Author’s response to reviews

Title: Impact of e-resources on learning in Biochemistry: first-year medical students’ perceptions

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Author’s response to reviews: see over
To,                                                   3rd April, 2012

Dr. Peter Anderson
Journal Editorial Office
BMC Medical Education
BioMed Central

Dear Dr. Anderson,

This is with reference to the manuscript (MS: 1914524030661564) that my co-authors and I had submitted to BMC Medical Education. As you have suggested, I submit a revised manuscript, in which my co-authors and I have addressed all the concerns the reviewers have raised. Please find below detailed explanations for the revisions made.

Best wishes,

Yours sincerely,

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REVIEWER 1: Dr. Saran Shantikumar

Major compulsory revisions:

1. Page 4, line 23 and page 5, line 22: You mention that ‘lecture presentations’ are available on the e-learning site. Please qualify whether these are audio/video/PowerPoint slides only/PowerPoint with voiceover etc.

Response:

The lecture presentations mentioned in the manuscript refer to Microsoft PowerPoint slides. This has now been clearly stated in the revised manuscript, where the change that has been made is shown in red text on page 5, line 3 and also on page 6, line 9.

2. Introduction, page 5, line 11: ‘there is little published literature...’ Are there any similar examples in the literature of the impact of additional e-learning to lectures that are worth citing? If so, please give a short summary in the introduction and refer to them in the discussion if relevant.

Response:

In keeping with the reviewer’s suggestion, we have modified the introduction and discussion sections as follows:

Introduction:

Original text:

“There is little published literature available on the use of e-learning as an adjunct to conventional lecture-based teaching”.

This has been replaced with:

“Several studies have compared the effectiveness of e-resources as learning tools with that of lectures [8–10]. There are, however, very few reports on the use of e-learning as an adjunct to conventional lecture-based teaching. In this regard, Shanthikumar [11] has reported that use of podcasts was effective in enhancing medical students’ learning when provided along with conventional lectures, while Lancaster et al [12] have made similar observations with the use of technology to provide “blended learning modalities” for nursing students.”

The changes made have been indicated in red text in the revised manuscript on page 5, lines 14-19.

Discussion:

The following sentence has been added to the discussion section of the revised manuscript:
“It has been shown that provision of e-learning material in the form of audio-visual podcasts consisting of PowerPoint sides with a voice-over narrative was popular among students as a revision aid prior to assessments [11].”

The changes made have been indicated in red text in the revised manuscript on page 12, line 1-3.

3. Page 5, line 19. What percentage of the students in the year answered the questionnaire (or does n=60 account for all the students on the course)? In any case, please mention this explicitly.

Response:

The total number of students in the first year of the medical course was 60. All 60 students participated in the study. The following change has been made in the revised manuscript to make this clear:

Original text:

“Sixty first year medical students in Christian Medical College, Vellore, India, were the subjects of this study”.

This has been replaced with:

“Sixty first-year medical students in Christian Medical College, Vellore, India, were the subjects of this study. They constituted the entire first-year class”.

The changes made have been indicated in the revised manuscript on page 6, lines 5 and 6.

4. Results, 1st paragraph. Regarding the text relating to figure 1 – it appears as if all the data is both described and presented in pie charts. As the pie charts are included, please could you abbreviate the written text to include the salient findings only, otherwise the figure serves no purpose.

Response:

As suggested by the reviewer, the first paragraph of the results section has been re-written to present the salient findings only.

The original text:

“The mean age of the subjects of this study was 19.5 ± 0.85 years. They consisted of 34 males (56.67%) and 26 females (43.33%). Almost all the students (59 out of 60) used the e-learning resources to varying extents during the academic year. Among them, 7% used this resource exclusively to study biochemistry, 64% utilized it to a “great extent”, 17% to a “moderate extent” and 12% to a “minimal extent” (Fig 1A, item 3 in questionnaire). When asked about the frequency with which they accessed the e-resources, 58% said that they accessed the material just prior to periodic formative assessments, 32% did it once or twice a week on a regular basis, 8% did so every day and 2% did so only prior to the summative
assessment at the end of the course (Fig 1B, item 4 in questionnaire). Fifty eight percent of students said that their usage of the e-learning resources increased as the year progressed, while 36% said it remained unchanged and 6% said their usage decreased as the year progressed (Fig 1C, item 7 in questionnaire). Seventy one percent of students who accessed the website said that they found the material available extremely useful. Twenty five percent said it was moderately useful and 4% said it was useful to a minimal extent (Fig 1D, item 5 in questionnaire). Most students rated the overall quality of learning material on the website as excellent (42%) or good (54%) (Fig 1E, item 11 in questionnaire)."

This has been replaced with:

“The mean age of the subjects in this study was 19.5 ± 0.85 years. They consisted of 34 males (56.67%) and 26 females (43.33%). Almost all the students (59 out of 60) used the e-learning resources to varying extents during the academic year. Among them, a majority of them (64%) said they used the e-resources to a “great extent”. A small group of students (7%) said they used this resource exclusively to study biochemistry (Fig 1A, item 3 in questionnaire). When asked about the frequency with which they accessed the e-resources, 58% of them said that they accessed the material just prior to periodic formative assessments, while 32% of students did so once or twice a week on a regular basis (Fig 1B, item 4 in questionnaire). The majority of them (58%) also said that they accessed the e-resources more frequently as the year progressed (Fig 1C, item 7 in questionnaire). Seventy one percent of students found the material available “extremely useful” (Fig 1D, item 5 in questionnaire). Most students rated the overall quality of learning material on the website as excellent (42%) or good (54%) (Fig 1E, item 11 in questionnaire).”

The changes made have been indicated in red text on page 8, line 12 to page 9, line 3.

5. Figure 2. Please mention what the error bars represent.

Response:

In the study, the students had been asked to state the extent to which they used e-resources to study each of the 14 major topics in biochemistry, both for periodic formative assessments as well as the final summative assessment. Based on their responses, they were classified as low, moderate and high users of the e-resources for each of the 14 topics. The error bars indicate the standard deviations of the number of students classified as low, moderate and high users for each of the 14 topics.

This has been clarified in the revised manuscript by including the following text (indicated in red text) in the legend for figure 2 (page 19, lines 11 to 18):

“The students were asked to state the extent to which they used e-resources to study each of the 14 major topics in biochemistry, both for periodic formative assessments as well as the final summative assessment. Based on their responses, they were classified as low, moderate and high users of the e-resources, as described under “Methods”, for each of the 14 topics. The bars in the figure denote the means of the numbers of users in each category, when data for all the topics were combined.
The error bars in the figure indicate the standard deviation of the number of students classified as low, moderate and high users for all the topics combined.

6. Figure 2. Comparisons are given within each assessment group. Are you able to analyse if there is a statistically significant difference in each of the low/moderate/high users between each assessment group? E.g. is there a significant reduction in high users for the summative assessment? (The raw percentages are given in the text page 8, line 17-18, but no statistical result).

Response:

As suggested by the reviewer, comparisons were made between the 2 assessment groups in each of the low, moderate and high users’ categories.

Using one way ANOVA and Bonferroni correction (as a post-hoc test), we found no significant differences in the numbers of low users (p = 1.000) and moderate users (p = 0.108) in the 2 assessment categories. However, the number of students who were high users for the final summative assessment was significantly lower than the number who were high users for the periodic formative assessments (p = 0.005). The following changes have been made in the revised manuscript to indicate this:

1. Figure 2 has been modified to reflect this.

2. The following text has been added to the legend for figure 2, where the changes made have been indicated in red text (page 19 lines 20 and 22):

   “* indicates p < 0.05 when comparisons were made within the same user group in the formative and summative assessment categories.”

3. The following change has been made in the results section:

   **Original text:**

   “This is reflected by a fall in the average number of students who depended mainly on e-resources (high users) from nearly 60% for the formative assessments to 46.1% for the summative one. Concurrently, there was an increase in the number of students who used textbooks and e-learning resources to equal extents (moderate users) (Fig 2)”

   **This has been replaced with:**

   “This is reflected by a statistically significant fall in the average number of students who depended mainly on e-resources (high users) from nearly 60% for the formative assessments to 46.1% for the summative one (p = 0.005). Changes seen in the numbers of moderate and low users were not statistically significant (Fig 2)”
The changes made have been indicated in red text in the revised manuscript on page 9, lines 8 to 11.

7. Methods: can you clarify what statistical test you used to analyse the results in figure 2?

Response:

For figure 2, data were analyzed by one-way ANOVA, followed by Bonferroni’s correction (for pair-wise comparisons). A p value of less than 0.05 was taken to be statistically significant. The statistical methods used have been indicated in the legend for figure 2 on page 19 lines 18 to 22.

Minor Essential Revisions:

8. Page 3, line 13-14. Quote ‘ …does not involve student participation.’ then ‘students are usually passive participants’. This is a little clumsy – if using the term ‘passive participants’ you cannot also say that students are ‘not participants’. Maybe something along the lines of ‘Delivery of a lecture by a teacher does not actively engage learners. Rather, students are usually passive participants in the process.…’

Response:

As suggested by the reviewer, the text has been suitably modified in the revised manuscript, as shown below:

Original text:
“Delivery of a lecture by a teacher does not involve student participation”.

This has been replaced with:
“Delivery of a lecture by a teacher does not actively engage the learners”.

The changes made have been indicated in red text in the revised manuscript on page 3, lines 14 and 15.


Response:

As suggested by the reviewer, the change required has been made in the revised manuscript. The change made has been indicated in red text in the revised manuscript (page 7, line 3).
10. Figure 1. Some of this was cropped on the pdf!

Response:

Figure 1 has to be uploaded again to create a new pdf document that shows the entire figure. This will be done when the manuscript is re-submitted.

11. Figure 3. There is a dip in the number of ‘high users’ at molecular biology, and a marked rise at ‘carcinogenesis’. Can you think of a reason for this? Did it happen at a particular time of year, or do you think the students may have been keener to use the e-resources with the prospect of impending exams?

Response:

We think that the marked rise in the number of high users of e-resources on carcinogenesis may be related to the fact that the e-resources were a more comprehensive source of information on this topic than most of the standard textbooks commonly used by first-year medical students. This has already been commented on in the discussion section (page 12, lines 17-20). To emphasize this point the following sentence has been added to the discussion section (page 12, lines 20 and 21):

“In fact, more than 80% of students were high users of the e-resources for this topic (Fig 3)”.

We think that the dip seen in the number of high users of the e-resources for molecular biology (about 52% of students) is probably related to the fact that standard textbooks commonly used by first-year medical students were a more comprehensive source of information on this topic than the e-resources.

We do not think that it is likely that the changes seen were related to timing of examinations because:

1. A periodic test on each topic was conducted after the completion of lectures and other teaching modules on that topic. This was true for both molecular biology and carcinogenesis.

2. Both the topics were taught and assessed about 3 to 4 months prior to the final summative assessment.

12. Figure 4. ‘Moderate users’ scored significantly lower than ‘high users’. Was there also a statistically significant difference between ‘low users’ and ‘moderate users’ in this module? The percentage difference is certainly as large as that between ‘moderate users’ and ‘high users’, but given that there were lower numbers of ‘low users’, this difference may not be significant. If ‘moderate users’ scored significantly lower than both ‘low users’ and ‘high users’, can you think of a feasible reason for this? (There may not be!)

Response:

Figure 4 (A) (data on marks obtained in the test on molecular biology) shows that the moderate users scored significantly lower marks than both the low users and the high users. This is indicated in figure 4
as well as in its legend, where * indicates $p < 0.05$ compared to low users and # indicates $p < 0.05$
compared to high users.

We do not know for certain why the moderate users scored lower marks than the low and high users.
One possibility may be that attempting to study from multiple sources (text books and e-resources) in a
short period of time may not be ideal for understanding and remembering complex concepts in
molecular biology. We could postulate that studying from only one source may have helped students to
finish studying the basics in the topic to a reasonable extent. However, we have no way of testing this
hypothesis and hence, have refrained from commenting on it in the manuscript.

13. Page 9, line 14. If reporting to one decimal place, please write ‘10.0%’ rather than ‘10%’

Response:

The revised manuscript has been modified as suggested. The change that has been made is indicated in
red text on page 10, line 9.

14. Discussion page 13, line 10, ‘The students’ interest in and understanding of the subject seemed to
have improved as a result of access to e-resources.’ I understand that this may be what the responses
indicate, but can we really come to that conclusion without sub-stratifying the responses given in
figure 5 into the different usage groups. For example, if a greater percentage of ‘high users’ found that
the e-learning increased understanding compared to the ‘low users’, it would allow us to more firmly
attribute the improved understanding to the e-resources.

Response:

We agree with the reviewer that sub-stratifying the responses of students into low, moderate and high
user groups would provide additional information regarding the impact e-resources had made on the
various aspects of students’ learning in biochemistry that is shown in Figure 5. However, it would not be
possible to sub-stratify the responses into different usage groups, as each student’s degree of usage
varied among the various topics at different time points in the academic year. Nevertheless, given that
majority of the class were high or moderate users of the e-resources (Figure 2), we suggest that it is
reasonable to conclude that the responses shown in figure 5 reflect those of students who used the e-
resources to a great/moderate extent.

15. Conclusion, page 14, line 10. Missing word – amend to say ‘The attitude of the majority of...’

Response:

The amendment suggested has been made in the revised manuscript. This has been shown in red text in
the revised manuscript on page 15, line 21.
16. Does ‘Biochemistry’ need to have a capital ‘B’?

Response:
We agree with the reviewer that the word “Biochemistry” need not begin with a capital ‘B’. We have, therefore, made this change, wherever applicable, in the revised manuscript. This is indicated in red text on page 2, line 20; page 3, lines 2 and 8; page 5, lines 2 and 7; page 6, line 1; page 11, line 1; page 14, lines 12 and 20; page 15, lines 21; page 16, lines 1 and 13.

17. Decide on whether to use ‘first year’ or ‘first-year’ (ideally the hyphenated form should be used).

Response:
We have decided to use the hyphenated form (first-year) in the revised manuscript. This is indicated in red text on page 2, line 5; page 3, line 2; page 5, line 1; page 6, line 9; page 14, line 11; page 15, line 1; page 16, line 13.

18. Results, paragraph 3, page 8. Out of interest, was there any way that the website could actually record the number of times people viewed pages of certain topics? This would be a surrogate of how much each resource was used.

Response:
The biochemistry page of the website was accessed 1943 times by students during the academic year concerned. Data is not available for the number of times people viewed pages of specific topics on the biochemistry page. We know for a fact that students share files widely, once someone has downloaded them. Hence, the number of those who accessed the site would not be an accurate estimate of the number of users of the material on the site.

19. Figure 5. Would it be better to change the order of the bars in this comparative bar chart to ‘increased, remained unaffected, decreased’? That seems to me a more logical way of ordering these ordinal groups, rather than ‘increased’, then ‘decreased’, then ‘remains unaffected’. But stick to what you feel works best.
Response:

We would like to keep the order as “increased”, “decreased” and “remained unaffected” because this was the order in which the choices were presented to the students in the questionnaire.

REVIEWER 2: Dr. Laura Fraser Cotlin

Major Compulsory Revisions

None

Discretionary Revisions

None