Medical Physiology Online
Exploring the logic of life

Letter to the Editor
To give or not to give lecture slides to
students before I deliver the lecture?

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To the Editor:

It is widely acknowledged that didactic lectures are less effective compared to more active teaching-learning (T-L) methods in terms of promoting meaningful learning [1]. Despite increasing implementation of T-L methods that promote active learning, the lecture format remains and it is likely to persist as an important T-L method in several higher education settings. Thus, factors that affect the effectiveness of lectures and measures that can be taken to promote meaningful learning within the context of a lecture format have been the subject of much interest and research [2-4]. In the Faculty of Medicine at AIMST University where I teach undergraduate students in years 1 and 2 of the Bachelor of Medicine and Bachelor of Surgery (MBBS) programme, lectures are typically delivered face to face with the aid of PowerPoint$^®$ presentations. Once the lecture is delivered, students are typically free to take an electronic copy of the PowerPoint files and print out copies for their personal use. Intended learning outcomes [ILO] for each T-L session are either available to students in advance or incorporated into the PowerPoint presentation used at the time of the lecture. It is worth highlighting that in years 1 and 2 of our MBBS programme, about 45% of teaching time is used to deliver lectures.

The motivation for the exploration described in this paper is that if students come prepared for a lecture, it might contribute to improving the effectiveness of lectures. This idea has been extensively researched [5, 6]. While there are a variety of ways in which this could possibly be achieved, I describe two simple approaches I tried out. One is the

idea that providing the PowerPoint file **[PPT File]** prior to an index lecture might sensitize learners to the upcoming lecture. Alternatively or additionally, if the lecturer provided a brief (1-2 min) preview **[Preview]** of an upcoming lecture using 2-3 slides (at the end of the previous lecture), it might be another way of sensitizing students to concepts and content to be covered in the next lecture, motivating them to come prepared for it. The primary purpose of this study was to examine students' perceptions on the usefulness of these strategies and this required that they be explicitly exposed to these strategies.

METHODS:

The strategies tested are briefly defined below:

Strategy 1 [called here as **"PPT file"**]**:** Students were given an electronic copy of the PPT file of the lecture 2-3 days in advance of that lecture and encouraged to review them and come prepared. This 'PPT file' included the title and focus of the lecture, listed the learning outcomes intended to be achieved and included all lectures slides with images, animations (if any), and suggested references for reading. However, the PPT files did not contain lecturer's voice. For readers' reference, slides of an entire lecture are included in *Supplement 1.* One can see that some of the information included in the slides is concrete while some are at a slightly higher level of abstraction in reference to the upcoming lecture.

Strategy 2 [called here as **'Preview'**]**:** Here the lecturer provided a brief face to face preview lasting 2 min at the most, with the help of 2-3 PowerPoint slides **[See Supplement 2]** of the upcoming lecture at the end of the previous lecture in that course; for example, a 2 min preview about Lecture 4 was given at the end of Lecture 3. The slides used for Preview contained the title and the focus of the lecture, 1-2 slides on that topic, a list of intended learning outcomes, as well as any suggested reading.

Strategy 3 [**'Control' Strategy**]**:** This entailed giving students a half-page handout containing the title, the focus of an upcoming lecture with a list of intended learning outcomes and references for reading such as this:

A sample handout provided to students ('Control' Strategy)
Coming Monday 8 am.

Lecture 5: **A primer in intercellular communication**

Focus: How cells talk to each other?

At the end of the lecture, we should be able to

- Briefly explain the differences between endocrine, neurocrine, paracrine, autocrine and juxtacrine communication with an example for each.
- Briefly describe the cellular mechanism of action of steroid hormones.
- Briefly describe the cellular mechanism of action of peptide hormones.

Suggested reading:

- Review of Medical Physiology by William F Ganong, 2005, Mc Graw Hill. Read the section on intercellular communication in the first chapter The General and Cellular Basis of Medical Physiology.
- You could google for meanings of the terms endocrine, paracrine, autocrine, neurocrine and juxtacrine.

This closely matches prevailing practice in our institution; i.e., the schedule of lectures is on the timetable and learning outcomes are in the course handbook, which students already have with them. Thus, this represented an active "control" arm rather than a new strategy.

The 13th batch of undergraduate medical students (n = 68) in the first month of their Bachelor of Medicine and Bachelor of Surgery (MBBS) course were approached and consented to participate. The class was randomized to three groups using the RAND function on the Microsoft® EXCEL programme, with a near equal proportion of males and females in each. That randomization was satisfactory was ascertained by administering a test at baseline containing 10 multiple-choice questions. The mean scores of the three groups were 6.4, 6.6 and 5.8 ($P = 0.14$ by Kruskal-Wallis test). Lectures in this course were held on Mondays and Fridays. I thought 3 days time between two lectures was reasonable time for students to benefit from this strategy if they were keen. All strategies were used 3 days ahead (and equally in advance) of the next lecture. I delivered all the lectures. Also, students were subject to only one strategy at a time. The reason for randomizing students into three groups was not to determine if one strategy was any better than the other. Rather, it was to ensure that each group was exposed to three different ways of being sensitized toward the same upcoming lecture. The Faculty of Medicine Research and Human Ethics Committee approved the study protocol. The three groups rotated between the three strategies as tabulated below *(Table 1)*:

Table 1: **Student Groups and strategies they were subject to**

	Group A (n = 22)	Group B (n = 22)	Group C (n = 23)
Prior to *Lecture 2*	PPT File	Preview	Control
Prior to *Lecture 3*	Preview	Control	PPT File
Prior to *Lecture 4*	Control	PPT File	Preview

The corresponding lectures were *Lecture 2:* Transport across cell membrane; *Lecture 3:* The cell cycle; *Lecture 4:* A primer in intercellular communication

As I do at the end of many of my lectures, I conducted a test containing 5 multiple-choice questions at the end of each of the above lectures for the whole class on content and concepts covered in that lecture (**Supplement 3** – Post-test following a lecture on body fluid compartments). This test was designed to obtain an overall measure of immediate effectiveness of lectures and as a means to provide students feedback on their immediate grasp of the lecture, but was by no means a test of all intended cognitive competencies. At the end of this block of 4 lectures held over 2 weeks, students were requested to complete a questionnaire **(Appendix 2).** Free text comments were also invited and were required for one particular question (*Question 6* on the Feedback form).

RESULTS:

64/68 participants completed the Questionnaire. Students' responses to Questions 1-6 on the Questionnaire are summarized in **Table 2.** Representative free text responses to *Question 6* are presented in **Table 3** categorized by the major presumed underlying idea in that comment. Only 1 respondent recommended being given only a list of learning outcomes without either an active preview by the lecturer or a handout of the PowerPoint presentation. S/he wrote: *"give only a list of learning outcomes, we read more from textbooks and other references".* No student recommended being given only a Preview of an upcoming lecture; i.e., they would additionally require the PowerPoint slides. *P* values for intergroup comparisons of students scores in tests at the end of each of 3 lectures was greater than 0.1 (not significant, Kruskal Wallis test).

Table 2: Students Responses to Items on the Questionnaire

Questionnaire Item	Number of responses, Response				
1. Do you believe that coming prepared for a lecture will enhance the usefulness of a lecture?	**44** Yes I strongly believe in that	**18** Yes I believe so	**2** Neutral	**0** No I do not think so	**0** No, not at all
2. How interested are you in coming prepared with some idea of what a subsequent lecture is about?	**27** Extremely interested	**27** Quite interested	**9** Neutral	**0** Not interested	**1** Not at all interested
3. In your opinion, how useful do you think it would be for you to be provided with **only** a handout containing the title, focus, learning outcomes of the next lecture?	**3** Very useful	**32** Useful	**16** Neither useful nor useless	**10** Not useful	**2** Not at all useful
4. In your opinion, how useful do you think it would be for you to be provided a 2-3 minute preview (using some slides) by the lecturer of the next lecture, and in addition being given a handout containing the title, focus, learning outcomes and suggested reading for the next lecture?	**6** Very useful	**38** Useful	**15** Neither useful nor useless	**4** Not useful	**0** Not at all useful
5. In your opinion, how useful do you think it would be for you to be provided with a handout of the PowerPoint presentation of a subsequent lecture? This handout also contains the learning outcomes you are expected to achieve and some reading is also suggested.	**50** Very useful	**13** Useful	**1** Neither useful nor useless	**0** Not useful	**0** Not at all useful
6. Of the strategies below, which of the following do you believe is the most useful for improving the effectiveness of lectures? If you believe none of them is useful, tick option 5	**1** 'Control'	**27** Give 'Preview' and 'PPT File'	**36** 'PPT File'	**0** 'Preview'	**0** I do not recommend any of these

Table 3: Students' responses to Question 6 – Please explain why you chose what you chose in Question 6.

1. Students who recommended that the PPT File be given in advance said:

Orientation:
"Students get an idea of the syllabus that will be covered in the subsequent lecture"

Orientation to to-be-learnt material and Prior Preparation and thus Effective Use of Lectures:
"We can check textbooks for meanings of terms in the slides that are not clear to us"

"I can ask questions based on the PowerPoint slides on the same day as the lecture. This will help revision, as I will not have to wait another day to have my questions answered."

"I feel I will be able to answer the Posttest questions confidently if I go through the PowerPoint slides before I come for the next lecture."

"If we have the PowerPoint, we can search and find extra material to read. In contrast, a brief preview is too short and it will only give us a hazy picture – so not that useful."

"With the PowerPoint presentation, it is easier to learn the content in the next lecture in a simpler way before we proceed to read from reference books"

"A handout of the PowerPoint given in advance helps because I need some time to think about concepts and mechanisms and then raise questions"

Increased clarity on teacher's expectations:
"With only the learning outcomes, we are not clear about what we are supposed to know – sometimes they mislead us out of the syllabus. But with PowerPoint slides, it will be perfect for me to study because I know what I am expected to know"

"Providing PowerPoint slides before the next lecture clearly indicates the scope of the lecture – in contrast, when we read from books – there is a lot of irrelevant data that tend to confuse the student rather than give a clear picture"

Facilitate note-taking on print outs of slides:
"Students can make notes while the lecture is proceeding"

2. *Students who preferred being given a Preview by the lecturer in addition to PowerPoint slides said:*

<u>**Orientation**</u>

"A brief preview gives me a chance to listen to the lecturer on how he breaks the topic down whereas a handout of the PowerPoint alone would leave me confused"

"Previews and learning outcomes should be made into a CD and given to students prior to entering the course"

"Preview gives me a brief idea of what I should know and study – thus curiosity will arise that will cause me to read more."

3. *Comments suggesting a superficial learning style:*

"Enhancing understanding during the lecture; can catch up during the lecture; easy for memorizing things"

"Giving PowerPoint slides in advance helps learn and helps us stick to the syllabus – not go beyond or lag behind expectations"

DISCUSSION:

It can be seen that students' perceptions are quite varied and they provide some window into their learning styles; this is open for readers to interpret. However, it can be seen that most prefer to have lecture slides in advance. Several (though not all) of the reasons students presented for this appeal to me and I wish to emphasize that I look at this issue primarily from the standpoint of seeing how effectiveness of lectures can be improved. Indeed it is worth noting that some comments suggest the commenter's approach to learning might be predominantly superficial. While there has been one recent study [7] from our university in which students' learning styles was assessed using the VARK questionnaire, there has thus far been no published systematic inquiry into our students' depth of learning.

Students' scores in tests conducted immediately at the end of each lecture was not a prespecified outcome measure of effectiveness of these strategies, as I believed the strategies employed here were subtle and several other factors affect the effectiveness of lectures, and this study was primarily designed to gather their perceptions regarding the strategies used. However, it is possible that a more comprehensive post-test of intended learning outcomes that tested the ability to apply knowledge in new contexts in addition to retention may have detected differences between the groups, as pointed out by Mayer [6]. Another important limitation of this work is I did not attempt to determine what

fraction of students who had been provided with lecture slides in advance actually went through it in preparation for the upcoming lecture.

There is an extensive literature on the effect of *'advance organizers'* [5, 6]; as originally defined by Ausubel [5], these are learning materials or aids of a conceptual nature and at a higher level of abstraction and generality that are likely to provide an anchor for subsuming and assimilating more differentiated material to be presented in an index learning experience. According to the theory of learning by assimilating new knowledge to existing cognitive structures, advance organizers would not be expected to have strong effects on learning outcomes if the index learning experience (in this case, the lectures delivered) is well organized or when the advance organizers do not provide a context for assimilation of material to be learnt [6]. In this study, although the PowerPoint slides of entire lectures (provided as 'advance organizers', see *Supplement 1* for example) did not contain overarching general principles, they did contain a schema for assimilating details from an upcoming lecture. Indeed, one of the students wrote: *"a handout of the PowerPoint given in advance helps because I need some time to think about concepts and mechanisms and then raise questions".*

Providing lecture slides to students in advance of lectures obviously has intrinsic merits including the possibility that a less active lecture format of delivering content can be stepped up to an interactive discussion that enable teachers to sample students' understanding of concepts as the lecture is proceeding; otherwise, much lecture time would have to be spent orienting students to the lecture topic and transmitting core knowledge that contributes to understanding.

Several other merits are obvious from students' comments (***Table 3***) including: one, the possibility of learners achieving a reasonable level of orientation and activating prior knowledge; two, clarity in advance as to what is expected of learners; three, avoiding the need for extensive note-taking during lectures; finally, the possibility of increased interaction with the facilitator (teacher) during or immediately after the lecture. Regarding the *Preview* method described here, I personally am not sure if such a brief preview would make an impact if I were also going to provide the slides in advance. In my experience, invariably it is time for me to leave the lecture hall by the time I have responded to some of students' questions arising from the lecture; thus I have found giving previews of the next lecture somewhat difficult to accomplish on a routine basis. This is not to say, of course, that I don't give a preview of a block of 4 lectures, say, on control of posture and movement when I start the first lecture in that block.

From this little exploration of students perceptions and my own reflections which take into consideration the overall goals and objectives of our undergraduate medical programme, the message I derived for my teaching practice within the courses I teach was that I should give my lecture slides preferably a week in advance, not just 2-3 days earlier, whenever possible. I have been able to do it for lectures I have taken for previous classes of students but it somehow has not been the case for lectures allotted to me for the first time, but I will work on this. I do not see providing slides in advance doing any harm but any benefit would vary depending on how well students use it. I suspect many institutions already do this, for example, by enabling students enrolled in a course access designated T-L materials from a repository on the institution's intranet or Internet.

When I presented this view to my colleagues in my Faculty, some expressed reservations to providing lecture slides to students not only in advance but of giving them to students at all, the main reservation being that they thought it important for students to study textbooks rich in concepts, explanations, and illustrations and that PowerPoint slides contained only an outline of concepts and content. I too am concerned that my students must study 'textbooks' (by that I refer to any authenticated source of information including study material available on the internet, CD-ROMs etc) instead of being contended with information provided during lectures and included in lecture slides, but think it can be dealt with as a distinct issue. Indeed, fostering curiosity and self-directed learning is an important objective of our undergraduate medical programme. Our programme features Problem-based Learning (from Year 2), and Special Study Modules (basically, opportunities for indepth study of a topic of students' choosing). And there are other ways of motivating students to taking to textbooks such as using open book assessments, using questions that test ability to apply concepts to novel contexts. However, I think it is incorrect to generalize my view that lecture slides should be provided to learners in advance because approaches to facilitating learning should follow from the philosophy and intended outcomes of the programme and course in question.

Supplement 1 – Slides of an entire lecture (illustration, for readers' reference)
Supplement 2 – Slides used for offering a Preview (illustration, for readers reference)
Supplement 3 – Post-test from a lecture on body fluid compartments
Supplement files can be accessed from
http://medicalphysiologyonline.wordpress.com/2010/03/21/to-give-or-not-to-give/
Appendix 1 – Feedback form**,** which students completed.

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Appendix: *Feedback Form*

Your name is not required. Please clearly circle your response.

1. Do you believe that coming prepared for a lecture will enhance the usefulness of a lecture?
1. No, not at all
2. No, I do not think so
3. Neutral
4. Yes, I believe so
5. Yes, I strongly believe in that

2. How interested are you in coming prepared with some idea of what a subsequent lecture is about?
1. Not at all interested
2. Not interested
3. Neutral
4. Quite Interested
5. Extremely interested

3. In your opinion, how useful do you think it would be for you to be provided with **only** a handout containing the title, focus, learning outcomes of the next lecture?
1. Not at all useful
2. Not useful
3. Neither useful nor useless
4. Useful
5. Very useful

4. In your opinion, how useful do you think it would be for you to be provided a 2-3 minute preview (using some slides) by the lecturer of the next lecture, and in addition being given a handout containing the title, focus, learning outcomes and suggested reading for the next lecture?
1. Not at all useful
2. Not useful
3. Neither useful nor useless
4. Useful
5. Very useful

5. In your opinion, how useful do you think it would be for you to be provided with a handout of the PowerPoint presentation of a subsequent lecture? This handout also contains the learning outcomes you are expected to achieve and some reading is also suggested.
1. Not at all useful
2. Not useful
3. Neither useful nor useless
4. Useful
5. Very useful

6. Of the strategies below, which of the following do **you believe is the most useful** for improving the effectiveness of lectures? If you believe none of them is useful, tick option 5.
1. Just a handout with the title, learning objectives, outcomes and suggested reading for the next lecture.
2. The lecturer providing a brief 2-3 minute preview of the next lecture along with the learning outcomes and suggested reading.
3. Providing a handout of the PowerPoint presentation of the next lecture, which also includes expected learning outcomes and suggested reading.
4. Give a brief preview (as in option 2) as well as the PowerPoint presentation (option 4) of an upcoming lecture.
5. I do not recommend any of these.

Please briefly explain why you choose what you chose in question 6. If space is insufficient, please continue on the reverse side of this page. This question must be answered.

If you have any other ideas for improving the effectiveness of lectures, please write them here.