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BELBIN TEAM ROLES THEORY AS ENGINEERING STUDENT GROUPING STRATEGY. INFLUENCE WORKING ON FLUID MECHANICS: LABORATORY AND PROJECT BASED LEARNING ACTIVITIES

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Abstract

Group learning mechanisms are often used in engineering degrees at university level and many research studies have concluded benefits when using Collaborative Learning (CL) in most of the cases. In the present work, we bring a group formation strategy that has been widely used around the world in many companies and organizations in order to improve results of working groups. It is based on the Belbin's Team-Roles Theory, introduced by M. Belbin on 1981, which sets main 9 different roles that human being can play working as a team. Then, after analysing each member behaviour as a team worker, makes the group composition so that the team is balanced in all its roles.

The presented Belbin group formation strategy has been applied in the Fluid Mechanics course (2nd year), in a class group formed by 86 students from four mixed different Engineering Degrees (Mechanical, Electric, Electronics and Chemical). Among all students of this class, 31 formed their working groups by the Belbin method, rest were self-organized. Working Groups were used in two kinds of activities: Laboratory Practice sessions and a Project Based Learning (PBL) activity. Laboratory accounts for the 20% of the final mark and the PBL activity for the 10%. Conclusions are presented by comparison between both group formation strategies at both activities.

Keywords: Belbin, Collaborative Learning, Grouping Strategy, Fluid Mechanics.

1 INTRODUCTION

Group learning [1]–[4] mechanisms are often used in engineering degrees at university level and many research studies have concluded benefits when using Collaborative Learning (CL) [5]–[8] in most of the cases. Student-teacher relationship is enriched by group member thoughtful discussions [7], engaging individuals in interdependent learning activities. At the same time, students can experience team working as they may do it in future as professionals. One of the main issues in order to have a successful result when using CL is the way the groups are formed [9], [10]. Two main strategies have been used traditionally: students Self-organized groups and randomly assigned by tutor [11]–[13]. The former method usually gives a homogenous composition while with the second there is some probability to get heterogeneous teams. From the beginnings of the CL, many studies say that, in general, heterogeneous teams work better than homogenous ones [13]–[15]. In addition, Belbin strategy's strength is that it builds a more balanced group than other strategy [16]–[19].

In this work, we present results of some engineering degree's (Mechanical, Electric, Electronics and Chemical) student teams working on Fluid Mechanic's Laboratory sessions and making an open case Project Based Learning (PBL) activity. Both activities are part of the same course, 2nd year undergraduate. 31 students among 86 built their Working Groups applying Belbin Team Role Theory grouping strategy. Rest students were self-organized. Results are shown by each activity mark comparison. In addition, other class Groups marks (all self-organized) are presented as well.

The presented document is organized as follows: Section 2 describes the Belbin methodology and used specific tools. Section 3 describes the course tasks which Teams need to achieve, while results of obtained marks are presented in Section 4. Section 5 shows Conclusions.

Table 4. *Team marks*

	Working Group name	Working Group Size	Team Members' average **Laboratory** mark (over 20)	**Laboratory** average mark according to strategy	Team Members' average **PBL** mark (over 10)	**PBL** average mark according to strategy
BELBIN GROUPING STRATEGY	WG1	5 members	11.5	14.92	9	8.64
	WG 2	5 members	14.4		10	
	WG 3	4 members	14.5		8.5	
	WG 4	5 members	14.6		10	
	WG 5	4 members	16.5		6	
	WG 6	4 members	18.5		7.5	
	WG 7	4 members	14.5		9.5	
SELF-ORGANIZED GROUPING STRATEGY	WG 8	5 members	10	14.87	5	6.78
	WG 9	5 members	13.5		5.5	
	WG 10	6 members	15.75		7.5	
	WG 11	5 members	17.5		6.5	
	WG 12	6 members	18.5		6	
	WG 13	5 members	17.7		9.5	
	WG 14	5 members	16.5		7.5	
	WG 15	5 members	14.1		6.5	
	WG 16	6 members	10.3		7	

Table 5. *Other class-group average marks*

Group	Class Size	**Laboratory** average mark (over 20)	**PBL** average mark (over 10)
Class Group B	95 students	14	6.2
Class Group C	74 students	10.4	5.3
Class Group D	79 students	12.6	5.2
Class Group E	26 students	12.6	4.8

University student are very used to work taking notes, reading texts, and working with computers but in addition to this, Fluid mechanic laboratory sessions require of touching real parts, and thinking about fluids experimental behaviour. In this kind of activity is much appropriated to work with teams formed by Belbin strategy, which makes heterogeneous [14] small groups and includes a wide spectrum of behaviours and roles. This increases the student success ratio.

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