Does drawing a diagram help or hinder problem solving when students solve electrostatics problems in introductory physics?

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Recommendation

Unsatisfactory revision

CONFIDENTIAL COMMENTS TO THE EDITOR(S)

The title (page 1; line 4): the question in the title does not represent the point of a research, and is too general.
It is a well-known fact that a diagram per se is not enough to make it helpful or hindering for a problem-solving process.
Abstract (page 1; line 14): a diagram is not just a useful problem-solving heuristic; a diagram is a required element of a solution building process. A related research question could be asking for the features of a diagram which would make it more helpful than a diagram without those features; or for the features of the teacher-student interaction which would be helpful for prompting students to draw a useful diagram; or what features of the teacher-student interaction would help students to appreciate the use of the diagrams?
Page 3; question 1 (line 12): since the mere fact of having drawn a picture is not enough to make a definite conclusion that a student will successfully solve a problem, the correlation for a research should be a correlation between different features of a diagram, or different features of the process of the drawing a diagram and the success in the solving a problem.
Page 3; question 2 (line 15): the further reading (page 4; line 40, page 5; line 3) indicates that a diagram offered to students (in one of the groups) did not have all the features which a diagram drawn by an expert would have. In this context, question 2 is not really about giving a diagram or asking to draw a diagram, but about the quality/structure of a not very helpful diagram v. the quality/structure of a more helpful diagram. However, this question has not been addressed in the paper.

QUALITY ASSESSMENT Please score on a 1-10 basis (1 = low, 10 = high) how you rate this article on the following aspects:	
req Originality	5
req Scientific Rigour	5
req Significance	5

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Page 3; line 29. The question “how drawing diagrams is correlated with problem solving performance” may have different interpretations. In the authors’ interpretation, it is essentially equivalent to question (page 4 lines 3 - 8): “what option will lead to a larger number of students successfully solved a given problem: (a) not offering any picture and not asking to draw it; (b) asking to draw a picture; (c) giving to students a picture”.
This question, however, has no particular research value, because it leaves outside of the scope many factors which could have influenced students’ performance in any direction.
Page 9, line 32. Authors write that “students who draw productive diagrams perform better than students who do not”. This statement however, repeats the finding from a

previous research (page 7; line 20). Page 10, line 32 also repeats this statement ("The performance of students who drew diagrams with the highest level of detail is nearly twice that of students who drew unproductive diagrams"). This statement, however, indicates the importance of being able to draw a "productive diagram", hence, requires the analysis of the difference between "productive" and non-productive" diagrams, and how it might affect the performance.
Page 7. The authors try to ask many different research question, some of which are not related to the title of the paper; for example, RQ2, RQ5.
The questions like: "Why some students draw a productive diagram and others don't?", or "How to increase the probability of that a student will draw a productive diagram?" could have been an important part of the investigation, but the paper does not provide the relevant information.
Pages 11 – 13 are related to RQ4, which is not related to the title of the paper. This type of research could have represent a separate study on how different student approach a task of drawing a diagram.
Pages 13 – 15 are related to RQ5, which is not related to the title of the paper. This discussion is less related to how students approach diagrams, than to how students are taught about the relationship between electric field and electric force.
The recommendation is to divide the paper into two or even three different papers related to different but specific aspects of the study.

COMMENTS TO THE AUTHOR(S)

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Files attached

Author's Response

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