Author's response to reviews

Title: Introducing global health into the undergraduate medical school curriculum using an e-learning program: a mixed method pilot study

Authors:

Douglas Gruner (gruner18@yahoo.ca)
Kevin Pottie (kpottie@uottawa.ca)
Douglas Archibald (darchibald@bruvere.org)
Jill Allison (jill.allison@med.mun.ca)
Vicki Sabourin (sabourin.vicki@gmail.com)
Imane Belcaid (ibelc081@uottawa.ca)
Anne McCarthy (amccarthy@toh.on.ca)
Mahli Brindamour (mahli.brindamour@usask.ca)
Lana Augustincic Polec (laugusti@uottawa.ca)
Pauline Duke (pduke@mun.ca)

Version: 2 Date: 30 June 2015

Author's response to reviews: see over
Dear Editor in Chief,

Re: Response to manuscript – 2087202585161393

We thank you for the recent BMC Medical Education peer review. The peer reviewers made a number of suggestions and insightful comments relating to defining global health context, measurement tools, findings and statistics with regard to our manuscript. We have responded in detail to each of the comments and revised the manuscript, adding value and education relevance for your readers.

Sincerely,

Dr. Douglas Gruner on behalf of authors,
Department of Family Medicine, University of Ottawa
75 Bruyère Street, Ottawa, ON, K1N 5C8;
telephone: (613) 795-9904; e-mail: gruner18@yahoo.ca
**Peer Review from BMC Medical Education**

**Editor’s Comment:** The authors are to be commended for presenting one of the best rationales for non-significant results that I've read in a while.

**Authors’ Response:** Thank you; statistically non-significant, but full of contributions nonetheless.

**Editor’s Comment:** The reviewers suggests should be reviewed and the authors should provide responses to them. I will summarize the comments by section of the manuscript. First, while the introduction provided a definition of global health, refugee health was not defined. It may be considered part of 'global health' but that could be stated.

**Authors’ Response:** (see comments to reviewer #2)

Refugee health refers to the study of populations who are forced from their home countries due to conflict, torture or other forms of violence and the effect this has on their overall health. This would include mental health and the chronic and infectious conditions they are more at risk for having given their precarious migration history. They are a clear example of a vulnerable population which requires a unique approach to address their health care needs. Refugee health falls under the umbrella of global health (see line 86), which is defined as “an area of education, research and practice that places priority on improving health and achieving equity in health for all people worldwide”.

The focus of global health, like refugee health, is ensuring timely access to health care for vulnerable populations who often fall through the cracks of many health systems. Global health also refers to reducing health disparities and is not bound by national borders.

We will clarify this in the manuscript (see line 86-92).

**Editor’s Comment:** More importantly, there was little information on the competencies that students were expected to acquire. While the supplemental graphic provided some top level information, the knowledge quiz likely addressed more of the particulars about the competencies. It would be helpful to the reader to have a more detailed overview to the competencies measured with the roles particular to global health.

**Authors’ Response:** As the reviewers also have pointed out, and we have addressed below, the study focused more on the acquisition of conceptual knowledge rather than competencies per se. We will give a more detailed overview of what concepts the learners did acquire through doing the e-learning modules or reading the articles. We have decided to create a table which lists several of the basic concepts the learner would have been exposed to and these have been arranged according to the CanMEDS roles (this table can be added to the manuscript or added as an additional file).
<table>
<thead>
<tr>
<th>CANMEDS ROLES</th>
<th>GLOBAL HEALTH CONCEPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPERT</td>
<td>Demonstrate an awareness of how war, conflict, and famine impact the health of individuals.</td>
</tr>
<tr>
<td>COMMUNICATOR</td>
<td>Recognize how your own cultural biases, values and belief systems may affect your interaction with patients.</td>
</tr>
<tr>
<td>COLLABORATOR</td>
<td>Skills include assessing problems, identifying key players, listening to team members, and working together in design and implementation of programs.</td>
</tr>
<tr>
<td>MANAGER</td>
<td>In humanitarian contexts, manager skills play a critical role in directing human resources, engaging and training local staff, networking with nongovernmental organizations, and effectively utilizing limited resources.</td>
</tr>
<tr>
<td>ADVOCATE</td>
<td>Being a health advocate means treating your patient in their own particular context, without dismissing their cultural concerns.</td>
</tr>
<tr>
<td>SCHOLAR</td>
<td>As scholars, professionals demonstrate a lifelong commitment to learning, as well as the creation of knowledge</td>
</tr>
<tr>
<td>PROFESSIONAL</td>
<td>Professionals learn to maintain healthy boundaries to keep both themselves and their patients safe.</td>
</tr>
</tbody>
</table>

**Editor’s Comment:** Methods - clarify whether the same items were seen before and after the course (i.e., was the same instrument was used). If the instrument was adapted, what was changed?

**Authors’ Response:** The same instrument was used pre and post intervention. We used the RCT design to reduce risk of bias. As mentioned below to the reviewers’ questions on this issue, the self-assessment survey was adapted by changing the wording of the demographic questions but we maintained conceptual knowledge questions the same. This was done to ensure the questions applied to our study.

To give the editor and reviewers an idea of the minor changes to the instrument we provide an example here:
For the collaborator role:

**Our question:** I understand the importance of building partnerships with medical and other health professionals to benefit patients who are marginalized.

**Question from the original instrument:** I was comfortable building partnerships with medical and other professionals to benefit my patients with different backgrounds.

The reason we changed the wording was because our target group were pre-clinical medical students and so would NOT have had any experience, for example, building partnerships yet. Hence the subtle change in wording but not meaning.

**Editor’s Comment:** I assume that the analysis was restricted to paired sample t-tests (called repeated measures t-tests in the manuscript) because there were only 59 students included in the study. Table 2 (role level averages pre and posttest) could have been grouped by condition with effect size (standardized mean differences) reported.

**Author’s Response:** Yes paired sample t-tests, there were only two time points. See table 2: Cohen’s d values for the effect sizes.

**Editor’s Comment:** While you may not have had enough power to detect an effect with an RM ANOVA, some idea of the effect size associated with the instructional method would be of interest.

**Author’s Response:** We calculated the Cohen’s d values for paired sample t-tests. We cannot use RM ANOVA because there were only two time points.

**Editor’s Comment:** While there was not a statistically significant difference in pretest-posttest scores for the communicator and collaborator roles, did it matter which group the students were in?

**Author’s Response:** No, both learning interventions showed shift in scores. The RCT design aimed to reduce risk of bias. Our intervention content was similar, meaning a larger sample would have been needed to show any potential differences.

**Editor’s Comment:** Conclusions - I wondered whether the authors thought that it would be worthwhile to propose the use of e-learning to supplement any orientation provided to students prior to their global health experience.

**Authors’ Response:** Yes, absolutely. This is the principle goal for this intervention, to improve access, links to other sources for conceptual knowledge. We have revised the conclusion to make this point clearer (see line 383).

**Reviewers Queries**

**Referee #1**

**Reviewer’s Comment:** Line 177 - for consistency, may want to rewrite:

Out of the 161 medical students who completed the pre-test, 59 went on to
Authors’ Response: Thank you for your suggestion. In our manuscript we have revised this sentence as follows:

“Out of the 161 medical students who completed the pre-test, 59 went on to complete all aspects of the RCT…”

We are happy to make this minor change (see line 134).

Referee #2

Reviewer's Comment: Dear Authors,
Thank you very much for the interesting manuscript and your work. It is a very timely and interesting topic. Below in the text are some edits and some major points to address.

Maybe it would be good to not use the wording competencies in the headline. Otherwise Please future explain what is meant by Global Health (GH) competence.

Authors’ response: Thank you. We agree that using the term competencies in the title is not consistent with our main research question. Our research question asks whether the refugees and global health e-learning program is an effective tool to introduce the basic concepts (conceptual knowledge) of global health to learners. Competency on the other hand involves not only knowledge but skills and attitudes and being able to demonstrate and perform an activity at the right time and right place. Basic concepts of global health are indeed needed and are in fact the first steps along the pathway to competency in global health. So we have decided to eliminate the word ‘competency’ from the title. The revised title is:

Introducing global health into the undergraduate medical school curriculum using an e-learning program: a mixed method pilot study

Reviewer’s Comment: Background:
You are missing the theoretical introduction of certain aspects of your manuscript. Using the term `conceptual knowledge` what does that mean?

Authors’ Response:
We refer the reviewer to line 112 where we define what is meant by conceptual knowledge. We have reworked this section in an attempt to more clearly define conceptual knowledge. But essentially conceptual knowledge refers to the basic concepts or fundamental and guiding principles of an area of study. In this case global health, which is the umbrella term for the area of study in which refugee health is one aspect and is used as an example for which readers may more easily understand the importance of teaching global health in the curriculum.

Reviewer’s Comment: Please clarify the concepts you are measuring: `conceptual knowledge` Global Health competence.
**Authors’ response:**
Regarding conceptual knowledge we refer the reviewer to line 112 of the manuscript: “Basic concepts of global health (i.e. conceptual knowledge), are essentially the first steps the learner takes on the pathway to competency in global health.”
We have also included the following sentence to further explain ‘conceptual knowledge’: “Conceptual knowledge refers to essential concepts and guiding principles. Examples of some of the basic concepts students were exposed to by using the e-learning program are outlined in table form (see Discussion).”

Here again the reviewer makes an important point regarding global health competence. We have modified our manuscript to reflect our focus which is on acquiring basic knowledge (conceptual knowledge) and we reserve the term competency to describe the more extensive journey of attaining knowledge, skills and attitudes in a particular field of study. Gaining conceptual knowledge is the first step in that journey. The focus of the study was on introducing early concepts to the learner, global health concepts that could later form the framework for developing global health competencies as is described in our Redwood-Campbell BMC Medical Education reference. This earlier paper developed the framework that was used to create the e-learning modules. We have also added the table mentioned above which gives more concrete examples of what global health concepts specifically the learners were exposed to.

**Reviewer’s Comment:** Please clarify the terms ‘Global Health’ and ‘refugee health’ is it the same?

**Authors’ Response:** Refugee health (see line 86) refers to the study of populations who were forced to flee from their home countries due to conflict, torture or other forms of violence and the effect this has on their overall health. This field includes mental health and the chronic and infectious conditions they are more at risk for having given their precarious migration history. Refugees are a clear example of a vulnerable or disadvantaged population which often requires a unique approach to address their health care needs. Refugee health falls under the umbrella of global health (see line 91), which is defined as: “an area of education, research and practice that places priority on improving health and achieving equity in health for all people worldwide” (see line 85). The focus of global health, like refugee health, is ensuring timely access to health care for vulnerable populations who often fall through the cracks of many health systems. Global health also refers to reducing health disparities and is not bound by national borders.

In our manuscript we have clarified this important point as both reviewer #2 and #3 have made this point, and the editor has asked for clarification as well.

**Reviewer’s Comment:** In the Background you are naming some aspects why GH is important. This is very important. But it is lacking why this research is needed and interesting?
Authors’ Response: This is an excellent point; we agree that we need to express more clearly in the manuscript why this research is needed and why it is interesting. We have done this (see line 120-122). A more detailed explanation (not in the manuscript) is found below.

We believe that it is important that medical students be exposed to and acquire knowledge in global health as there is some literature that suggests early exposure in ones clinical experience to vulnerable and underserved populations leads to a more likely possibility that the clinician will continue to work with this population later in their careers (Ramsey AH, Haq C, Gjerde CL, Rothenberg D. Career influence of an international health experience during medical school. *Fam Med* 2004, 36(6):412-6). The emerging fields of global and refugee health continues to captivate medical students and medical schools are seeking innovative approaches to support global health. As mentioned earlier, global health encompasses the principle of health equity and the focus of ensuring that the most vulnerable members in society have access to timely, high quality health care. The Refugees and Global Health e-Learning Modules represent an example of a tool that educators could use to introduce these basic concepts of global health. Our research is needed to assess whether the Refugees and Global Health e-Learning Program is in fact an effective tool to introduce these global health concepts to pre-clinical medical students.

Reviewer’s Comment: Please highlight the research question more clearly. Please use RQ 1 RQ 2.

Author’s response: We have modified the research questions and made this clearer by labelling them RQ1 and RQ2 as the reviewer suggests.

RQ1: What is the effect of the Refugees and Global Health e-Learning Program versus peer reviewed PDF articles on the acquisition of conceptual knowledge in medical students? (see line 117)

RQ2: What was the experience for the students using the e-learning program? (see line 119)

Reviewer’s Comment: Please make it clear in the research question what you measure and then explain the concept of the concepts behind it.

Authors’ response: The research question identifies that this study will measure the acquisition of global health knowledge. There were two instruments used to measure this knowledge. First, the knowledge quiz, which was developed by global health experts and tested during a summer institute on refugee health in 2012 and measured key concepts of global health acquisition organized around the seven CanMEDS roles. The second instrument was the validated global health self-assessment tool which measured self-perception of knowledge. We were looking at whether one’s self perception of knowledge changed once they were exposed to key concepts of global health. You can refer to the data collection section of the manuscript (see line 149).

Reviewer’s Comment: Methods:
Please give more information about the participants. Maybe it would be good to put line 177 – 183 into the method section.
Authors’ Response: We have revisited this section, and also note that reviewer #3 makes a similar comment. Therefore, we have moved this paragraph to the methods section. We refer the reviewer to table 1 outlining specific information about the participants as requested.

Reviewer’s Comment: It is unclear if participants had to complete the same knowledge quiz pre/ and post. If they were identical then it is quite clear why they gained knowledge. Please clarify on that.

Authors’ response:
Yes, it was the same test pre and post, the students did the tests several weeks apart. Participants were randomized to 2 learning intervention groups and were then given the same quiz. We endeavoured to make the content of the learning interventions similar to limit bias that could result due to the learning content. Improvements in quiz were anticipated, but it was a difference in the degree of improvement between control and experimental group that interested us. This was not an observational study, but rather controlled.

Reviewer’s Comment: Line 136 – 140 How was it adapted? What has been really measured with the test?

Authors’ response: We adapted the self-assessment instrument which was developed initially to investigate students understanding of global health prior to doing international electives. It must be stressed that the meaning of what was being tested was not altered with this adaptation but rather the wording was slightly modified to be more suitable to this study which assessed the effectiveness of the e-learning modules and the experience students had in using the tool. See response to this above with the specific example provided of how the instrument was modified.

We were measuring whether a students’ self-perception of their own knowledge changed once they were exposed to key concepts of global health (see line 163). The knowledge quiz was clearly the more objective measure of knowledge acquisition; however this more subjective measure of a learners’ self-perception of knowledge also interested us. From the literature, early learners tend to over-estimate what they know and once they are exposed to a particular field of study they realize how much they do not know (Eva KW, Regehr G: Knowing When to Look it Up: A New Conception of Self-Assessment Ability. Acad Med 2007, 82(10):S81-S84). It is also true that learners being unique will differ in their ability to self-analyze; we were thus measuring the degree of change in their self-perceived knowledge base from having little to no exposure to global health to having access to our intervention.

Reviewer’s Comment: Line 144 Could you future describe how you have developed the Knowledge Quiz and how you know that you are measuring ‘conceptual knowledge’?

Authors’ Response: We established content evidence by asking global health experts to comment on the quiz that was developed by a master’s student from Ireland. The internal consistency of the scale was tested using a reliability analysis. We also made use of survey
experts to revise the questions (Dr. Ian McDowell) and we tested the tool during the summer institute in Ottawa in 2012.

**Reviewer’s Comment:** Could you name the Cronbach's Alpha (#) of scales?

**Authors’ Response:** We refer the reviewer to line 226 where the Cronbach’s alpha coefficients for the knowledge quiz are detailed.

**Reviewer’s Comment:** Could you describe assessment tool in more detail?

**Authors’ Response:** Two tools were used to assess conceptual knowledge. The first was a knowledge quiz developed and pilot tested with junior medical students. It was developed to measure changes in conceptual knowledge related to the seven global health roles. The second was a self-assessment tool and it was validated at an international conference for medical students and this validation was published as a MSc Thesis (as referenced in the paper). We used these tools with as much fidelity as possible, the quiz was not changed, and the self-assessment tool had minor changes to the demographics section as well as other changes in wording but not the meaning to make it appropriate for current participants.

**Reviewer’s Comment:** 177 – 183: Maybe it is better to put this section into the methods.

**Authors’ Response:**
We have addressed this concern and moved this section to Methods.

**Reviewer’s Comment:** Does it has an influence that 71% were considering a cross-cultural medical exchange and 93% had traveled outside Canada? Could you find out if this group distinguishes to others?

**Authors’ Response:** We found no statistically significant differences between those students who have travelled outside of North America or participated in cross cultural medical experiences (see line 215).

**Reviewer’s Comment:** 184 Have you used the same Knowledge Quiz two times? Then the knowledge gains would maybe cause from other causes?

**Authors’ Response:** Yes, of course but this justified our RCT design which aims to control for risk of bias. Any differences in participants experience and learning between quizzes would be controlled in the RCT design. See detailed response above.

**Reviewer’s Comment:** 229 – 249: Can be shortened

**Authors Response:** Given the fact that our quantitative results were lacking power and the fact that the qualitative results were crucial to our ability to draw meaningful conclusions, we respectfully disagree with the reviewer that we should shorten the qualitative section. More importantly the section on student barriers enabled the authors of the Refugees and Global
Health e-Learning Program to use this invaluable feedback to create a new and improved version.

**Reviewer’s Comment:** It would be interesting to get more information on the quantitative results. Therefore the qualitative results can be shortened.

**Authors’ Response:**
We are adding more information regarding the quantitative results including the effect size and the question about the participant demographics. We have tightened up the qualitative section, but retained a good portion as we feel the qualitative results are crucial to our ability to draw conclusions as to students’ preferences with the Refugees and Global Health e-Learning Program.

**Reviewer’s Comment:** 279-280: Why is it consistent with the literature? The present study showed no differences.

**Authors’ Response:** As mentioned above the quantitative results clearly shows that there was no significant difference between gaining knowledge in the traditional approach which makes use of journal articles and other print literature as opposed to a more novel approach which makes use of e-learning modules. This is consistent with the literature in that it does not seem to matter what approach is used to facilitate the acquisition of knowledge in medical students; all are effective. However, the literature has consistently shown that there is satisfaction with the e-learning and often it is preferred over the traditional approach for many reasons. Our study found this to be the case for the many reasons cited in the focus groups and thus is consistent with what we found in the literature (see Cook DA, et al., JAMA 2008).

**Reviewer’s Comment:** 302-303: This is a very interesting result. Here one would normally expect the highest increases (see also the Publications). Do you have an explanation way it was already so high? Could you elaborate on it?

**Authors’ Response:** The reviewer is referring to the ceiling effect that was noted as those students who chose to take part in this voluntary study already had an interest in global health and so their knowledge pre-test was high and thus there was little room for improving on it. This was noted for both communicator and collaborator roles.

**Reviewer’s Comment:** Could you elaborate if maybe only some aspects of Global Health was supported

**Authors’ response:**

We concede global health is a broad and complex field. Content areas may include refugee health, tropical and non-communicable diseases in lower- and middle-income countries, health systems, tobacco control and many other areas. The foundation of our work is based on a framework that was created using a competency-based medical education approach (see Redwood Campbell L. et al., BMC Med Education 2012). This framework is built on the
theory that there are core competencies that student must develop in order to work in the various medical areas and content areas of global health. The idea of our project is to seek an approach that could support the introduction of conceptual knowledge as a starting point to support the development of the actual competencies. We acknowledge our intervention provided only an introduction to the competencies. The refugee health element provides a context and example for learning this start-up conceptual knowledge.

Referee #3

Reviewer's report:
This pilot study addresses an important and current issue by combining two innovative aspects: E-learning and global health competencies of physicians. Mixed methods seem appropriate in order to explore the research question, which is dealing with the use of e-learning for improving conceptual knowledge of global health competencies. The data seems sound and unmanipulated. The power of the sample as well as confounding variables, e.g. previous knowledge and the treatment itself, are clearly stated as limitations. The authors draw interesting conclusions, which are well balanced with the results and the discussion. Finally, the manuscript mainly follows the standards for reporting and the writing is entirely understandable and transfers the ideas of the authors to the audience. This includes the title and the abstract, which convey the results of the pilot study. The manuscript may be improved concerning the following aspects:

Discretionary Revisions I (Minor aspects):

Reviewer’s Comment: L 61/90-92/ / 342/357: The pilot study itself deals with conceptual knowledge of global health competencies. “Social accountability learning” and service learning are mentioned but the relation with global health competencies as well as its meaning for this manuscript might be further elaborated and discussed. Therefore, the reader might be distracted from the main research question.

Authors’ Response: This is an excellent point the reviewer makes regarding the relationship between global health education, service learning and social accountability.

Social accountability as it pertains to health care professionals involves the notion of taking responsibility for and being responsive to the changing health needs of society.

According to the World Health Organization (WHO) social accountability of medical schools refers to “the obligation to direct their education, research and service of activities towards addressing the priority health concerns of the community, region and/or nation that they have a mandate to serve” (Rourke J: Social Accountability in Theory and Practice. Ann Fam Med 2006; 4(suppl 1):S45-S48).

In other words, medical schools have a responsibility to ensure that the physicians they graduate will be competent to provide care to the entire population or community in which they practice including and perhaps most importantly to the vulnerable and underserved.
Many medical schools now use service learning as a way to introduce learners to the idea of social accountability. Service learning involves an opportunity for the learner to serve in the community while learning in a very pragmatic way the essential aspects of a particular area of study; for example, learning about refugee health by working in a clinic for newly-arrived refugees. The service learning connects what has been taught in the classroom with the real life lessons that come through service.

Global health is often the vehicle used to introduce the fundamentals of social accountability which include many ethical considerations before students embark on their service learning opportunity. The Refugees and Global Health e-Learning Program is an example of one tool that students have access to prior to their in-class global health course work, which again precedes their service learning. Ultimately the hope and aim of the service learning is that the graduating physician will have developed a sense of social accountability that will better serve the community.

To address the reviewers concern regarding the links between social accountability, service learning and global health, we have tried to make the background section simpler and more focused on the research question and removed talk of social accountability in that section. Instead we decided to bring this concept up in the conclusion and attempt to make the link there.

Reviewer’s Comment: 2. L 75: Mentioned/ stated could be used instead of “identified”

Author’s Response: Happy to make this change in the document.

Reviewer’s Comment: 3. L 70: How many focus groups with how many participants each?

Authors’ Response: There were four focus groups, with between 5-7 participants in each. There were participants from both the control and intervention groups included in each focus group session; 14 who did the intervention and 10 who did the control (see line 178).

Reviewer’s Comment: 4. L 90: Global health is defined. Refugee health may be also defined, if it is not subsumed under global health.

Authors’ Response: Please see comments under reviewer #2. Refugee health falls under the umbrella of global health, it is used in this study as an example of a vulnerable population that struggles to access timely and effective health care due to multiple barriers and the importance of a health system to recognize and address these barriers. Essentially global health attempts to address the health care disparities that exist in society and refugee health puts a face to this challenge.

Reviewer’s Comment: 5. L. 100: “Outcomes” has a broad meaning. You may substitute it with “care”.

Authors’ Response: We believe ‘outcomes’ is a more accurate description as ‘care’ is too narrow in this context.
Reviewer’s Comment: 6. L 101: “Need to have” according to who?

Authors’ Response: Fair question. According to the Royal College of Physicians and Surgeons of Canada (see line 107), all student physicians need to develop and demonstrate certain competencies to practice medicine in Canada and these are based on the CanMEDS roles. It is the governing body that licenses physicians practicing in Canada. It is also the governing body that developed and continues to refine the CanMEDS roles.

We have made this clear in the manuscript.

Reviewer’s Comment: 7. L. 102-103: Even if the reader finds an additional file, the main ideas of the “Ontario Global Health Competencies Framework” might be shortly introduced.

Authors’ Response: The Ontario Global Health Competencies Framework is an evidence-informed interactive framework which provides a foundation to guide the design, delivery and evaluation of global health education programs for Ontario’s family medicine residency programs. It was created by educators from Ontario’s six medical schools (see line 107).

Reviewer’s Comment: 8. L 104: E-learning modules or e-learning?

Authors’ response: We mean here e-learning modules; more specifically the Refugees and Global Health e-Learning Program (see line 110).

Reviewer’s Comment: 9. L. 106: As conceptual knowledge of global health is the main dependent variable, the meaning of basic concepts, especially in contrast to full global health competence, might be explained.

Authors’ response: Excellent point that has been raised by reviewer #2 and so we recopy the response here:

We refer the reviewer to line 112 where we define what is meant by conceptual knowledge. We have reworked this section in an attempt to more clearly define conceptual knowledge. But essentially conceptual knowledge refers to the basic concepts or fundamental and guiding principles of an area of study. In this case, global health, which is the umbrella term for the area of study in which refugee health is one aspect and is used as an example for which readers may more easily understand the importance of teaching global health in the curriculum.

“Basic concepts of global health (i.e. conceptual knowledge), are essentially the first steps the learner takes on the pathway to competency in global health” (see line 112).

We provided examples of what we mean by some of the basic concepts that the learner would be exposed to. The editor also suggests a table to outline these basic concepts and we agree this would be helpful to the reader.
In contrast to conceptual knowledge, competency involves much more than mere knowledge. It involves using knowledge, skills and attitudes at the right time and in the right place to provide a service to an individual or population.

**Reviewer’s Comment:** 10. L 111-113: Focus group data is not necessarily be text data, if data is not transcribed.

**Authors’ Response:** The focus groups were transcribed.

**Reviewer’s Comment:** 11. L 116: The benefit of mixed methods and especially focus groups might be explained, as different sequences or qualitative methods (e.g. (expert) interviews) could be possible.

**Authors’ Response:** We have added a section to explain our reasoning for using the mixed methods approach (see line 124).

**Discretionary Revisions II**

**Reviewer’s Comment:** 12. Research question (RQ): a. L 61/ l. 104/ l.108: The research questions could be clarified. On the one hand, it is unclear whether the pilot study is dealing with the effectiveness of e-learning or e-learning “versus” peer-reviewed articles. E-learning is stated as experimental treatment and the control treatment consisted of peer-reviewed articles, it might thus be assumed that e-learning is superior to peer-reviewed article. If so, this hypothesis might be stated, explored and discussed within the manuscript. Furthermore student experience is mentioned only in a subordinate sentence, but according to the results, it represents an important aspect of the research. To clarify the RQ, the major research question (“Does e-learning affect conceptual knowledge of global health competencies?”) might be divided in sub questions, which on the one hand focus on on the dependent variable (effects on conceptual knowledge) and on the other hand on the learning environment itself (overall student experience). The RQ might be formulated as questions and the methods, the results and the discussion might refer to each RQ, in order to further structure the manuscript according to the RQ.

**Authors’ response:** It is quite reasonable to sub divide the research question into two distinct questions. As the reviewer quite rightly points out, the student experience is crucial and as such should be explored as a research question on its own. For this reason we have decided to take the suggestion of the reviewer and create two distinct research questions:

**RQ1:** What is the effect of the Refugees and Global Health e-Learning Program versus peer reviewed PDF articles on the acquisition of global health conceptual knowledge in medical students?

**RQ2:** What was the experience for the students using the e-learning program?

As to structuring the manuscript to refer to the RQs, we feel it is essentially formulated this way already in that the RQ1 refers to the quantitative data and results and RQ2 refers to the
qualitative data and results. We have put in parenthesis the RQs according to the different data sets to remind the reader which RQ is being addressed.

**Reviewer’s Comment:** 13. Treatment: b. “E-Learning” as a technological approach of learning and “peer-reviewed articles” as learning material do not necessarily improve conceptual knowledge of global health competencies. Following the idea of constructive alignment, both treatments should be thus elaborated with regard to their benefit for conceptual learning. The terms “e-learning” and “peer-reviewed articles” might then be specified in order to clarify the cause – effect links.

**Authors’ Response:** E-learning was indeed a technological approach with the future potential to introduce global health conceptual knowledge to more and more medical students. Peer reviewed articles or a syllabus represented the standard knowledge introduction approach. Many questions remained unanswered and we elected a pilot approach to be able to test recruitment, completion, effect on knowledge and participant perspectives and satisfaction. We knew that studies have consistently shown that e-learning does not produce better outcomes than traditional learning (see Cook DA, et al., JAMA 2008). Learning requires some degree of student engagement, whatever the motivation, in order to improve knowledge on related subject area. The logic model with its cause and effect would include a box for engagement. Within this box would be motivation, interest, quality of presentation, and student factors. One of the factors would be access to learning material. We hypothesized that a computer e-learning with links to internet would improve access to material, and it would be done in an efficient manner. This is the modification we wanted to study. So if it can reach more students, be delivered in a more affordable fashion and receive positive reviews from students, we felt this study would contribute to the global health education field.

**Reviewer’s Comment:** 14. Measures/ Method: c. L 138/ 139: It should be mentioned why this tool is appropriate to assess the awareness of global health concepts and why it was adapted. Furthermore, conceptual knowledge may be explained in advance in order to be linked to the awareness of global health competences in a better way.

**Authors’ Response:** See reviewer #2 comments on adaption of tool. Reprinted here for convenience:

We adapted the self-assessment instrument, which was developed initially to investigate students understanding of global health prior to doing international electives. It must be stressed that the meaning of what was being tested was not altered with this adaptation but rather the wording was slightly modified to be more suitable to this study which assessed the effectiveness of the e-learning modules and the experience students had in using the tool.

The tool was measuring whether a students’ self-perception of their own knowledge changed once they were exposed to key concepts of global health. The knowledge quiz was clearly the more objective measure of knowledge acquisition; however this more subjective measure of a learners’ self-perception of knowledge also interested us. From the literature early learners tend to over-estimate what they know and once they are exposed to a particular field of study
they realize how much they do not know (Eva KW, et al., Acad Med 2007). It is also true that learners being unique will differ in their ability to self-analyze, we were thus measuring the degree of change in their self-perceived knowledge base from having little to no exposure to global health to having access to our intervention.

As for explaining conceptual knowledge in advance, we did attempt to provide the definition earlier in the manuscript and revised the document in an attempt to put conceptual knowledge of global health in context with global health competency. See above comments to reviewer #2 related to this issue.

Also from the manuscript (see line 112): “Basic concepts of global health (i.e. conceptual knowledge), are essentially the first steps the learner takes on the pathway to competency in global health. Conceptual knowledge refers to essential concepts and guiding principles.”

**Reviewer’s Comment:** d. L 141: More information about the statistic quality criteria could be given.

**Authors’ Response:** Sample size was small. We had hoped to have a larger sample, as we knew of course that a smaller sample would limit the statistical analysis. When we developed our control intervention to resemble in content our e-learning intervention this meant a larger sample size would be needed to show statistical differences. The statistical approach led to large confidence intervals, imprecision, which is common in trails with small sample sizes.

**Reviewer’s Comment:** L 149: Which aspects were deemed significant or interesting?

**Authors’ Response:** After analysis of the knowledge quiz and self-assessment survey, we developed the questions for the focus groups based on interesting observations that we made. For example why was it that only 59 students of the initial 161 who began the study actually went on to complete it. We thus asked “what are the factors associated with successful completion of the e-learning program?”

Another observation from the results was that both the PDF articles and the e-learning program were able to increase conceptual knowledge and so we wondered if one was preferred over the other and why. This formed the basis of our focus group questions.

**Reviewer’s Comment:** f. The choice of grounded theory should be explained, because regarding the procedure (development of the guide) it seems categories already existed before the coding phase, especially as the results refer to the guide categories.

**Authors’ Response:** We agree with the reviewer here, on closer inspection it is more accurate to say that we used thematic analysis in our study (see line 67 and 194). We have removed the term grounded theory as it was not truly reflective of the analysis we used.
Reviewer’s Comment: 15. Sample: g. L 70: Composition of focus groups remains unclear, especially whether participants of both treatments (control and experimental condition) participated. The choice of the focus group participants and the size of each group are not transparent but might influence the results.

Authors’ response: As mentioned above, 4 focus groups with 5-7 participants were conducted. Participants from both the intervention and control groups participated in each focus group session. We specifically went back to the transcripts to answer this question: there was a total of 24 students who participated in the FGs; 14 did the e-learning modules (intervention) and 10 did the PDF articles (control). The manuscript was modified to include this (see line 178).

Reviewer’s Comment: h. L 121/ l. 177-183: In addition to the participants of the study itself, the sample could be introduced before the results. The composition of the different groups (focus groups, RCT) could be mentioned in particular.

Authors’ response: We agree to move section 177-183 from the results section to the methods. This was also a comment made by reviewer #2.

Reviewer’s Comment: 16. Results/ Discussion: Even if no significant differences were found, the manuscript itself might further elaborate the “versus”, e.g. by discussing the composition of the control/- experimental group and differences in learning that might result due to (group) differences in socio-demographics.

Authors’ response: We agree it would be important to include more information about the composition of the two groups (control/intervention) and so we ran Chi-Squares and found no differences with respect to demographic information like male/female and Canadian born/not Canadian born (see line 222). As such we did not find any other reason for lack of significance aside from small sample size.

Reviewer’s Comment: i. The large standard deviation should be discussed or further explored.

Authors’ Response: This imprecision is due to the small sample size. This was discussed in detail above.

Reviewer’s Comment: j. L 184: The results could refer to the measures mentioned before to be clearly assigned.

Authors’ Response: We are not sure what is being asked here. Could the reviewer please clarify this question further, sorry.

Here is line 184 to 188 of the original manuscript:
184 Self-Assessment Questionnaire and Knowledge Quiz Results
185 After conducting a repeated measures test for both the control and intervention groups, there was
186 a statistically significant difference between the pre and post-test results for the self-perceived
187 competency questionnaire in the following CanMEDS roles: health advocate, medical
188 professional, scholar, manager, and medical expert (see Table 2).

Reviewer’s Comment: L 221-224: “Designated allotted time” seems to be a possible facilitator. This might be mentioned in line 205 (possible facilitators).

Authors’ Response:
Agreed. Designated allotted time is actually mentioned as a facilitator in the manuscript. We refer the reviewer to (see line 255).

“Taking this further, integration into the official curriculum as a mandatory course with designated allotted time would clearly be a motivator as one student commented, “I think it is important to consider the time you spend on the e-learning as part of class time so that you don’t overwhelm students.”

Reviewer’s Comment: L 267-273: This part does not fit in the curriculum delivery part, as it deals with features of e-learning.

Authors’ Response:
We respectfully disagree with the reviewer as we believe this section does fit in curriculum delivery. Students are providing important observations of how the tool can be improved and used to maximize the experience of global health teaching (i.e. as an adjunct to face to face interactions with global health experts in the classroom setting).

Reviewer’s Comment: L 275-279: Would be better placed in the background part, as it provides background information.

Authors’ Response: The reviewer makes an important point that the information regarding medical schools attempting to incorporate global health into their curriculum and the benefits of e-learning should be in the background section. We refer the reviewer to line 93 and line 98 where this is mentioned. However, we believe that this section (line 275-279, now 309) belongs in the discussion section as it is a summary statement based on our pilot study.

Reviewer’s Comment: L 285-287: Satisfaction must not be connected to other effect levels. The conclusion that textbook study is sufficient to improve conceptual knowledge might be drawn as well. Stronger arguments for e-learning should be thus presented.

Authors’ Response: E-learning is indeed a technological approach with the potential to introduce global health conceptual knowledge to more and more medical students. Peer reviewed articles or a syllabus represented the standard knowledge introduction approach. Many questions remained unanswered and thus we elected a pilot approach to be able to test recruitment, completion, effect on knowledge and participant perspectives and satisfaction. We knew that studies have consistently shown that e-learning does not produce better outcomes than traditional learning (Cook DA, et al., JAMA 2008). Learning requires some
degree of student engagement, whatever the motivation, in order to improve knowledge on related subject area. The logic model with its cause and effect would include a box for engagement. Within this box would be motivation, interest, quality of presentation, and student factors. One of the factors would be access to learning material. We hypothesized that a computer e-learning with links to internet would improve access to material, and it would be done in an efficient manner. This is the modification we wanted to study. We are able to report promising qualitative results that suggest more students could be reached and the e-learning received positive reviews from students. We felt this study would contribute to the global health education field.

Essentially the reviewer is making the comment that both the Refugees and Global Health e-Learning Program and the PDF articles on global health are effective in improving conceptual knowledge as was seen in the quantitative results. We did not show a clear advantage for the e-learning program over the traditional approach (articles) to introducing global health concepts to early learners, at least with the quantitative arm of the study. However, the qualitative arm did show a preference in the focus groups for the e-learning program over the traditional approach and this is what was used to draw our conclusions as to the advantage of using an off the shelf tool to introduce students to global health. Again this was a pilot study which did not have the power to make stronger arguments, further study would be required to make these stronger arguments that the reviewer is inquiring about.

**Reviewer’s Comment:** L. 310: Self-assessment could be mentioned as limitation.

**Authors’ Response:** Yes, we now mention this inherent measure limitation in the limitations section (see line 358).