

The iDEeA Project: Exploring Design Mindset and Toolset of Biomedical Engineering Undergraduates

Hamzaid, Nur Azah^{1,2}, Mohd Zain, Noor Athirah¹, Mohktar, Mas Sahidayana¹, Usman, Juliana¹, Ahmad, Mohd Yazed¹, Wan Kamarul Zaman, Wan Safwani¹

¹*Department of Biomedical Engineering, Faculty of Engineering, University of Malaya*

²*Academic Enhancement and Leadership Development Centre (ADEc), University of Malaya; azah.hamzaid@um.edu.my*

The ability to design a particular solution, including the application of design thinking process as well as to perform and justify the design, is a core competency sought after in undergraduate biomedical engineering students that sets them apart from technicians and lab technologists. This will empower the graduates to have innovative value creation mindset and toolset; as it is about thinking, doing and feeling. Therefore, the efficiency of improving students' learning experience on design-based problems is important. The integrated design in engineering education approach (iDEeA) project was introduced throughout one semester among five academic staffs, affecting about 400 students in few identified courses across the first to final years of undergraduate Biomedical Engineering and Biomedical Engineering (Prosthetics and Orthotics) studies. In this project, design-based tasks were assigned to the students in each of their technical subject class. The students were asked to implement or design a solution that would require the knowledge and to apply the technical knowledge they learn in class. A design thinking workshop was held for the students at the beginning of the semester and the design-based assignment was monitored and assessed throughout the semester and evaluated by the end of the semester. The projects were performed in groups of 4 to 5 students. Multiple outcome measures including students' portfolio, formal assessments, and exit interview were performed and results were triangulated. The most significant finding of this project is the learning effects of implementing an innovation in strategic planning of the design components. All students successfully completed their design assignments based on formal assessment standards. In addition, all students were more aware of the design steps after completing the semester. Nevertheless, when enquired deeper about their innate ability to design and their confidence of their own design skills, multi-factor relationship was detected in several aspects. Students would 'feel' that they are able to design a solution if they had the opportunity to either complete the prototype or have a physical 'hands-on' encounter with the design subject. Students also claimed that they could remember and appreciate the subject content better by doing the projects. In overall, the greatest challenge in realizing the design is the technical skills required to complete the project. The final year students especially realized that the most challenging design step was to impart commercial usability of the designed solution. Most importantly from this research, it was found that the pedagogical methods that may have worked best in improving the

students' learning ability about design is first, the opportunity to perform a complete design assignment or project in a collaborative learning setting, and second, the guidance and encouragement and appropriate feedback they received from the lecturers. In conclusion, the iDEeA project provided a platform and opportunity to identify and realize the important values in imparting the design ability and skills to students.

This project is supported by RU002G-2016 grant under UM-LiTeR Grant of 2016.