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SYNCHRONOUS AND ASYNCHRONOUS DISCUSSIONS. A WAY TO IMPROVE CREATIVE IDEAS IN ENGINEERING EDUCATION

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Abstract

In modern engineering, educators demand effective strategies to foster creativity in students. These strategies should be implemented in the class (face-to-face teaching) and in virtual courses, providing the students to gain new skills adapted to the new technologies. Although, creativity in teaching has been investigated and there are many papers and methodologies in the literature, very little research has been carried out about the implementation of new technologies when virtual teaching is used. Thus, the main goal of this paper is to study whether the implication of asynchronous teaching can help the students to develop their knowledge and skills in the generation of new ideas. The methodology presented in this work includes the use of asynchronous material developed by the instructors and asynchronous discussions carried out by the students. These learning activities are combined with synchronous teaching and discussions taking place in the classroom. A case-study is presented in this paper where the instructors developed an active learning process using a Project-Based Learning (PBL) approach. The students, working in groups, are encouraged to use creative methods to generate original ideas using well-known approaches such as Brainstorming, Analogical thinking, Attribute list, etc. To generate new ideas discussion is needed. Thus, the instructors provide two scenarios for discussion. One of them is the classroom, where the students can discuss face-to-face (synchronous discussion). The other one is the virtual course of the subject where they can discuss online the different ideas (asynchronous discussion).

The instructors collect all the information from the asynchronous discussion generated by the students in the virtual course, and this is made in the sequential order. In this way, they can follow the discussion and participation of each student. The results of the study indicated that using asynchronous discussion in project-based learning could help to promote creativity. The influence of the virtual technological context and how it reshapes the way in which the students think and collaborate are analyzed.

Keywords: Creativity, innovation, divergent thinking, synchronous discussion, asynchronous discussion.

1 INTRODUCTION

Many courses have increased the number of online classes or using online tools to improve the efficiency of the educational activities [1], [2]. However, many instructors and lectures doubt about the capability that online sessions have to prepare students to succeed [3], [4]. Therefore, it is important to determine whether online activities can provide the students the necessary skills to be successful in their future work. On the other hand, one of the main skills that are necessary to introduce in the courses is creativity [5]–[8]. Many works have been presented in the literature where creativity has been introduced in face-to-face classes [6], [9]. Unfortunately, little work has been done in this topic to be introduced in online activities. A typical methodological strategy used in online educational activities is asynchronous discussions [10]–[14]. Asynchronous discussions enable students to participate with each other to discuss about one topic proposed by the instructor. This interaction is possible due to the existence of virtual educational platforms where forums of discussion can be created. However, there is little research work on the use of asynchronous discussion to make the students improve their creative skills. Thus, it is important to determine whether the use of these tools help the student to develop creativity. To solve this problem, it is necessary to find the answer to two questions which are (1) How should be the instructor-student interaction during the asynchronous discussions? and (2) How should be the student-student interaction? The answers to these questions should be present during the design of the educational activity. In this work, an educational activity has been designed to incorporate synchronous and asynchronous discussions during the performance of PBL in class and online.

discussion. Figure 4 shows the same assessment using synchronous discussion. The physical principles of ideas have received a better evaluation when using asynchronous discussion than those obtained using synchronous procedures. This difference is significant. However, concepts generated are very similar in the assessment. No significant differences have been found in this case. The design ideas show bigger and significant differences. Details ideas shows better results with synchronous discussion.

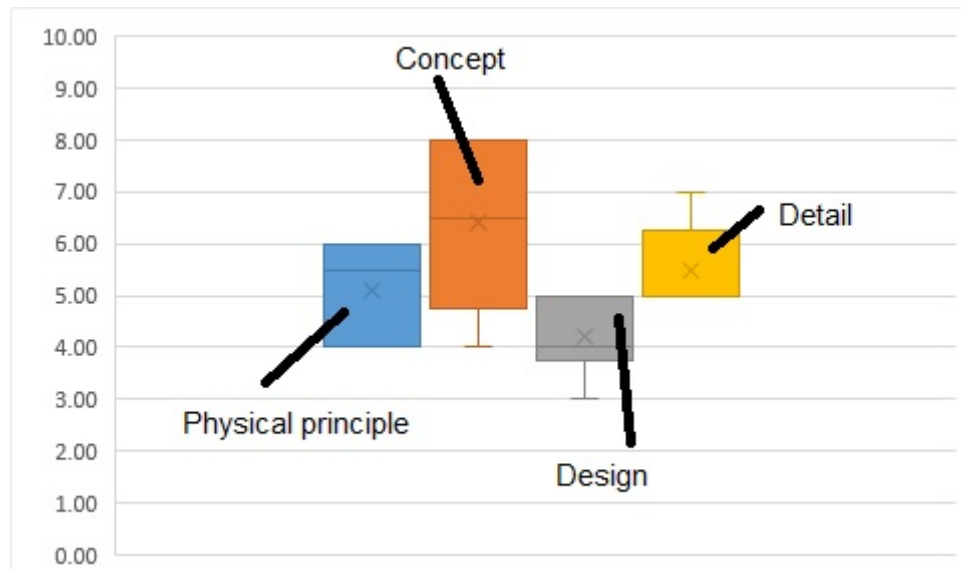


Figure 4 Assessment of the results using synchronous discussion

4 CONCLUSIONS

In this paper, the use of synchronous and asynchronous discussion in activities fostering creativity has been investigated. The main goal has been to study if the use of asynchronous methodologies could maintain, deteriorate or improve the results. The outcome shows that the results has a significant improvement. Indeed, the work has found the positive influence of using this type of communication between students. This fact allows introducing online discussion throughout the forums available in the educational virtual platform provided by the universities. Thus, the student can use these virtual tools to generate and propose ideas at any time and from anywhere. It is not necessary to schedule meetings at the university or at home. In this way, they can organize their time and chose the best moment to do the work. On the other hand, instructors can follow the students' activities in an easy way. Furthermore, the activity is recorded in the forum and the lecturers can better evaluate the work. Evidences of the students' work are also available for claims after evaluations. Future research work and more experimentation is necessary to report the efficacy of this procedure in different methodologies to foster creativity.

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REFERENCES

- [1] C. Charyton, R. J. Jagacinski, and J. A. Merrill, "CEDA: A Research Instrument for Creative Engineering Design Assessment," *Psychol. Aesthetics, Creat. Arts*, vol. 2, no. 3, pp. 147–154, Aug. 2008.
- [2] Z. Liu and D. J. Scho È Nwetter, "Teaching Creativity in Engineering*," *Int. J. Eng. Educ.*, vol. 20, no. 5, pp. 801–808, 2004.