the knowledge score, the application score, satisfaction scores, and shelf exam scores; and Mann-Whitney U tests to determine differences between the groups on individual satisfaction items. We included only

data from students who answered all satisfaction questions in these analyses. The Saint Louis University IRB granted this study an exemption.

Results

A total of 119 clerkship students (59% men) participated in the study during the 2017-2018 academic year; 58 in the lecture group and 61 in the online module group. There were no gender differences by group ($P=.273$); *t* tests revealed no differences between the lecture and online module for knowledge scores. However, students who completed the online module did better on the application questions than students in the lecture. Students in the lecture group had greater satisfaction with the course and higher shelf exam scores than students in the online group

(Table 1). For individual satisfaction items, students in the lecture group rated their satisfaction with enhanced learning, graphics, and overall value of the course higher than the online group (Table 2).

Discussion

Clerkship students who completed the interactive online module had similar scores on the knowledge section to the students taught via lecture, but students in the online module group scored higher on the application of knowledge questions. For remembering facts, lectures are effective,⁸ but active learning is important for deeper learning described in the revised version of Bloom's Taxonomy.⁹ Our lecture resulted in adequate recalling of facts, but the interactive, online method resulted

Table 1: Differences in Knowledge, Application of Knowledge, Satisfaction Scores, and Shelf Exam Scores Between Students in the Lecture Group and Interactive, Online Module Group

	Teaching Method		
	Lecture M (SD)	Online Module M (SD)	P Value
Knowledge questions	3.6 (1.1)	3.7 (1.1)	.515
Application questions	3.0 (1.2)	3.5 (.89)	.013
Satisfaction with course	27.9 (4.1)	24.8 (5.7)	.001
Shelf exam score	76.3% (17.8)	64.3% (23.4)	.002

Table 2: Differences in Individual Satisfaction Items Between Lecture and Interactive Online Methods of Teaching

	Teaching Method		
	Lecture M (SD)	Online Module M (SD)	P Value
Content stimulated interest in the topic.	4.62 (.79)	4.16 (1.23)	.052
New information and content was presented that I did not already know.	5.22 (.65)	5.08 (.95)	.733
The format of this lesson enhanced learning for meaningful clinical application.	4.59 (1.01)	3.79 (1.38)	.001
The graphics enhanced my learning.	4.84 (.83)	3.92 (1.20)	<.001
Overall, the value of this learning improved my confidence in pain management.	4.27 (1.06)	3.95 (.99)	.118
Please rate the overall value of this learning activity.	4.42 (.99)	3.95 (1.15)	.047

in students being better able to apply the knowledge to new situations. Higher application of knowledge scores could be due to students viewing the module the night before the questionnaire, but we would expect the knowledge questions also to be higher for the online group. Students in the lecture group scored higher on the shelf exam, suggesting that higher scores on the application questions were not due to better academic performance in general.

For student satisfaction, students in the lecture group reported higher scores than students in the online module group. Examining satisfaction items individually, students in the lecture group were more satisfied with the format, graphics, and overall value than students in the online group. The content and the graphics were identical, so there must be another factor influencing satisfaction with the lecture. Given that today's medical students grew up with technology,¹⁰ we might expect they would prefer the online module. However, learners typically prefer methods that are less effortful, and simply listening to lecture material requires

less effort than participating in an interactive module.¹¹

Although we conducted our study over four rotations with alternating methods, findings may not be generalizable across all settings. We studied just one topic, and some content may be better adapted to online learning. However, we found differences in the application of knowledge scores consistent with the literature on active learning methods,^{8, 9} but further study is needed and attention should be paid to student satisfaction. Providing interactive online modules where students can practice applying knowledge is important for higher levels of learning, but it should be noted that satisfaction ratings may decline.

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References

1. DeLozier SJ, Rhodes MG. Flipped Classrooms: a Review of Key Ideas and Recommendations for Practice. *Educ Psychol Rev.* 2017;29(1):141-151.
2. Chen KS, Monrouxe L, Lu YH, et al. Academic outcomes of flipped classroom learning: a meta-analysis. *Med Educ.* 2018;52(9):910-924.
3. McLaughlin JE. Flipped classrooms, by design. *Med Educ.* 2018;52(9):887-888.
4. Miller CJ, McNear J, Metz MJ. A comparison of traditional and engaging lecture methods in a large, professional-level course. *Adv Physiol Educ.* 2013;37(4):347-355.
5. Raleigh MF, Wilson GA, Moss DA, et al. Same Content, Different Methods: Comparing Lecture, Engaged Classroom, and Simulation. *Fam Med.* 2018;50(2):100-105.
6. Garcia-Rodriguez JA, Donnon T. Using Comprehensive Video-Module Instruction as an Alternative Approach for Teaching IUD Insertion. *Fam Med.* 2016;48(1):15-20.
7. NIH Pain Consortium. Centers of Excellence in Pain Education (CoEPEs). https://www.painconsortium.nih.gov/Funding_Research/CoEPEs. Accessed 2018.
8. Zakrajsek T. Reframing the lecture versus active learning debate: suggestions for a new way forward. *Education in the Health Professions.* 2018;1(1):1-3.
9. Anderson LW, Krathwohl DR. A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives. New York: Longman; 2001.
10. Twenge, J.M., *iGen: Why today's super-connected kids are growing up less rebellious, more tolerant, less happy, and completely unprepared for adulthood.* 2017, Atria Books: New York.
11. Brown PC, Roediger HL, McDaniel MA. *Make it Stick: The Science of Successful Learning.* Cambridge, Massachusetts: The Belknap Press of Harvard University Press; 2014.