

## Engaging Students in Learning through Visual Demonstration Models in Engineering Education

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**Abstract :** Student engagement in learning is instantly affected by the sources of learning methods available for them, such as videos showing the applications of the concept or showing a practical demonstration. Specific to the engineering discipline, there exist enormous challenging concepts that can be simplified when they are connected to real-world scenarios. For this study, the concept of heat exchangers was used as it is a part of multidisciplinary engineering fields. To make the learning experience enjoyable and impactful, 3-D printed heat exchanger models were created for students to use while working on in-class activities and assignments. Students were encouraged to use the 3-D printed heat exchanger models to enhance their understanding of theoretical concepts associated with its applications. To assess the effectiveness of the method, feedback was received by students pursuing undergraduate engineering via an anonymous electronic survey. To make the feedback more realistic, unbiased, and genuine, students spent nearly two to three weeks using the models in their in-class assignments. The impact of these tools on their learning was assessed through their performance in their ungraded assignments as well as their interactive discussions with peers. 'Having to apply the theory learned in class whilst discussing with peers on a class assignment creates a relaxed and stress-free learning environment in classrooms'; this feedback was received by more than half the students who took the survey and found 3-D models of heat exchanger very easy to use. Amongst many ways to enhance learning and make students more engaged through interactive models, this study sheds light on the importance of physical tools that help create a lasting mental representation in the minds of students. Moreover, in this technologically enhanced era, the concept of augmented reality was considered in this research. E-drawings application was recommended to enhance the vision of engineering students so they can see multiple views of the detailed 3-D models and cut through its different sides and angles to visualize it properly. E-drawings could be the next tool to implement in classrooms to enhance students' understanding of engineering concepts.

**Keywords :** student engagement, life-long-learning, visual demonstration, 3-D printed models, engineering education

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