THE UNIVERSITY
OF ARIZONA

College of Medicine

The Interactive Lecture

An Instructor's Manual

OMSE
Office of Medical Student Education

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Considerations for Implementation

1. Assess available resources

During the planning stages of Interactive Lecture for a block or course, review the resource requirements for implementation in the Appendix of this manual. This document provides some guidelines about number of instructors needed, classroom space and technology requirements, and estimated time commitments of faculty members.

2. Use Office of Medical Student Education resources (OMSE)

Interactive lecture is a method of lecturing that increases active student involvement. Interactive lecture shifts the student's role from "listener" to "participant." This may be a new experience for many faculty and students. An OMSE learning specialist can provide supplemental training and support for faculty who are designing interactive lectures, or adding interactive components to existing lectures. **To make an appointment, call (520)-626-5923.**

3. Consider the role of instructional technology (IT)

Instructional technology offers faculty the opportunity to ensure student preparation for cases or questions that will be discussed during lecture. IT can also be used to ensure student participation and feedback during the interactive segments of lecture. Faculty should consult with an Instructional Technology Specialist to discuss effective use of instructional technology for preparatory assignments, and effective use of the responder system for in-class feedback.

Assumptions for Implementation

1. Faculty have a course syllabus and notes with clear learning objectives.
2. Faculty are experienced with fundamental principles of effective lecturing.
3. Students are expected to attend lectures and participate appropriately.
4. Lectures will include activities centered on active student participation.

Why Interactive Lecture?

The lecture is the most commonly used didactic tool. Although the lecture requires a lot of preparation time for the instructor, it is viewed as being most "cost effective" when compared to other learning/teaching methods. However, the lecture is often acknowledged as the least 'engaging' method of teaching if the student is not actively involved. Discussion-based methods are superior in many ways with regard to the desirable end-points of instruction, including improved problem-solving skills and increased student retention of information after the course has ended.

A properly structured lecture can capture students' interest and attention, engage them in self-learning, efficiently cover important topic areas, and increase retention of information. It is also an efficient complement to other methods such as Team Learning and Case-Based Instruction. A properly structured lecture can also save valuable preparation time for the instructor. Therefore, "Interactive Lecture" will continue to be an important and critical element of the revised medical curriculum.

Design & Development of the Interactive Lecture

The design of an interactive lecture is based on two simple guidelines:
- Break the lecture into segments
- Build-in opportunities for students to actively participate

Several elements must be considered when developing an interactive lecture. These include:

Resource requirements
During the planning stages for a block or course, review the resource requirements for implementation of Interactive Lecture on pages 9-10. This section provides some guidelines about the number of instructors needed, classroom space and technology requirements, and estimated time commitments of faculty members.

Explicit connection to objectives
Directly referencing how lecture material relates to course objectives establishes the relevance of the material. This increases student motivation to learn and understand the material, which increases the likelihood that students will actively tune in to the lecture.

Integration of Curricular Threads
As appropriate, lectures should include purposeful integration of information relevant to designated Curricular Threads. Resources specific for facilitators regarding how to integrate Curricular Threads can be obtained directly from Thread Directors.

Case-based examples
Linking the lecture to realistic medical cases captures students' attention and provides strong motivation to learn the material. Furthermore, using cases during lecture aids retention by helping students link what they learn in class to memorable real life examples.

Change-up activities
Research has shown that students' attention begins to wander after about 10 minutes (the faculty's attention span is somewhat less than this). The best device for maintaining attention, therefore, is to break up the lecture rather than trying to hold attention for a full 50 minutes. Many different strategies can be employed to break up a lecture into discreet segments. A list and discussion of change-up activities is provided on pages 7-8.

In-class assessments
Including "quiz" items during the lecture is mutually beneficial for students and teachers. For students, quiz items provide an opportunity to actively participate (a chance to tune back in if their attention span has waned), check their understanding, and get immediate formative feedback. For instructors, in-class quiz items provide immediate feedback on what, how much, and how well their audience is learning.

Sample Structure of an Interactive Lecture

1. Outline the objectives & segments for the day's lecture

Establish what the students are expected to learn from the lecture, and how the lecture topics will be divided into segments. This can be accomplished by briefly talking through a slide that lists the objectives and lists the lecture's major topics. It helps orient the students to what they will be learning and how.
Time: 3-5 min

2. 'Mini-Case'

When possible, begin the lecture with a realistic mini-case involving a concept that will be discussed that day. Include a brief question that requires the use of a key concept. Students will each work on the question then report their answers. Mini-cases are more effective when students are presented the case beforehand (i.e. in the notes or at the end of the previous lecture) and asked to develop their ideas before class.
Time: 3-5 min

3. General lecture segment

This segment should cover either a basic concept or a single point with examples. End with a brief summary and transition to the next section.
Time: 10-15 min

4. Change-up activity

Provide a brief breakout moment designed around a thought question that concerns material just presented and/or builds on concepts presented in previous lectures. (Examples of change-up activities are discussed on pages 6-7.) To ensure active participation, build in an expectation that each student will be held accountable for completing the activity. For example, stipulate that students will discuss their answers with peers, fill in their own copy of a chart, cast a vote for the answer, or potentially be called on at random to explain their reasoning.
Time: 5 min

5. General lecture segment

This lecture segment should cover another basic concept or a single point with examples. End with a brief summary and transition to the next section.
Time: 10-15 min

6. Return to the mini-case

Allow the students to discuss and vote again on further developments of the case, using their vote as a springboard into a brief discussion of application of that lecture's key concepts.
Time: 3-5 min

7. Pose questions

Use the final minutes to pose one or two questions (of a style/format similar to those used on exams). Probe students' understanding of the material presented in the lecture. This provides valuable feedback for both the students and the lecturer.
Time: 3-5 min

Change-up Activities

Mini-Cases

Prepare a realistic medical case relevant to the lecture content. Present the case and ask students to identify important information in the case and/or answer questions related to the case (i.e. diagnosis, treatment, etiology, structures affected, etc.) When used at the beginning of lecture, mini-cases develop student interest. As a mid-lecture or end-of-lecture activity, mini-cases can be used to challenge students to apply what they have learned. Likewise, a case can be introduced at the beginning of lecture, then revisited or expanded later in the lecture.

Think-Pair-Share

Pose a question that requires some thought. Have the class members think about it individually for one minute. Then, ask them to discuss it with the person next to them for a minute. Call the group back together and discuss it as a class.

Minute paper/One-minute essay

Have each student write a very brief paper in which they 1) identify the key points, or 2) summarize the lecture. This activity is effective at the end of a lecture because it gives students a chance to solidify the information while the major points of the lecture are still fresh in their minds.

Application notes

After introducing an important principle, have the class come up with 1 or 2 "real world" applications. This is effective because it gives students a chance to connect the lecture concept to something that is meaningful to them. Research has shown that meaningful applied knowledge is more memorable.

Exam-style questions

This exercise can be done in groups or individually. Have the audience write exam questions over the material presented. They should use the same format as on their exams (e.g.: multiple choice, fill-ins). When they have finished, you can opt to have volunteers pose their questions to the class.

Background knowledge probe

Posing questions at the beginning of the lecture session is a good way to assess students' background knowledge, and to prime them for learning important concepts. Prepare 2 or 3 short-answer questions or 5 multiple choice questions from the lecture content. Have the audience work individually or in pairs to answer them, and then have them report their answers. The questions can be readdressed in a mid-lecture or end-of-lecture activity to help students see how their knowledge and understanding has increased.

Misconception/Preconception check

Similar to the Background Knowledge Probe, this activity assesses whether the audience can distinguish facts from opinion. Write a few open-ended or true/false items about the lecture's content. Have the audience work individually or in pairs to answer them, and then have them report their answers. The questions can be readdressed as a mid-lecture or end of lecture activity to help students see how their knowledge and understanding has increased.

Quiz questions

After a lecture segment, give students 3-5 quiz questions and have them report their answers.

Categorizing grid

Provide the students with a grid representing 2 or 3 categories or superordinate concepts along with a list of items belonging in the categories (e.g.: subordinate terms, equations, structures). The students work individually or in pairs to match the items with the categories. **7**

Change-up Activities, (cont)

Memory matrix

Distribute a matrix with row and column headings representing categorizing variables for information covered in lecture. Have student fill in the relevant cell information. For example:

	Structure	Functions	Enzymes
Mouth			
Stomach			
Pancreas			
Esophagus			

Defining features matrix

This activity requires the audience to categorize concepts according to the presence or absence of defining attributes. Distribute a matrix with features listed down the side and 2 or 3 vital topics across the top. The audience enters + or – in the cells to indicate the presence or absence of the features. This is effective when the lecture contains similar concepts that students need to be able to differentiate between, because it allows an opportunity to compare and contrast the concepts. For example:

	Freudian Psychology	Behaviorism
Focus on the unconscious mind		
Uses scientific experimental method		
Associated with term "psychoanalysis"		

Including Thread content

Change-up activities can also be used as an opportunity for students to apply appropriate thread related topics. For example, if students are learning about treatment options for severe hypertension, the change-up activity could ask them to compare the best course of action if the patient is below the poverty line and lives in a rural area vs. the best course of action if the patient is middle-class and lives in Tucson.

Appendix A - Resource Requirements

Number of instructors

One instructor can provide 50 minutes of lecture. In some circumstances it might be useful to have 2 instructors in the classroom, particularly for activities such as clinical correlations that would illustrate the basic science concepts covered during lecture.

Size of each student group

The entire medical school class can be accommodated for lecture

Number of rooms required

A large amphitheater or auditorium,

Technology required

The current lecture halls already have many of the technological features that are necessary to deliver interactive lectures. The interactive nature of the lectures will be enhanced as we continue to assure instructors that the following will be available: PC and Mac computers with LCD projection and internet access; capability to play DVD and VHS tape through LCD projection; and an audience response system (ARS). An ARS that has the capability to track individual responses, will be even more useful for both interactive lectures and for team learning sessions. Given the prospect of providing medical education (and by extension medical education cooperation and coordination) for students in both Tucson and Phoenix during the first 2 years of medical school, strong consideration should also be given to telecommunications capabilities such as teleconferences and streaming video.

Number of student contact hours per instructor

Instructors are usually in the classroom for about 1 hour per session. Some time is also devoted to tutoring of students or meeting with them to clarify points covered in lecture. This is variable, but rarely more than ½ hour per hour of lecture. Additional hours should also be devoted to tutorial and review sessions, approximately 2 hours for every 8 hours of lecture.

Training needed to familiarize instructors with the instructional method

UACOM instructors are obviously familiar with lectures. The Learning Team recommendations for interactive lecture include activities that are not routinely employed by most instructors, however. Exercises such as think-pair-share, one minute thought experiments, and audience response questions are to be incorporated routinely, and faculty would benefit from training about how to develop and deliver these exercises. We recommend this training be available regularly throughout the academic year and estimate that 1-2 hours of training will be necessary annually. An important component of instructor training that should be developed is a system of peer evaluation. There are currently no systematic efforts in the curriculum for peers to assess one another. Fellow faculty members are in the best position to judge the appropriateness of instructional content, and in many cases they will also be able to suggest improvements in lecture delivery, student involvement, and clinical relevance.

Number of hours of required preparation for each teaching session

For most lecture material, instructors have ready access to content and have developed it over the course of several years. Most instructors are already spending 1-2 hours annually to update their lecture material. In the new curriculum, in which lectures will include participatory activities, an additional 1-2 hours will be required annually to update each lecture hour.

Appendix A, (cont)- Resource Requirements

Staff support for lectures

Most instructors will be able to create content and to deliver lectures without substantial staff time. Those responsible for monitoring the curriculum, however, may find it useful to require instructors to undergo some instruction about development of the material, use of audience response technology, and use of thought experiments and other active learning strategies for lecture. Staff time will also be necessary for evaluation of instructors and potentially for remediation of instructors with unsatisfactory performance.

To note, or NOT to note?

Should students take notes? Some instructors provide extensive and detailed notes to go along with their lectures. Evidence suggests that this tends to foster passivity on the part of the students and makes an argument for limiting notes to a general outline. This can encourage the students to become more engaged through the act of taking notes. However, other evidence suggests that for some students the effort required to take notes is a serious distraction from listening and absorbing lecture material.

The consensus of the Teaching Methods group is that it is better to err on the side of providing the students with a comparatively complete background guide to the lecture, rather than with a more skeletal outline. Instructors should provide students with a detailed set of lecture notes. The important exception is when the relevant material is clearly available in the course text.

Appendix B – Additional Resources & References

Angelo, T.A. & Cross, K.P. 1993. Classroom assessment techniques: A handbook for college teachers. 2nd ed. San Francisco: Jossey-Bass.

Barkley, EF, Cross, KP, and Major CH. 2005. Collaborative Learning Techniques: A Handbook for College Faculty. San Francisco: Jossey-Bass.

Cross, KP. 1981. Adults as Learners: Increasing Participation and Facilitating Learning. San-Francisco: Jossey-Bass.

Brown, G and Atkins, M. Studies of lecturing in *Effective Teaching in Higher Education*, Routledge, London, 1988.

Derek Bok Center for Teaching and Learning, Harvard University accessed on-line at: http://bokcenter.harvard.edu/progs/lecturing.html on March 17, 2005.

Large Lectures. Accessed at: http://oct.sfsu.edu/implementation/largelecture/htmls/resources.html on March 17, 2005.

McKeachie, WJ. 2002. McKeachie's Teaching Tips. Boston: Houghton Mifflin.

Teaching Handbook. Accessed at http://ftad.osu.edu/Publications/TeachingHandbook/chap-5.pdf on March 17, 2005.

Tools for Teaching. Accessed at: http://teaching.berkeley.edu/bgd/largelecture.html on March 17, 2005.