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Abstract
A profound process of integration is currently taking place to adapt our methodologies to the new guidelines established by the Bologna Scheme or European Higher Education Area (EHEA). This situation is changing the way university subjects are taught in Europe. As consequence, we have to modify the teaching-learning process in terms of syllabus, didactic procedures, evaluation methodologies, etc. This paper seeks to redesign the subject of Operation Management, in the Industrial Engineering degree, to improve the work of teachers and the results for students. Several weaknesses have been detected and this justifies the need for measures to improve the efficiency of teaching and evaluation.

Keywords
Teaching-learning process, Operation Management, Bologna Scheme, Methodology redesign

1. Introduction

At present, we are facing a period of profound change in the mid-term future in the area of European university education. The European Higher Education Area (EHEA) (Council of Europe, 2011; European Commission, 2011) will form the common framework for universities in Europe. The redefinition of higher education objectives involved in this process of standardisation brings with it innovations in the way education is approached which have been evolving in universities for some time. Success will depend on the specific actions of both teachers and students, who have become the core stakeholders in this reform.

Constructing the EHEA is a process that was consolidated in the Bologna Declaration (1999), in which European education ministers urged the European Union countries to develop and implement a series of actions aimed at promoting the higher education dimension and in particular curriculum development, institutional cooperation, mobility plans, and integrated programmes of study, training and research. Learning is a crucial element and universities and their members have an active role in the realisation of the standardisation process.

The EHEA was launched in March 2010 but the implementation began ten years before. A wide range of achievements are reported during this decade of reform (Sursock et al., 2010). The higher education in Europe has been modified in a significant way as a result of globalisation and different common and national policies. European higher education institutions have embraced and implemented a complex number of changes that have affected how they operate in critical aspects. Society requirements and graduates' employability are two important reasons to alter higher education activities. Internationalisation and lifelong learning have become keys in this context. The Bologna decision-making method has led to clear advances. Some of the most relevant changes are the new student-centred learning, the reform of doctoral education and the development of quality assurance systems and certification and accreditation procedures (Gvaramadze, 2008). Obviously, some changes have not had the same level of success because they need certain conditions, such as funding. The final objective of the Bologna Scheme is to improve education with a cultural challenge and transforming the traditional teaching methodologies. It is necessary to face important costs, human resource development, new infrastructures and smaller student-teachers ratios. The condition for successful changes in the next decade requires reinforcing the links in the knowledge chain and placing universities at the centre of European and national policies.

This document describes research carried out by a team of teachers of Operation Management in the Industrial Engineering programme at the University of Malaga, Spain. The study contributes to the process of adaptation to the requirements in the Bologna Scheme.

A fundamental issue was to clearly define the problem. An initial diagnosis was made using the previous experience of teachers and brainstorming sessions with the students in the classroom. Several areas in teaching and evaluation practice which could be improved on were detected in a representative Industrial Engineering subject, Operation Management, in the Spanish university context. Ultimately, the subject under study is characterised by their inflexible and traditional methodology. Specifically, the areas for improvement are:

- Priority is given to the teaching process, and the necessary role of the learning process is forgotten. Thus, students have a secondary function in the classroom.
- Topics are strictly structured in lessons based on content with little or no coordination.
- There is a need to assess teaching because the methodologies involved are based only on lectures. Students are supposed to take notes on what they consider most relevant.
- Lack of certain technological resources.
- Limited professor-student interaction and coordination.
- Low levels of coordination and cooperation between teaching staff.
- Absence of supplementary materials to complement teaching.
- Somewhat deficient teaching methods.
- Evaluation mechanisms are based on a final exam. Continuous evaluation is missing.
- There is not a focus on entrepreneurship.

The main consequence of this situation is that the efficiency of learning process is very low since there is no interaction.

Responding to these weaknesses is the purpose of the present study. The EHEA is a relatively new development and despite the fact that much has been written in recent years on the highly relevant subject of the implications of the EHEA model for the Spanish university system, and that research has been increasingly detailed, we have not found a similar study with emphasis on Operation Management as a subject of the Industrial Engineering degree.

2. Theoretical context

As in other fields of knowledge, the teaching of Industrial Engineering subjects within the University framework has been changing in line with the demands of the current educational system. Hence in recent years there has been an emphasis the use of lectures in the teaching-learning process (Myrick, 1993) in detriment of other aspects which could be taken into consideration in a more detailed way for evaluation, such as, for example, the student's work. The requirements of the European model are changing this trend (Alvarez-Rojo et al., 2011).

This list highlights the core ideas of the EHEA with respect to teaching (Zabalza, 2006):

- Learner-centred teaching.
- Role of teacher as facilitator of learning.
- Clearer definition of objectives and competencies.
- New organisation of teaching activities, in blocks, and using seminars and practical classes.
- Changes in the organisation of learning: modules.
- Preparation of the individual for autonomous, yet accompanied learning.
- Emphasis on the use of learning tools, not just the accumulation of knowledge.
- Balance between demands on and support for learning.
- Teaching adapted to curriculum parameters: continuity.
- Teaching revolving around the following aspects: intellectual, social, practical and personal.

The new system forces us to re-think teaching. We cannot persist with traditional classes. Classes will have to be planned and developed with learners and their specific needs. Teaching has to be restructured around the students and their particular characteristics and motivation to learn (Law et al., 2009). The three basic components which have to be taken into account in the teaching process are: large groups (lectures), small groups (seminars, workshops, etc.) and tutorials. Curricula need to be interdisciplinary and modular which makes them more adaptable to the continuous changes in the teaching-learning process.

The active role of students in their own learning must be enhanced in the new system and resources must be provided to allow them to achieve this to the full. This is a central point. A lack of resources could jeopardise the process. Furthermore, students must be prepared for ongoing training, or rather life-long learning.

The concept of *quality* takes on a crucial role in the new process of teaching-learning promoted by the new EHEA scheme (Stankeviciene, 2007). This is due to a variety of reasons such as greater competitiveness, high levels of achievement required, etc. The current trend for quality in education is focused on the global effectiveness of the education offered. Teaching quality is thus becoming more and more important.

A common feature of all types of education is the greater importance given to student performance (learning effectiveness) and the overall efficiency of the education offered. The student is the focal point of the system, as endorsed by the EHEA. This is the reason for the increased interest in quality assurance methods. Despite the greater attention paid to organisational factors such as the necessary conditions to guarantee quality, effective education cannot take place without significant dedication by teachers. The methods employed in optimising quality in education are doomed to failure if they fail to support the internal motivation of teachers or are incapable of maintaining or improving their levels of training (Schmidt and Gibbs, 2009).

The need to improve teaching practice and all that this implies, such as the teaching-learning process, motivation to learn, evaluation, the student-teacher relationship, links between the university and business, etc., is clearly illustrated in many recently published books and papers. We can highlight, for example, the study by Benito and Cruz (2005) which tackles the new issues for university education raised by the EHEA and Bergström (2010) who analyses the relationship between student and teacher under a process-based assessment perspective.

Special emphasis is placed on active methodologies (cooperative learning, problem-solving, or case methodology), continuous academic evaluation, evaluation and learning, technological resources, and research into teaching. Furthermore, in 2006 the Spanish Ministry of Education and Science published proposals for revamping educational methodologies in the universities.

Villar-Lopez and Linares-Navarro (2011) analyse the subject Business Management and compares learning-teaching methodologies and evaluation systems in two degrees, one of them non-adapted to the EHEA framework and the other one adapted to it. They compare methodologies used in the practical part of the subject (expositions, work in groups, multimedia resources, etc.) and systems of evaluations (practical and theoretical parts of the subject). This comparison enabled them to understand how are working the new degrees adapted to the EHEA and which is the students' perception in both cases. The results of the paper establish the better perception of adapted students compared to non-adapted students.

Medina-Lopez et al. (2011) analyse the publication of studies on Operations Management teaching in high impact journals. Their objective is to examine trends and establish future challenges. According to them, there are not many articles on teaching in Operation Management. 62.2% of the journals analysed have not published any and the remainder have devoted only 0.4% of all their publications to this subject. Both descriptive and theoretical studies dominate. They mainly deal with teaching innovations. One of the most relevant challenges identified is the need to develop quality empirical studies to know in a better way the impact of teaching methodologies on improving student performance.

As a starting point for our research, a previous study by Alfalla-Luque and Dominguez-Machuca (2001) was taken in which teaching staff, course contents and teaching methodology used are the three aspects explored. These aspects are important to university training. Their study focuses on the subject *Operations Management* in the Industrial Engineering programmes. These were analysed empirically at Spanish universities, based on a survey of the total population of instructors in this discipline. The study concentrates particularly on the third element mentioned previously, specifically the teaching methods used, assessment methods, didactic material and support tools, all basic to effective teaching in that discipline. The main conclusion is that the teaching process is remarkably traditional, using typical oral lessons, supported by blackboard and presentations with slides. Students have to prepare individually to pass the final exam. On only a few occasions were case studies, working in teams, or laboratories considered didactic tools.

The document presented here is an extension of the above studies, considering a very relevant subject in Industrial Engineering that is Operation Management and topics to be analysed. Therefore, it involves a major undertaking. This is one of the main novelties of this research.

3. Purposes of the research

The main aims of the study were basically to as follows:

- evaluating teaching process to detect weak points and opportunities for improvement;
- gathering students' opinions regarding theoretical and practical content as well as that of other teachers linked to the subject involved in the study;
- identifying the skills of students to maximise them in the teaching-learning process;
- establishing the resources to increase the efficiency of the teaching-learning process;
- building university-to-business relationships in order to complement teaching practice;
- involving students in the project to familiarise them with established procedures which may also be useful to them in their professional careers;
- improving coordination between teachers and between participating students;
- developing new syllabi for the subject to cover current requirements; and
- promoting entrepreneurship among students.

In short, it is an attempt to draw up a complete set of guidelines to reflect the main features of the teaching-learning process as established by the EHEA. The previously outlined objectives make up the essence of the new EHEA approach. They have been modelled in terms of a group of hypothesis to be verified or refuted. The present empirical study aims to investigate them. The hypotheses are described as follows (Romero et al., 2003; Álvarez, 2000):

Hypothesis 1: Traditional teaching methods have to be adapted to new requirements. Teaching should not only be carried out through lectures. Students have to be more relevant.
Hypothesis 2: Many current teaching materials which are obsolescent and lacking in educational rigour need to be reformulated and improved to adapt them to changing demands.
Hypothesis 3: Teachers play a facilitating role in the new process in the sense that they are responsible for guiding the student in their learning tasks.
Hypothesis 4: Assessment and grading methods need to be modified. They are traditional methods and prioritise teaching above learning. The role of student needs to be emphasised.
Hypothesis 5: Study programmes need to be restructured to make them more practice-focused, rather than built around traditional lectures.
Hypothesis 6: Teaching aids such as computer, slide projector, etc., play an essential role in the new model.
Hypothesis 7: Tutorials are not merely useful for resolving individual questions. They should be converted into a student resource covering three areas: academic, social and professional.
Hypothesis 8: There is a need to include the experience of real companies in order to adapt the theoretical content to the real business world.
Hypothesis 9: Students have not a vision of entrepreneurship when they conclude the degree of Industrial Engineering.

4. Methodology

The key task was to modify the curriculum and the evaluation procedures of the subject of Operation Management taught by the teachers on the research team, who are members of the School of Industrial Engineering at the University of Malaga.
The subject of study is Operation Management. It is taught in the fifth-year course of the Industrial Engineering degree at the School of Industrial Engineering. This subject is aimed at developing the issues related to a production system: products and services, costs, processes strategies, capacity, plant layout, location of factories, work methods and measurement, logistics, inventory management, planning, programming, control, etc.

Our experience in carrying out the study includes:

- an initial diagnosis; setting of objectives;
- setting tasks to meet the objectives;
- carrying out a diagnostic procedure to ascertain the initial situation;
- developing a questionnaire for students which would illustrate strengths and weaknesses in teaching practice and perceived needs;
- information gathering via the questionnaire;
- analysing the information statistically;
- drawing conclusions;
- making proposals for improvements in curriculum design and evaluation procedures;
- implementing improvements; and
- following up and controlling the actions taken.

The follow-up and control of the actions taken in the study is ongoing. The data provided here will feed back into the system and contribute to future improvements.

Throughout the period in which the study was carried out, meetings of participating teachers were held with the aim of establishing common ground through group activities such as brainstorming, presenting data gathered individually, etc.

The actions forming part of the research *methodology* are outlined below:

a) Developing a questionnaire on evaluation.
b) Interviewing students.
c) Encouraging the active participation of both students and teachers.
d) Analysing the students' work.
e) Reporting on the teacher diaries for improving efficiency at work and wider recognition.
f) Adapting didactic materials for each subject.
g) Using Information and Technology applications to the teaching of the subject.
h) Using evaluation tools agreed on with students.
i) Designing efficient training strategies to help students work on the course content.
j) Encouraging students to participate in practical sessions.
k) Comparing the students' post-research results with those from previous courses.
l) Contrasting the initial objectives with the results achieved at the end of the study.

We assessed the impact of the study in terms of the interest and motivation among students towards the subject considered. There were regular research coordination meetings to evaluate the ongoing study and to have critical reflections of the participants in the working group.

In terms of research stages, we have: planning, implementation, follow-up and control, and conclusions, spread out as can be seen in Figure 1 below across seven months. The chronology corresponds from February to July 2011.

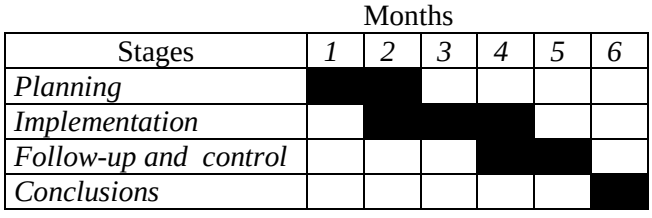

Figure 1. Timeframe of the study

5. Results, discussion and practical implications

The results which were obtained during the study were based principally on data from the questionnaire handed to the students. The information was collected after a reasonable period of time had elapsed to allow the students to be as objective as possible in evaluating methodology, syllabus and the work of the teachers. The questionnaire was designed using closed questions with a 5-point Likert scale. Open questions were also used so that students could express their opinions. The global results obtained from all the questionnaires given to the subject are displayed here.

5.1. Total population of the study

The analysis is carried out on a sample of 122 students.

5.2. General student information

The following points show general student data.

1. Age distribution
Students age 23/26 are the largest group (48.36%) and age 27/30 (19.67%) are the second one and age under-23 comes in third (18.03%).

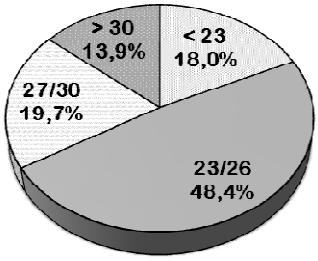

Figure 2. Age distribution

2. Gender distribution
Males represent 82.79% and females, 17.21%.

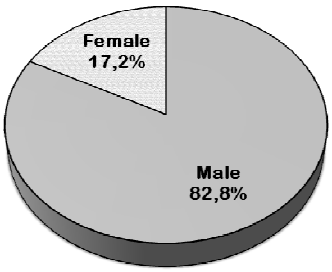

Figure 3. Gender distribution

3. Distribution of repeating students
Non repeating students make up 68.03% of the sample and repeating students 31.97%.

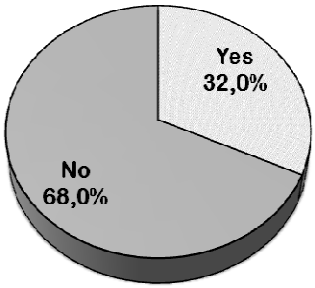

Figure 4. Repeating student distribution

4. Attendance distribution

Very high attendance: 57.38%. High attendance: 22.95%. Average attendance: 15.57%. Low attendance: 2.46%. Very low attendance: 0%. The rest, 1.64%, did not respond.

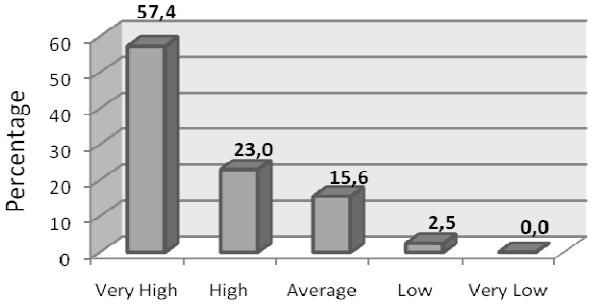

Figure 5. Attendance distribution

5. Work and study distribution

Students who only study represent 74.59%. Students who are working and studying are 23.77%. The rest, 1.64%, did not respond.

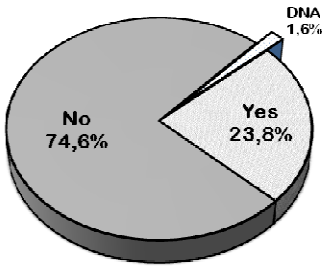

Figure 6. Work-Study distribution

5.3. Dimensions considered

All questions here are of the closed type with the higher numbers on the 5-point Likert scale representing higher degrees of satisfaction. Responses are supplied for each case, as well as numbers who did not answer (DNA), the mean (M) and the standard deviation (SD). The results are shown in Tables 1-9.

Table 1. Class management

	1	2	3	4	5	DNA	Total	M	SD
1.1. Clarity in explaining concepts	2	14	42	47	17	0	122	**3,52**	**0,93**
1.2. Explanatory style	1	23	47	40	10	1	122	**3,29**	**0,90**
1.3. Setting objectives and signalling main section of each topic	1	12	41	47	19	2	122	**3,59**	**0,90**
1.4. Maintaining student interest and attention	4	21	44	46	3	4	122	**3,19**	**0,88**
1.5. Transmission of knowledge	2	10	45	48	15	2	122	**3,53**	**0,88**
1.6. Ordered presentation of content	2	6	25	60	28	1	122	**3,88**	**0,88**
1.7. Mastery of the subject by the teacher	2	9	35	50	26	0	122	**3,73**	**0,94**
1.8. Clear answers to student questions	4	11	41	41	22	3	122	**3,55**	**1,01**
1.9. Friendly attitude towards students	1	7	26	66	19	3	122	**3,80**	**0,81**
1.10. Teacher present in class	2	2	3	25	88	2	122	**4,63**	**0,77**
1.11. Teacher punctuality	1	9	14	41	55	2	122	**4,17**	**0,96**
1.12. Valuing of student opinions by teacher	4	16	32	50	14	6	122	**3,47**	**0,99**
1.13. Enjoyable/relaxed classes	7	25	36	42	12	0	122	**3,22**	**1,06**
1.14. Breaks	40	21	24	21	13	3	122	**2,55**	**1,39**
1.15. Number of students in class	10	15	33	45	17	2	122	**3,37**	**1,13**
1.16. Positive attitude by students in general in class	1	8	46	42	19	6	122	**3,60**	**0,87**
Frequency	*84*	*209*	*534*	*711*	*377*	*37*	*1952*	**3,57**	**1,06**
Percentage	*4,3*	*11*	*27*	*36*	*19,3*	*1,9*	*100*		

Table 2. Subject contents

	1	2	3	4	5	DNA	Total	M	SD
2.1. Syllabus contents adapted to proposed objectives	1	13	30	57	10	11	122	**3,56**	**0,85**
2.2. Number of topics (amount of subject matter)	4	15	28	40	33	2	122	**3,69**	**1,11**
2.3. Topics conform to content	2	4	33	70	10	3	122	**3,69**	**0,75**
2.4. Coverage of the topics	5	8	51	43	13	2	122	**3,43**	**0,92**
2.5. Up-to-date contents	2	5	41	55	12	7	122	**3,61**	**0,80**
2.6. Usefulness of contents for professional career	4	14	28	52	19	5	122	**3,58**	**1,01**
2.7. Student proposals regarding content taken into account	17	19	43	21	3	19	122	**2,75**	**1,05**
2.8. Overlap of contents with other subjects	16	25	37	22	14	8	122	**2,94**	**1,21**
Frequency	*51*	*103*	*291*	*360*	*114*	*57*	*976*	**3,42**	**1,02**
Percentage	*5,23*	*11*	*30*	*37*	*11,7*	*5,84*	*100*		

Table 3. Teaching resources

	1	2	3	4	5	DNA	Total	M	SD
3.1.Suitability and sufficient quantity of resources used	7	17	54	24	6	14	122	**3,05**	**0,93**
Tools used									
3.2. Slide projector	58	15	20	16	5	8	122	**2,08**	**1,28**
3.3. Blackboard	7	6	28	45	34	2	122	**3,78**	**1,10**
3.4. Website for the subject	60	22	19	6	1	14	122	**1,76**	**0,99**
3.5. Use of computer room	61	18	9	10	8	16	122	**1,92**	**1,31**
3.6. Additional information (bibliography, articles, photocopies, etc.)	16	18	43	32	7	6	122	**2,97**	**1,11**
3.7. Transparencies	15	20	41	28	10	8	122	**2,98**	**1,14**
3.8. Classroom debates, conferences, seminars, etc.	66	19	13	9	2	13	122	**1,73**	**1,08**
Frequency	*290*	*135*	*227*	*170*	*73*	*81*	*976*	**2,55**	**1,33**
Percentage	*29,7*	*14*	*23*	*17*	*7,48*	*8,3*	*100*		

Table 4. Communication between student and teacher

	1	2	3	4	5	DNA	Total	M	SD
4.1. Interaction in class	6	16	42	43	11	4	122	**3,31**	**0,99**
4.2. Teaching style adapted to students' needs	2	14	45	45	12	4	122	**3,43**	**0,89**

4.3. Readiness of the teacher to help	2	8	23	60	23	6	122	**3,81**	**0,89**
4.4. Students encouraged by teacher to raise questions and doubts	1	19	34	51	16	1	122	**3,51**	**0,94**
4.5. Accessibility of the teacher in his office	5	19	22	41	19	16	122	**3,47**	**1,12**
Frequency	*16*	*76*	*166*	*240*	*81*	*31*	*610*	**3,51**	**0,98**
Percentage	*2,6*	*12,5*	*27,2*	*39,3*	*13,3*	*5,1*	*100,0*		

Table 5. Practical classes

	1	**2**	**3**	**4**	**5**	**DNA**	**Total**	**M**	**SD**
5.1. Evaluation of individual practice	6	14	42	40	13	7	122	**3,35**	**1,01**
5.2. Evaluation of practice in group	10	16	42	27	6	21	122	**3,03**	**1,03**
5.3. Sufficient practice	7	28	38	34	15	0	122	**3,18**	**1,10**
5.4. Practical sections apply theoretical content	4	16	38	49	12	3	122	**3,41**	**0,96**
5.5. Teacher involvement	2	6	41	52	20	1	122	**3,68**	**0,87**
Frequency	*29*	*80*	*201*	*202*	*66*	*32*	*610*	**3,34**	**1,02**
Percentage	*4,75*	*13*	*33*	*33*	*10,8*	*5,25*	*100*		

Table 6. Tutoring

	1	**2**	**3**	**4**	**5**	**DNA**	**Total**	**M**	**SD**
6.1. Student attendance at tutorials	23	26	38	12	1	22	122	**2,42**	**1,01**
6.2. Accessibility of teacher	3	10	41	44	19	5	122	**3,56**	**0,95**
6.3. Types of tutorials proposed (face-to-face, virtual, etc.)	8	19	33	35	9	18	122	**3,17**	**1,07**
6.4. Sufficient number of tutorial hours	5	25	30	36	18	8	122	**3,32**	**1,12**
6.5. Teacher gives tutorial timetable	4	11	25	50	29	3	122	**3,75**	**1,04**
6.6. Teacher keeps to timetable	8	10	27	47	22	8	122	**3,57**	**1,11**
6.7. Teacher encourages students to go to tutorials	5	21	33	38	12	13	122	**3,28**	**1,05**
Frequency	*56*	*122*	*227*	*262*	*110*	*77*	*854*	**3,32**	**1,12**
Percentage	*6,56*	*14*	*27*	*31*	*12,9*	*9,02*	*100*		

Table 7. Evaluation system

	1	**2**	**3**	**4**	**5**	**DNA**	**Total**	**M**	**SD**
7.1. Evaluation system is suitable to subject	8	20	47	28	12	7	122	**3,14**	**1,05**
7.2. Aspects evaluated (exams, exercises, written work, classroom participation, attendance, reviews of texts and articles)	8	19	41	28	9	17	122	**3,10**	**1,05**
7.3. Continuous assessment	22	26	30	25	7	12	122	**2,72**	**1,20**
7.4. Importance given to traditional exam	5	8	28	40	24	17	122	**3,67**	**1,06**
7.5. Evaluation criteria known to students	8	21	39	31	14	9	122	**3,19**	**1,10**
7.6. Required level is fair with respect to class work covered	2	13	31	40	20	16	122	**3,59**	**0,99**
7.7. Speed in returning results	11	15	38	21	7	30	122	**2,98**	**1,09**
Frequency	*64*	*122*	*254*	*213*	*93*	*108*	*854*	**3,20**	**1,12**
Percentage	*7,49*	*14*	*30*	*25*	*10,9*	*12,6*	*100*		

Table 8. Entrepreneurship development

	1	**2**	**3**	**4**	**5**	**DNA**	**Total**	**M**	**SD**
8.1. Importance of entrepreneurship knowledge	0	2	22	48	49	1	122	**4,19**	**0,79**
8.2. Personal level of entrepreneurship knowledge	10	36	34	29	12	1	122	**2,98**	**1,13**
8.3. Entrepreneurship knowledge level provided by the Industrial Engineering degree	14	31	53	17	4	3	122	**2,71**	**0,97**
8.4. Need of increasing entrepreneurship skills in the Industrial Engineering degree	0	5	29	48	38	2	122	**3,99**	**0,85**
8.5. Level of development of entrepreneurship in the Industrial Engineering degree	20	50	41	10	0	1	122	**2,34**	**0,85**
Frequency	44	124	179	152	103	8	610	**3,24**	**1,17**
Percentage	7,21	20,3	29	25	16,9	1,31	100		

Table 9. Distribution of global scores

Evaluation	*Frequency*	*%*
1	0	0%
2	11	9.01%
3	50	40.98%
4	51	41.80%
5	7	5.74%
Did not answer	3	2.46%
Total	*122*	*100%*
Mean: 3.45		
Standard deviation: 0.75		

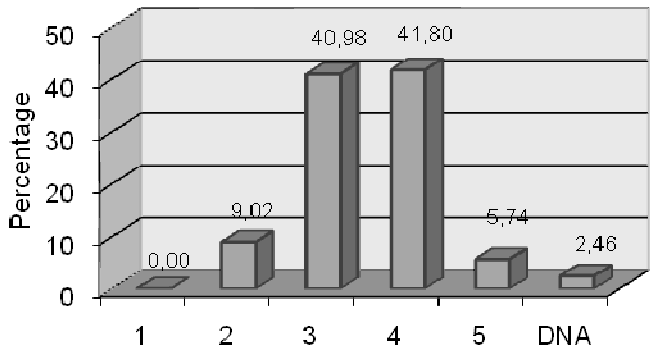

Figure 7. Distribution of global scores in terms of percentage for every answer from questionnaire

After analysing the information gathered, the findings stress the existence of strengths and weaknesses in the teaching of Operation Management. The main objective is to eliminate or reduce the effects of the weaknesses detected. In essence, the aim is to satisfy the needs of the student, ensuring a minimum level of quality regarding syllabus, methodology and evaluation of teaching. These aspects need to meet the demands of the EHEA.

We will now make a global evaluation of the subject involved in the study, highlighting the most relevant aspects observed by the working group.

Overall, the students who answered the questionnaire attended class with a high or very high frequency (around 80%), which means the data can be considered representative. Students age 23/26 are the largest group (48%). There is a large majority of men (more than 82%) compared to women (around 18%) in the sample. Almost a quarter of the students (24%) have jobs, which helps them understand the practical side of the subject. The great majority (68%) are studying the subject for the first time.

Given all the findings, we can make the following assessment of each of the dimensions included in the study.

1. Class management

Here responses are grouped around 3.5, and the most valued aspects are: attendance and punctuality of the teacher, clarity of explanations, ordered presentation of contents, friendly attitude towards students and mastery of the subject by the teacher. Helping the students towards an overall vision of the subject by frequently telling them where they are in relation

to the objectives and the topic as a whole was also highly valued. Teachers attempt to keep the students' attention focused on the topic in question, to make classes enjoyable and to improve the transfer of knowledge. This is a direct result of student feedback. Class size did not seem to be a big problem in any of the classrooms. It is always better to have smaller classes to ensure greater interaction and thus greater efficiency in the teaching-learning process. Students also want to have a break during the class. This is the least valued item.

2. Subject content

The average score here is 3.4. In general, students appear to be satisfied with the subject contents, scoring them as up-to-date and useful for their careers. They also seem to agree with the coverage of the topics in the subject. However, they feel that their own proposals regarding content should be given more attention. Some students find that the contents of some subjects overlap with others. In subjects related to engineering, there is often a gap in the contents of the course and the advances in some of the fields covered. The students detect this and the teacher makes an effort to transmit the new knowledge. As soon as the students move out into to professional world, which is usually up-to-date on all innovations, they must not find a noticeable gap between the knowledge they acquired at university and that required outside. This will ensure that they are able to deal with their work more successfully.

3. Teaching resources

This is one of the weakest areas, given that the subject is basically taught through lectures and problem solving, using almost exclusively the blackboard as a medium. The average mark reaches level 2.55. Of all teaching resources, students clearly favour the improvement of the technological resources. Because of its usefulness and suitability for the subject, students recommend using websites. In addition, an increased use of computer rooms is requested.

4. Communication between student and teacher

In general, questions relating to communication between teacher and students are scored medium-highly. The most frequent response to each item is 3.5. The attitude of the teacher towards the students is highlighted as is the encouragement to ask questions. Communication between student and teacher in the classroom depends to a large extent on how well the former grasp new concepts. Once the material is learned, students begin to ask their teacher questions, thus forging a new relationship.

5. Practical classes

In this section, responses cluster around 3.3, pointing to a moderate degree of satisfaction. Specifically, the results of the questionnaire show that students complain about the insufficient number of practical classes and would like to see an increase. They note that these should be based on illustrative exercises, problem solving, case studies, problem-based learning, etc. They also feel that practical work, both individual and in groups, should play a more important role. In the case of engineering one of the main areas of dissatisfaction is the overload of practical work in the subject. Nevertheless, this is fully justified as it is essential for consolidating theoretical knowledge and putting it into practice.

6. Tutoring

This item has a satisfactory score. Teachers observe their timetables and are normally accessible, although it is true that there should be more encouragement for students to attend tutorials. Furthermore, with an average score somewhat above 3, it can be improved. The most highly valued point is that the teachers make their timetable known. We should point out that tutorials are generally used infrequently by students, except when examinations are

approaching. It is worth noting that in some cases of smaller groups many doubts are resolved during the class itself, making the need for tutorials unnecessary.

7. Evaluation system
Scoring this section 3.2, it is clear that the evaluation system currently in use is not considered to be highly suitable. It must be said, however, that in some cases students could not give well founded opinions as they had not yet been examined. The evaluation system is usually presented to the students and deemed suitable by them, but with some exceptions. The system comprises an examination along with some marks for class or project work. Students believe that the traditional examination has a disproportionate influence in the final grade. Further, there are occasional complaints regarding the enormous workload necessary for the final exam. The great majority are in favour of a system of continuous assessment. Given the large number of classes, however, a continuous assessment of student work is not feasible.

8. Entrepreneurship development
The average score in this section is 3.2. This means that students are not satisfied with the current implementation of activities aimed at promoting entrepreneurship. They consider this a key point for their near future because the analysed subject is included in the last year of the Industrial Engineering degree. Therefore, teachers should introduce more entrepreneurship-based activities not only in the subject of Operation Management, but also, in the degree.

9. Global evaluation of the subject
An important percentage of those questioned responded with medium-high degree of satisfaction (between 3 and 4). While this is a positive result, it should not lead to unfounded optimism as the level of dissatisfaction is considerable.

In the interests of improving teaching practice in the subject covered, as well as other subjects, the methodology of the study is based on the opinions of the students. Having evaluated the different aspects of the teaching-learning process, we have been able to point out certain issues which could be improved. The results of the experience can be broken down into a list of improvements needed to be made in the subject with the aim of achieving the proposed goals. The main points of the action plan are as follows:

1. Class management
- Present an outline at the start of the class, clearly stating objectives and the practical use of the topic to be covered.
- Feedback can be obtained from the students using questions related to the subject.

Hypotheses 1 and 3 are confirmed.

2. Subject content
- Explain the importance of the subject matter for their professional career.
- Use current examples.
- Fit the number and timing of the topics to be covered to the course length.
- Gather student suggestions at the end of each term to improve course contents.
- Reduce overlapping course content to the minimum necessary to ensure understanding.

This confirms *Hypothesis 5*.

3. Teaching resources
- Make greater use of the computer room to promote computer assisted learning or virtual learning.

- Design a website for the subject that contains essential information, such as the objectives and methodology, supplementary exercises, additional reading and bibliography, web links of interest, etc.

Hypothesis 2 is thus confirmed, as is *Hypothesis 6* in part. The use of other complementary tools was not highlighted, given that these are typically used already.

4. Student-teacher communication

- Drawing up a questionnaire for evaluation purposes.
- Reducing the number of students per teacher to ensure closer guidance during the course.
- Emphasise the need to clear up possible doubts about material covered, so as to avoid problems with the upcoming subjects.
- Better teacher-student relationships should be encouraged, and there should be incentives for increased teacher accessibility.
- Student presentations should be developed, incorporating teacher corrections.

This should allow us to confirm the arguments posited in *Hypothesis 3*.

5. Practical classes

- Increase the number of practical classes.
- Use case studies involving real companies covering the final topics of the course when the student has reached a fuller understanding of the subject.
- Update the practical lessons and give the student reasons and objectives to carry them out, so that they are not just the application of theoretical tools studied in class.
- Promote practical sessions which involve teamwork.
- Avoid overloading the student with too many practical sessions.

As with the previous area, *Hypothesis* 5 is confirmed. With regard to *Hypothesis 8,* it is confirmed only in part.

6. Tutoring

- Encourage students to go to tutorials.
- Flexible timetables.

These points do not confirm *Hypothesis 7* but it must be pointed out that students are still heavily influenced by the traditional notion of tutorials. Nevertheless, their interest in approaching other topics, mainly relating to careers, has been noted in class. This means that the idea of the tutorials should be extended from the teachers' office to the classroom.

7. Evaluation system

- Apply a system of continuous assessment.
- Consider the possibilities of continuous assessment of class work and projects, and consider reducing the importance of traditional examination.

This then illustrates *Hypothesis 4.*

8. Entrepreneurship development

- Introduce the business plan as a tool to bring about entrepreneurship among the students.
- Give lectures by young entrepreneurs to explain their experience.

This confirms *Hypothesis 9.*

In addition, it would be interesting to carry out complementary activities which can help students to understand their subject better. Visits to companies, for example, can provide valuable learning experiences for students, as long as the learning objectives to be covered are clearly established. Conferences, seminars, talks and workshops can also be organised, to

which businesspeople and professors researching in areas linked to the subject can be invited as speakers. This would provide a practical vision and greater insights into business realities.

With regard to the usefulness of the study, it is necessary to point out that it has yet to be evaluated fully, which means that the course of action is still open. Nevertheless, the group is generally quite happy with the study and its findings. All the demands required of the study at the start have been met, both in terms of quality as well as in learning and experience gained.

6. Conclusions

The traditional process of teaching has to be modified so that students are taught how to learn as established by the European Higher Education Area (EHEA). It is necessary to decrease the influence of subject contents, oral lessons by teachers, individual study by students, exams, classrooms, etc. Conversely, other aspects have to be enhanced, such as multidisciplinary topics, problem based learning, supervised learning, practical lessons, working teams, self-evaluation and peer evaluation, working rooms, etc. Teachers have to improve their expertise in order to include all these aspects in their methodologies.

The paper provides a comprehensive framework that can be adopted to evaluate the usefulness of an instructional approach using a student survey via a structured questionnaire. A set of hypotheses were posed and they were almost completely validated.

The novelty of this research is the consideration of a relevant subject related to Industrial Engineering, Operation Management, analysing the teaching-learning process through a multi-topic questionnaire. The final objective was to understand the current situation and to establish different ways to correct the inefficiencies detected and guidelines to improve that process. It is important in that it addresses students' demands.

According to the results of our research, the principles of the EHEA demands that teachers acquire and put into practice new teaching skills. They presents shortcomings on competences to facilitate the development and evaluation of a teaching-learning process focused on the student. Teaching methodologies focused on content are mostly used in universities, instead of active teaching-learning methodologies. Furthermore, teachers resources, practical classes, evaluation system and entrepreneurship development are dimensions to be improved.

Although this work applies to a specific context, the results and conclusions obtained could be generalized to other engineering degrees because the problem profile is approximately the same. With some limitations, they could even be extended to other engineering degrees due to the general nature of the questionnaire. Therefore, it is possible to channel efforts to generate results which can be of use to the rest of the university community.

We are in a point of no return in the implementation of the EHEA which means to be on the way of continuous improvement. It should be noted that it is the road to follow for teachers and students alike in their journey towards convergence in the improved efficiency of the university education system.

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