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A horizontal banner image showing a blue and green geometric pattern of overlapping triangles and squares, with a green leafy plant on the right side.

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B-LEARNING METHODOLOGY FOR THE DEVELOPMENT OF CREATIVITY SKILLS IN UNDERGRADUATE STUDENTS

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Abstract

Teaching creative thinking to undergraduate students in industrial engineering requires the design of new methodologies and assessment methods. These methodologies need not only changing the teaching methods but also the learning environment in which traditional classes are carried out. Nowadays, in order to improve the capabilities of the students the universities have developed new education resources which lead to improve the teaching methodologies. They include the blended learning concept (b-learning) as one of the most innovative tool for developing new ideas in the educational environment. The virtual platforms provided by universities allow having communication between lecturers and student outside the classroom in an easy way. Under this point of view the in-person learning experiences inside the classroom are combined with online teaching classes outside of the educational center. In the case under study in this paper the creativity capabilities are defined as transversal competences, being the specific competences the technological ones. Although transversal competences are currently considered a key factor of the outcomes of Higher Education, the way in which these competences are implemented in the curricula remains a challenge for which there is little guidance. This paper deals with a case study where the development of creativity skills of the students has been implemented using a b-learning methodology. Thus, the full description of the learning methodology is described in the paper including the learning activities inside and outside the classroom, with particular emphasis in the use of virtual platforms. The result of this study demonstrates that it is possible to integrate specific and transversal competences by means of using b-learning methodologies. This fact allows developing creativity skills in the student at the same time that they have the opportunity to develop the full level of the cognitive domain. Furthermore, the assessment of these competences can be done easily by the instructor due to the registration of the activities carried out by the students using a portfolio.

Keywords: Creativity, innovation, b-learning, transversal competences, assessing competences.

1 INTRODUCTION

It is clear that engineers involved in product design need to be creative. Creativity is a key ingredient which is present in many steps of the design process, from the conceptual idea to the final detail design of products. Creativity generates innovation, is an essential tool in problem solving and allows companies to open new markets being more competitive. However, the market competition often forces engineers to develop new products in a very short time. Thus, the time necessary for obtaining creative designs is reduced. Indeed, to be the first in the market requires being the fastest in developing new designs. The lack of creativity often results in the simultaneous introduction in the market of similar products by different competitors, being very difficult distinguish the differences between them. In order to improve the creativity of the products it is necessary to include methodologies into the design process that foster creativity in a natural way for the engineers. In this way engineers become familiar with creative procedures and their application could be simple and effective. To achieve this objective the importance of creativity and the methodologies associated should be incorporated in engineering degrees in higher education. Students should know how to include creative methodologies and the assessment of products from the point of view of creativity.

Creativity, in the broadest sense, has been defined as the ability to look at the problem in a different way or to restructure the wording of the problem such that new and unseen possibilities arise [1]. Creativity is a general term that can refer to four different categories which are the person, the process, ideas and product. Indeed, a person could be more or less creative and psychometric approaches try to classify the different capabilities of creativity in individuals. Creative processes are those process or methodologies that foster creativity. These processes encourage the individuals to

Table 2: Comparison of the results obtaining in the creativity process for face-to-face and collaborative virtual platform.

	Face-to-Face		Virtual platform		<i>p</i> -value
Novelty	6.3	1.06	6.6	1.06	0.640
Variety	5.8	0.99	7.1	0.83	0.016
Quality	6.0	0.81	6.7	1.25	0.230
Quantity	6.8	1.24	6.3	1.19	0.548

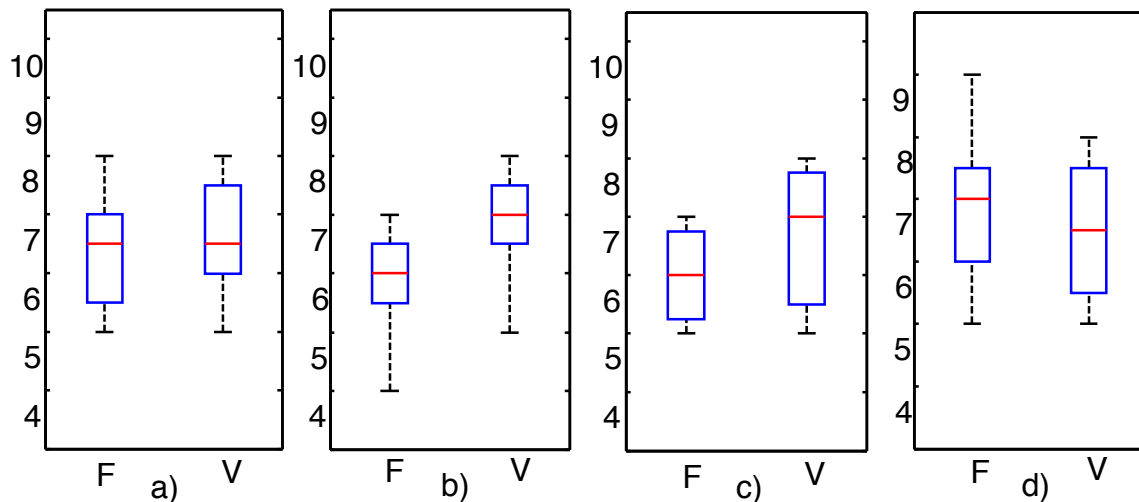


Fig. 7 Results for the evaluation of the creative process at a) Novelty, b) Variety, c) Quantity and d) Quality.

4 CONCLUSIONS

This paper explores the influence of using collaborative virtual platforms in the creative process using the well-known technique of Project Based Learning. B-Learning supposes an important help for students and instructors. It has been statistically determined that the choice of using collaborative virtual platforms has a positive effect of the variety of ideas generates in the creative process. For design problems, such as the ones that have been analyzed in this paper, the ideation method based on Brainwriting can be improved by using a virtual platform, being most effective than using oral communication alone. Out of the four factors analyzed on this paper (novelty, variety, quality and quantity) variety is the most influenced by the use of collaborative platform in the Brainwriting process. Indeed, a wide range of ideas are generated when b-learning process is implemented the educational activities and this fact has a significant influence in the outcome.

The paper also demonstrates that it is very useful to use assessment tools to evaluate the results obtained in the creative process. Two metrics tools are necessary in the PBL methodology. One metrics is necessary for the measurements of concepts generated and products, and another one for the measurement of the creative process. Metrics for concepts and product are a valuable tool for helping the students to make decisions. Metrics for creativity is useful for instructors in order to assess the creative work carried out by the students. The evaluation method is coherent with the results obtained regarding the efficiency, effectiveness and usability of the product. It has been demonstrated that an improvement in one of the creativity factors has influence in the final outcome.

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