APPLICATION OF PROMOTIONAL MARKETING ACTIVITIES TO INDUSTRIAL DRAWING COURSES IN ENGINEERING GRAPHICS

C. Martin-Doñate1, F. Lucena-Muñoz1, L. Garcia-Cabrera1, A. Mesa-Villar2

1University of Jaen (SPAIN)
2Amenduni Ibérica (SPAIN)

Abstract
The learning of standards in industrial drawing courses is traditionally based on expository methodologies. This procedure is discouraging for engineering students who can't link the knowledge of graphical standards with real industrial applications. In the field of mechanical engineering, concept design must be focused on the customer and his requirements. However, practical training activities in the field of technical drawing do seldom guide the student to obtain the best design solution according to the requirements of the customer, the one who will buy the product. With this objective, a set of innovation activities related to promotional marketing have been carried out to propose design solutions that add value to the extreme customer. The students of first course of industrial drawing, working by groups have to provide different solutions to an innovative design problem proposed by an industrial company. The CAD results and manufacturing drawings together with a promotional marketing plan have to be presented by the students to the company. The results of this innovation activities show an increase of the motivation in the students in front of the learning of the graphical standards, and an improvement in the teaching results.

Keywords: Creativity, Design, Collaborative learning, Entrepreneurship.

1 INTRODUCTION
The learning of standards in industrial drawing courses is traditionally based on expository methodologies. The use of this methodology allows the acquisition of theoretical knowledges preventing the development of practical skills required in the business field of graphic engineering. So as to improve student learning in the field of industrial design, teaching strategies centered on the student are required. These strategies have already been proposed by several authors [1] and are currently being implemented in the field of engineering. The results of these methodologies are highly effective in the field of learning industrial drawing, increasing the student motivation in areas as innovation, creativity and entrepreneurship. In this way it is possible to develop a framework for learning the standards of drawing developing skills related to collaborative learning and design.

In the field of mechanical engineering, concept design must be focused on the customer and his requirements [2,3]. However, practical training activities in the field of technical drawing of the seldom guide the student to obtain the best design solution according to the requirements of the customer, the one who will buy the product [4,5]. This fact makes the student learns methodologies in graphic engineering far from those that he will have to use in his daily work as an engineer [6]. This fact makes necessary the use of a "transdisciplinary" teaching approach (beyond the disciplines) as a pedagogical strategy focused on the fulfilment of business-type requirements. The concept of "learning by doing" as an alternative to learning encourages the creation of business spaces in which university-industry collaboration allows student learning.

The conceptualization and marketing of a design are of great importance in the growth of a company. The designer's contribution to the value of the product has been a topic of great interest for some time. Simultaneously, design is a key strategic activity in many companies, since new products contribute to the creation of a new product in substitution of an old one defining new competences in the market. Innovation is frequently incorporated into the design of new consumer goods that, in addition to including creative thinking, take into account all values for consumers.

In order to improve the skills of the students of the first course of industrial drawing, they have been presented different solutions to an innovative design problem by an industrial company working in teams. The CAD results and manufacturing drawings together with a promotional marketing plan have been presented by each team to the company. The objective of these innovation activities has been to increase the motivation in the students in front of the learning of the graphical standards, as well as
the teaching results. In a parallel manner, the students have complemented the design project with a product marketing plan.

2 METHODOLOGY

With the aim of developing graphical skills in industrial engineering a set of activities was carried out during the academic year 2018/2019. These activities have been framed in an innovation project funded by Jaen University - Spain. With this objective, a set of activities consisting of developing new design concepts and proposing a marketing plan based on a real design problem were carried out. The purpose of these activities has been to motivate and train engineering students of first course in the use of industrial design as a tool for learning the standards in industrial drawing.

An industrial company has collaborated in the innovation project. The company presented to the first course engineering students a design problem to solve. Fig 2

This design problem has been based in the increasing use of electric scooters. Unfortunately once the user has reached his destination, he does not know where to put it, depositing it in places not allowed that can cause people to stumble upon it, see Fig 3.
The students have solved by groups the design of a new fully folding scooter, capable of occupying the volume of a briefcase or a backpack. In such a way the user can have a scooter in their workplace. The new design proposals have to be different from the existing ones.

The design has been carried out in a parallel way using CAD, SW and Catia V5 tools Fig 5b, as well as free-hand sketching methodology Fig 5a. In Fig 4 it has been presented the students work.
Design is the collection of skills and abilities to develop the right ideas and market them as the successful design products. These skills are not limited with conventional ones as idea generation or CAD drawing but skill for today's modern business need the knowledge of marketing issues. For this reason the training of students in marketing techniques and business development has been complemented, applying the Canvas model and a commercial marketing element designed for customers and users.

**Fig 6a y 6b. - CAD design and virtual representation of the design proposal.**

**Fig 7. - Canvas model based on product completed by the students.**
3 RESULTS

In order to validate the results of this methodology a survey was conducted in ILIAS platform to the students that have participated in the presented activities. The survey was completed voluntarily by 64 students from different groups. The survey aims to assess whether the implementation of this activities has helped engineering students to improve their motivation during the course, and to improve the knowledges about CAD, bidimensional representation for 3D assemblies and marketing methodologies. The survey was conducted in three groups:

- Group A: 25 Students: 2 women 23 men
- Group B: 18 Students: 4 women 14 men
- Group C: 21 students: 2 women 19 men

Students were asked about the importance of applying the new design activities as an aid to the learning of drawing representation of parts and assemblies, as well as CAD modelling. Students answered affirmatively (group A in 100% Fig 9, group B in a 100% Fig 10, Group C in a 95.24% Fig 11 ). All groups evaluated the performance of the developed activities as an aid to the learning of standardization, two-dimensional representation and entrepreneurship.
Students were surveyed about the motivation of the new design activities carried out as a complement to the traditional teaching. The level of motivation was valued in a ratio of 1 to 4, with 4 being the maximum value. Students answered with the maximum value (4) (group A in 72% Fig 12, group B in an 88.89% Fig 13, and group C in a 68.18% Fig 14). The value of the arithmetic mean in group A was 3.68, in group B it was 3.78 and in group C 3.59. In all groups the most selected value was 4. All groups considered that the completion of the activities of design and marketing had increased their motivation for the subject.
Fig 12.- Survey Results.

Fig 13.- Survey Results.
4 CONCLUSIONS

In the field of mechanical engineering, concept design must be focused on the customer and his requirements. However, practical training activities in the field of technical drawing seldom guide the student to obtain the best design solution according to the requirements of the customer, the one who will buy the product. The development of the entrepreneurial capacity in engineering requires a significant change in the training processes, integrating educational and research systems to generate and experience sustainable creative processes and practices. Following this line, in the course 2018/19 in industrial engineering degree at the University of Jaen a set of activities related to developing the marketing capacity in students of engineering have been realized. The students of first course of industrial drawing, working by groups have provide different solutions to an innovative design problem proposed by an industrial company. The CAD results and manufacturing drawings together with a promotional marketing plan have been presented by the students to the company. The survey results indicate an increase of the motivation due to the new methodology that includes the marketing activities. The students of all groups have valuated the usefulness of the activities with 100% of satisfaction.

ACKNOWLEDGEMENTS

This work has been supported by the University of Jaen through the project titled “Patentabilidad, transferencia de resultados y gestión web en el desarrollo de diseños industriales con alumnos del área de expresión gráfica en la ingeniería” (Project Code PID36_201617).

REFERENCES


