Student Performance and Perception of the Teaching Methodologies Implemented by COVID-19

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Abstract

The 2007 London Communiqué Towards the European Higher Education Area: responding to the challenges of a globalized world confirms that a major effect of this globalization process will be a transition to student-centered higher education. This methodological transition in teaching processes has been accompanied in all cases by technological innovation, but it is the health crisis caused by COVID-19 that drives and accelerates it.

Given this, we ask ourselves how student performance has been affected as a result of the accelerated emergence of Information and Communication Technologies (ICTs) in teaching processes, for which the results of the continuous evaluation of students of a certain subject before and after the pandemic.

The achievements show that both at a quantitative level and in the perception of the students, the changes have been positive and should have been carried out earlier, that progressivity in teaching innovations loses its meaning due to the volatile and uncertain environment in which we operate and that we learn and teachers are able to adapt quickly, even if this forces them to leave our comfort zone.

Keywords: teaching innovation, technological innovation, ICTs, academic performance, pandemic

1. Introduction

The relationship between the educational project of an institution and innovation proposes to carry out the strategic design of innovative proposals that make the University adapted to the current environment, a volatile, uncertain, complex and ambiguous environment (VUCA), further increased by the irruption of COVID-19.

The problem arises because there are no previous teaching experiences linked to pandemics and this can cause fear in the face of uncertainty and resistance to change on the part of teachers and students. The main obstacle to change is the fear of the unknown, but when you have the information and knowledge of the possible modifications to make the feelings towards it can be favorable (Abdul et al., 2004). If organizational change processes are communicated or socialized in employees, positive responses are generated, and negative responses, such as fear, decrease (Nelissen and Selm, 2008). For this reason, the University has been involved in teaching innovation for several years, training professors in new methodologies, creating innovation commissions by Faculties, and promoting workshops and congresses. All these projects and experiences that have been carried out previously in the line of educational innovation demonstrate the interest of the University in the implementation of new experiences, which improve the future professional development of students and, in general terms, the educational quality of the institution.

In addition, we must not forget that the need to innovate must always be linked to the concept of improvement, although the concept of improvement does not usually incorporate risk while innovation does; Therefore, an innovation project is always a risky project, while an improvement project does not risk, it only modifies what has already been established. The application of innovations involves risks and a whole process of cultural change on the part of teachers and students, but the commitment of any educational institution means considering education as a good for society that we must constantly improve, where teachers must become an agent of change and promote cultural change. We are aware of this and, therefore, in the case of the project that is presented, it aims to advance in what has already been done after years of teaching experience, putting into practice new teaching-learning processes and evaluation systems more in line with these innovative systems. The quantitative evaluation quantifies the acquired learning by assigning them figures in order to promote and certify, instead of giving a globalizing vision of the student's real performance; The qualitative evaluation focuses its interest on the processes

that have been occurring during the educational event, regardless only of what has been achieved, but how it has been achieved, what part is achieved and why others were not achieved. Therefore, these new learning processes must focus on this last evaluation, in many cases complex and that requires greater effort, training and experience of the teacher.

On the other hand, the educational improvements for which we are going to bet are based on the empowerment of a series of values, both individual and group, as a primary element in the development of the student's skills, favoring a relationship with others always based on ethical and moral principles. This is one of the aspects on which the educational philosophy of our University is based: the integral formation of the student.

In summary, the general objective is to measure the perception of the methodologies used in teaching and their impact on the learning outcomes and acquisition of competences in each subject, taking into account the acceleration in methodological changes forced by the situation caused by the COVID19 pandemic.

2. Theoretical Framework

The European Higher Education Area (EHEA) was consolidated in 1999 with the Bologna Declaration. Its objective was to create a system of easily recognizable and comparable academic degrees, thereby promoting the mobility of students, teachers and researchers, guaranteeing high quality teaching and adopting a European dimension in higher education (Royal Decree 1393/2007). After five years since the definitive implementation of these changes, the Spanish Government approved a new reform of the Spanish university system (Royal Decree 43/2015), where provided that they were not degrees subject to specific regulations, the possibility was introduced for universities to offer degrees of between 180 and 240 ECTS (between three and four years). compared to the 240 that were the minimum required with the previous system. This fact reinforced the almost obligatory need for universities to be immersed in different innovation processes, which would allow them to implement the modifications proposed a few years earlier in the teaching processes and move from an education focused on teaching (in the teacher) to another focused on learning (on the student).

In recent years, educational institutions have been carrying out the so-called "guided innovation", establishing the existence of seven different types of innovation (Hannan and Silver, 2005, p. 161), being in the University the individual and group innovations the most developed, since they are related to the classroom and the course and respond directly to the needs of students and professional issues. Teaching innovation has thus become a necessity imposed by the EHEA, but also by the labor market, since, according to the 2020 *Workplace Learning Trends Report: The Skills of the Future* (Udemy, 2019) it is estimated that organizations will not only seek digital skills, but that soft skills will also be valued to develop an organizational culture that encourages innovation and creativity, which implies that universities adapt their curricula to the search for them.

A greater involvement of the student is demanded in the whole process, so that he not only worries about trying to assimilate everything that is transmitted, but also must group knowledge to shape his personal learning, and be able to develop his own network of contents and know how to use it to face problems in his disciplinary field, At the same time, consideration of the need to learn to work collaboratively with other people increases. This makes it necessary to develop innovative methodologies focused on the student himself and his development, granting him a leading role that improves his active participation (López, 2011), and allows his better adaptation to VUCA environments. Among these methodologies we propose to apply Challenge-Based Learning (CBR), similar to Project-Based Learning (PBL), where students have to give a concrete and feasible solution to a real problem (Escribano, 2008; Observatory of Educational Innovation, 2016; Lynch, 2017;).

Gradually, students should be made to understand that, through practical activities, it is possible to understand, strengthen and acquire theoretical knowledge as proposed by the "learning by doing" approach. It is about the teacher stop teaching in the classroom only the theoretical part, which the student will only put into practice in the future, to teach the practical application of his subject. This ensures that the student practices theoretical knowledge, learns from possible mistakes and takes advantage of the feedback generated with all this, since it should not be forgotten that "learning occurs when someone wants to learn, not when someone wants to teach" (Schank, 2013). The student adopts a much more active and autonomous role, ceasing to be a mere receiver of knowledge, to become the architect of his own learning process (Delgado, 2005) and the achievement of different competences acquire great importance in the teaching-learning process, understanding by such "the set of knowledge, skills, attitudes that are acquired or developed through coordinated training experiences, which have the purpose of achieving functional knowledge that efficiently responds to a task or problem of daily and professional life that requires a teaching and learning process" (ANECA, 2012). As competencies are learned and developed from activities that allow integrating these skills, attitudes and knowledge, they must be evaluable and make students the center of the educational process.

Among the advantages of the "learning by doing" methodology, it should be noted that the exercise of an activity guarantees the greatest possible retention during learning. (Van Dam, 2004), but "learning by doing" also allows to develop learning by discovery, which causes enormous commitment and participation of students derived from the motivation of owning their own learning.

In many cases, university institutions that have been virtualized have not applied new learning methodologies, but continue to prioritize a content-centric educational system, where the only difference is that the contents are on platforms. This would be the state in which universities are now, where after the pandemic caused by the coronavirus, they have been forced to accelerate their innovation processes, incorporating virtual campuses into teaching. This will be our first starting hypothesis. It is considered that at this time it is important to improve the capacity of Information and Communication Technologies (ICTs) of universities, prioritizing innovation systems that involve a true teaching transformation (Gallardo, De Castro and Saiz, 2020). But itis necessary to go a step further and integrate ICTs with various "e-Learning" platforms, to favor "learning by doing" and to be able to face the new challenges posed by society.

It should be noted that "e-Learning" has been conceptualized in different ways while it has been gradually developed, but in all cases it is based on the use of the Internet as a system of access to content and training activities, where interaction and communication are very important aspects; our aim is to be able to use it as a participatory simulation of a real situation, as has been put into practice in some university subjects (Sands and Shelton, 2010).

García-Peñalvo and Seoane-Pardo (2015) describe the evolution of "e-learning" from three generations. In the first, online learning platforms appear and virtual classrooms and campuses are created; In the second generation, platforms support socialization by enabling interaction between peers and communication between teachers and students The third generation is characterized by the fact that "e-learning is no longer exclusively associated with online learning platforms". For these authors, "e-learning" is a training process, aimed at the acquisition of a series of competences and skills in a social context, which takes place in a technological ecosystem in which different user profiles interact who share content, activities and experiences and that, in formal learning situations, must be supervised by teaching actors whose activity contributes to guaranteeing the quality of all the factors involved.

Until the pandemic caused by the coronavirus gave way to a teaching development in exclusively virtual environments, where all teaching, communicative and evaluation activities have been developed online, universities were based on face-to-face training complemented by a virtual classroom, understanding as such a space where the teacher uploads the contents of the course, practices, readings, schedules, ...

The evolution of the pandemic has made us move forward, modifying not only the traditional teaching processes that have now been virtualized, but also the evaluation systems of students, who must learn by searching and investigating. The student must find a solution to real simulations by investigating and searching in a group, sharing the documentation found and analyzing its usefulness to solve the case raised.

According to Larmer and Mergendoller (2010) learning related to project work increases the more real the research students do. These same authors point out that a good project is not one that involves the student finding the information and copying it, but that it begins as a path that is traced through the questions that the student asks himself and thanks to which the student seeks information and discovers his answers. This means creating a new methodology and a new way of evaluating supported by virtual spaces.

But all this change necessarily implies that universities must be able to achieve the following challenges:

1). Provide students with a vocation for leadership. For authors such as Haslam, Reicher and Platow (2011) leadership is not reduced to getting others to do things, but implies that they want to do them, inspiring and stimulated, since the leader transforms his beliefs, desires and priorities and mobilizes his energies in order to achieve a common purpose.

Achieving formal leadership among students is a complex task, since leadership tends to be associated with course delegates, student representatives in purely advisory university councils, and even with those brighter students or with easy social relationships; Here we consider forming management leaders who are chosen by their peers generally for aspects other than those that a good leader should have.

According to Quintana *et al* (2015,) an adequate educational environment can favor the acquisition during studies of the necessary skills for the exercise of leadership capacity, which in turn favors the subsequent development of these same skills in the first work experiences, thus increasing the propensity of graduates to act effectively as leaders in the organizations for which they work.

Therefore, it is considered that universities must be able to train leaders as a complement to their educational process, for which the values that a leader must have both individually and in groups must be influenced. It is the university itself that must ensure that leadership and its values have a certain importance in the curriculum of the students, but also the professors themselves must be an example of a leader to be followed by the students. If the different stackholders of the institution are involved, learning the values that a good leader must have will be a simple task.

2). Challenge-based learning with the use of agile methodologies.

At the corporate level, the use of these agile methodologies is increasing in recent years in project management. In this sense, a Report carried out by the Business Agility Corporation (BAC) (2018), highlights that almost 70% of the companies surveyed, all large in size, use Agile on a regular basis and 20% have adopted it as a default way of working, while 60% of the companies surveyed already have at least 100 people working in this methodology, some even more than 1,000, and 80% are using or about to start using scaling models, figures that highlight the importance of these new ways of working.

The implementation of agile methodologies has a series of advantages over traditional methodologies, since in addition to enabling a quick management of possible changes, it allows prioritizing activities according to needs, the active participation of the user, who will give feedback to the results that are delivered gradually, through sprints or iterations, as well as the collaborative self-management of the project by the work team.

In this regard, agile methodologies applied to teaching are based on practical and experiential learning, where students learn by doing. This ensures that the student develops their autonomy, their abilities and abilities. It is about putting into practice a learning based on challenges, where the teacher must make cases with similar contents or based on real experiences, so that the student can develop the competences of the subject and achieve the learning results proposed in the teaching guide of each of them. In summary, cases that allow the use of an agile methodology of work by projects.

The benefits for the student derived from the use of agile learning methodologies are numerous (Batet and Pellicer, 2017):

> • Agile pedagogy teaches students to divide the tasks they must perform into blocks that they will carry out in short periods. This way of organizing the project makes it simpler and brings a lot of flexibility.

> •In addition, it allows the work to be very collaborative and that the group can be organized horizontally. This gives them a lot of autonomy and self-management capacity.

> •Heterogeneous groups bring great richness to teamwork. Teachers here have a fundamental role in making their students aware that they are not looking for a single answer, but that precisely the projects are enriched when they are unique and take advantage of the value of the differences of their components.

> • Leadership and roles must be changing for all team members to learn. It also fosters a culture of trust and tolerance. Shared leadership favors proactivity and autonomy in an extraordinary way.

> •Constant self-assessment, rather than a final self-assessment.

3). Modification of evaluation systems.

This novel culture of learning implies a review of the evaluation systems, generally structured around the pass/fail, or the pass/fail, in order to adequately reflect the student's ability to acquire the competences specified in the Teaching Guide of the subject or subject.

We think that an innovative mode of evaluation should be proposed since it can be improved in competences if feedback is obtained from classmates and teachers, in addition to a reflection of each subject, where the design of a rubric helps to measure, at the end of the semester, the participation in the proposed group tasks.

In this sense, we propose the use of an online analytical rubric, also called e-rubric, with a 180-degree evaluation, where the students themselves, in addition to the teachers, are the ones who value throughout the process (Martín and Masa, 2017). A well-designed rubric provides feedback on how to improve their work, which will allow the level of self-control and effectiveness of the student to increase (Panadero, Tapia and Huertas, 2014), and the teacher the possibility of analyzing their possibilities on the learning objectives set and results achieved.

The objective is to make an analysis of the performance achieved by students with the teaching methodologies used at two different times (before and after the pandemic) to, in this way, know if the non-progressive irruption of new teaching models has positive consequences on student results. Academic performance is associated with

knowledge of learning styles, allowing teachers to create a more student-centered approach to teaching (Torres, 2014).

The conclusions obtained from the analysis of this central objective will allow conclusions and reflections to be drawn on how the University should be after the stage of non-attendance, how to take advantage of the advanced with the use of new technologies to complete it with methodological changes and evaluation systems, studying if the results are altered by the methodology and virtuality. ICTs offer us new ways of doing and evaluating, motivating students (Laro-González, 2020), accustomed to their use and management but the system must be changed, it is not simply about moving classes and face-to-face exams to a virtual platform, it is necessary to advance in this sense and that is the challenge that we propose that depends not only of the attitude and commitment of teachers to methodological change but also of the support provided to them by the university institution to meet their training needs and thus facilitate the incorporation of these new resources into the teaching-learning process (Álvarez et al., 2011).

To this end, we want to demonstrate the impact and degree of satisfaction that the use of the "Learn-Doing" and "Learn-Search" methodology has had on the learning process, initially developed in person and since last year virtually. For this, Challenge-Based Learning (ABR) has been used in the subject of Business Management and Organization.

In conclusion, it is about carrying out a study on the perceptions of new methodologies through an evaluation of the performance achieved by the students, making a comparative study of the results of continuous evaluation and the ordinary final grades obtained by applying some new methodology in the last academic years and after the methodological changes made in a forced way by the pandemic. In this way we can make an analysis of possible relationships between methodology and results, studying if the results are altered by the methodology and virtuality.

As secondary objectives that we intend to develop more exhaustively in the future we want to analyze the following aspects:

1). Degree of satisfaction and adaptation of students to the use of new technologies and methodologies. At the moment, this study has begun only in a pilot group.

2). Degree of satisfaction and adaptation of teachers to the use of new technologies and methodologies. It will be the teachers of the chosen subjects themselves who will participate in the study and also the academic tutors of the students involved, since tutoring can serve so that other teachers who do not teach the subject, have notions of what is being done in other subjects and can also have a perception of how the new methodology is influencing them through simply the comments of the students.

3). Viability as a pilot experience of the implementation of the so-called "Live Programs" for some subjects. The Live modality (Learning Interactive Virtual Experience) has been launched in March 2020 at the Tecnológico de Monterrey as online programs that combine two types of learning, synchronous and asynchronous. The classes under this modality are virtual with groups of no more than 30 people and have discussion forums with experts where real cases with solutions for a work environment are raised. (Observatory of Educational Innovation, 2020)

These last two secondary objectives are pending study for future academic years.

3. Methodology

It will take as a sample the subject of Business Management and Organization that students study in the second semester in the Degree in Business Administration and Management, in the Degree in Marketing and Commercial Management and in the Simultaneous Degree in Business Administration and Management and Marketing and Commercial Management of the Faculty of Economic and Business Sciences during the Academic Years 18-19 and 19-20. It is considered that the sample formed by these subjects is representative of the degrees offered by the Faculty of Economic Sciences by also taking into account the double degrees in which the subjects under study are offered.

In addition, this subject is chosen because being taken in the second semester allows comparing the results of the methodology applied before the pandemic with the most innovative and completely virtual that had to be put into practice during the confinement stage of early March 2020. This is a significant sample, since in the Academic Year 18-19 there were 278 students enrolled and in the Academic Year 19-20 with 254.

The quantitative assessment of the student's performance was carried out with the results obtained by the students in the different tests of Continuous Evaluation and in the Ordinary Call, whose results will allow us to explore the needs detected, which will help us to improve our teaching practice and focus it towards an adequate development of professional skills of the students.

A study has also been carried out, as a pilot experience, through online questionnaires, of the degree of satisfaction and adaptation of students to the use of new technologies and methodologies; this questionnaire was only sent to two groups of students, who made up 18.3% and 21% respectively of the total sample in both academic years. It was done in this way to be able to introduce improvements in the questionnaires after obtaining the feedback of the students. Before sending the questionnaires, they were guaranteed the voluntariness and confidentiality of the data, clarifying that it was a research that is part of a process of continuous improvement in teaching.

In these same groups has also studied the quantitative assessment of students of the methodological and didactic part based on the results of official surveys validated by ANECA.

As for the instruments and variables under study, they are summarized as follows:

1. For the analysis of the student's performance in the subject, a descriptive study will be carried out based on the grades of the different evaluation tests, which have been collected in the Grade Center of the Blackboard platform carried out for each group. The platform then calculates the weighted average of all grades, also making the statistical calculation of the average and median of the group. In order to do the study we will rely on the results of the continuous evaluation and the final test carried out by the students.

   The continuous evaluation, which accounts for 50% of the qualification, consists of a control based on practical knowledge (30%) and the resolution of a challenge on the management of the production of a company that works by workshops (20%), which must be solved in a group, using agile methodologies, in our case, scrum. Subsequently, this qualification is completed with a practical exam where they will solve a case similar to the one proposed as a group challenge, to take advantage of the learning derived from it.

   As a novelty, during the Academic Year 19-20, as a result of the pandemic, the resolution of the challenge has been carried out following the Design Sprint methodology, a new problem-solving model developed by Google Ventures in 2010, which gained enormous popularity in 2016 with the publication of the book Sprint, by Jake Knapp. It consists of a process that allows validating complex ideas and problems in just five days, through the creation of rapid prototypes and testing with real users. In our case, two weeks of class were used, with a total of eight hours of work with the mentoring of the teacher and as many of autonomous group work by the students. To do this, the Teams platform was used, enabling as many channels as workgroups had emerged.

   The different work sessions ended with the formalization of a deliverable that is collected in a private folder of the channel, where the key points of the session are specified, the progress of the work done, the revisions made after the teacher's specifications, observations, etc.

   Here the role of the teacher / mentor is very important in the different stages, because he must periodically monitor the work done by the students to be able to make feedback for improvement, since the more frequent the feedback between the mentor and the group of students, the greater the help he can offer them.

   As for the control and practical examination, they were carried out through the Blackboard platform in order to be able to use a proctoring system.

   In Academic Courses prior to 19-20, students performed these tests in person and the resolution of the group challenge in the classroom itself, through scrum, but without applying Design Sprint, since the teacher took advantage of the class hours to check the degree of progress of the groups and establish feedback.

2. To check the degree of satisfaction of the student with the new methodologies and the use of technologies in teaching, a descriptive study of the results obtained from the questionnaire sent to students through Google Forms has also been carried out, using the Likert scale where the value of 10 = Totally agree and 0 = Totally disagree. It has been made with this scale because it is similar to the one used by teachers to reflect the qualifications of students, so we think it is closer to them and, therefore, easier to handle. In addition, the characteristics posed by the questionnaires carried out by this system, such as unlimited number of surveys, download of data in Excel, personalization, ..., we think are viable and simple for our objective.

   The questions in the questionnaire are as follows:

   1. The teacher has previously explained to me what Challenge-Based Learning consists of and the agile methodologies that will be used.

2.   Challenge-Based Learning seems useful to know the practical application of the subject

3.   The resolution of the challenge has helped me to learn the use of agile methodologies.

4.   The process of solving the challenge has been well organized (information, compliance with dates and times, delivery of material ...).

5.   The content of the challenges has responded to my training needs.

6.   There has been an appropriate combination of teacher mentoring and group resolution.

7.   The work of the mentor/teacher has contributed to the successful completion of the challenge by the team.

8.   The technological means and resources used have been adequate.

9.   Overall, I have been able to acquire new skills and abilities.

10.   General satisfaction with the new methodologies applied.

11.   Would you recommend the use of these methodologies in other subjects?

1.   The conclusions on the assessment of the students of the methodological and didactic part based on the results of the official surveys validated by ANECA have been obtained after the realization of the same by the University.

The questions related to this part asked to the students, and which are valued between A = very agree and D = very little or not at all agree, are the following:

1.   It raises the capacity for reflection and reasoning.

2.   It stimulates student learning and work outside the classroom.

3.   This subject has provided significant learning for my integral formation.

In conclusion, we will briefly detail the phases in which the proposed study will be carried out by the teacher:

1º.- Design and manage in an Excel, which is obtained from the BlackBoard Qualifications Center, which allows to group the academic results of the grades obtained in the different groups under study in the last two academic years.

2º.- Collect the necessary information to be able to execute the previous Excel.

3º.- Analysis of the results achieved, to check the relationship between the methodologies adopted and their importance in the final grade of the subject.

4º.- Manage an Excel that allows grouping the academic results in the different subjects that have been taught online as a result of the coronavirus during the second semester of the Academic Year 19-20.

5º.- Analysis of the results achieved, explaining the adaptations that had to be made in the teaching guides of all of them, studying the methodologies adopted to teach the subject virtually, the types of exams carried out and their influence on the final grade of the subject.

6ª.- Elaboration of a questionnaire for students, at the moment only in a pilot group, which collects qualitative aspects of the teaching improvements. This way we can assess if the students of the chosen group understand the questions clearly, or if they need to be modified. In addition, we will be able to create a more open environment allowing students to express perceptions without limits in the questions.

In this way, it will be possible to improve the quality of the data obtained in subsequent courses when the methodology is extended to a greater number of students.

7ª.- Collection of the methodological assessment carried out in official ANECA surveys for the pilot group.

8ª.- Analysis of the information obtained from the questionnaires and surveys of this pilot group.

9ª.- Preparation of a questionnaire to measure the degree of satisfaction of the teacher and treatment of the information collected.

10ª.- If the viability of the proposal is demonstrated, study of its progressive implementation in other subjects of the Area.

11ª.- Choice of group and subject to put into practice pilot experience of the Live Program.

12ª.- Design of document on the basis of the Live Program, where it is analyzed how to incorporate it into the teaching guide of the subject.

The last four points are pending study and analysis for the current academic year.

4. Results

The results obtained on student performance, degree of student satisfaction with new methodologies and the use of technologies in teaching and the assessment of students of the methodological and didactic part that emerges

from the official surveys validated by ANECA are summarized below, for the Academic Year 18-19 and 19-20 in the subject under study.

4.1 Student Performance

The student's performance, measured by the academic results achieved in the ordinary call for Academic Years 18-19 and 19-20 is reflected in Figures 1 and 2.

Figure 1 shows the changes in the different grades between both courses, being significant the evolution in the percentage of failures that is practically reduced by half, doubling the grade of notable and increasing by 72% that of outstanding. The reduction in the number of no-shows is also striking, since it allows to reflect the greater motivation and interest of the student.
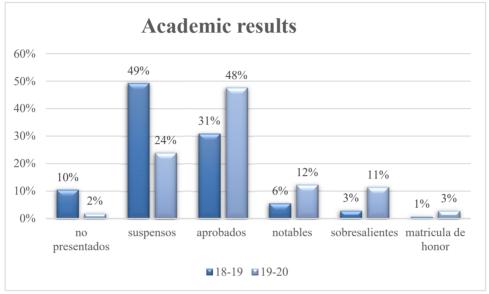

Figure 1. Evolution of the different grades between the 18-19 and 19-20 courses.

Source: Authors.

Figure 2 shows the percentage with which each grade contributes to the total, seeing more easily the evolution in academic results between both courses and how there has been a change in trend in student performance, measured by their academic results.
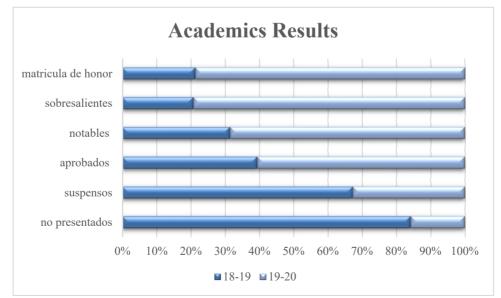

Figure 2. Comparison between grades per contribution to the total.

Source: Authors.

4.2 Degree of Student Satisfaction with New Methodologies and the Use of Technologies

Regarding the results that emerge from the degree of satisfaction of the students, the following table reflects a summary of all of them, where the field refers to the question number of the questionnaire, detailed above and the count to the number of students who answer the question:

Table 1. Results of the questionnaire on the degree of satisfaction for the Course 18-19

Field	Average	Standard deviation	Recount
1	8,2	1,4	25
2	7,1	1,8	21
3	6,8	2,1	23
4	9,2	1,1	25
5	7,2	1,9	21
6	7,4	1,6	23
7	8,1	1,3	25
8	5,4	2,1	25
9	6	1,9	23
10	6,5	2,1	25

Source: Authors.

In the Academic Year 18-19, we found that students value the effort made by the teacher in terms of explaining the methodology, organization and support for the achievement of the challenge, but they do not understand the applicability of what they are doing nor are they aware, in most cases, that they are acquiring skills for their professional future, Not knowing on the part of some what answer to give.

Table 2. Results of the questionnaire on the degree of satisfaction for the course 19-20

Field	Average	Standard deviation	Recount
1	8,6	1,4	31
2	7,9	1,8	29
3	7,8	2,1	29
4	9,3	1,1	30
5	8,2	1,9	31
6	7,9	1,6	31
7	8,8	1,3	29
8	9,5	2,1	30
9	9	1,9	31
10	8,5	2,1	31

Source: Authors.

During the Academic Year 19-20, the student's perception has changed. It is true that, as a result of the pandemic we have students more accustomed to new teaching methodologies, but in this course they are already able to assess that beyond a new methodology, they are acquiring professional skills, hence they value this field with a 9 and all respondents respond, so, in addition, it follows that they understand the subsequent usefulness of knowing these skills.

They are also more satisfied with the use of these methodologies, although they still value them with 8.5, which denotes that there is work to be done by the teacher so that the student becomes an active character in the learning process.

On the contrary, virtual classes make the student satisfied with the use of means and technological resources used and continue to value very well that the resolution process is well organized.

In conclusion, the comparison of the results of both courses indicate that much progress has been made in terms of student perception but there is still a way to go in terms of the teacher's use of these methodologies, since they continue to put a note of remarkable to that there has been an adequate combination of mentoring by the teacher

and group resolution, Although it is important to note that students continue to value the work of the mentor/teacher in terms of their contribution to the successful completion of the challenge by the team.

Finally, the last question of the questionnaire (11. Would you recommend the use of these methodologies in other subjects?) allows us to analyze the promoters, detractors and passives of these new methodologies for both academic years.

As can be seen in the figure, the promoters of the last course practically double those of the previous year, which can be considered as a success factor in the implementation of these new methodologies. Something similar happens with those considered passive, which have practically disappeared, which shows that students have verified what the ABR consists of, although there are a few who have not liked this way of teaching / learning (detractors).
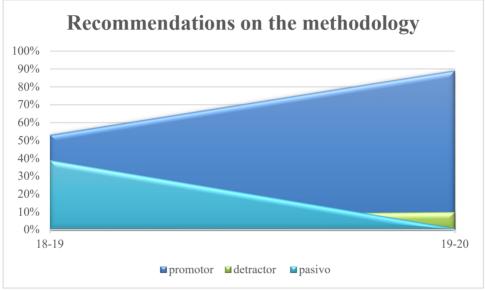

Figure 3. Would you recommend this methodology?

Source: Authors.

4.3 Assessment of the Students of the Methodological and Didactic Part

As for the results that emerge from the official survey carried out by the University, endorsed by ANECA, on methodology and didactics, it should be noted that the pilot group values this item with a 9 out of 10 with a standard deviation of 1.66, while the average of the faculty for this field is 7.71 with a deviation of 2.69. This qualification shows that the students of this group value this new way of teaching positively.

5. Discussion

The controversy brought about by these new methodological forms refers to the digital divide that exists not only between teachers and students, but also to the technological differences between groups of teachers, students and universities.

The incorporation of ICTs in teaching innovation is a new challenge for students and teachers, but these are technologically different generations, which will need to be brought closer for this pedagogical relationship to be effective. Until now, the incorporation of new technologies in universities "has been done somewhat arbitrarily, obtaining results that are not always generalizable." Each University has been incorporating them in isolation, responding to the immediate need that suddenly arose among institutions, or obeying the technological fashion. But, without a doubt, pedagogical reasons were not, in this first approach, a priority reason. (Sangrá and González, 2004).

It is pending, therefore, to promote among teachers the use of ICTs in teaching processes, which will contribute to reducing the digital divide since our students arrive each academic year at the university with greater technological and digital training and with a generalized use of social networks; in this sense, according to data from the Annual Study of Social Networks, 2019, 46% of university students use social networks, with mobile being the main

device for accessing social networks (95%) although the computer is also widely used; while the mobile leads the connections of WhatsApp, Instagram, Twitter and Telegram, the computer does it on Facebook, Youtube and LinkedIn.

Therefore, the teacher must update his technological knowledge, and probably also must expand and update his pedagogical knowledge, which historically the university has not required (Sangrá and Gonzalez, 2004).

As Cabero (2004) points out, the problem for the use of ICT in teaching-learning processes does not come from students but fundamentally from teachers. They feel increasingly insecure in the new technological framework where they find themselves for different reasons, ranging from their lack of mastery to the speed and speed with which they are incorporated into society.

We think that this new learning system will favor this update, since the teacher will be able to reflect with the results obtained in our study on the strengths and weaknesses of the incorporation of ICTs into the classroom. In this sense, we propose to generate an Educational Innovation Radar, following the idea of Tecnológico de Monterrey, which has been developing since 2015 a document with a map that includes the perspective of teachers on the motivations, obstacles and benefits that these teachers bring to the forefront of educational practice. In this way, we can also measure in our case part of the impact generated by our idea.

In the case of Monterrey, the comparison of the pedagogical and technological trends of Radar 2015 and Radar 2017 reveals a highly dynamic evolution of educational innovation. On the one hand, most of the trends that in 2015 were perceived as relevant are still relevant two years later. However, the position of these trends in the preferences of the teachers surveyed is highly variable. Regarding the position of teachers in terms of teaching innovation, they experienced a fundamentally intrinsic motivation when it comes to innovating their classes, derived from their own needs and illusions, that is, that it comes "from the inside out". On the contrary, they gave less value to motivations that come to them "from the outside in", such as the usefulness for their research agenda, the entrustment of their managers or the interest of the students (Observatory of Educational Innovation, 2017). This implies that it is necessary to generate personal motivation in the teacher so that he gets involved in new methodologies.

6. Conclusions

The great advance that teaching methodologies have achieved as a result of the pandemic has to be consolidated in the university. Something that until now was a gradual and slow process, which only developed some teachers, has become a necessity. The digital transformation that has been suffered vertiginously means that teaching processes have to change and adapt to these circumstances.

The students have welcomed these methodological changes relatively well since they have accepted that the economic and social influence that these innovations will have on their professional opportunities and their future contribution to the generation of more agile ways of working will be very positive. With the forced acceptance by health circumstances of the use of technology, the way of facing collaborative or team work within companies has changed substantially. Now it becomes a necessity for people to know how to work in this way.

Companies need professionals who know how to adapt to the new environment with greater productivity, agility, capacity for innovation and motivation, who are able to communicate through different social networks and / or communities of interest and know how to handle agile management tools. According to the Pulse of the Profession Report 2017, the Agile method is one of the most used to optimize the work of managers and middle managers of companies and 71 percent of the organizations surveyed use these methods in their projects sometimes or more frequently than in the past.

Years ago, the financial crisis and the continuous change to which companies were subjected, already made them transform their way of doing and acting, but now the panorama is more complex, and a new financial crisis, other aspects are joined such as changes in the competitive landscape and / or changes in the form of customer service. This will require greater agility from companies to be able to adapt continuously.

The problem is that according to the "Agile State 2018" Report, in 35% of cases agility fails due to insufficient training in these methods, and in 41% of cases due to lack of experience in agile methods. If the university manages to train in these aspects, the positive impact that can be generated in the world of work will be important, where our students will be trained thanks to teaching innovation in tools highly requested by companies.

This positive impact can be evaluated in the short term by analyzing the graduates who are incorporated into the labor market thanks to the agile knowledge of collaborative work.

However, this proposal is not without difficulties, one of the biggest we can find is the resistance to change on the part of the two active subjects of the research, professors and students.

In many cases, resistance to change on the part of teachers is, according to Garcia (2002), passive, its most common forms of manifestation being the following: questioning even the most intimate details of the change project, doubts regarding the need to introduce a change, turning the initiative of change into an object of ridicule and mockery, feigning indifference in order to make the project fall on deaf ears, nostalgically evoking the merits of a not too remote past, evoking the multitude of annoying consequences that the implementation of change will surely entail, refraining from actively cooperating in the process of change, expressing apathy, hindering the pace of work, discrediting the initiators of change, take every opportunity to provoke discussions about the change in question, etc.

In order to reduce this passive resistance, it must be taken into account that the insertion of ICTs in teaching and with it teaching innovation, must consider the emotions, fears, experiences and needs of teachers; as well as sufficient clarity of why, how and for what to use them (Padila, Páez and Montoya, 2008). In this sense, we think that the training courses provided by the university can collaborate positively in this regard.

As for the resistance of the students, we believe that it will be superior in the most advanced courses, since in the initial ones the customs of the previous educational cycles are rooted, where teaching innovations are generally frequent. However, the student usually changes his attitude as soon as he can verify that learning by doing, allows him to be part of his learning process, motivating him to achieve the proposed challenges, which will benefit his final result in the subject.

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