

## **PREPUBLICATION RECORD**

**Note** – This contains the version of the manuscript first submitted for publication, editor's comments, and the author's response to editor's comments. The final accepted version is the most authenticated and it can be accessed from

<http://medicalphysiologyonline.wordpress.com/2010/03/21/to-give-or-not-to-give/>

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**Category: *Point of View***

***To give or not to give my lecture slides to students before I deliver the lecture?***

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### **BACKGROUND:**

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 [examples, Refs. 2-4]. In the Faculty of Medicine of AIMST University where I now mainly teach undergraduate

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students in year 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 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 the simple idea that if students come prepared for a lecture, it might contribute to improving the effectiveness of lectures. While there are a variety of ways in which this could possibly be achieved, I describe two practical approaches I wished to test. 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*.

**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 (see *Appendix 1*). This closely matches prevailing

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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 13<sup>th</sup> 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 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 these three strategies as tabulated below:

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

	<b>Group A (n = 22)</b>	<b>Group B (n = 22)</b>	<b>Group C (n = 23)</b>
Prior to <i>Lecture 2</i>	PPT File	Preview	Control
Prior to <i>Lecture 3</i>	Preview	Control	PPT File
Prior to <i>Lecture 4</i>	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. 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 AND DISCUSSION:**

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

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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. 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. Obviously, students’ perceptions are quite varied and their perceptions provide some window into their learning styles and this is open for readers to interpret. However, 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 [5] 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 believe the strategies employed here were subtle and several other factors affect the effectiveness of lectures. In fact,  $P$  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).

I do not have the resources to systematically inquire using a controlled experimental design to determine if strategies as subtle as I have described in this paper improve student learning outcomes in courses; however, on the face of it, 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 much difference if I were 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 practically 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 in this programme in this institution was that I should give my lecture slides preferably a week in advance, not just 2-3 days earlier, whenever possible, while continuing to inquire systematically into other factors that affect our students learning. 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 obviously vary depending on how well students used 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 contented with information provided during lectures and included in lecture slides, but think it can be dealt with as a distinct issue. Indeed, fostering self-directed learning is an important component of our undergraduate medical programme. One, our programme already 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.

All this said, I think it 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. For similar reasons, students' perceptions on this issue might also vary in another programme within our institution, in a different institution or country.

**Supplement 1** – Slides of an entire lecture (illustration, for readers reference)

**Supplement 2** – Slides used for offering a Preview (illustration, for readers reference)

#### REFERENCES [all hyperlinks accessed 25 Feb 2010]

1. **DiCarlo SE.** Too much content, not enough thinking, and too little fun. *Advances in Physiology Education* 2009; <http://advan.physiology.org/cgi/content/full/33/4/257>
2. **Reich R.** The Socratic Method: what it is and how to use it in the classroom. *Speaking of Teaching* 2003; [http://ctl.stanford.edu/Newsletter/socratic\\_method.pdf](http://ctl.stanford.edu/Newsletter/socratic_method.pdf)

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3. **Geer UC and Rudge DW.** A review of research on constructivist based strategies for large lecture science classes <http://wolfweb.unr.edu/homepage/crowther/ejse/geer.pdf>
4. **Michael JA and Modell HI.** Ch 7 - Preparing students to participate in an active learning environment; Ch 8 – Creating an active learning environment in the science lecture hall. In: *Active learning in secondary and college science classrooms: a working model*. Lawrence Erlbaum Associates Inc., New Jersey, 2003.
5. **Kumar LR, Voralu K, Pani SP, Sethuraman KR.** Predominant learning styles adopted by AIMST University students in Malaysia. *South East Asian Journal of Medical Education*, 1; 37 – 46, 2009, [http://www.md.chula.ac.th/jmet/articleVol3No1/OR6\\_Latha%20Rajendra.pdf](http://www.md.chula.ac.th/jmet/articleVol3No1/OR6_Latha%20Rajendra.pdf)

**Table 2: Students Responses to Items on the Questionnaire**

Questionnaire Item	Number of responses, Response				
	44	18	2	0	0
1. Do you believe that coming prepared for a lecture will enhance the usefulness of a lecture?	Yes I strongly believe in that	Yes I believe so	Neutral	No I do not think so	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 <b>only</b> 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 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:**

**Orientation**

*“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”*

**APPENDIX 1:**

**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 explain the cellular mechanism of action of steroid hormones.
- Briefly explain 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.

**APPENDIX 2:**  
**Feedback Form**

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

**Question 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

**Question 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

**Question 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

**Question 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

**Question 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

**Question 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.

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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.

### **EDITOR'S COMMENTS TO THE AUTHOR:**

Dear Dr Prakash,

I have read your letter and added a number of comments to the document which is attached. I think the manuscript is publishable as a letter but would need additional work to be publishable as an article.

The basic premise of your manuscript that summarizing material to be covered in future lectures in the previous lecture promotes learning is not a new idea. I suggest you look further into the educational literature in particular focusing on the work of David Ausubel in the 1960's on advance organizers which I believe promotes a similar concept. There is a significant literature based on Ausubel's ideas that is probably relevant to your proposal.

The research design that was used to compare the three strategies (Table 1) is called a Latin Square and is a classic research design widely used in agriculture. It is a quite rigorous experimental design that controls most potential confounding variables. I think you underplay its value. While there was no statistically significant effect of the different teaching modalities, I do not think that can be attributed to the experimental design. I believe the weakness in this component of the study is in the relatively few multiple choice questions used in the assessment rather than the experimental design.

The manuscript contains quite a large amount of personal reflection that perhaps is appropriate for a letter but would not be so for a research article.

### **Comments inserted within the Manuscript:**

1. You may wish to reference the work of David Ausubel on advance organizers.

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2. Suggest stating how the randomization was accomplished. If done correctly such that each student has an equal chance of being assigned to each group, there is no need to test.
3. This is called a “Latin Square” design and is often used in agriculture.
4. The results and discussion are separate sections in standard research reporting. I suggest sticking with that format. You will have difficulty publishing in most journals if you combine the two.
5. The Latin square design used actually is a pretty rigorous design that controls many potential confounding variables. I think a bigger issue would be a very sensitive outcomes measure.
6. Again, if you wish to pursue this line of research I would suggest reading the literature on advanced organizers.

Best wishes,

**Professor David Solomon, PhD**

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**AUTHOR’S RESPONSE TO EDITOR’S COMMENTS:**

Dear Sir,

Thank you very much for helpful comments on this work. I agree the manuscript contains a large amount of personal reflection, and it was indeed submitted for publication in the *Point of View* section of the journal, not as a research article.

Thank you for pointing me to the literature on advance organizers and the work of Dr David Ausubel. In the revised version, I have included a reference to Dr David Ausubel’s review on advance organizers. I understand the strategies I used here were much simpler and cannot be called *advance organizers* as originally defined by Ausubel [1] in the sense they were not at a much higher level of abstraction and generality around which to subsume subsequent material to be learnt. In this particular exploration, what I have done is simply provide an orienting overview (in the case of *Previews*) or an organized summary of the learning material (in the case of providing the PowerPoint files in advance) in the hope that it would sensitize or motivate the learner to come prepared to better receive an upcoming lecture. However, Dr Mayer [2] has performed a systematic

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review of studies that evaluated *advance organizers* and has used a broader definition of advance organizers than Ausubel's in that he emphasizes the ability of the AO to provide a basis for assimilation of to be learnt material as its cardinal feature. What I intended to achieve by providing lecture slides in advance is this.

The cohort was randomized to three groups using the RAND function on the Microsoft EXCEL programme. I agree that randomization, if properly done, should result in groups that are indeed comparable and a pre-test would not be needed to ascertain this.

The results and discussion are now put in separate paragraphs.

I totally agree that it is possible that a more comprehensive test of cognitive competencies at the end of these lectures may indeed have shown some differences between groups that had the facility to better organize their thoughts and ideas in advance of the lectures. As noted in the manuscript, the post-tests administered were indeed not actually incorporated into the study design as an outcome measure to test if one intervention was any better than the other. They were simply part of the lectures with about 40 min for the lecture, 5 min for the post-test and a few more minutes for discussing answers to the post-test; the manuscript is simply a report of *action research* carried out within the constraints of the course schedule.

[1] **Ausubel D.** The use of ideational organizers in science teaching. 1970; available from [http://www.eric.ed.gov:80/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/36/3a/57.pdf](http://www.eric.ed.gov:80/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/36/3a/57.pdf)

[2] **Mayer RE.** Twenty years of research on advanced organizers. Available from <http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED206691>

Sincerely,

E.S.Prakash