ARTÍCULO 3

TEACHING MANAGEMENT IN ENGINEERING SCHOOLS: A PRACTICAL APPROACH[1]

ENSEÑANZA DE LA GERENCIA EN ESCUELAS DE INGENIERÍA: UN ENFOQUE PRÁCTICO

ENSINO DA GESTÃO NAS ESCOLAS: UMA ABORDAGEM PRÁTICA

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ABSTRACT

By means of an action-research approach, this paper is an account of a comprehensive academic experience. It was performed and assesed using a sample of 344 participants, distributed in 12 different groups who were part of the bachelor degree program in Industrial Engineering at a Colombian university. To this end, a set of pedagogical practices, based mainly on teaching cases supported by ICT tools was implemented. This study includes a summary of each case developed, a description of their implementation and their assessment process and results. Outcomes indicate that according to student's perceptions, there is a clear superiority of these initiatives over traditional teaching techniques based on conventional lectures, even after six months of the experience. It contributes by encouraging the transfer of this knowledge into some other contexts to stimulate further development and to help in the creation of better educational processes for future professionals in engineering, as well as in other professions.

Keywords: Pedagogy in management; teaching-case methodology; ICT for education; action-research.

RESUMEN:

Este trabajo documenta una amplia experiencia académica que, mediante un enfoque de investigación-acción, se completó con una muestra de 344 participantes, distribuidos en 12 grupos diferentes que formaban parte del programa en Ingeniería Industrial de una universidad colombiana. Para ello, se implementó un conjunto de prácticas pedagógicas, basadas principalmente en casos de enseñanza apoyados por herramientas TIC. Este estudio incluye un resumen de cada caso desarrollado, una descripción de su implementación y su proceso de evaluación y resultados. Los resultados indican que, según las percepciones de los estudiantes, existe una clara superioridad de estas iniciativas sobre las técnicas de enseñanza tradicionales basadas en clases convencionales, incluso después de seis meses de experiencia. Contribuye a fomentar la transferencia de este conocimiento a otros contextos, con el fin

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de estimular su desarrollo y a desarrollar mejores procesos educativos para futuros profesionales en ingeniería, así como en otras profesiones.

Palabras clave: Pedagogía en gestión; Metodología de enseñanza-caso; TIC para la educación; investigación para la Acción.

RESUMO:

Este trabalho documenta de uma experiência acadêmica abrangente que, por meio de uma abordagem de pesquisa-ação, foi concluída com uma amostra de 344 participantes, distribuídos em 12 grupos diferentes que faziam parte do programa de licenciatura em Engenharia Industrial em uma universidade colombiana. Para este fim, foi implementado um conjunto de práticas pedagógicas, em grande parte com base em estudos de casos apoiados por ferramentas de TIC. Este estudo inclui um resumo de cada caso desenvolvido, uma descrição da sua implementação e processo de avaliação e resultados. Os resultados indicam que, de acordo com as percepções dos alunos, há uma clara superioridade dessas iniciativas sobre as técnicas tradicionais de ensino com base em palestras convencionais, mesmo após seis meses de experiência. Contribui para promover a transferência desse conhecimento para outros contextos, a fim de promover o seu desenvolvimento e contribuir para a criação de melhores processos de ensino para futuros profissionais de engenharia e outras profissões.

Palavras-chave: Pedagogia na gestão; Metodologia de ensino-caso; TIC para a educação; Pesquisa-ação.

INTRODUCTION

Lately, teaching strategies and learning techniques have an increasing importance to develop fundamental students' capacities in all levels and programs (Perry, Hunter, Currall & Frauenheim, 2017). Up to now, student-centred strategies are considered a worthwhile effort that leads to good performance of future professionals in management-related areas. In engineering schools and faculties, this idea has been at the top of their pedagogical agenda during last years, even despite being considered purely technical institutions (Cropley, 2015). In those institutions, pedagogical methods are usually aimed at properly educating future professionals in different fields of engineering, who in turn will look for a better performance of projects, systems and organizations (Perry & others, 2017). From this point of view, since these programs have common elements with many management-related studies and programs, designing and implementing pedagogical strategies could be shared with those, to deliver an effective educational process. Considering the above, there is a clear opportunity for engineering schools to evaluate and eventually adopt new ways to deliver knowledge to students.

Teaching with cases is one of those alternative techniques that has been evaluated as both valid and efficient by the academic community, especially in management-related topics (Peters, Celucci, & Ford, 2015; Yildiz & Palak, 2016). However, the analysis of pedagogical dynamics related with both case-construction and case-teaching in management-oriented courses in engineering schools, is something that, to the best of our knowledge has been neglected by the literature to date. In this work, we describe a whole academic process of creating, teaching and evaluating real study cases belonging to the students' environment coidenty, and account for the results obtained. Our goal in this paper is, in turn, to present a rigorous approach to a valid educational practice as well as to provide further evidence of the perception of this methodology by participating students.

The entire process carried out and described, corresponds to a conventional action-research approach (Lewin, 1946; Mertler, 2016), when interventions from real life were done and measured over a sample of 344 participants (all of them engineering students). The departure point of our work was represented by the construction of four locally based cases that have a sense of "familiarity" due to student's prior awareness of the companies involved in those cases. Then, case planning and implementation (following a conventional case-teaching methodology) took place in the classroom of 12 groups, of two different courses. Finally, an assessment of the teaching experience was conducted on two different occasions, to obtain valuable feedback for future experiences.

Our first contribution is to report a constructive educational experience based on the case-teaching method, where many details were considered to obtain proper integration between theory and practice. The fact that industrial engineering students are eager to experience this kind of classroom activities is something that must be noted for further applications. Naturally, our final ambition is that similar experiences are replicated or adjusted for other programs in the field of engineering or any other program. Among other things, we cannot deny that future professionals (regardless their knowledge area) will deal with social issues daily in their work and personal life.

The second contribution is based on our finding of a positive perception of the activity, even after six months of the experience. This result is interesting as active methodologies tend to produce a "nice" first perception (probably because of their perception as novel activities) but this perception tends to decrease over time. Again, the way to define, plan and implement an activity is important to deliver meaning, but the content and treatment during the activity are critical in obtaining sustained results.

Finally, the third contribution is the potential link of this study to other approaches, scenarios or contexts that can be comparable and therefore complementary. In this study, we claim that the efforts made to implement such

practices in the classrooms of future industrial engineers in the context of Colombia were worthwhile. This is especially true for lessons relating to administrative and managerial issues. However, this opens a door to many other possibilities enabling better understanding of the process, and to perform further empirical tests.

In the next section of this article, we review the relevant theoretical contributions related to active-learning methodologies and case-teaching methodology in business schools. Then we explain the methodology carried out, from the case-construction and planning, the case-implemented, the data collection, and the analysis for the assessment of the experience. Next, we discuss the results obtained, and finally, we conclude by highlighting the important findings, the limitations of our research, and the areas where further research is needed.

THEORETICAL BACKGROUND

Teaching using case studies is considered a widely justified practice by academics and scholars given the fact that, instead of being a passive actor, the student becomes the centre of the entire process (Wasserman, 1994). For instance, by a rigorous process of case teaching, the role of the student is active and interactive, with an enhanced opportunity to express their criteria and build their character. In other words, this methodology gives more evidence to the notion of learning has evolved and is now seen as a process in which students develop their own understanding by assembling facts, experience, practice, and participation (Finney & Pike, 2008; Oblinger, 2004; Yadav, Shaver & Meckl, 2010). Particularly, the case teaching method represents a proven pedagogical strategy for teaching managerial disciplines (Ellet, 2007) with special emphasis on social science topics. Law, business, psychology, and sociology are just a few examples of some of the application areas of this pedagogical method.

The requirement for educational innovation or transformation of the educational process, moving away from the demotivating theoretical approach, emphasizes the importance of implementing alternative experiences in the learning process. Strengthening experience through practice and the production of "in situ" knowledge involving flexible and innovative teaching methods helps to encourage independent learning and student motivation (Ellet, 2007). The latter involves tasks such as the processing of real information, the deployment of skills for problem solving and the enrichment of decision-making. These are all aspects that constitute a work environment that promotes learning at engineering schools (Perry & others, 2017). Given this, the use of laboratories, role-play games and case-related methodologies are examples of the most common, innovative and effective mechanisms in teaching to date (Contreras-Pacheco & Ruiz, 2015). However, the case-teaching method has demonstrated to be particularly important because its widely acceptance as a pedagogical strategy in several teaching managerial disciplines (Ellet, 2007). Furthermore, it allows for the student to, somehow apply the knowledge while in the conventional theoretical approach; the knowledge is simply delivered (Jakka & Mantha, 2012).

The case-teaching method is a cognitive learning tool that performs a simulation of reality using language and at the same time presents an organized educational dialogue (Wood & Anderson, 2001). This technique transfers knowledge to the student, by fostering the analysis of business reality facts, described through the implicit definition of a problem and its possible solutions. It promotes familiarity with the process of analysis and complex decision-making process, by making students get involve into the case events with thoughts and ideas (Blank, 1985, HBS, 2016; Muñoz & Santoyo, 2013; Brodin, 1978; Millar & others, 1999; Shamos, 1960). However, it is not only management-related courses that can benefit from the use of this tool. Penn & others (2016) state that case-teaching methodology is used in a variety of contexts where its most important advantage is the development of the skills and competencies of the learner.

In the same vein, according to Abrahams and Millar (2015), practical work with case methodology has two levels of effectiveness: (1) where there is compatibility between what the professor tries to enable students to learn from the tasks performed by them; and (2) where there is compatibility between what students learn in relation to the learning objectives proposed. Challenging students to take an action or view with respect to a problem presented in a case and to deal with implies the involvement of the intellect, the emotions, and intuitions. As a result, students develop mental agility and power, as they would in their professional lives (Angelo & Boehrer, 2002).

Likewise, Raju & Sankar (1999), focus on the perceptions of students and instructors as to the usefulness of teaching cases and learning methods and presents the views of those involved where the meaning is highlighted by cases, allowing students to examine the environment, process information, understand, and validate previously acquired theoretical knowledge about the subject raised in the case. They also determine the effectiveness of the case method in general for many disciplines since the student regularly can communicate ideas and findings to their peers. Considering the above, the overwhelming effectiveness of using the case-teaching methodology is evident where problem-solving skills are developed through this method (Popil, 2011).

Nonetheless, sometimes, a total concentration of external and distant aspects of different disciplines, makes the student feels an alien of the learning process in management-related fields (Thompson, 2000). Competitive strategies of multi-national companies, fusions and acquisitions of giant corporations, marketing and advertising of top-of-mind brands are only a few typical examples displayed in conventional textbooks. And despite, they can be very useful to teach some concepts; it is also suggested that sharing examples that are part of students' own reality contributes to the educational process by making those concepts more "tangible". That is why, besides examining global paradigms in the classroom, it has been also implied to consider the advantages of providing students with local and quotidian problems and challenges (Wasserman, 1994).

Moreover, it is insinuated that case-teaching methodology is a truly fruitful experience, especially when the process is implemented in full (Pitt & Watson, 2007). This is, from the cases construction, teaching notes development and classes' preparation, to their effective implementation in the classroom. Likewise, it is noted that the whole process leads to a close examination of the reality of the context cases and could awaken additional interest in the process involved and lead to more effective learning outcomes (Pitt & Watson, 2007). Finally, relevant literature observes that documentation and evaluation of the educational experience are necessary to the extent that the socialization of these activities supports the improvement of teaching and learning processes for further opportunities (Deniz & others, 2008; Sinatra & others, 2008; Scott & others, 2007; Kickul & Fayolle, 2007; Koc, 2011).

METHODOLOGY

First and foremost, it is required to indicate that the entire fieldwork was executed within the context of the bachelor program of industrial engineering at the Universidad Industrial de Santander (Bucaramanga, Colombia) one of the most traditional engineering-focused universities in Latin America. Also, it is worthwile to mention that this program is the pioneering program of industrial engineering in Colombia, which was formally created in 1958 (Contreras-Pacheco & Ruiz, 2015).

Case-Construction and Planning. To find attractive ideas for developing relevant concepts, we only considered some business situations and initiatives of the region. They had to be related with some key areas like sustainability, new venture creation, business ethics, organizational behaviour, and new trends in strategy.

Specifically, cases developed were about 4 particular events: (1) a brand positioning strategy aimed at vulnerable sections of the population and how a manager gives up control of his business so that the business can thrive and grow in the market; (2) a strategy on social media marketing, new technologies, and youth entrepreneurship; (3) a decision on the convenience in adopting business models unsustainable and which can affect the identity of the leading people in companies; and (3) a dramatic social impact and loss of shared value due to the sale of an iconic company that provides development to an entire region.

Prior to the case-construction stage, we decided that cases would be focused mainly on decision-making scenarios, as indicated by the characterization methodology presented by Ellet (2007). Consistent with this assumption, structuring them is carried out using the methodology proposed by Pérez (2011). First, we considered that during the process of writing a case history, it is necessary to carry out two parallel processes, one concerns the search for information and its documentation, while the other is a scientific process of continuously searching and testing of the data. Second, the information collected was organized and evaluated to select more timely data to support the case and then to write it in a global language to facilitate the understanding by any reader.

Once cases' first version (together with their teaching notes) was ready, they were submitted to four different colleagues and a proofreading service to be critically reviewed. Further changes were done in both content and style to the four documents. Finally, cases were delivered to students in PDF format, and were implemented by using a dual interaction: Information and Communication Technology (ICT), and presenciality.

Summaries of the four case studies resulting from the process of construction are as follows:

CREZCAMOS: Steps Towards Progress

This case, better illustrated in Contreras-Pacheco, Muñoz and Hernández (2015), is about a young entrepreneur, who faced the challenge of turning an idea into a profitable and socially sustainable business model, named *CREZCAMOS S.A.*, after recovering from the failure of his former micro financial credit project called *FUNDACOOP*. He organized the capital for his new company at the end of 2009, with the help of a European impact investor. At the end, he and his team clashed about the uncertainty of the strategy that would allow them to grow and achieve the success they wanted. The Executive Board of this company scheduled a meeting in order to discuss the future strategic course of the company, looking for alternative ways of growing with the intention of ensuring a viable future. This resulted in this microcredit company achieving national coverage, and, at the same time, meeting the expectations of its shareholders, customers and employees.

ALICIA WONDERLAND. Redesigning its Business Model

In 2009, a 3rd year student of mechanical engineering, made the decision to start a small business selling footwear of his own design, using his parent's machinery for manufacturing footwear that had been used for an old failed family business. To start his project, he had to overcome several drawbacks such as lack of family support, criticism of footwear designs, and insufficient financial resources for the acquisition of the necessary raw materials and advertising costs. However, he managed to develop his idea and brand-reputation among young people in the city of Bucaramanga. He offered something different to the market: bold designs, outstanding quality, and social-media advertising campaigns. He achieved a steady growth in sales and he made an impact on the community through job creation.

Once the company was established, this entrepreneur decided to devote himself entirely to his business, so he set out to create a business strategy that allows him to appeal to the young population and move towards internationalization at the same time. His commercial proposals were: Focusing on customizing shoes using web tools for designing and marketing, successfully reducing the production line by the very nature of the orders; or

creating a production line for the sake of targeting customers who purchase the product wholesale causing increased production capacity at the plant, but a change in the current pattern of marketing. The case is entirely narrated in Contreras-Pacheco, Barbosa and Muñoz (2015).

AGUAVIVA: A Strategy Exercise or a Sustainability Concern?

The AGUAVIVA case exhibits the situation faced by the executive manager of the Acueducto Metropolitano de Bucaramanga S.A. E.S.P. (AMB) (Colombia), with respect to a new business unit corresponding to the production of bottled water (AGUAVIVA). The case, which is better presented in Contreras-Pacheco and Rodríguez (2015), leads to question the relevance of this business's unit adoption, due to unfavourable economic results of the operation, coupled with sustainability issues related with the production of bottled water. It mainly considers factors such as corporate social responsibility and greenwashing (i.e. when a company claims to be responsible, when it is not). The ambivalence happens when on behalf of the company, he receives a national recognition for its social performance, when at the same time, he questioned himself because of the negative environmental/social impact caused by bottled water production. Taking this into consideration, the case tries to deepen in the questioning of the relevance of this kind of business-lines as part of companies with a CSR-salience reputation.

From ECOGAS to TGI – Social Value at Stake

In July 2004, a proposal to the National Congress of Colombia for selling out the *Empresa Colombiana de Gas (ECOGAS)* was presented. This important company, belonging to the oil & gas industry, was created in 1997 in the city of Bucaramanga and for more than ten years was the strongest corporation of the Santandereana region. It was also a pioneer in consolidating the culture of gas in Colombia, generating profits, employment and growing in a sustained fashion. During the session where the government planned to sell it, proponents considered that the income from the operation was necessary to stabilize the debt that had been generated during the setting up of the company, and to freeing up resources for investment by the state. Nevertheless, *ECOGAS* was considered a strategic company for boosting the future development of the region. Finally, on December 6, 2006 the government at a public hearing, "successfully" sold *ECOGAS*. A short-term/long-term dilemma was presented afterwards. The result had an impact on the public, generating a variety of opinions and questions about whether it had made the best decision for the region or if the action had been carried out to cover up irregularities and political interests in the process. See the case in Contreras-Pacheco, Barbosa and Hernández (2015).

Case-Implementation. Conventional lectures on the case-teaching methodology are based on guided discussions, where the professor is only the means that promotes reflection in the students with a specific learning objective. This is considered a powerful student-centred teaching strategy that can impart critical thinking, communication, and interpersonal skills to students (Schwartz, 2015). According to CTL (1994), professors interested in involving the students in classroom discussion have found that teaching with cases can provide a rich basis upon which to develop student's problem-solving and decision-making skills.

However, our aspiration consisted of transcending the mere learning and reflection over a topic by creating a multi-level scenario that encourages participants in the creation of meaning, and makes them feel able to transform reality. This is something that combines rigor with the flexibility of using many tools in the process; learning a defined study object with the development of several skills that will be useful in their future as professionals. That is the reason why this challenge was faced by intervening in an educational process and somehow assessing its effectiveness by measuring of the participant's own perception.

In this regard, and considering that the faculty of the school is constantly encouraged to probe and use innovative techniques in order to improve their teaching process, we base our study on a typical action-research approach, where facts are not merely analyzed to arrive at a diagnosis, but to help to improve a problematic situation (Lewin,

1946; Mertler, 2016). That was why we followed a systematic process, which, besides the alignment with the theory (Lewin, 1958; Mills, 2000; Potash & Kalmanowitz, 2016) also allowed us to make decisions that were effectively integrated into the syllabus of two courses, and afterwards executed in the classroom with the support of ICT (See Figure 1).

Figure 1. Process for the Action-Research Approach
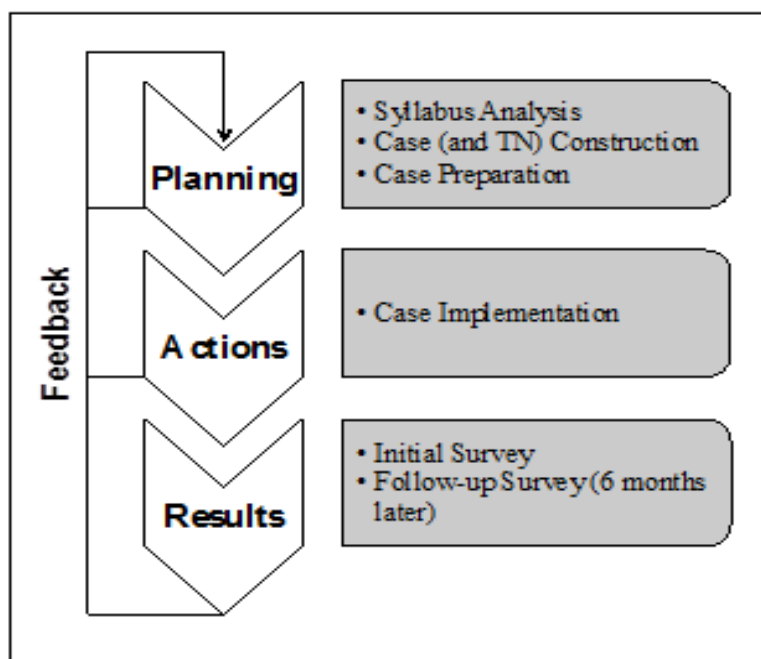
Source: Own

What did the exercise consist of? The implementation of this process was carried out in four consecutive semesters (years 2012–2013), within 12 different groups, equally distributed over two different courses belonging to the same area of study (Management). The total number of participants was 344, which represents an average of 28.67 participants per group. We name them "participants", since it is possible that one student attended both courses in the same semester or in different semesters. One of the authors acted as a professor for every scenario and conducted all the evaluations.

The courses were: (1) Strategic Management; and (2) Managerial Skills. Both courses are part of the 'final intense phase' of the program (usually conducted during the last year). Cases and activities for each course were naturally different (See Table 1).

Table 1. Features of cases constructed and implemented

Course	Case	Subject	Schedule
Strategic Management	ECOGAS	Competitiveness	3rd Week
	ALICIA WONDERLAND	Marketing Strategy	10th Week
Managerial Skills	CREZCAMOS	Leadership	5th Week
	AGUAVIVA	Sustainability	13th Week

Source: Own

It should be noted that the program of industrial engineering at this university comprises a total of ten cycles (one cycle per semester), and therefore students demonstrate an age range between 21 and 25. The gender ratio in the sample was 63%–37%, with a female predominance. The hourly intensity of each course is four hours a week for 16 weeks of conventional lectures, plus an important amount of time spent in class preparation, reading, individual study, and other tasks. Besides, since the activities designed for this work were related to ICT, the teaching process was also supported through the EDMODO platform (www.edmodo.com), which is an open, interactive, and free educational social network, that hereinafter is going to be called "the platform".

Specifically, each implementation was done using two elements in which the subjects of study and their relevant topics were totally covered in each case. On the one hand, participants were engaged in a process of continuous interaction and task-oriented activities (both in person and online); and on the other hand, the corresponding professor rigorously conducted a conventional student-centred case-teaching methodology. Each work-plan for each teaching case is suggested and described in the respective teaching note (TN).

During the first part, the cases were shared with the participants (the same case for the entire group), accompanied by a set of relevant readings, videos and analytic questions. Random subgroups were formed and identified through the platform to be asked to discuss each case and to work out a specific task, which was related to the substance of the corresponding case. Some tasks are focused on designing a better alternative (or decision) in order to construct a desired scenario, while others consist of interpreting the situation on a more macro level. However, every task implies a prior submission by means of an interactive presentation (video, PPT, Flash, etc.) that has to be uploaded to the platform in order to be observed by everyone in the group before the face-to-face lecture. Usually, the time given to achieve the entire objective was between two and three weeks in advance.

Later, a four-hour class (with a 15-minutes break in the middle) is needed to discuss the substance of each case and the planned activity. Each student is invited to participate in the reflexive session, and each sub-group can present their conclusions, which are mainly derived from the feedback provided by the rest of the participants before (through the platform) and during the class. Participation was mandatory, but discussions had to be mediated by the professor to obtain a fluent and productive analysis.

Data collection. Our proxy for measuring effectiveness was the participant's insights manifested through their "judgment" about some features and outcomes derived from the activity. A first round of measurements took place at the end of the implementation of the second case in each group, followed by a second round (a follow-up survey with the same questions written and presented in a different form) that was applied after one semester of finalizing respective courses. Surveys were designed and applied using Google Drive, a link was submitted through the platform. Response rates were 100% in the first round and 77,03% (265 participants) for the second one. This latter result is mainly due to the lack of direct contact with participants after they finished the courses.

Questionnaires were designed using the recommendations of Krosnick & Presser (2010), where four bipolar closed-ended questions (each with a five-scale points possible answers: from -2 to +2) intended to ask the participants regarding the comparison of traditional methodology with the described methodology (local teaching cases + ICT), which was experienced by them during the respective courses. As we said before, "judgment" was the only dimension that was effectively measured by each question, which had a specific purpose related to the learning process: Professor performance (Q1); Resources used (Q2); Future contribution (Q3); and Overall perception of the activity (Q4). These four items were our four variables.

Note that, even though the data collection process occurred in different courses after the implementation of different cases, and besides, there were different types of students (in terms of gender, age, and social strata, among others), for the sake of this analysis they were globally analysed, with total independence of these situations.

Rather than being developed statistically, data interpretation was based on a pragmatic inference (Schwarz, Knäuper, Hippler, Noelle-Neuman, & Clark, 1991), where the comparison is logical and direct; given the nature of every variable, which as mentioned, is based on a bipolar scale (see Table 2). At the same time, a comparison was made between the results obtained in the first and second round to measure overall consistency and to detect a certain variation in their responses, due to further reflections or personal experiences that could occur during those different six months. Since the dataset is composed basically by observations of ordinal variables (only five possible options for each case) we treat this analysis in a more qualitative, than a quantitative way, meaning that besides a graphical summary of the distribution, the central tendency will be measured only by means of the mode and somehow the overall behaviour of the variables for each time of observation.

Table 2. Bipolar scale used in the instrument

-2	-1	0	+1	+2
New methodology is extremely inferior to conventional methodology	New methodology is somewhat inferior to conventional methodology	Neutral point between new methodology and conventional methodology	New methodology is somewhat superior to conventional methodology	New methodology is extremely superior to conventional methodology

Source: Own

Furthermore, it is important to make clear that in spite the opportunity to measure consistency in the answers of each participant, by comparing both results of the questionnaire (round 1 with round 2); no one-to-one analysis took place since the purpose of this measurement was focused on global, rather than individual results.

Results. According to the participant's assessment, it was clear that since the beginning of this work there has been high acceptance of the activities executed and described above. In a consistent way, for first round as well as second round of observations, every variable was positively evaluated, with several special aspects that are worthy of note. The only strong exception for this overall scrutiny was the variable "resources" on first round (although this improved in the second round), which can be noted when observing Mode behaviours (Table 3).

Table 3. Modes per Variable (Round 1 Vs. Round 2)

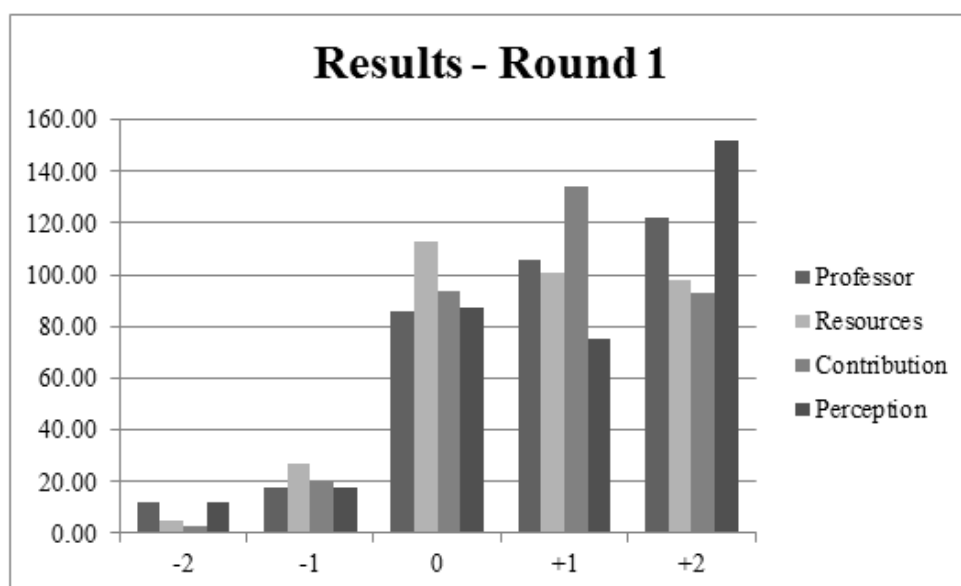| Variable	Round 1			Round 2		
	Mode	Mode Frequency	Mode Percentage	Mode	Mode Frequency	Mode Percentage
Professor	+2	122	35,47%	+2	114	43,02%
Resources	0	113	32,85%	+1	83	31,32%
Contribution	+1	134	38,95%	+2	134	50,57%
Perception	-2	152	44,19%	+2	136	51,32%

Source: Own

When observations of positive values are summed ('+1' and '+2'), it is noted that for the first round of observations (made just after the implementation), the positive judgment of participants for the variable "professor" were 66,28% of the responses, which suggested a preference for the professor's role in this new methodology over the traditional one. In the same line, but in a lower value, the other variables were also considered superior, -except for the variable "resources", that in a certain way, showed a virtual majority with a neutral result (32,85% of the observations were '0') and an important amount of 9,30% that implies that for this specific item the new methodology was inferior to what it has been before ('-1' and'-2' together). This means that somehow, participants did not feel that too much value was added through the educational resources that were used to implement these new practices. See Figure 2.

Likewise, for the measurements made after six months (second round), the good perception that the new activities effectively constructed in the participants' minds was even more evident. However, interestingly for this stage, the variables "contribution" and "overall perception" became the leading indicators, with a mark of clear favorability for this new methodology over the traditional one, given by 87,92% and 86,04% of the responses respectively (obtained when '+1' and '+2' values are added in each variable). Under this same analysis, with regard to the variables "professor" and "resources", slight improvements in student perceptions were noted among the rounds of observations. For the case of the former variable, the total favorability moved from 66,28% to 75,09%; while in the case of the latter, this same impression moved from 57,85% to 61,13%. See Figure 3.

As mentioned before, even though no statistical analysis was applied to the dataset, a simple adjustment with further "statistical" interpretation was carried out to obtain later results. This was made by turning the bipolar scale into a unipolar scale, by means of the equivalence with a 1–5 nominal numeration (where the value of '1' was assigned to '-2', '2' to '-1', '3' to '0', '4' to '+1', and finally '5' was assigned to '+2') and calculating corresponding averages in pursuance of a calculation of their percentage variation. Note that this transformation is useful only for this purpose because of the nature of the variables and the original meaning of the bipolar scale; in other words: these new values are not valid for being assumed as typical "up-to-five" measures for each variable. See Table 4.

Figure 2. Comparison of Results of Items – Round 1

Source: Own

Figure 3. Comparison of Results of the Items – Round 2

Results - Round 2
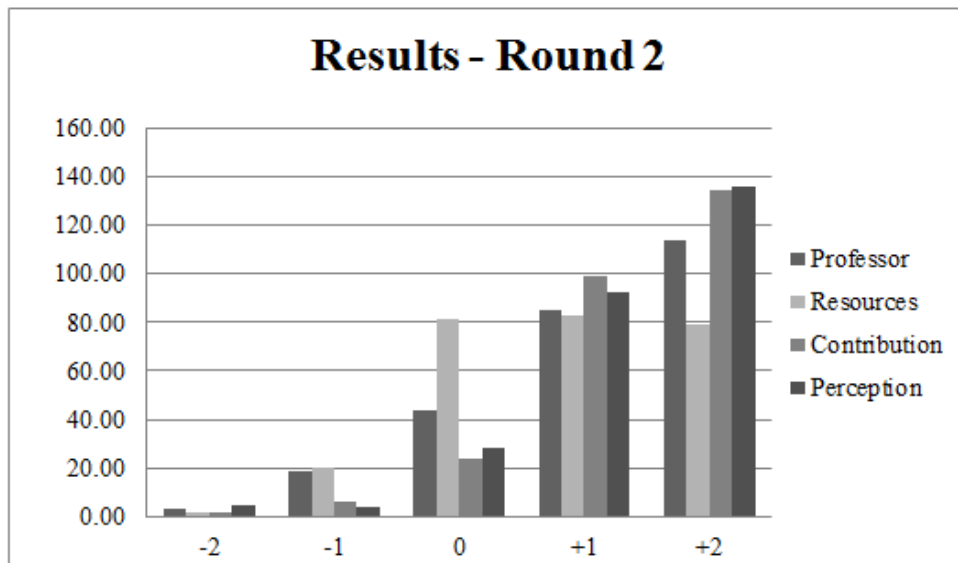
Table 4. Equivalences and variation (Round 1 vs Round 2)

Equivalence	Round 1	Round 2	Variation (%)
Professor	3,90	4,09	4,91%
Resources	3,76	3,82	1,68%
Contribution	3,85	4,35	12,78%
Perception	3,98	4,32	8,57%
TOTAL	**3,87**	**4,14**	**7,03%**

In this sense, one notices that all the results evolved from one round to the other in a positive direction, meaning that original results that were in line with the consideration of a clear positive affirmation for this methodology over other pedagogical activities were maintained, and even enhanced over time. Special mention has to be made of the behaviour of the variable "contribution", which rose by 12,78%, followed by the variable "perception" that also rose by 8,57% from one period to another. As a highlight: when comparing the overall value of the experience (average of averages) was graded a 7,03% better in the second measurement in relation to the first assessment.

DISCUSSION AND CONCLUSION

Results obtained in this study are consistent with other exercises carried out by other scholars in different academic areas (e.g. Finney & Pike, 2008; Yadav & others, 2010). However, the novelty of this activity consists on the complete intervention of the educational process, from the beginning (adapted to the syllabus and construction of teaching cases with their corresponding teaching notes) to the end (entire implementation with immediate and postliminary assessments). In this same vein, the action-research approach, as in many other fields and studies has been proven a helpful methodology to deliver this same type of contributions (Lewin, 1946; Mertler, 2016).

In consequence, we identify some student-centered strategies, like the case-teaching methodology, in which the role of students becomes more active in terms of their motivation and participation in the classroom; especially in comparison with more traditional strategies such as conventional lectures, conferences and workshops (Cropley, 2015). This statement is also consistent with Angelo & Boehrer (2002), who mentioned that their attractiveness (central to what was designed and implemented in this work) lies in the active participation of the students because they can determine the relevant facts, analyse them, and draw conclusions about the causes of the problem and the decisions to make.

The broad judgment of the interventions that took place during this work, gave a clear signal of the openness and favorability that students can confer to diverse, responsible and focused initiatives in the classroom to achieve predefined learning outcomes, even months after the experience. This support the idea that experimentation and openness to new ways of learning create new opportunities to expand and socialize knowledge. Apparently, students can also be engaged when using more applicable approaches where reality can be positively affected in a measurable way.

Our findings suggest that the students can engage once they perceive discipline in the organization and preparation of the entire process. Particularly when many details are considered, and make the experience more interactive and more "fun". Presumably, the fact of being immersed in different rhythms and activities during the sessions makes them feel responsible for the process too. There were a few exceptions to the general positive attitude. These could form the basis for future research.

We want to make clear that although our findings that are aligned with an evident superiority of the perception about the new methodology over traditional practices, they do not necessarily imply that the learning objectives were effectively achieved (see: Yadav & others, 2010). Then, it is important to conduct further research to measure real long-term impacts of these kinds of initiatives, meaning that further robust longitudinal research is encouraged. Moreover, there is room for other relevant studies that intend to resolve related research questions like the effects of other emergent methods such as challenge based learning and/or social pedagogy, which enable students not only to solve problems collaboratively but also to identify them in society.

The theoretical implications of this work can be represented in further studies that correlate certain factors like the adoption of new pedagogical methodologies or the use of factual and close experiences with the participants, with their performance as students and as future professionals. This can also be related to more general constructs like educational quality or impact on society. This study can even transcend academia into more organizational environments, where new methods of training can be analysed (and probed from a practical perspective) to create an adequate set of competencies for employees and to achieve objectives of competitiveness and sustainability for their organizations.

A logical limitation of this work is its nature as a single case of study that reports a single experience (probably an interesting and positive one) but that cannot be generalized as if it were the discovery of "revolutionary knowledge". On the contrary, the main contribution of this study is mainly the possibility of transferring this same experience into some other contexts, which can prepare the ground for strong theoretical models that can be rigorously tested in the long term.

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