Student Academic Engagement - An approach to ensure students success in engineering and engineering technology curriculums

Hossein Rahemi, Ph.D.
Professor and Chair, Department of Engineering and Technology, Vaughn College of Aeronauitics and Technology, Flushing, NY, 11369-USA, Email: hossein.rahemi@vaughn.edu

Shouling He, Ph.D., Amir Elzawawy, Ph.D., Khalid Mouaouya
Professor, Department of Engineering and Technology, Vaughn College of Aeronauitics and Technology, Flushing, NY, 11369-USA,
Emails: shoulin.he@vaughn.edu, amir.elzawawy@vaughn.edu, khalid.mouaouya@vaughn.ed

ABSTRACT

This paper details the development process of all in-class and out-of-class student activities which contributed to the enhancement of students' analytical, hands-on, teamwork, communication capabilities and expanded their career-building experiences. For the in-class activities, this paper not only addresses fundamental and core courses that engage students in an integrated approach to improve their learning but also concentrates on activities that can enhance students' analytical, hands-on, and comunication skills. For the out-of-class activities, this paper aims on the engagements that enhance and expand students' hands-on and career-building experiences.

This paper will specifically address the following topics

1. Supplemental instruction (SI), a student academic assistance program that enhances student's academic foundation for the college level education.
2. In-class course activities that stimulate students' critical thinking, problem solving, and build communication and teamwork skills.
3. Out-of-class activities, internship programs, professional societies, conferences, and technical competitions. These activities provide students with greater hands-on and career-building experiences and prepare them to be successful in their chosen career path.

1. INTRODUCTION

Today engineers are facing the challenge of having knowledge in multi- and interdisciplinary areas and working in team with people in a broad range of professional disciplines. Therefore, it is necessary to create activities in both course and program level such that to enhance students' knowledge base, understanding and practical cross-platform skills. In addition, activities such as student chapter of professional societies, technical competitions, conference participations, presentations and publications are intended to strength students' communication and collaboration capabilities.

For the in-class activities, this paper will present the development process of both fundamental and core courses that can incorporate cross-disciplinary knowledge teaching, computational project-based learning, critical thinking and hands-on experiences (Rahemi, He, and Mouaouya). Furthermore, this study will also address on a process that can enhance teaching and learning effectiveness through core courses in enhancing and achieving those learning outcomes.

1.1 SUPPLEMENTAL INSTRUCTION

During the spring of 2012, as part of the Hispanic-Serving Institution HIS-STEM grant, a new SI program, a student academic assistance program, has been established to assist and enhance students understanding through the fundamental courses in engineering and engineering technology programs. For the courses such as statics, dynamics, strength of

materials, and DC/AC circuits highly talented students who already completed those courses are selected to sit-in on the course with the instructor for the second time and serve as a designated teaching assistant for these courses (Rahemi and LaVergne, 2009). The student supplemental instructor assigned the task of reviewing class lectures, conducting problem solving sessions and communicating with the faculty member about the areas where students need reinforcement in order to be successful in the course.

The student supplemental instructor will be scheduled for ten hours per week to assist students in the fundamental engineering and engineering technology courses. This will include three hours per week that the SI attends in a class with the instructor for the second time, and another seven hours per week to assist students with problem solving sessions.

1.2 Computational and Hands-on Project-Based Learning Model

The aim is to implement a methodology based on computational and hands-on project-based learning model (Rahemi and LaVergne, 2009), (Rahemi and Baksh, 2010) such that to improve and enhance students' hands-on experiences, problem solving skills and communication capabilities through the junior and senior level courses in engineering and engineering technology programs at Vaughn College. Figure 1 shows the graphical model of computational and hands-on project-based learning.

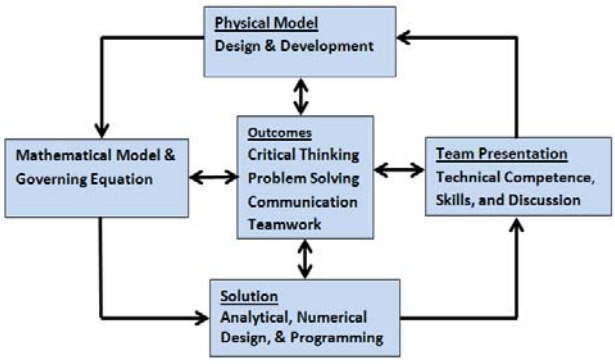

Figure 1: Computational and Hands-on Project-Based Learning

In computational method and engineering analysis courses, students will be introduced to numerical methods based on both finite difference and finite element approaches. Students are arranged in several teams and each team is assigned to a technical project with a specific engineering application. The assigned project must be studied and investigated based on available mathematical principles and MATLAB computer programming. The students' projects will be measured based on learning objectives that are identified in the course syllabus and will be graded based on the criteria such as proposal, model development, programming, analysis, report and presentation. Some of these students' computational-based projects were submitted and accepted for publication and presentation at technical conferences.

2. Evaluation and Assessment

Each in-class and out-of-class academic engagement is assessed and evaluated based on student retention, and success through the program and professional career. As a direct measure, courses offered through the program as an indirect measure, department exit, alumni, internship supervisor, and employer surveys are used in the assessment process to measure the effectiveness of in-class and out-of-class activities in achieving student learning outcomes. The direct and indirect assessment process and results will be discussed in LACCEI conference Proceedings.

References

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