Author's response to reviews

Title: A randomised-controlled trial of two educational modes for undergraduate evidence-based medicine teaching and learning

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Author's response to reviews: see over
Dear Miss Pafitis

Re: MS ID#: 7853844782795085

MS TITLE: A randomized controlled trial of two educational modes for undergraduate evidence-based medicine teaching and learning in Asia

Thank you for your email of July 20th, 2009. We were pleased receive the feedback of the reviewers and have provided a detailed response to the reviewers questions below.

Referee 1.

1. Add a very short description of what you mean by EBM in the context of this article. I have a feeling that you use different definitions for EBM such as education research, integrative based learning, statistics and epidemiology as part of the medical curriculum, two different EBM teaching methods (usual teaching versus PBL).

Thank you for pointing out the lack of clarity between evidence based medicine (as a set of principles guiding practice adopting core knowledge and skills) and the pedagogy of PBL. The introductory paragraph on page 4 has been amended as follows:-

Evidence-based medicine (EBM) has been defined as the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients”. While the teaching of EBM has most frequently been located in residency, internship, postgraduate and continuing education programmes, information management and decision making skills, core constituents of evidence-based medicine, are also key competencies for medical students in their formative years. There remains, however, a lack of consensus as to the best teaching and learning methods for integrating EBM (or its precursors of statistics and epidemiology) into an undergraduate medical curriculum.

2. In the introduction you make a link from EBM to PBL. Make the link more clear.

Thank you for pointing out the lack of clarity in the link between EBM and PBL. The last sentence of the introductory paragraph on page 4 has been amended as follows:-

Though there is some evidence from western populations that students in a problem based learning (PBL) curriculum become better at problem solving and self-directed learning than those in a traditional curriculum; others present contrasting evidence of the effectiveness of PBL. Overall, there is little evidence to support the utility of PBL for EBM learning or the generalisability and applicability of these findings across cultures.

3. In the introduction you mention the “there is little evidence to support the generalisability of these findings across cultures”. I agree with this finding, but it is
not clear if this statement is also part of your research question or whether you use this statement to express that the research you did is relevant? Make it part or link it with the research questions.

Thank you for your comment. The research question has been amended to increase clarity on page 5 as follows:-

As the overall evidence of teaching effectiveness for EBM is not strong, and the impact of cultural and societal influences on teaching methods are poorly understood, we undertook a randomised-controlled trial with undergraduate medical students to test the effectiveness and learning satisfaction of two different teaching methods (usual teaching vs. PBL) for EBM.

4. In the article two different teaching methods are compared. You use the term “usual teaching”. Later on in your article you use the term hybrid instead of usual teaching. Do hybrid or usual teaching belong to teacher-centred education? Better describe what you mean with this form of teaching and use one word.

Thank you for your suggestion. I agree hybrid is not the best word to describe my intention. Usual teaching does not refer to teacher-centred education. I have revised both the abstract page 2 and the sentence on page 13 as follows:-

The evidence presented here would suggest that the teaching of EBM within an Asian environment should adopt a format that facilitates both the acquisition of knowledge and encourages enquiry.

The conclusion on page 15 has also been amended as follows:-

Our randomised-controlled trial in an Asian setting indicated that undergraduate EBM teaching was most effectively implemented in a format that facilitates both the acquisition of knowledge and encourages enquiry.

5. PBL belongs to student-centred education. You mention already a lot of theoretical reason why PBL is student-centred. I agree with this. But do the same for teacher-centred education. Better make clear what is actually meant here.

The ‘usual teaching’ as described on page 7 is not by definition teacher-centred – that is the first 2-hour session is a whole class session that is teacher led but highly interactive, the second 2-hour session is student led in a large group format. This is why I have explicitly not used the term teacher-centred education nor described this pedagogy.

6. The introduction could be more clear if you formulate your research question(s) very explicitly in your introduction. In general, the introduction section should more clearly lead to the research questions formulated.

Thank you for your comment. We agree that the introduction should clearly lead to the research questions formulated. I believe the amendments made in response to points 1 and 2 with the resulting restatement of the research question in point 3 above have now clarified this matter. The introduction now clearly leads to the research question.

7. Page 5. “of the 129 eligible students, 25 were individually approached and invited to participate, 15 agreed and 9 attending the first focus group session and 5 the second. You add a (too complex) figure of how the study is designed. I suggest to leave this
figure out. Describe in a few words how many students in total participate in the first group session and how many in the second group session. The non-response rate is rather high. Do you have an explanation for this? Add information around the non-response rate.

Thank you for your comment. I apologise for the error in the above quoted sentence. This has been amended on page 6 as follows:-

Of the 129 eligible students, 25 were individually approached and invited to participate, 15 agreed and attended the baseline focus group, 9 attended the first focus group session and 5 the second.

To comply with reporting standards for a randomized controlled trial I would prefer to leave in the figure. However, I am willing to remove it if the editors also feel it is unnecessary.

I agree the non-response rate was rather high. We encountered difficulties scheduling the focus groups within the very tight undergraduate student timetable. In addition the students did not perceive this of high personal value and were therefore less likely to give up personal time to attend – even though we provided an incentive. Further explanation of the student non-response has been added on page 7 as follows:

The tight system block schedule led to little flexibility in scheduling focus group sessions and contributed to the student non-response to these sessions.

8. Page 5 “Focus groups allow us to explore different learning experiences of the students in the two intervention arms.” On page 9 you write “Three focus groups (comprised of students in each intervention arm)”. Is this inconsistent information?

Thank you for your comment. I apologise for the lack of clarity of this statement which has been revised on page 9 as follows:

Three focus groups were conducted, (one each at baseline, after the first and after the second assessment) (Figure 1) to explore student opinions about their previous experience with EBM teaching, as well as perceptions regarding usual teaching and PBL for EBM learning.

9. Page 8 You use three focus groups to explore student opinions about their previous experience with EBM teaching as well as perceptions regarding usual teaching and PBL or EBM learning. In the article not enough information is included about the method used/the focus groups approach. Who is the moderator of the session (One of the authors of this article?) An important part of the focus groups is that saturation needs to be reached. I cannot find information in your article about the level of saturation and whether saturation did take place after the interview were conducted (ie new themes emerged).

Thank you for your comments. To address the concerns above I have revised the focus groups methods section on page 9 as follows:

Transcripts were carefully examined and all references to EBM learning were independently coded by JJ and the focus group facilitator by hand, any identified differences were resolved by consensus agreement. We used a constant comparative method of data analysis in order to explore for emergent themes. During the course of the study, categories and concepts arising from different transcripts were compared and contrasted to ensure they were mutually exclusive and to see how they clustered or connected. No new themes were identified in the final focus group.
10. **What is the starting point for the focus group? (do you use questions, topics)**

Yes, guiding questions were used for the focus groups. These questions were drawn from the literature and our past experience in this research area. The focus group questions were follows:-

1. Tell me about the challenges or problems that you had with the EBP tutorials you attended.
2. What did you find most / least useful about the EBM tutorials you attended? Why? Tell me more.
3. What aspects of the EBM tutorials do you think will be most useful in facilitating your future care for patients? (break down into different areas, e.g. understand the disease/illness, patient related outcomes, clinical decision making) Why? Tell me more. What else?
5. Which aspects of this learning opportunity enhanced or discouraged your intention to integrate EBM in your clinical practice? Why? Tell me more.

11. **Page 9 “All references to learning were coded by two independent coders”.**

Describe the process of coding. Include information about consensus between the two raters.

Thank you for your comments. I have revised the description of the focus groups to address the process of coding, and information about consensus between the two raters on page 9 as follows:-

Each focus group, facilitated by a teaching assistant, was conducted for 45 - 60 minutes in English, audio-taped and transcribed. Transcripts were carefully examined and all references to EBM learning were independently coded by JJ and the focus group facilitator by hand, any identified differences were resolved by consensus agreement. We used a constant comparative method of data analysis in order to explore for emergent themes. During the course of the study, categories and concepts arising from different transcripts were compared and contrasted to ensure they were mutually exclusive and to see how they clustered or connected. No new themes were identified in the final focus group.

12. **Three main themes were identified in the focus groups. My advice is to explain the three themes in more detail to illustrate each theme with comments of the students. Now, there is no general conclusions (only citations of the students are given.)**

Thank you for your advice. To avoid repetition I have removed Box 2. I have revised the description of the themes and added comments to illustrate these points on Page 11 as follows:-

Three main themes, ‘learning skills and concepts’, ‘group process as an aid to learning’ and ‘role of the tutor’ reflecting students attitudes towards and perceptions of learning in groups were identified in the focus groups. “Learning skills and concepts” reflects on the organisation and structure of the learning environment. In contrast to the usual teaching, students found the EBM PBL sessions difficult as they lacked the statistical knowledge necessary to support discussion, failed to understand the core concepts, and therefore lost direction. The limitations of minimally guided small groups were reflected in the students comments illustrated as follows:-

“We need to learn something about the facts first – if we are not all prepared then efficiency in the small group is a disaster.”
“Without a whole class lecture we do not have enough knowledge for the small group discussion.”

In the theme ‘group process as an aid to learning’ in contrast to the ‘usual teaching’, the students as with others 9,10 described perceptions both in support of and contrast to PBL pedagogy. Although the PBL environment enhanced communications between members of the group, students used what was taught in lectures to direct their problem solving which is antithetical to the PBL hypothetico-deductive process. These are illustrated as follows:-
“Communications are easier in a small group. It is helpful to learn in a small group.”
“For PBL, we will talk about what was being taught during lectures, finding something in addition to what the teachers have told us.”

As reflected in the theme ‘role of the tutor’ students in EBM PBL defaulted to the tutor for in depth explanation and support more than in usual teaching, and were also more tutor dependent 11 than in ‘usual teaching’ as illustrated as follows:-
“EBP PBL depends more on the tutor than normal PBL.”
“Tutors need to be more involved/interactive. It requires higher level of tutor skills.”
“In EBM PBL it is easy to loose direction. Many concepts are not understood.”

As medical school progress and assessment is very important to the students, they are highly motivated by their perceptions of efficient and effective learning. Overall students were frustrated by the EBM PBL learning process.

13. In the discussion you suggest that EBM teaching within an Asian environment should adopt a hybrid format … (page 11). I am wondering if you have enough empirical evidence for this conclusion/statement because it is not really part of your research question.

Thank you for your observation. I would agree that for a variety of reasons drawing a definitive conclusion is difficult. Consequently I have revised the main concluding statement on page 15 and in the abstract as follows:-

The evidence presented here would suggest that the teaching of EBM within an Asian environment should adopt a format that facilitates both the acquisition of knowledge and encourages enquiry.

14. The added value of this article should be that the authors will link the results of this study to the Asian context. Include this idea in the title.

Thank you for your comment. The title has been edited as follows:-

A randomised-controlled trial of two educational modes for undergraduate evidence-based medicine learning in Asia.

Referee 2

1. On page 3 the authors state that “there are some evidence from western populations that students in a problem based learning (PBL) curriculum become better at problem solving and self-directed learning than those in a traditional curriculum; 3-5 there is little evidence to support the generalisability of these finding across cultures.”
In fact other references state that there is no evidence that PBL curricula lead to better problem solving or self-directed learning. (Advances in Health Sciences Education 2004; 9257. Also Cunnighoton et al, 1996; Albances & Mitchell 1993; Colliver, 2000; Newman, 2004; Vernon & Blake, 1993).

Thank you for your comments. As advised I have revised the section on page 3 as follows:-

Though there is some evidence from western populations that students in a problem based learning (PBL) curriculum become better at problem solving and self-directed learning than those in a traditional curriculum; others present contrasting evidence of the effectiveness of PBL. Overall, there is little evidence to support the utility of PBL for EBM learning or the generalisability and applicability of these findings across cultures.

2. There is also recent evidence that the type of diagnostic problem solving learned in PBL curricula (hypothetico-deductive reasoning) is the least successful of all diagnostic strategies (Heemsker, Norman, Chou, Mintz, Mandin, McLaughlinin Advances in Health Sciences Education, 2007)

Given such evidence, as well as the recent review article by Kirschner et al (“Why minimal guidance during instruction does not work: An analysis of the failure on constructivist, discovery, problem-based, experimental and inquiry-based teaching” Education Psychologist 2006; 41(2):75-86), the authors need to consider other possible reasons for their results.

Thank you for the comments. The discussion has been amended on page 12 as follows:-

Students within the PBL programme, in the absence of prior teaching, could not derive facts from the discussion and thus became increasingly frustrated, findings which are consistent with others and reflect a failure of the hypothetico-deductive approach in developing reasoning skills.

3. In their conclusion, the authors state “---our study also draws attention to the importance of locating teaching methods within their social and cultural context, so to take advantage of students existing epistemological beliefs." Although social and cultural context may in part explain the results, the authors should consider other possibilities. In the face of some of the references cited above, one distinct possibility is that some of the original assumptions of PBL have been proven to be untenable, and that curricular changes away from PBL may well resolve the problems identified by the students in the present study. Thus, the possible solution to the findings in this manuscript is not simply “---a hybrid format comprising of a prefacing lecture followed by a small group PBL session.” In view of the evidence cited by Kirschner et al. small groups may need to reject the minimal guidance advocated by PBL curricula, and instead substitute small group tutors who have process expertise as well as the content expertise to identify misconceptions, diagnose their cause, and provide immediate feed-back that will correct the misconceptions.
Thank you for the comments and suggestion. I have revised the text on page 13 as follows:-

In an Asian setting and perhaps elsewhere, small groups may need to reject the minimal guidance directive advocated for PBL curricula substituting instead small group tutors who have the necessary process and content expertise to identify misconceptions, identify problems, and provide immediate, content specific feedback to correct misunderstand or misconceptions.

I look forward to receiving your favourable reply.

Yours sincerely

Dr. Janice Johnston
(for all the authors)