Lemmer & Gunstone: Responses to Reviewers

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| REVIEWER 1 Comments  (1) The authors present a diagram of a ‘Proposed modelling cycle’ which they claim ‘is derived from literature described in the theoretical framework above’. This and other wording suggests that this ‘Proposed modelling cycle’ is the work of the authors.  --However this diagram (with trivial differences) has been published previously in reference 13, Uhden et al. However the authors do not credit Uhden et al with this diagram – instead all that is attributed to Uhden et al is that they ‘argue that this transfer [suggested by Redish and Kuo] should be perceived as a continuum’.  (2) The authors then present what they see as an ‘application’ of this modelling cycle. However the example they present only uses the first stage (out of 4) of the modelling cycle. The terminology of the rest of the cycle does not appear at all in the rest of the paper.  (3) The example they use for this application is a teaching sequence which dates back to Minstrell (1982).  --The version in the paper appears to me to be identical to that suggested by Clement (1993) in his paper on ‘bridging analogies’, although the authors appear not to have seen this paper, and attribute the work instead as follows ‘The approach outlined here has been evolving over many years in the teaching of the second author, and of a high school science teacher.’  Moreover the efficacy of this teaching sequence in the author’s context is not supported by any data.  The paper also ignores the considerable body of work on ‘Modelling instruction’ which is pertinent. Instead, the authors make the sweeping claim that ‘The processes that connect the real world with physical models ([…]) are profoundly neglected in physics instruction’.  In summary, this paper is a conceptual paper (rather than an empirical paper), but I can see nothing new in the concepts presented. Moreover there is inadequate referencing of these ideas. There is also nothing new in the teaching sequence example; no empirical evidence and the application of the model to this teaching sequence is incomplete. | Our changes and/or responses  (1) It is correct that Uhden et al. was one significant piece of extant work impacting on our thinking. However we see a substantive and most important difference in the model we propose from anything written by Uhden (the significance for learning of the transfer between real world and physical models). While this difference was stated in the submitted paper, we have made additions/adjustments to the text on pp 4 & 5 to further emphasize this difference, and also on p.3 to lead into this difference in model.  --We assume that the Figure in Uhden et al. that Reviewer 1 sees as ‘only trivially different’ is their Fig 2 (b); we see the differences as more substantive than trivial but do not see how we advance our position other than by assertion. What is most important here is the substantive difference that derives from “the significance for learning of the transfer between real world and physical models” now further emphasized by our text changes.  (2) We did not make clear that our example of application was focused on the significant difference in our model (the significance for leaning of transfer between real world and physical model). This has now been emphasized by a clarifying addition to heading for section 6 (p.5). The assertion that the example only addresses ‘Real world’ TO ‘Physical model’ is incorrect; the use of predictions about what is needed to be shown with the ‘Real world’ table (a prediction about change to the ‘Real world’ that is derived from the physical model) which are then tested via the mirror demonstration (see p.5 last para) is the validation of the ‘Physical model’ (i.e. ‘Physical model’ TO ‘Real world’). We see the original paper as clearly showing use of both Stages 1 and 4 (the 2 of specific concern in the example), and so have not made any change.  (3) Minstrell was appropriately referenced in the original ([16], Section 6, para 1, line 3), and still is (unchanged from earlier version).  --Re John Clement and ‘bridging analogies’:  \*that this sequence is not a reproduction of Clement’s publications is now made unequivocally clear by provision of self-citations from 1984 and 1985.  \*if the editors wish we are happy to provide the detail of the quite explicit and substantive ways our example differs from John Cs bridging analogies, and the ways in which these differences relate to the “new” aspects of our proposed model (and hence our illustration of this via section 6).  Re “efficacy of this teaching sequence…not supported by any data”: As we believe is made clear in the paper, the sequence is presented here solely to illustrate the ways transfer between real world and physical model can be approached in teaching. (Data as to efficacy does exist, it has no place in this paper.)  Re our “sweeping claim”: we have both moderated this (“profoundly neglected” is now “often neglected” [even though we would with more space justify “profoundly”, but it is a relatively minor matter here]); see top para p.5), and have given references to support “often” (also top p.5) |
| REVIEWER 2 Comments  The paper is well constructed illustrating the link between real world, physical and mathematical models as part of the teaching and learning processes - the motivation provided is sound. The text is clear and the contents are very relevant in the teaching practice. The introduction and the theoretical framework forms the basis of the research and the example of the "normal force" is used to connect these models. The conclusions are a concise overview of the study. Sufficient literature reviews are provided by the authors.  Some minor suggestions:  (a) In Table 1, Is this the authors construction? If not this requires references.  (b) In section 6, a summary of student responses (thoughts) regarding the examples in Figures 2 and 3 could illustrate the students "misconceptions/concepts" and connection of the models - this could be "quoted".  (c) Spelling/Grammar/Formatting:  --Section 1, Page 2, Paragraph 5: Change "leaner" to "learner".  --Section 2, Paragraph 2, Include "be" after understanding.  --In Table 1 for consistency include "Fullstops" after text.  --Section 4, Page 3, Change "upwards" to "upward". --Under references, either omit "Fullstops" after a reference or include for all. | Our changes and/or responses  No response required  (a) This is our construction (of course including the consequences of our reading and discussing and reinterpreting and extending aspects of the considerable number of references re Modelling etc already cited – but there are no direct specific linkages of the form that could (and therefore should) be referenced). So, no change has been made  (b) This would certainly add to the paper, and we considered this in our writing pre SAIP2016. However in our judgement it is less important to our arguments than those maters we have chosen to be included in the 6 pp limit (and can be accessed through the references given – nos 14 onwards). So, no change has been made.  (c)  --changed  --yes, there is an error here; we believe it is a better solution to change “understanding” to “understand”  --This has been done for the cases where fullstops had not been inserted  --changed  --fullstops at end of reference now included in all cases |