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Changing Misconceptions in Heat Transfer: A Problem Based Learning Approach for Engineering Students

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Abstract : This work has the purpose of study and incorporate Problem Based Learning (PBL) for engineering students, through the analysis of several thermal images of dwellings located in different geographical points of the Region de los Ríos, Chile. The students analyze how heat is transferred in and out of the houses and how is the relation between heat transfer and climatic conditions that affect each zone. As a result of this activity students are able to acquire significant learning in the unit of heat and temperature, and manage to reverse previous conceptual errors related with energy, temperature and heat. In addition, student are able to generate prototype solutions to increase thermal efficiency using low cost materials. Students make public their results in a report using scientific writing standards and in a science fair open to the entire university community. The methodology used to measure previous Conceptual Errors has been applying diagnostic tests with everyday questions that involve concepts of heat, temperature, work and energy, before the unit. After the unit the same evaluation is done in order that themselves are able to evidence the evolution in the construction of knowledge. As a result, we found that in the initial test, 90% of the students showed deficiencies in the concepts previously mentioned, and in the subsequent test 47% showed deficiencies, these percent ages differ between students who carry out the course for the first time and those who have performed this course previously in a traditional way. The methodology used to measure Significant Learning has been by comparing results in subsequent courses of thermodynamics among students who have received problem based learning and those who have received traditional training. We have observe that learning becomes meaningful when applied to the daily lives of students promoting internalization of knowledge and understanding through critical thinking.

Keywords : engineering students, heat flow, problem-based learning, thermal images
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