

The Hawai'i Convention Center, Honolulu, Hawaii, USA  
Sunday January 8 - Tuesday 10, 2017

Zaed Sahem

Ontario Society of Professional Engineers , Canada  
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Contact Email: sahemzaed@gmail.com  
Presentation Type: Oral Presentation

Submission Title: The Transport Phenomena: Course Teaching Strategies Using Comsol Simulation Apps for Engineers and Scientists  
Submission Number: 33493

Authors: Zaed Sahem, Mohamed Edali, Faraj Ben Rajab and Ali Elkamel

Dear Mr. Sahem,

On behalf of the IAFOR local organizing committee and the IICEHawaii 2017 conference chairs, Professor Sue Jackson, Professor Barbara Lockee, Professor Ted O'Neill, Professor Steve Cornwell and Professor Curtis Ho, I am pleased to inform you that your proposal, "The Transport Phenomena: Course Teaching Strategies Using Comsol Simulation Apps for Engineers and Scientists", has met the accepted international academic standard of blind peer review, and has been accepted for Oral Presentation at IICEHawaii 2017. You are also invited to submit your full paper to the official conference proceedings.

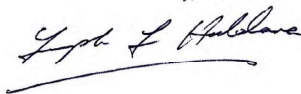
The conference will be held in Honolulu, Hawaii, U.S.A., at The Hawai'i Convention Center from the afternoon of Sunday, January 8th through Tuesday, January 10th, 2017. The keynote and plenary session will be on Sunday and parallel panel sessions begin Sunday afternoon and run for the duration of the conference. For more detailed information about the conference and accommodation, please visit the conference website.

If you cannot present for any reason, please notify the conference administration team at [iicehawaii@iafor.org](mailto:iicehawaii@iafor.org). If there is a day that you are unable to present, please contact the administration team at the time of registration. Not everyone can be accommodated with preferential dates and time, so please limit any request of this nature to unavoidable situations.

A PDF of the full Conference Programme will be uploaded on the IICEHawaii 2017 website by Saturday, December 10th. Please check the programme at that time to make sure all information pertaining to you is included and correct.

Thank you for participating in The IAFOR International Conference on Education - Hawaii 2017. All of us affiliated with the organization aim to make this conference a success.

Yours Sincerely,



Joseph Haldane, Ph.D. (London), F.R.A.S.  
President, IAFOR

## **The Transport Phenomena Course Teaching Strategies using Comsol Simulation Apps for Engineers and Scientists.**

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### Abstract

Teaching undergraduate transport phenomena fundamentals course in universities worldwide was mainly based on the well-known most useful chemical engineering textbook ever written by Bird, Stewart and Lightfoot, (BSL, 1960). Students in recent years are motivated by real-life examples, but they have limited time to investigate the physics beyond them. This research paper presents the enhanced teaching methods used to introduce undergraduates to Comsol Multiphysics Apps solving research projects. The learning goal is achieved by going through sequent teaching approaches. Normally, the students learn to solve problems in their textbooks analytically and learn to validate their solution with the available numerical techniques. Progressing into solving more complicated 2D problems is a result of building the validation confidence with computer programs that develops students to go beyond their textbooks by removing assumptions. This approach is illustrated in details using the feature of App building; where changes and optimization can be implemented to show the breadth of analysis techniques. Students gain better insight into the interaction between realistic system design geometries, and the role of various Multiphysics. From an educational perspective, students in different engineering and science disciplines can now solve complex problems in a relatively short period of time, which provides new opportunities for strengthening their technical skills. One key result is an acceleration of their development as technologists, which allows them to ultimately provide greater business impact and leadership in their chosen career.

**Keywords:** Transport Phenomena, Multiphysics, COMSOL Application builder.

**Case study:** some of the course Apps studies included in the paper research work.

