Author's response to reviews

Title: Why not just Google it? An assessment of information literacy skills in a biomedical science curriculum.

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Author's response to reviews: see over
Enclosed, please find our manuscript entitled, *Why not just Google it? An assessment of information literacy skills in a biomedical science curriculum*. This manuscript has been revised based upon the comments of the four reviewers. We believe that this manuscript is an innovative, important research study of particular interest to the readership of BMC Medical Education. Detailed below is a response to each reviewer comment and suggestion:

**Reviewer 1**

General comments: The authors seek to discern whether health professions students (dental) who are not adequately prepared with regard to information literacy when entering school (information garnered from a prior study by the same authors) can benefit from an educational intervention designed to remediate this gap and bring them to a level of competence. The question and background are clear and well written. The title and abstract are appropriate. The question is important and applicable to all health professions. Three consecutive classes of dental students were enrolled in the project. The authors used a single experimental group without control as seems appropriate given the nature of the question. The appendices are very good and will enable this work to be generalizable.

Comment 1-1: The data gathered are very straightforward and presented primarily as percentages. Much of the data seem to be presenting only one of the three cohort years and that year is not stated. Other graphs present more than one cohort but without explanation as to why the third is not presented. The major question – the differences between percent incorrect answers prior to and after the educational intervention – uses only a single cohort. This would be significantly stronger if all three cohorts were presented.

- We agree that the comparison of assignment data from three cohorts, and the survey and intervention data from only the last of these cohorts may be confusing and not provide sufficient and readily comparable information. In light of this comment (and related comments from other reviewers), we have modified the manuscript to include the most recent of these dental student cohorts that completed the entire study protocol (assignment, survey, intervention, post-intervention assignment). In addition, we have collected data from another student cohort that was unavailable at the time the original manuscript was
prepared, which has now been incorporated into the data analysis to provide two, sequential years of data analysis. We believe these modifications adequately and directly address the concern of this reviewer.

**Comment 1-2:** Differences between the two of the three cohort years of students are presented in figure one. Although the authors note “significant percentages of students unable to provide correct responses,” no statistical analysis is presented. Thus, the word significant should not be used.

- We agree with this comment and have included an expanded section in the Methods section of the revised manuscript, which outlines the specific statistical analyses that were incorporated, which now reads:

  Line 162-176 "Statistical evaluation Cronbach’s alpha was used to determine the internal consistency of the Needs Assessment survey. At least one-fifth of students from each cohort (C1, n = 19; C2, n = 15) were re-tested one week after the initial survey in order to gauge reliability. Virtually all responses were unchanged (C1 = 94.7%, n = 18/19; C2 = 100%, n = 15/15), providing evidence to support the reliability of this instrument.

  Following the assessment of information literacy skills, hypothesis testing could be performed using a chi-square ($\chi^2$) test, to determine if any characteristic (demographic or search preference) was different than expected among any specific group of students. Students who missed one or more sections of the technology-dependent portion of the assignment could be tested to determine if the proportion of those with any particular characteristic (gender, age, race, search preference) falls outside of the range that could reasonably be expected. A probability level of alpha ($\alpha$) = 0.05 was used to determine significance.”

The appropriate results and conclusion have also been revised, which we believe directly and specifically addresses the comments of this reviewer.

**Comment 1-3:** Further, while there are clear differences between the two cohorts presented no discussion of this or analysis is offered. Examining the information from an experimental point of view requires that one compare the groups (as is discussed briefly but not presented in your tables or figures). The information presented does indicate that the intervention was, in many ways successful. I would suggest that the three cohorts be represented in Figure 1 and a note added to the discussion speculating, if possible, on differences seen between the groups.

- After careful review of this (and other) comments, the authors concur that limited or no discussion was offered and that comparison of these groups was not presented in the tables and figures, limiting the conclusions that might suggest the intervention was successful.
• The results, including a revised figure and three revised tables, now directly compares the results of the student assignment (Figure 1), which demonstrates that a troubling percentage of first-year dental students were unable to locate and retrieve any evidence-based (peer-reviewed) citations to support their answers – confirming our previous report in this journal.

• Moreover, the results now includes a demographic description of these cohorts (Table 1), as well as an analysis of those students who were unable to complete this task – providing analysis of age, sex, and race within and between these two cohorts. An in-depth analysis of the survey instrument (Table 2) was then cross referenced to the individual student scores to determine if their preference of search method might be associated with an incorrect response (Table 3).

• In addition, Figure 1 has been modified to include both student cohorts pre-intervention and post-intervention to more accurately demonstrate that the results obtained from the initial intervention could be replicated.

• We believe these modifications directly and specifically address the comments of this reviewer.

Comment 1-4: Tables 1 and 2 are fine but note what cohort(s) the data comes from. Table 3 is obsolete if this data is added into figure 1. Either include table 2 or Figure 2. Both are not necessary. Figure 3 may be helpful but should again include all three cohorts.

• We concur with the comments of this reviewer, and have modified Figure 1, as well as Tables 1 – 3, to specifically indicate which data is associated with each cohort. In addition, a summary of both cohorts is provided in all Tables to reduce the influence of individual differences within each cohort. We have removed redundant data, as suggested and believe these modifications adequately and specifically address the concerns of this reviewer.

Comment 1-5: No limitations of the study are stated in the manuscript. This should be added to the discussion. This work builds on the author’s prior work (Kingsley and Kingsley, BMC Medical Education 2009, 9:7.). Attribution is adequate although it seems that there is key literature in the nursing and medicine fields that is appropriate and not used.

• We concur with this reviewer and have added Study Limitations to the Results section of the revised manuscript (Lines 296 – 303), as well as incorporating these limitations into other sections. After extensive consultation, the authors agree that most of the key literature from medical education that directly and specifically addresses this topic has been used – however, there are other studies from Nursing and other health related professions that were not selected for inclusion. Two new references regarding previous, relevant studies of information literacy and the relationship to age, gender, and race were incorporated, however, many other previous studies involved students at the undergraduate level, or do not
specifically address the topic of this study, and were therefore not included in either the Background or Discussion sections of this manuscript.

**Reviewer 2**

General comments: This paper explores the interesting and important topic of graduate biomedical science students’ information literacy skills. It reports on students’ baseline preferences and use of online search engines, describes how to assess information literacy skills, and outlines an intervention of providing information literacy skills training.

*Comment 2-1:* The specific educational research question/s the authors posed were unclear to me in that they describe an assignment, a needs analysis and the go on to put in place an intervention which in the end is the interesting finding and one that is focused in the conclusion. The interesting question “Why not just Google it” posed at the end of the fifth paragraph in the background is not addressed directly yet is a pertinent question.

- We concur with the comments of this reviewer and have restructured the Background to reflect the three stated objectives in measurable terms (Lines 106 – 115), as described below:
- “Based upon this information, the current study evaluated the information literacy skills of first-year dental students; surveyed the preferred methods of online information searches and database usage of these students; and examined demographic characteristics, such as age, sex, or race which might correlate with the use of particular search engines or which might be associated with the need for improved information literacy competencies. These findings would then be incorporated into the curriculum by means of an intervention designed by the University Health Sciences Librarian to improve student performance, address any questions regarding the quality and reliability of online information sources, and to provide specific instructions for finding evidence-based materials for subsequent use.”
- Moreover, the question of “Why not just Google it” was specifically addressed by the inclusion and analysis of the Needs Assessment survey data in Table 3. The students who were unable to find evidence-based citations overwhelmingly used Google as their preferred search method (75.7%), while a strikingly low percentage of those students who reported using Google were able to complete this task (22.1%). Following the intervention, virtually all students were able to then discern evidence-based materials from other data - strongly suggest that this type of curricular intervention is both necessary and should be placed early in the graduate curriculum.

*Comment 2-2:* The methods are appropriate but I would place less emphasis on the description of the assignment. Instead the authors could refer to their previous published paper which outlines this clearly. This would allow for ease of reading and also more emphasis could be placed on the needs analysis and describing the intervention. That is,
paragraph 8 of the results could be moved into, or at least alluded to, in the methods section.

- We concur with the comments of this reviewer, and have removed the majority of the description assignment – referring to the previously published paper, as suggested (Lines 127 – 135). Paragraph eight of the results was similarly incorporated, thus addressing the concerns of this reviewer.

Comment 2-3: The study does not clearly state that every student enrolled completed the assignment and the needs analysis although I have made that assumption since the ethics committee allowed them to use all student assessment data.

- We concur with this comment and have modified both the Methods to reflect this information, as follows: (Line 148 – 150) “Human Subjects Exemption All students from both dental student cohorts (n = 160) completed both the assignment and survey, and were included in this study.” We believe this modification adequately address the specific concern of this reviewer.

Comment 2-4: There is no overall demographic description of the students provided to assess the generalisability of the study findings, and in the discussion there is no mention of how student characteristics or previous experience may influence the use of the online resources and their skill level.

- We concur with the comments of this reviewer, and these data have now been incorporated into the Results section of the revised manuscript in Table 1 (see also Comment 1-3). In addition, the revised Discussion section now includes how student characteristics (Age, Sex, Race) might have influenced previous experience and skill levels, which were found in other previous research of this nature (Line 284 – 305). We believe these modifications are sufficient to address the concerns of this reviewer.

Comment 2-5: The discussion was brief and there needs to be wider consideration as to the implications of findings and perhaps linked more to literature in other discipline areas. No limitations are discussed at all, yet some things could have been addressed, e.g. the background of the students. I think the claim in the second paragraph of the discussions “that students ... apply them... in different contexts” is not really supported by the data from this study. The assignment was completed 6 weeks after the intervention. What evidence is there that the skills will be retained, be recalled, and transferred to future practice in different contexts?

- We concur that the discussion was far too brief and more links to previous studies of this nature were needed. Previous studies that linked information literacy to age, gender, and race are now discussed specifically in the context of the results
from the current study (Line 284 – 305), with these references now incorporated into the manuscript.

- We have added Study Limitations to the Results section of the revised manuscript (Lines 296 – 303), as well as incorporating these limitations into other sections (see Comment 1-5).
- In addition, the reference to applying this information in different contexts was removed completely, as the data from this study can only directly indicate whether or not these students could apply this information in a similar context only. We believe these modifications are sufficient to address the concerns of this reviewer.

Comment 2-5: The writing is acceptable but the paper could be shortened by removing a few details that do not add value to the overall message of the paper. For example it is not necessary to have the lecturer’s names and so much detail, e.g. first paragraph of the methods, and in the first paragraph of the needs assessment.

- We concur with the comments of this reviewer and have modified the manuscript to incorporate these suggestions, reducing the overall length of the manuscript. We believe these modifications are sufficient to address the concerns of this reviewer.

Reviewer 3
General comments: This paper addresses a very important subject: students’ limited development of information literacy within the health sciences. Information literacy involves the ability to access reliable sources on the internet with evidenced based knowledge, and also, the students’ ability to evaluate adequately the information they tap from the web. The paper is presenting an empirical study of first year students in dentistry, and the authors show that Google and Wikipedia are far more frequently used by the students than the databases covering scientific findings, the latter are regarded as more cumbersome to explore by the students. Also, the effects of an intervention are tested.

Comment 3-1: When it comes to the content of the paper, there are many aspects in need of major changes. The paper is too long in relation to its content; I would suggest that the number of pages is reduced by at least 30%, preferably by around 50%.

- We concur with the comments of this reviewer and have modified the manuscript to incorporate these suggestions (see Comment 2-5), reducing the overall length of the manuscript. Although we sought to decrease the overall length by at least 30%, the addition of demographic analysis into the main body of the manuscript only allowed for an overall reduction of 18% (17 down to 14 pages). We believe that the inclusion of the assignment and the survey (as Appendices) is warranted, in order to facilitate the replication and integration of similar modules in other programs. We believe these modifications are sufficient to address the concerns of this reviewer.
Comment 3-2: Moreover, the aims of the study should be clearly stated.

- We concur with the comments of this reviewer and have restructured the Background to reflect the three stated objectives in measurable terms (Lines 106 – 115), as described above (Comment 2-1): “Based upon this information, the current study evaluated the information literacy skills of first-year dental students; surveyed the preferred methods of online information searches and database usage of these students; and examined demographic characteristics, such as age, sex, or race which might correlate with the use of particular search engines or which might be associated with the need for improved information literacy competencies. These findings would then be incorporated into the curriculum by means of an intervention designed by the University Health Sciences Librarian to improve student performance, address any questions regarding the quality and reliability of online information sources, and to provide specific instructions for finding evidence-based materials for subsequent use.”

Comment 3-3: The presentation of the method does not have the clarity and structure that would be expected in an empirical paper. Design, Procedure, Participants, measures/variables and intervention are not described up to par. The references to Part A and B, to subpart A and to (b) and (2) are more than confusing. The nature and purpose of the intervention also requires an explicit presentation in the method section.

- We concur with this suggestion and have restricted the Methods to more accurately reflect the nature and goals of this study. The study design, procedure, participants and intervention are now more accurately detailed, as is the statistical evaluation employed (Lines 118 – 178). We believe these modifications adequately address the concerns of this reviewer.

Comment 3-4: The first paragraph of the Result section is not covering any results and should be removed.

- We concur with this comment and have removed this paragraph, as suggested. We believe this modification is sufficient to satisfy the concerns of this reviewer.

Comment 3-5: The Results are not presented in relation to clear aims of study, and in addition, parts of the Result section are comments and reflections made by the authors; they are not without interest, but they rather belong in the Background or in the Discussion.

- We concur with the comments of this reviewer and have restructured the Background to reflect the three stated objectives in measurable terms (Lines 106 – 115), as outlined in Comment 2-1 above. “Based upon this information, the
current study evaluated the information literacy skills of first-year dental students; surveyed the preferred methods of online information searches and database usage of these students; and examined demographic characteristics, such as age, sex, or race which might correlate with the use of particular search engines or which might be associated with the need for improved information literacy competencies.

- In addition, the Results are now presented in clear relation to these specific study aims (Lines 182 – 249), which discuss the evaluation of information literacy skills (Assessment and Evaluation), the preferred methods of online searches (Needs Assessment Survey), and the association of any variables with the need for improved skills or competencies (Demographics, Table 3). We believe these modifications clarify the aims and relate them to specific, measurable outcomes in this study to incorporate (and address) the concerns of this reviewer.

**Comment 3-6:** The only part of the paper that I find too short is the Discussion. Main findings should be summed up first, and subsequently, point by point they should be discussed before concluding.

- We concur with this comment and have extended the Discussion from two (2) to five (5) full paragraphs that detail and summarize the findings, and also provide more relevant discussion and analysis. We believe these modifications are sufficient to address the concerns of this reviewer.

**Comment 3-7:** I find it irrelevant to include the designations of the local curricula tested, DEN7110, C2011 etc. as well as the name of the persons who are leading or lecturing at the various courses involved.

- We concur with this comment and have removed all references to course names and lecturers, as suggested. We believe these modifications are appropriate and sufficient to address the concerns of this reviewer.

**Comment 3-8:** For me, it was impossible to know exactly where the figure legends belonged. There are no figure numbers given on the figures. There are 3 tables, 2 appendixes and 3 figures – together I find that this more than required. Some of the tables could be merged or explained in the text. The relationship between the text of the Result section and the Tables/Figures/Appendices should more evident. In general I find the topic highly relevant, but more focus, a clearer structure and a well developed argument from aims to method to findings to discussion is warranted.

- We concur with this comment and have reduced the total number of figures to one (1). The addition of demographic data and then analysis of the survey data required the inclusion of Table 1 and Table 3, but have reduced the overall number of tables and figures, in general. Also, the relationship between the
results and tables/figures is more evident. We believe that our provision of more clearly articulated aims, as well as the point-to-point relationship between these aims and the methods and results sections are sufficient to satisfy the concerns of this reviewer.

**Reviewer 4**

General Comments: Authors revealed that first-year dental students become able to use evidenced-based references by taking an hour course of information literacy in the next semester.

**Comment 4-1: The identical sentences to another published manuscript should be reconsidered.**

- We concur with the comments of this reviewer, and have removed the majority of the description assignment – referring to the previously published paper, as suggested (Lines 127 – 135), thus addressing the concerns of this reviewer.

**Comment 4-2: Published research should be excluded from the results and explained in the background and discussion. All research design and methods should be explained in the methods section. Whole structure of the manuscript should be organized and focus on the new findings.**

- After careful review of all data, we concur with the comments of this reviewer and have modified the entire Results section to only reflect new findings that are previously unpublished. All references to the previous student assessments are now referred to exclusively in the Background (Lines 96 – 99) and Discussion sections (Lines 255 – 258), as suggested. We believe these modifications adequately address the concerns of this reviewer.

**Comment 4-3: Omitted many repetition of description in the main text, tables, and appendix.**

- We concur and have removed the repetitive descriptions in the Results, Tables, and text. Some repetition may still be found in the Appendices, but based upon the comments of other reviewers, such as Reviewer 1 “The appendices are very good and will enable this work to be generalizable” provide justification for their retention in their current form. We believe these modifications are sufficient to address the concerns of this reviewer.

**Comment 4-4 : Words authors used such as ‘clinical’, ‘clinical relevance’, ‘evidence-based medicine’, ‘e-learning’, ‘research-based assignment’, ‘skill-based instruction’,**
‘evidence-based teaching and learning’, ‘evidence-based information literacy skills’, ‘evidence-based medical practice’, ‘needs assessment’ needs explanation and should be used by their original definition.

- We concur, in part, with these comments and have removed all references to clinical, clinical relevance, and e-learning. However, some references have been retained due to their frequent and commonly understood meanings, which include: Research-based assignment (student must actively perform research to complete the assignment); Evidence-based medical practice (requires medical treatment and decision making to be based upon peer-reviewed scientific evidence); Needs Assessment survey (determine and gauge the needs of students, in this case relating to information literacy, by means of a survey instrument). We believe the revised manuscript has incorporated more detailed and specific descriptions of these terms and the manuscript, as revised, adequately addresses the concerns of this reviewer.

In summary, comments provided by the Associate Editor and these reviewers were incorporated into the body of this manuscript, as appropriate. We have made every attempt to incorporate all of the reviewer comments and believe that these revisions adequately address the concerns of each reviewer and make this manuscript more interesting and relevant. We would like to thank the editors and reviewers for their thoughtful consideration of this manuscript and strongly believe that this manuscript, as a result of their input and suggestions, is considerably strengthened and is of great scientific interest to the readers of BMC Medical Education. We thank the editors of this journal for their patience and consideration during the process of our revisions.

Respectfully submitted,

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