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Study of Student's Expectations about the Biochemistry Lecture Handouts at RAK Medical and Health Sciences University

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ABSTRACT

Keywords

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Lecture handouts are widely used as instructional tools, useful for the student preparation, comprehension and revision. They have become an integral component of the lecture in undergraduate medical education. This study was conducted to analyze the perceptions of first year medical students about the effectiveness of using complete and incomplete lecture handouts in Biochemistry course. This cross-sectional study was conducted at RAK College of Medical Sciences (RAKCOMS). About (n=98) first year medical students were administer with 10 item questionnaire to determine their perceptions and expectations about the lecture handouts. Data analysis was done using descriptive statistics for each questionnaire. To analyze the multiple comparisons between the groups, one sample Kolmogorov-Smirnov test was applied. A p value <0.05 was considered as significant. As per our study majority of the students reported that they use and read the lecture handouts as a reference. They also expressed their satisfaction as it stimulated their desire to learn biochemistry. They use complete handouts as a means of substituting their learning rather than supplementing. Overall, experience of the students was positive towards the use of lecture handouts, specifically for complete handouts as means of preparation, comprehension, revision and performance.

Introduction

Lecture handouts are widely used as instructional tools. Handouts make the lectures “portable and enduring” (Kroenke, 1991) and helps to improve the recall of information and test performance. It is a common practice to provide PowerPoint presentations and to publish on the website

for the students' access. First year medical students are mostly dependent on teacher because of their exposure to a new curriculum in a medical school. Because of this, they have the requirement for the learning resources, especially lecture handouts (Kroenke, 1991).

It is often necessary to guide them through handouts, as they are not mature enough to manage their time for learning and to look for the right references. (Kroenke, 1991).

A lecture handout can be defined as an instructional tool that complements a lecture resulting in improved understanding of information and test performance (Wayne state university).

There are different formats exists for lecture handouts. The use of a particular format depends on the purpose (Kiewra, *et al.*, 2002).

1. Do you want the students to use the handout as a guide or reference after the lecture?

If the handout is intended as a guide to promote active learning during the lecture, it should be structured in type of handout is called 'incomplete' since students must add their own notes in order to complete the handout.

If the handout is meant to be a reference, it should contain all the information that students need to learn and therefore is called a 'complete' handout. (Kiewra, *et al.*, 2002)

How you want the students to use the handout may depend on one or more of the following factors:

Nature of the Content You are Teaching

Certain content areas may naturally lend themselves to a specific format. For example, if the content involves a complex pathway, better to provide a complete handout which can be used as a reference (Wayne state university, Bligh, *et al.*, 2000).

Level and/or Characteristics of the Learner Group

In some circumstances, a learner at an introductory level may require a more complete handout compared to an advanced level learner. Likewise, there may be circumstances where a beginner can learn best by actively participating in the lecture by using an incomplete handout. Perhaps, an advanced learner is at a point of learning the critical information and skills and may need a complete handout (Wayne state university).

Educational Philosophy

Some educators believe that learning is best achieved through active note taking by the student, whereas others believe learning is best achieved by providing the complete information to the students. Research does not support one philosophy over the other – what's important is that one way or another (notes either taken by the student or provided by the instructor), students should have complete and accurate information to review and process after the lecture. (Wayne state university, Bligh, *et al.*, 2000)

Objectives

Present study was designed to analyze the perceptions of first year medical students about the effectiveness of using complete and incomplete handouts provided to learn Biochemistry.

Methods

This was a cross-sectional study conducted among the first year medical students (n=98) studying Biochemistry at RAK College of Medical Sciences (RAKCOMS).

At RAKCOMS, classes were conducted using white board and PowerPoint

presentations (PPT). After the class, lecture handouts (PPT) were uploaded on to the university management system (UMS) for the students' access. Type of the lecture handout may vary from one faculty to other as some of them use complete handouts whereas others use incomplete handouts to teach Biochemistry.

Once lecture handout is prepared and used for teaching it is important to determine its effectiveness. Purpose of the present study was to determine the student's perceptions and expectations with regards to lecture handouts provided to them.

The 10 item survey questionnaire was developed after literature review and discussion with the faculty and staff. Most of the questions were close-ended type. After obtaining permission from the institutional ethics committee, prevalidated survey questionnaire was administered to 98 first year MBBS students.

Data analysis was done separately for each questionnaire using descriptive statistics. For multiple comparisons between the groups, one sample Kolmogorov-Smirnov test was applied. A p value <0.05 was considered significant.

Results and Discussion

Students enrolled were 98 and represented in the study sample. There were 57 (58%) females and 41 (42%) males. Majority of the students were (95.27%, $p < 0.001$) using the lecture hand-outs for studying Biochemistry. Many of them were having the opinion (91.75%, $p < 0.001$) that lecture handouts were useful for learning Biochemistry.

About 83.0% of the students ($p < 0.001$) have

felt complete lecture handouts were useful in understanding biochemistry topics and also stimulated their desire to learn biochemistry (66.34%, $p < 0.001$).

Majority of the students (75.76%, $p < 0.001$) felt that complete lecture handouts helped them to understand the subject and made their learning enjoyable. About 84.0% of the students ($p < 0.001$) were having the opinion that complete lecture hand-outs satisfied their quantity of learning in comparison to incomplete handouts. They also opined that (79.21%, $p < 0.001$) complete lecture hand-outs were helpful in filling the learning gaps. Almost three fourth of the students ($p < 0.001$) prefer a complete lecture hand-out over the incomplete handout for understanding of the Biochemistry.

About 64.95% ($p < 0.001$) of the study group felt that there should be mix of incomplete and complete lecture handouts for understanding of a particular system and associated clinical conditions. Along with lecture handouts, students were using other resources like text books (38.16%) and You Tube (31.58%) (Table-1).

The faculty, who is an academician and content expert, is in the best position to determine how to design the handout to accomplish his or her learning outcomes. (11)

It is important to devote sufficient time for developing lecture handout. A well-developed handout augments the lecture and enhances student learning and creates interest in a topic. A poorly developed handout usually results in poor student learning and consequently poor faculty and course evaluations (Better teaching, Frederick, 2002).

Table.1 Showing the results of students' perception on Lecture handouts

Demographics:	Males (Total 41)		Females (Total 57)		Total %		One sample Kolmogorov- smirnov test
	Yes	NO	Yes	NO	Yes	NO	
Question							
1. Do you use faculty lecture hand-outs for studying Biochemistry	40	1	53	4	95.27		0.001
2. Do you think lecture handouts are useful for learning Biochemistry?	39	2	50	6	91.75	8.25	0.001
3. In understanding biochemistry topics which type of lecture handouts were useful?	*CLH	**ICL H	CLH	ICL H			
	34	8	49	9	83.0	17.0	0.001
4. Which type of lecture handouts stimulated your desire to learn?	27	13	40	21	66.34	33.66	0.001
5. Which type of lecture handouts made you enjoy understanding the portion of the Biochemistry course?	30	10	45	14	75.76	24.24	0.001
6. Which type of lecture hand-outs satisfied you with regards to the quantity of learning experience in biochemistry?	34	7	50	9	84.00	16.00	0.001
7. Which type of lecture handout was helpful in filling the learning gaps?	32	8	48	13	79.21	20.79	0.001
8. You prefer to have which type of lecture hand-out for understanding Biochemistry?	31	10	47	14	76.47	25.53	0.001
9. Do you feel that there should be a mixture of incomplete and complete lecture hand-outs for a better understanding of a particular system and associated clinical conditions?	YES	NO	YES	NO			
	26	14	37	20	64.95	35.05	0.001
10. What are the other resources you use to study?	Text book 38.16%		Web sites 19.74%		You Tube 31.58%		Any other 10.53%

* Complete lecture handout (CLH), **Incomplete lecture handout (ICLH).

Example - COMPLETE HANDOUT

INSULIN STRUCTURE

- C-peptide has no biological activity but essential for proper insulin folding.
- Its estimation in plasma serves as a useful index for endogenous production of insulin.

INSULIN DEGRADATION

- Insulin is combined with Zn to form complexes.
- In this form, insulin is stored in the cytosol in granules on proper stimuli released by Exocytosis.
- It is degraded by the enzyme insulinase which is present in liver and kidney and hepatic glutathione- insulin transhydrogenase which cleaves the disulfide linkages.

Example - INCOMPLETE HANDOUT

Metabolism of purines

Synthesis of purine nucleotides

- De novo synthesis of purine nucleotides

NORMAL SECRETION

- It has a plasma half life of approximately 6 min.
- About 40-50 IU of insulin is secreted daily.
- Normal insulin in blood is 5-15 micro units/ml.

Case Report

A 50 year old male, alcoholic awake from the sleep with painful and swollen greater toe. Later he was seen by the doctor and he ordered few investigations and given some drugs

Glucose is the major stimulant of insulin secretion

- β -cells have GLUT 2 receptors through which glucose is absorbed and oxidized; so more ATP is made available to open calcium channels.
- Increased intracellular calcium activates adenylyl cyclase to produce cAMP.
- cAMP along with calcium causes insulin secretion.

MECHANISM OF INSULIN ACTION

- Insulin receptor exists as a dimer.
- Each half containing alpha and beta subunits.
- Auto phosphorylate each other when insulin binds and thereby activates the receptor.

Sources of purines

- Aminoacids: _____
- _____
- _____
- _____

Salvage pathway for purines

Normal turnover of cellular nucleic acids

According to Nelson-Wong *et al.*, complete handouts allow students to write less this enables them in listening. This approach is best for courses that include a greater degree

of conceptual topics such as Biochemistry. (Nelson-wong, 2000).

In line with previous studies, our study also

showed the usefulness of complete handouts in learning Biochemistry.

If students are assured of complete lecture presentations they would give their full attention to the lecturer and refer to the presentation later (Joe Varghese 2012).

In case of incomplete handouts, students are required to fill in the missing information through note-taking. This may be best utilized in analytical, problem-based courses such as applied clinical biochemistry (Nelson-wong, 2000).

Cardetti, *et al.*, concluded that incomplete handouts allow the students to follow the lecture attentively from which they can comprehend synthesize and apply the concepts. This could be the reason why some percentage of students in this study preferred incomplete handout (Cardetti, *et al.*, 2010).

The current findings suggest that there may not be a single best practice for handout completeness, and it may vary according to type of course or as per the educational philosophy of the faculty.

Around two third of study group opined that mix of complete and incomplete lecture handouts are better for understanding the concepts with their application. This finding is in line with Murray, (1997), they suggested that creative use of complete and incomplete lecture handouts will satisfy the needs of students' learning by achieving all the learning outcomes.(Murray, 1997)

Final Checklist

Once you have determined how you want the students to use the handout and which format best accomplishes your learning outcomes, it is important to construct your handout in a professional manner that is

useful for students. Using the following guidelines listed below will ensure the development of a high quality educational tool:

1. Always include lecture outcomes
2. Organize the material in a logical order
3. Use clear and simple language
4. Omit extraneous information
5. If appropriate, include references and review questions
6. Choose graphics that clearly illustrate the topic
7. Use an easy-to-read font
8. Clearly define all abbreviations
9. Minimize discipline-specific abbreviations, or clearly define them.
10. Proof read for clarity, organization, accuracy, spelling and grammar
11. For complete handouts, explain all technical terms and important information. Include all text and figures that students will need to meet learning outcomes.
12. Make sure all images are labeled.
13. For incomplete handouts, make sure students have the opportunity during the lecture to take notes and document all the important concepts covered during the lecture. Leave plenty of white space so students can add notes.
14. For technology based handouts, ensure the text and all graphics have transitioned legibly to a printed format (Wayne state university).

In conclusion, overall experience of the students was positive towards the use of lecture handouts, specifically for complete handouts as means of preparation, comprehension, revision and performance. Using a mix of lecture handouts (complete and incomplete) helped to meet the expectations of heterogeneous students and could be followed routinely in the classroom. Much care is needed when the educators provide a lecture handout to the students to enhance learning experience.

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