Author’s response to reviews

Title: Investigating the self-study phase of an inverted biochemistry classroom - collaborative dyadic learning makes the difference

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Author’s response to reviews:

In general, we thank both reviewers for their very positive feedback and comments resulting in minor revisions. For details see below.

Reviewer reports:

Reviewer 1

Amin Azzam (Reviewer 1): This is an elegantly designed study investigating the influence of both study materials and instruction provided to medical students enrolled in an inverted classroom phase of a biochemistry course in early medical school. The authors do a nice job describing their study design, and are to be applauded for the decision to include 2 control groups (the first being students in the "basis" group and the second being students in the "individual study" group). They have taken time to ensure and report how all 3 groups were homogenous relative to student sociodemographic characteristics.

My comments are offered in the spirit of raising the scholarly rigor of all medical education innovation and research. I trust the authors to react to these in the collaborative-spirit in which they are intended.
1. Manuscript page 4, line 21, sentence that begins with "This is supported by others showing a high student’s prevalence...": Like you do with most other sentences, I recommend moving the reference [21] to the end of this sentence as it is easier and clearer to read that way.
Autor response 1:

We now moved all references at the end of the sentences.

2. Manuscript page 13, line 18: I appreciate the explicit acknowledgement that in the dyad study group only 64% (self-study phase 1) and 58.7% (self-study phase 2) actually prepared in a learning dyad as instructed. But because these percentages of "adherent" students are relatively small, I think it is important to acknowledge this more explicitly in your discussion section. Of course this problem of "non-adherent" dyads only underestimates the power of your findings, suggesting that the more students study in dyads (as contrasted with individual study) the more they will learn. I think you should also make this point explicitly somewhere in the discussion or limitations section. I would recommend putting it in the limitations section.
Autor response 2:

We fully agree with the reviewer and integrated this fact in the limitation section of our discussion. Please see page 25 of the revised manuscript.

3. Manuscript page 15, line 2: Your statement that the results imply that the learning behavior of the students (e.g. collaborative vs. individual) has a stronger influence on the learning outcome is actually an extremely important finding. I would appreciate if you emphasized this again in the discussion section. I believe this is important because I surmise that most educators erroneously believe that the instructional material given is actually more important that the study approach.
Autor response 3:

We agree with the reviewer and integrated this conclusion in the discussion section on page 20.

4. Manuscript page 15, section about hypothetical dyads: You are to be commended on testing the hypothesis that knowledge acquisition of the "weaker" student in dyads is "merely" due to the superior intellect of the "stronger" student. This is an excellent reassurance that the findings are in fact due to what you hypothesized (namely that working collaboratively increases knowledge acquisition in inverted classroom models of instruction).
Autor response 4:

We thank the reviewer for this very positive comment.
5. Manuscript page 16, line 23, sentence that begins with "To analyze students' motivation...": I suggest changing the word "the interest" to be rephrased as "their interest in biochemistry" as that is less confusing to the reader.

Autor response 5:

We changed the text accordingly (page 17 of the revised manuscript).

6. Manuscript page 19, line 14, sentence that begins with "We here showed that..": I propose a modification of the sentence structure (which I think reads easier) as "...in the self-study phase in an IC is dependent upon the instruction given on how to organize the self-study phases."

Autor response 6:

We changed the text accordingly (page 19 of the revised manuscript).

7. Manuscript page 21, line 11, sentence that begins with "In our study, we use the two script...:" I suggest a modification of the sentence structure as "In our study, we used two script components (play and scene) according to..." as putting the components within the parenthetical is similar to what you do describing the 4 components earlier in the paragraph above.

Autor response 7:

We changed the text accordingly (page 21 of the revised manuscript).

8. Figure 2 Legend, page 34, line 8, sentence that begins with "Self-study phase 2 was similar to the first one:" I propose modifying the sentence as "Self-study phase 2 was similar to Self study phase 1."

Autor response 8:

We changed the text accordingly (page 35 of the revised manuscript).

9. Figure 2 Legend, page 34, line 10, sentence that begins with "Study procedure of the collaborative group:" I propose modifying the sentence as "...of the collaborative group was the same as that of the individual group..."

Autor response 9:

We changed the text accordingly (page 35 of the revised manuscript).
Reviewer 2 (Reviewer 2): "PEER REVIEWER COMMENTS: To view the full report from the academic peer reviewer, please see the attached file.

REVIEWER COMMENTS FROM REPORT:

Adds nuanced knowledge to understanding how flipped or inverted learning methods work. Authors have tried to explain statistically why and how collaborative dyads are effective here. Important to have such research.

ADDITIONAL REQUESTS/SUGGESTIONS:

Basic group rather than basis p. 7?

Worksheet rather than working sheet?

Autor response 10:

We changed the text, figures and tables accordingly.

Need to explain Apos, Aneg, Kprim and what are phase 1 and 2 of the self-study and on-site phases (indicate on Fig 1)? Conditional knowledge is problem-solving tasks? Need to say a little more.

Autor response 11:

We agree with the reviewer and defined the different types of questions in the material and methods part. In addition, we expanded the text part explaining the conditional knowledge in more detail (see page 10 of the revised manuscript). The different phases (self-study phase, on-site phase) were explained in the supplementary material of the revised manuscript.

Statistical procedures seemed appropriate with care taken to estimate sample sizes required and checked for possible threats of non-randomness in the three treatments. Also the bootstrapping ensured rigor.

Autor response 12:

We thank the reviewer for this very positive comment.

Scripted collaboration is a sound theory to base the explanations.
only 60% actually studied with a partner (possible threat?)

Autor response 13:

We agree with the reviewer and integrated this conclusion in the discussion section on page 25. In detail, we wrote the following: „The main limitation of our study is the fact that only 64% (self-study phase 1) and 58.7% (self-study phase 2) of students actually prepared in a learning dyad as instructed in the collaborative study group. Nevertheless, we decided to analyze and integrate the data for all students in the collaborative group because this reflects how students follow the teachers` instructions and provides teachers with a more realistic picture of what might be expected from this kind of instruction. The strength of our findings is therefore somewhat underestimated, suggesting that the more students learn in dyads, the better their learning outcome will be.”

Minor adjustments for improving language fluency and English expressions eg on p. 13 lines 11 "prepared" = answered?

Autor response 14:

The whole manuscript was corrected by a native speaker.

Finally, we would like to thank both reviewers for their comments. Your constructive feedback helped us, in our opinion, to strongly improve our manuscript.

We were able to respond to all issues raised by the reviewers and hope that our manuscript is now appropriate for publication in BMC Medical Education.

Thank you very much for your consideration,

with kind regards,

Susanne Kühl