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.

The article **"Implementing Simulation Software to Develop Virtual Experiments in Undergraduate Chemical Engineering Education"** by the authors from BMS College of Engineering describes developing virtual labs using tools like UNISIM, DWSIM, and MATLAB/Simulink.

While demonstrating clear strengths such as justifying the need for virtual labs and outlining experiments, opportunities remain to further bolster the work. Expanding on pedagogical approaches, including student work samples, discussing limitations, and refining certain writing aspects could help strengthen communication and the paper's contributions.

Strengths:

Thoroughly explains the rationale and benefits of implementing virtual labs in chemical engineering education. Provides good background on why a learner-centered approach is needed.
Clearly outlines the process of developing virtual experiments using various simulation software tools like UNISIM, DWSIM, MATLAB/Simulink. Provides specific example experiments developed.
Assesses the impact on student learning outcomes comprehensively through measurements of cognitive, psychomotor, and affective domains. Data presented on improved exam performance supports the benefits.
References recent literature to support arguments and position the work in the broader context of educational best practices.

Weaknesses/Areas for Improvement:

Could expand more on the pedagogical approaches used in guiding students through the virtual labs. More details on how interactions are designed would strengthen the evidence for impact.
Sample data/results from actual student work in the virtual labs could be presented (with anonymization) to further substantiate claims about improved understanding, problem-solving skills, etc.
Discussion of limitations could be strengthened - e.g., acknowledging that virtual labs alone may not replace all elements

of hands-on learning. Also discussing resource/infrastructure requirements.
Writing quality could be improved in some sections with tighter organization, clearer transitions, and active rather than passive voice.

Overall, this is a good article presenting valuable work developing and assessing virtual labs for chemical engineering education. With some expansion on pedagogical approaches, inclusion of student work samples, discussion of limitations, and polishing of writing, it could be a very solid contribution to the literature on virtual labs and hands-on lab learning.