Review of: "Augmented Reality (AR) Technology on Student Engagement: An Experimental Research Study"

Jule Krüger[1]

1 Universität Potsdam

This document is a work-in-progress and does not yet qualify as a manuscript for an empirical study, but it can provide a solid basis for writing up the research as a full scientific article. For this, a lot of work is still necessary, and I will summarize a few points that I saw as the most striking ones:

1) Literature on previous research in this field needs to be cited (not just provided in a reference list). A large number of systematic reviews is published on this topic by now, which should also be taken into account.

2) It should be clear how the focal variables are operationalized/measured. In the hypotheses, student engagement and learning outcomes are mentioned, but on one hand it is not made explicit what part of the questionnaire measures these variables and how, and on the other hand, many more variables are measured in the questionnaire, which are not even described in the hypotheses. It is important to show the operationalization of the variables, and to make clear, with what purpose which data is reported. There is no obvious connection between the hypotheses, the instrument and the data analysis.

3) For both hypotheses variables, it needs to be clear that these are (open-ended?) subjective self-report measures (e.g., no knowledge test, no standardized questionnaire). Why was this approach chosen? What value is seen in this, what goals does the author have for this?

4) The Method is written in future tense, which makes it seem that the study is only planned and not yet executed. However, data and results are provided, so I believe that the data has already been collected. However, at the start of the questionnaire it says that this is a "sample questionnaire that you can used as a starting point", so again I'm unsure if this is a plan for research with potential (fictional) data, or if it was already conducted.

5) A media comparison study like this requires a very systematic description of the different conditions, including an assessment of potential differences and how they should influence learning. Especially the AR technology that has been used needs to be described in more detail. In order to respond to potential criticism on media comparison studies concerning AR in education, it may be helpful to take a look at this paper:

Buchner, J., & Kerres, M. (2023). Media comparison studies dominate comparative research on augmented reality in education. *Computers & Education*, *195*, Article 104711. https://doi.org/10.1016/j.compedu.2022.104711

6) Tables with all data and full questionnaires should not appear in the body of the text, but can be added as appendices.

7) What is the score that is provided as the pre-test and post-test score? How is this calculated? How does this correspond to the hypotheses?

8) The discussion should not be in bullet points. Also, connections back to the literature need to be made in the discussion.

These are just a few comments. It is not possible to write a more detailed review at this stage of the manuscript.