Review of: "Implementing Simulation Software to Develop Virtual Experiments in Undergraduate Chemical Engineering Education"

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Potential competing interests: No potential competing interests to declare.

Review of: Implementing Simulation Software to Develop Virtual Experiments in Undergraduate Chemical Engineering Education

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This manuscript investigates the use of simulation software to create virtual experiments.

It is true that virtual labs have been essential during COVID, but I consider them to be a great tool at many times.

I think these are works that are currently carried out by engineering students in the subjects of projects or final degree projects. I think this work is interesting and should be published, but the following aspects should be modified:

1. Introduction:

- “The Ministry of Education, Govt. of India, has initiated and funded the development of virtual labs by renowned institutions like IITs, Amrita University, NIT Karnataka, for different disciplines of science and engineering for students at all levels from under-graduation to research.” Actually, students in these disciplines will be faced with working with computational tools, but what is the experimental alternative to this practice? Have the students previously carried out this practice on an experimental basis?
- Make possible comparison, experimental difficulty, time required, material...
- Include bibliography of virtual laboratories in other disciplines as an example

1. Development of Virtual Experiments

- I think the procedure they follow is well explained.
- Are flow diagrams designed by students?
- “The rate constant is estimated for the bimolecular reaction using the graph based on the kinetic rate of the bimolecular saponification reaction. The results obtained are validated with the theoretical values in the literature or from previous wet laboratory data.” If these experimental results have been published, reference them.

1. Assessment Methodology for Learning Outcomes

- Learning objectives: knowledge, skills, and attitudes
- Detail how the parameters shown in Figure 13 are evaluated
- What was done before implementing virtual labs? AY 2018-19 and AY 2019-20?
- In addition to students' opinion, I think there should be a more detailed study of student outcomes: individual qualifications, theory, practices...