Author's response to reviews

Title: Differences in the Self-Assessment of Clinical and General Competencies Between Problem-based Learning and Conventional Curricula Among German Medical Graduates

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Author's response to reviews: see over
Dear Dr. Norton and Dr. Pafitis,

Thank you very much for your continuous interest in our manuscript for publication in the prestigious Journal *BMC Medical Education*.

We thank the reviewer and editor for their helpful comments and have revised the manuscript accordingly. A detailed response with the changes we made is provided with this submission.

All authors have read and provided approval to the manuscript. This manuscript is not under consideration elsewhere, none of it has previously been published, and there are no financial conflicts of interest to disclose.

Thank you for considering our manuscript,

Dr. Martin Butzlaff, MD MPH  
Director Academic Affairs
Response to Reviewer Comments for Manuscript: 1288858861266700

Editor’s comments

1. You have stated within your cover letter that, according to an official request to the institutional ethics committee of the University Witten/Herdecke, ethical approval was not necessary for conducting your study (as there was no intervention). We ask that you please include this statement within your manuscript.

Response: We agree with the editor that this statement is crucial. Therefore we have included it in the revised manuscript.

Methods (page 7): “According to an official request to the institutional ethics committee of the University Witten/Herdecke, approval by an ethics commission was not necessary for conducting the study, as there was no intervention. All participants in the study participated voluntarily and provided informed consent.”

2. Please also ensure that your revised manuscript conforms to the journal style. It is important that your files are correctly formatted.

Response: We revised the manuscript accordingly to the journal style.

Reviewer’s comments

1. The authors have adequately dealt with the comments of the reviewers, but the text of the paper still needs major improvement, since it is formulated not very precisely and another major concern is the discussion section which is much too long due to which the reader cannot come to conclusions.

Response: We appreciate the comments of the reviewer. Similar to the first revision, we have addressed the reviewers concerns point by point. Especially, we have shortened the discussion as suggested by the reviewer. Details are provided below.

2. The abstract is not fully clear. What is meant with medical school duration in the second sentence. I miss the research questions in the abstract. Sentence 4 in the results section of the abstract is unclear because it does not deal with
difference between pbl and non-pbl. This sentence is difficult to read. Skip this sentence.

Response: We restructured and rephrased the abstract. Therefore we added condensed research questions and skipped sentence 4.

3. The introduction section contains several undefined and unclear words, such as profession-relevant knowledge, such as social and cognitive dimensions. Explain these terms. It is unclear how the study of Colliver et al (12) is related to the topic of this paper. Skip this reference and sentence or better explain, but then the text probably becomes too long.

Response: We defined in the introduction section the unclear terms. Further we skipped the sentence and the according reference of Colliver et al (12).

Introduction (page 4): “The cognitive domain involves the development of intellectual skills to enable judgments about the value of ideas or materials; the interpersonal domain focuses on people interactions [12].”

Introduction (page 4): “Prince et al. report in their study of 1,159 Dutch graduates from five medical schools with an average follow-up of 18 months after graduation that 83% of PBL-graduates are satisfied as regards their training in communication skills (such as interaction with patients or co-operation with other health professionals) compared to 41% of non-PBL graduates [8].”

Introduction (page 4): “Profession-relevant knowledge was defined in this context as knowledge and understanding of the scientific basis, etiology, pathogenesis and clinical manifestations of diseases as well as their current treatment options [13].”

Introduction (page 5): “The authors conclude that PBL has a positive effect on most physicians’ competencies after graduation, mainly with respect to social (including emotional and moral dimensions) and cognitive dimensions [15].”

4. It is written that, given the current controversy regarding PBL, .... This is however not true. The evidence so far is not contradictory with respect to the topic of this study. It is known from studies that there are no differences in theoretical knowledge acquired by pbl and non-pbl students and it is known that pbl alumni perceive themselves as better prepared for communication skills, team working skills, etc. The findings of this study are fully in line with what is already known.

Response: We thank the reviewer for her helpful comment. It may be that we overestimated the controversy about problem based learning (PBL). However, data about long-term
outcome effects of PBL are rare. We re-phrased the paragraphs accordingly, please see page 4 to page 6 in the manuscript.

5. The data were collected in 2004 and 2005 and are reported in 2009 (quite late). Are they still relevant or did the other medical schools in Germany change their curricula since then? Please explain and use one sentence in the discussion.

Response: Our results, which were selected 2004/2005, are still relevant for the development of medical education systems. While since 2004, supported by a new law in Germany, the curricula were reformed at many German medical schools (some are including new teaching approaches like pbl, others not), our results represent a unique dataset that allows a comparison of the only PBL-based curriculum and the other conventional curricula at the time. The reform curricula that were introduced since 2004 just produced the first graduates in 2008. In addition, our data identified weaknesses of the PBL-based curriculum, which should be included in the future development of the curricula.

Discussion (page 17): “Even so our data was collected 2004/05, it has still relevant for the development of medical education systems, especially while the dominant part of medical school is still based on a conventional curriculum. In addition, PBL-based curriculum should be developed further under the consideration of the identified weaknesses.”

6. The sentence on page 6 at the bottom about self-assessment is unclear. Reword the sentence or skip it. Skip alpha coefficient, is not relevant here, since the data are reported at the item level.

Response: We skipped the sentence about self-assessment including the paragraph about alpha coefficient.

7. Two questions were asked to the students: 1) required in daily job and 2) taught during medical education. The data with regard to question 1 are reported in Table 2. But this is not clear when reading the paper in which the authors use the word importance instead of required in daily job. Be more precise in the use of words, because it is difficult for the reader to understand the paper. In Table 3, the data are reported dealing with the question has it been taught. This is referred to in the paper as acquired. But, taught and acquired are different things. Be more consistent in terminology and refer to it as competencies taught.

Response: We have carefully checked the wording of the manuscript, especially whether the tables were in line with the text. Necessary changes were performed throughout the manuscript. Through the changes in the wording of the manuscript, we decided to change
the title. We believe the new title is much better in line with the research questions and fits the current wording.

**Old title:** “Differences in the Self-Assessment of Clinical and General Competencies Between Problem-based Learning and Conventional Curricula Among German Medical Graduates”

**New title:** “Job Requirements Compared To Medical School Education – Differences Between Graduates from Problem-based Learning and Conventional Curricula”.

8. The scale used is very difficult to interpret, since 1= high and 6 is low, normally it is the reverse order. Could this be changed in the paper, to make the tables much more easier to interpret by recoding the scores (1=6), (6=1), etc.

**Response:** We used this scale, because all German education systems (elementary school, high school, and medical school) are using the same 6-point Likert scale, where ‘1’ represents the best value and ‘6’ the worth. However, we strongly agree that this is scale is difficult to understand and that in the 'academic world' most scales are the other way around. However, this change implements a major change of the manuscript and a modification of the raw data. But while the Editor Dr. Pafitis has supported those raw data modifications (email from Nov. 4th), we revised the manuscript accordingly (see detailed below). Now, the score ‘6’ represents the best value [“very intensively required/taught”] and ‘1’ the worth value [“not at all required/taught”].

Changes of the raw data:

- The scoring of “1” was changed to “6”.
- The scoring of “2” was changed to “5”.
- The scoring of “3” was changed to “4”.
- The scoring of “4” was changed to “3”.
- The scoring of “5” was changed to “2”.
- The scoring of “6” was changed to “1”.

**Methods (page 8):** “These outcome variables were collected using a 6 point Likert scale on which a score of six (6) reflects the positive end [“very intensively required/taught”], and a score of one (1) the negative end [“not at all required/taught”] of the scale.”

9. Figure 1 presents the data of Table 2 minus Table 3, but I discovered this only later on. This should be explained better in the analysis section.

**Response:** The reviewer made a valid point and we rephrased accordingly the section about statistical analysis to improve the understanding, how the data of figure 1 were derived. Further, we picked up this issue in the caption of figure 1.

**Methods (page 9):** “To determine whether medical school education sufficiently covers the job requirements of physicians, we calculated the mean difference ($\Delta$) between the ratings of
competencies as required in the day-to-day work and as taught during medical school by subtracting those from each other. This comparison demonstrates whether an education is perceived to cover job requirements (Figure 1). It also permitted detection of deficits (mean difference was negative) and surplus (mean difference was positive) of teaching in the different curricula for each competence. To evaluate whether those so calculated deficit or surplus for a competence was significant, we applied a paired two-tailed t-test (Figure 1).

Caption (figure 1):
“Figure 1 - Differences between Required Competencies in the Day-To-Day Work and Competencies Taught during Medical School.

Figure 1 illustrates a subtraction for of the both ratings, how far those competencies were required in the day-to-day work and how well those were taught at medical school. Negative mean differences indicate a deficit in the teaching of competencies as compared to job requirements; positive mean differences indicate a surplus. The competencies were sort from top to the bottom by their extent of requirement in the day-to-day work of physicians. NS denotes no significant difference, * differences with a p-values <0.05 and ** differences with a p values <0.001.”

10. Furthermore these data are not related to any of the two research questions. Add a third research question.

Response: We appreciate the reviewers comment. We agree and believe that figure 1 is one of the central elements of our manuscript. However the two research question may be covering the idea of figure 1, while figure 1 shows the difference between ‘required’ and ‘taught’. This analysis is further more valid against biases, which may occur from different demographics while it’s performed on a per students basis. But to streamline the manuscript, we add a third research question dealing particularly with figure 1.

Introduction (page 5): “The primary research question of our study was to assess and compare graduates from PBL-based and from conventional curricula as regards to nine key competencies required in their day-to-day work. Secondly, we wanted to assess and compare how well those competencies were taught at medical school between those two groups of graduates. And finally we evaluated whether the competencies as taught during medical school sufficiently cover the requirements for the day-to-day work requirements of medical graduates.”

11. The subheading in the results section should be reformulated and should be more in line with the question asked, so they should be ‘Required competencies in daily job’ and ‘Competencies taught in medical school’ and ‘Differences between required competencies and competencies taught in school’.
Response: We changed the subheading accordingly.

12. Add a third research question dealing with the differences between competencies required and competencies taught.

Response: We added a third research question, see comment 10.

13. The discussion section is too long and needs major shortening and restructuring. Skip the first paragraph on page 11.

Response: We skipped the first paragraph on page 11 and restructuring the manuscript accordingly to reviewer’s comments.

14. First formulate conclusions per research question and keep it short (what are the main findings and how do they relate to the literature). The subitles are not in line with the research questions and can be skipped.

Response: The manuscript was restructured the discussion as suggested in Comment 11 by using the recommended subtitles ‘Required Competencies in the Day-To-Day Work of Physicians’, ‘Competencies Taught in Medical School’, and ‘Differences between Required Competencies and Competencies Taught in Medical School’. For each subtitle, we summarized briefly our main findings and discussed those in the context of the current literature.

15. After the conclusions, discuss some issues, thereafter give a few limitations and suggestions for further research. Use this order and not a different order. Research suggestions are now given before the limitations.

Response: We moved our suggestions for further research behind the limitation section. In addition, the limitation section was further shorten and straightened.

16. A lot of information on page 13 can be skipped.

Response: As requested by the reviewer, we skipped a lot of information on page 13.

17. Skip the conclusion at the end on page 17.

Response: The reviewer requested to skip the conclusion section. Unfortunately, the “BMC medicine journals - Authors’ checklist for manuscript formatting” requires a conclusion
paragraph at the end of the manuscript. Therefore we kept the conclusion section, however we rephrased and shorten it to address the reviewers concerns. Further, if the editor want to make an exception, we are happy to remove the conclusion.

**Discussion (page 16):** “In summary, this large survey among medical graduates demonstrates similar self-perceived job requirements between graduates from PBL-based and conventional curricula. Nevertheless, the PBL curriculum is associated with a positive effect on all key competencies that are highly required in the day-to-day work of physicians. However, research and business competencies deserve closer attention in future curricular development.”

18. Not only report that there are statistically significant differences, but also comment about the actual difference scores which are very small for some competencies, such as research competencies. In other words, the findings can be statistically significant, but a difference of 0.1 or 0.2 on a six point scale is not very relevant from a practical point of view. Comment about this in the discussion section. Only discuss major issues that both statistically and practically relevant.

**Response:** To address this concern appropriate, we have introduced the statistical approach of ‘effect size’. Effect size may allow identifying, which significant differences have a practical implication by including difference, standard deviation and sample size into account. Hedges’g has been demonstrated to be a reliable measure of effect size (Rosnow et al.; Computing contrasts, effect sizes, and counternulls on other people's published data: General procedures for research consumers. Psychological Methods 1996). A Hedges’ g of <0.5 is defined as a small effect size, a Hedges’ g of 0.5 to 0.8 as a moderate effect size and a Hedges’ g >0.8 as a large effect size. Beside changes in the text (see below), table 2 and 3 were modified accordingly.

**Methods (page 9):** “To express effect size, Hedges’ g was computed for all significant differences between graduates from the PBL-based curriculum and from the conventional curriculum regarding “Required competencies in the day-to-day work”, and “Competencies as taught at medical school” [23]. A Hedges’ g <0.5 was defined as a “small”, 0.5 to 0.8 as a “moderate” and >0.8 as a “large” effect size [24].”

**Results (page 11):** “However, both differences regarding the job requirements demonstrated only a small to moderate effect size, while Hedges’ g for differences in “research competence”, and “medical knowledge” were 0.6 and 0.4, respectively.”

**Results (page 11):** “The greatest effect size for the differences in ratings between the two groups were observed for “Psycho social competence” (Hedges’ g: 2.4) and “Practical medical skills” (Hedges’ g: 2.4), followed by “Interdisciplinary thinking” (Hedges’ g: 1.9). In contrast, PBL graduates rated “Medical knowledge” and “Research competence”
inferior compared to graduates from conventional curricula (4.38±1.0 vs. 4.69±0.9, p=0.002, and 2.57±1.3 vs. 3.10±1.3, p<0.001 respectively). Both competencies, which were rated inferior for the PBL-based curriculum - “Medical knowledge” and “Research competence”, demonstrated a small effect size as compared to the conventional curricula (Hedges’ g: 0.3 and 0.4, respectively).”

Discussion (page 13): “This hypothesis is in line with a recent study by Prince et al., which indicates that a lower rating of “possession of profession-relevant knowledge” is associated with PBL-based curricula [8]. However, those evaluated differences showed only a small to moderate effect size.”

Discussion (page 13): “The rating “How well were these competencies taught in medical school?” differs significantly between the two groups of graduates. The PBL-curriculum was rated superior in seven out of nine competencies, all with a large effect size.”

Discussion (page 16): “In this context, an interesting aspect may be that the evaluation of job requirements is very similar, even so great differences with a large effect size are observed between the evaluation of PBL-based and conventional curricula.”

19. The text under the tables needs to be reworded (in line with question asked, Skip the word clinical competencies in Table 2 and general and clinical competencies in Table 3.

Response: We reworded the table caption regarding the asked questions and the changed scale (see Reviewer 1, Comment 8).

Caption (Table 2):
“Table 2 - Evaluation of Required Competencies in the Day-To-Day Work of Physicians. Results for each group were expressed as mean ± standard deviation on this 6-point-Likert-scale, where “6” indicated ”very intensively”, and “1” indicated ”not at all” required in the day-today work of physicians. For significant differences, a small, moderate, and large effect size was defined as Hedges’ g <0.5, 0.5-0.8, and >0.8 respectively.”

Caption (Table 3):
“Table 1 - Evaluation of Competencies as Taught in Medical School. Ratings are provided as mean ± standard deviation on a 6-point-Likert-scale, where “6” indicated ”very intensively”, and “1” indicated ”not at all” taught during medical school. For significant differences, a small, moderate, and large effect size was defined as Hedges’ g <0.5, 0.5-0.8, and >0.8, respectively.”
20. English needs to be checked by a native English speaker!

Response: The manuscript has been revised by Mr. Bauer. He is a native English and German speaker, professional translator and is well experienced with language corrections of scientific texts in the area of medical education.