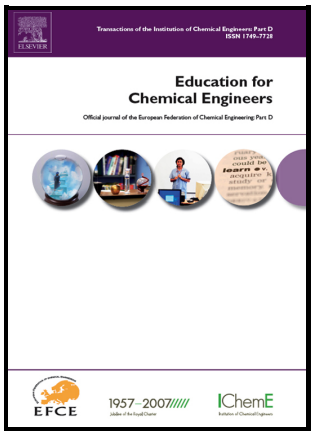
The Integrative Approach of Learning Chemical Engineering Thermodynamics by Using Simulation-Based Exercises



Krunal J. Suthar, Milind H. Joshipura

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The Integrative Approach of Learning Chemical Engineering Thermodynamics by Using Simulation-Based Exercises

Krunal J. Suthar[a], Milind H. Joshipura[b]

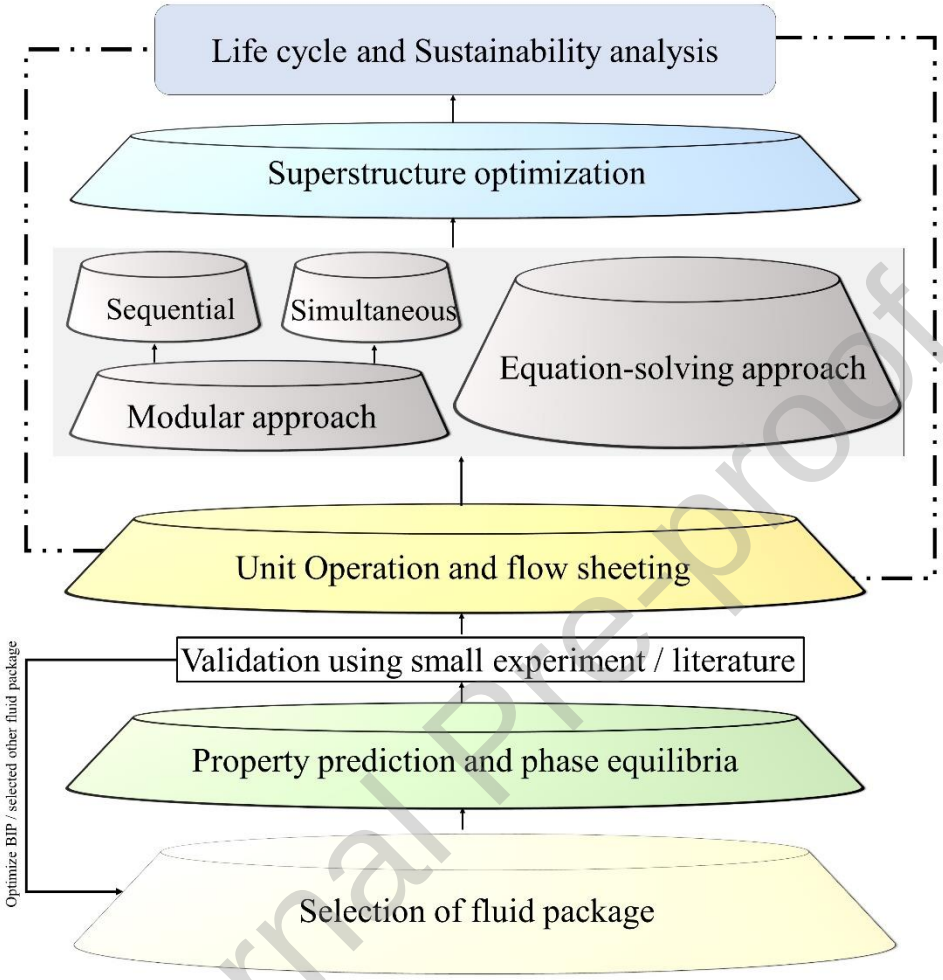
[a]Chemical Engineering Department, UPL University of Sustainable Technology, Ankleshwar, Gujarat, India

[b]Chemical Engineering Department, Nirma University, Ahmedabad, Gujarat, India

Abstract

The active learning integrative approach of simulation-based exercises along with the core course would help undergraduate students with more engaged learning. The present study describes the simulation approach using an open-source process simulator with the help of three simulation-based exercises. The first one exemplifies the importance of the selection of an appropriate fluid package. The second exercise presented in the study shows the effect of using optimized and default values of binary interaction parameters on VLE prediction of alcohol-ester systems. The small interactive simulation-based problems with expected outcomes were presented in the third exercise which makes the learning more engaging and interesting. The current study highlights an integrative approach to inculcating critical thinking and self-learning abilities using small simulation-based exercises while learning chemical engineering thermodynamics. Finally, a survey with closed- and open-ended questions was used to gather the opinions of students on the presented exercises. A short communication is needed that sheds light on the integrative approach of learning process simulation complementing the thermodynamic theory learning.

Graphical abstract



Keywords: process simulation, thermodynamics, teaching-learning, fluid package

1. Introduction

In the present era of intuitive computing, users work alongside an intelligent digital assistant that anticipates their needs and suggests or executes actions that are likely to fulfill those needs as they go about their daily lives. The approach to chemical engineering problem-solving undergoes drastic changes because of the early nineteenth century with the introduction of the personal computer and the subsequent advent of commercial internet service providers. These modifications have led to many numerical computations being performed using mathematical software programs like Excel®, POLYMATHTM, MATHCAD®, and Mathematica®. Computational fluid dynamics (CFD) software and process simulation software (such as Aspen, EMSO, PRO/II, SuperPro, DWSIM, UNISIM, CAPEOPEN, ChemCAD, etc.) are used to do more complicated computations. Chemical engineering students must understand and