Introduction

Preparing and Planning a Lecture
Best Practices for Teaching and Learning

Welcome to the session on "Preparing and Presenting a Lecture". We will begin the session with a simple set of questions based on the pre-session readings and your own personal experiences teaching and/or being a student.

What are traditional lectures good for? What are the disadvantages of a traditional lecture format?

Take a moment to think about the questions on your own. If possible, discuss your answers with another participant. Then, post your answers to the online course forum. Pause the video here while you complete this activity.

Welcome back. Let's discuss some of the answers to the pros and cons of lectures that you might have come up with during the brainstorming activity. So what's so great about lectures? Lectures can be great for providing students with the most up-to-date information, approaches, et cetera within a particular subject or field.

This is particularly important for subjects that change quickly, such as biology. Lectures can also be very good instructional models for summarizing large amounts of related information. Lectures can be adapted to different audiences. When provided by a good communicator, lectures can be inspiring in a way that other media for content delivery are not.

What are the cons of traditional lectures? Well, although the lectures are a good medium for transmitting information, lectures are not effective at helping students develop critical thinking skills or developing independent thought. Also, lectures are long, typically at least 50 minutes, and are difficult to keep students' attention.

This does not mean that we should completely discard the lecture as a mode of instruction. As we have discussed, lectures can be effective under certain circumstances.

During this session, we will begin by exploring what structure and delivery of a lecture work best to maximize student attention and understanding. During the next session, we will concentrate on effective techniques that you can integrate into your lecture to promote student understanding.

The goal of this session is to illustrate how you can structure and deliver your lecture to help support student learning. The learning objectives for this lesson are, that by the end of the session, you should be able to explain how the structure of a lecture can influence learning. Explain effective means of communicating content during a lecture. And critique and evaluate lectures.

This session will be organized into two parts. During the first part, we will discuss things to keep in mind when preparing a lecture. These things have the potential to increase the effectiveness of your lecture and include the goals of the lecture, the structure of the lecture and how it can help support learning, and lecture formats that you can use to introduce variability in your instruction which, as we have discussed previously, it's important for increasing knowledge retention.

The second part of this session will be focused on best practices for content delivery, mainly what we can learn from actors about voice modulation, nonverbal communication among others, and how we can create effective visuals using the blackboard or PowerPoint slides.

We've talked about the pros and cons of lectures. Now, take a moment to think about the attributes of an effective lecturer. What makes an effective lecturer? Pause the video here, and write down your answers.

Rosenshine and Furst reviewed more than 50 carefully selected studies and published their work in research on teaching performance criteria. In it, they proposed 11 teacher behaviors that influence learning. For the sake of simplicity, we'll only list here the top five teacher-behavior variables in order of importance.

These variables proposed by Rosenshine and Furst were one, clarity, two, variability, three, enthusiasm, four, task-oriented instruction, and five, student opportunities to ask questions. Do any of these five teacher-behavior variables appear in your own list?

During the session, we will concentrate on the first three of the teacher behaviors and how they can affect student learning. During our session on "Interactive Teaching and Active Learning", we will explore teacher-behavior variables four and five in more detail.

First, let's start by discussing the importance of identifying course goals and objectives when preparing your lecture. So when preparing and organizing a lecture, where do we start? You can use the backward design process to develop effective lectures, just like we did when we designed a course.

As we mentioned in the session on "Creating a Course and a Syllabus", backward design is used to effectively design courses that minimize rote memorization and maximize knowledge transfer. This can be applied to lectures, as well. Backward design is used to effectively design lectures that minimize rote memorization and maximize knowledge transfer.

Begin by determining your goal and learning objectives for that particular lecture. Then, think of the assignments that will help you evaluate whether your students have achieved your learning goals. And end by designing the in-class activities and instruction that will help support the learning objectives.

Let's take a closer look at what you should keep in mind when beginning to think about goals for your lectures. When we start to think about the goals for the particular lecture you are planning, we begin with a small number of concepts we would like our students to be able to know and do.

We often recommend that you try to cover only a few concepts, less than five, in a given lecture. The reason for keeping the number of concepts you cover to a minimum is because humans' working memory is limited.

What is working memory? Working memory is a brain system that allows you to temporarily store and manipulate information. It turns out that humans are not great at retaining lots of different objects, concepts, or abstractions in working memory.

In a classic paper, the Harvard University psychologist George Miller summarized various experiments testing the limitations of working memory. This figure represents one of these experiments which tested the ability to recall closely related sound pitches.

As you can see, when the number of different sound pitche is small, one or two, which in this figure is called input information, human subjects' ability to distinguish between the sound pitches, which in this figure is indicated as transmitted information, it's accurate.

However, as the number of different sound pitches increases to more than three, the ability to distinguish between different sound pitches plateaus. In this same paper, George Miller summarized other experiments that tested the limits of working memory in distinguishing between different colors, tastes, points on a square, et cetera.

He argued that the number of objects or abstractions the average human can hold in working memory is seven plus or minus two. This has great implications for how we teach and how material is presented. We should remember that our students have the same working memory limitations as everybody else.

In addition, our students are usually novices in whichever field we teach. Therefore, they haven't had time to incorporate the knowledge into their own existing frameworks.

Once you have chosen the concepts you will include during your lecture, it is important to make sure that your students are also well aware of your goals. This includes communicating your goals, the learning objectives of the lecture, and the concepts and topics to be covered.

As you can see, during this course, we always begin with our goals, learning objectives, and an outline of the session. The goals and learning objectives let students know what we expect of them, what they are supposed to know and be able to do by the end of the lecture.

The structure of your lecture can help tremendously in communicating your goals clearly and allowing you to retain your students' attention. As you recall, clarity was the top teacher-behavior variable associated with student learning in Rosenshine and Furst's meta-analysis. The structure of a lecture can help facilitate clarity.

Let's explore in more detail how this structure of the lecture can impact student learning. In this figure, the relative amount of student attention is plotted over the duration of a traditional 50-minute lecture. As you can see, students' attention is highest during the first 10 minutes of a traditional lecture and then decreases drastically with a small increase during the last 10 minutes of the class. Notice that students' attention can be quite low in the middle of the lecture.

How can we retain students' attention throughout the whole class period? One simple strategy involves structuring the lecture differently. In this strategy, we begin with introducing the topic of the lecture with a thought-provoking question or activity to spark students' interest.

Rather than lecturing throughout the whole length of the lecture, we lecture in 10-minute to 15-minute blocks followed by a small group activity related to that section. The lecture then ends with a concluding section. Breaking up the lecture in this way allows for students to reset their attention so that each time a new section begins, we have their full attention.

For increased clarity, let's break down the components of this strategy further. Rather than beginning a lecture with the goals and learning objectives for that particular lecture, we opened with an example or activity that demonstrates the importance or relevance for the set of concepts to be uncovered during that lecture. We call this type of opening an attention getter.

An attention getter is a powerful way to engage students. This also serves to demonstrate to the students why the set of concepts and topics to be covered are important and oftentimes are used to demonstrate how the concepts relate to real life. Here is an example of an attention getter.

In this lecture, the students explore the structure or shape of a protein that repairs damaged DNA. The goal of the lecture is to relate the structure of a protein to its function. Rather than starting with the basics of DNA repair or the basics of protein structure, the lecture begins with the following number, 10,000.

10,000 is the number of unintended changes, or mutations, that occur to a single human cell's DNA each day. The human body has, on average, approximately 10 to 50 trillion cells. This means that the body must repair an extraordinary number of mutations daily, which is quite a formidable task. How does the body do that?

By starting with a number of unintended changes in the DNA sequence, students become very interested and invested in the lecture. It makes the lecture really relevant to their actual lives.

Attention getters can be a simple set of surprising facts, a small activity, or a demonstration and/or a question to answer.

For example, at the beginning of this session, we began with a brainstorming activity that asked you to list the pros and cons of lectures. Another type of attention getter consists of starting with an experiment and a question. The rest of the lecture will then explore the concepts that are demonstrated in the experiment. The end of the lecture concludes with the performance of the experiment and answering of the questions posed at the beginning of the lecture.

After sparking students' interests, then it makes sense to explain your goals and learning objectives for that lecture. Outlines are also very important, since they allow students to know where you are and where you're going. Unlike an expert, a student does not have a good sense of what's important versus what is not. An outline helps students organize their notes and makes the organization of the lecture transparent.

After you have gone through the goal and learning objectives for your lecture, it is important to make connections between the current and prior lecture, as well as, to expose background information that the students will need to understand the main concepts being discussed during the lecture.

For example, my connecting slide for this session is the slide that illustrates the backward design process originally shown in the session on "Designing a Course and Constructing a Syllabus". This slide serves as a reminder of content covered during a prior lecture and connects information from a prior lecture to information in this lecture.

As we previously mentioned in the session on "Principles of Learning", connecting concepts from different lectures in a course serves to facilitate meaning-making and helps students decipher how different concepts of the course are related.

The body, or main section, of the lecture should be used to elaborate on the concepts that will be uncovered during the lecture. As we previously mentioned, the body of the lecture should be subdivided into smaller blocks, each 10 to 15 minutes long, followed by a small group activity.

Each block should only cover a single concept or key point, making sure to provide various and diverse examples to demonstrate the application of a concept.

As we will see in the session titled "Interactive Teaching and Active Learning", students learn best when they are actively engaged with the material and are asked to do something with it, particularly when they engage with other students, as well.

The small group activities that follow each session during the lecture facilitate interaction between the students and has the potential to increase the learning gains in your course. In addition, they provide opportunities for students to ask questions. The end of each block should provide a brief summary of what has been covered during that block and a transition into the next block.

A lecture should conclude with a summary of the main points to reinforce key concepts. We recommend that you use different words from those used to introduce the lecture. If possible, end the session with a question or a set of statements that asks students to apply the material uncovered during that lecture.

Here is an example of the question used to conclude a lecture. In this example, the lecture topic is DNA. And the three main points covered are the double helix or structure of DNA, the human genome, and the Book of Life project. The lecture concludes with a summary of the points covered.

Additionally, the lecture ends with the following question. "If you could genetically alter a vegetable or a piece of fruit, what will you change and why?" You can then ask your students to think about the question posed at the end of the lecture and come to the next class prepared to share their answers.

You can devote a few minutes at the beginning of the next lecture discussing the answer to the concluding question. By posing a question at the end of the lecture, we can encourage our students to think about the main points and concepts covered even after the end of the lecture.