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RETENTION OF STUDENTS AHEAD OF THE CHANGE FROM VIRTUAL TO FACE TO FACE CLASSES: CASE STUDY FROM THE COMMERCIAL ENGINEERING DEPARTMENT

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Abstract

The academic performance of our students is being presented as a permanent challenge for the academy due to its complex directly associated with the results of learning. So then, it originates the question: do academics' methodological innovation efforts impact academic performance? To answer this question, we present the results taken from these innovations applied to a Commercial Engineering course at Universidad de Antofagasta. Considering a universe of 251 students in a 4-year time horizon (2018-2021). It is proposed a teaching plan with digital resources for learning and centered in students increasing the interaction with resources and with peers. The goal of the innovation is to improve the average grade point average by at least 5% and the failure rate (will decrease) by at least 15%. The innovation in the subject has increased the percentage of approved and the participation in lessons.

Keywords – Academic performance, Retention, Digital learning.

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1. Introduction

In this study, is pretended to enhance the learning experience constructed by the students. The learning is facilitated by the peers and the prior knowledge as opposed to information transmitted from teaching staff to learners. In the search for the improvement of academic performance is promoted changes in the planning of learning introducing the student-centered learning and digital learning environments.

Academic performance, it's a concept that has several meanings and has evolved over time depending on the field in which it is applied. From the etymological origin, the word comes from the Latin reddere which "re" is going backwards and "dare" which is to give, this intersected with the conjugation of "prehendere" (to attach/seize) and "vendere" (to sell) - transformed into "reddere" which is understood as a measure of proportion that appears between the forms used to obtain something and evaluate the result that is concretely achieved (Flores, 2010). From the field of industry-economy labor market, it is

currently used as a productivity criterion, i.e., as the result of a process that shows the quality of a product obtained (Mozarán, 2013). From educational point of view, it is used to measure the effectiveness of the curriculum and curricular evaluation processes (Álvarez-Mendez, 2010; Kirkpatrick & Kirkpatrick, 2015). Usually, the primordial factor to determine their performance has been the qualifications obtained through objective tests (Tomás-Miquel, Expósito-Langa & Sempere-Castelló, 2014). From the educational sector, it is seen as the convergence of three factors (Rodríguez, 1982): i) Social, which implies understanding that the educational institution has the responsability to guarantee the leveling of social inequalities (academic performance is associated with equal access to productivity and the benefits that this entails; ii) Educational-Institutional, which is related to the adequacy of the ways in which the educational process is carried out (methods, programs, organization, teacher qualifications, among others); and iii) Economic, which includes the investments made by educational institutions and which generate an adequate climate between the demands of society and the resources applied to respond to these requirements. From the point of view of the performance's determinants, 5 groups of variables are identified (Tejedor, 1998): *I*) Identification, those that characterize or identify the subjects of study; *ii*) Social-familiar, are contextual variables associated with the family group or social groups in which the subject of interest interacts on a daily basis; *iii*) Academic, contemplate characteristics of the academic environment, such as previous performance, course, types of studies, among others; *iv*) Pedagogical, associated with the forms and methods used when teaching curricular content and ways of evaluating such content (teaching methods, didactics selected, forms of evaluation, etc.); *v*) Psychological, involving behaviors and forms acquired from the subjects that make up their way of being and are closely related to their daily actions (personality, motivation, self-concept, study habits).

In synthesis, academic performance is a complex concept, which represents an indicator that allows measuring in a certain way the efficiency of the educational system, involving the academy and the students. Considering this, the research will only focus on the pedagogical aspects, and specifically related to the didactic strategy.

Regarding the teaching-learning process, we will assume it as the process by which people acquire changes in their behavior, improve their actions, reorganize their thinking, or discover new ways of behavior and new concepts and information (Biggs, Kember & Leung, 2001). In this process, there are several elements to be investigated but we must always start with the didactic act, the moment in which information processing occurs, for which other factors with pedagogical purposes have an impact, such as mediation, context and the type of strategies used by the teacher. It is where the teaching process is concretely carried out; that is to say: the materialization in time and space of the process. This realization is conditioned by the same influences and determinants as any labor act, involving in it every factor that can modify the normal development of the process. The didactic act involves the teacher, the student, the content, didactic strategies and the context (Johnson, 2000). One of the components of the didactic act are the didactic strategies, whose function is to facilitate students' learning, including the set of activities, techniques and means that are planned according to the needs of the students to which they are directed, the objectives they pursue and the nature of the areas and courses, all this with the purpose of making the learning process more effective.

By other hand, the use of digital tools for learning, centered in students practice, drives an inclusive approach for learning that enable and engage the full participation by all students (May & Bridger, 2010). However, the institutional support can collaborate with their policies, values and an organizational alignment. It helps to retain more students and engage them in the learning process (Thomas, 2021).

Teaching based on active methodologies -from the active school model- focuses on the constructive process of the student. One of the characteristics is to facilitate self-directed learning. That is, it promotes the development of meta-cognitive skills through reflection and planning. Generally, self-directed learning is usually an individual process although it can also be promoted from collaborative work even in virtual contexts (Hadwin, Järvelä & Miller, 2017; Schoor, Narciss & Körndle, 2015; Asif-Qureshi, Khaskheli, Ahmed-Qureshi, Ali-Raza & Qamar-Yousufi, 2021; Volet, Summers & Thurman, 2009). Collaborative

work is a social-constructivist process in which an individual learns more than he/she would learn on his/her own, as a result of the interaction of the members of a team, who know how to differentiate and contrast their points of view, in such a way that they generate a process of knowledge construction (Chaljub, 2014; Guitert & Jiménez, 2000). The incorporation of collaborative work in the classroom requires the use of techniques that put the strategy into practice (Barkley, 2007).

One of the conceptions of didactic strategies is to consider them as necessary and valuable tools to improve both the teaching and learning processes, as well as the teaching action in the formative context. Their use fosters the development of cognitive and meta-cognitive skills on the part of the student, while promoting reflective and enriching teaching practices in the teacher. From the didactic strategy, the teacher guides the pedagogical path that students must follow to build their learning (Giné & Parcerisa, 2003).

The types of didactic strategies are classified into two: learning and teaching strategies. Learning strategies consist of a procedure or set of steps or skills that a student acquires and uses intentionally, as a flexible instrument, to learn significantly and solve problems and academic demands. On the other hand, teaching strategies are provided to the student to facilitate an even deeper learning (Kember, Biggs & Leung, 2004). These strategies are involved with the own strategies and motivational facts of the student to get the learning process (Biggs & Moore 1993).

Decision-making regarding which strategies to apply in class depends on two key elements: the moment of the class in which they will be used, whether during the beginning, development or closure, and also the way in which these strategies will be presented, an aspect that is intrinsically related to the moment of their respective use. It is possible to identify different rythms inside these phases depending on the attention, the hour of class, the external factors that determine different moments as wake up, active learning activities, explanations, interactive participation…

The Covid-19 pandemic has altered the habits of face-to-face teaching to introduce an unknown and uncertain scenario for many, while for others it leads to a scenario of learning and creativity through digital applications that allow remote learning, whether synchronous or asynchronous. Although difficulties have arisen since its emergence, interesting good practices are also emerging (Morgan, 2020; Yates, Starkey, Egerton & Flueggen, 2021). From this perspective, remote classes should have the necessary pedagogical support so that the disciplinary content is presented through a varied set of didactic strategies such as examples, demonstrations, analogies, simulations, etc. with the technological support inherent to the didactic intervention. Planning from the didactic sequence also consists of applying these strategies. Some characteristics that can be extrapolated to online learning would be (Tubin & Edri, 2004): state the learning objective, detect previous knowledge and motivate in relation to the topics to be worked on (anchoring); it is necessary to present the information fluently, clearly, hopefully in an interactive and dynamic way (appropriation of the new knowledge); It is essential to relinquish control and provide spaces for students to play a leading role, where they can apply, debate, solve, face a dilemma or make mistakes; it is a priority to end the session reflecting on what has been learned, expressing certainties and doubts, systematizing and connecting what has been discussed with the next session (meta-cognitive closure). In a remote classroom, it is essential to take into account that learning can be passive or interactive and that is why we must consider that the students, who are on the other side of the screen, are not necessarily learning, since learning implies a change in behavior generated by an experience (Carrillo & Flores, 2020; Feldman & Nuñez-Herrejón, 2005; Hazel, 2008; Psotka, 2022; Sahin, 2009).

The popularization of the applications and the educational intention to innovate by making use of them has made them proliferate and improve their educational possibilities. Regarding student support for learning achievement, new forms of interaction have become increasingly common, particularly bidirectional interaction between teacher-student and software-student (Mayer, 2001; Schär & Krueger, 2000). This was coupled with real-time support and peer-to-peer interaction (Mills & Tait, 2004; Sangrá, Vlachopoulos & Cabrera, 2012; Brindley, 2014) as well as teaching methodologies such as flipped learning (Thi-Thai, De Wever & Valcke, 2017).

Three main forms of learner support are now widely recognized in in-person and distance education: peer support, content support, and instructor-institution support (Barberà, Zhang, Galván & Fernández-Navarro, 2018). Peer support usually occurs because of the collaborative and affective relationship and bond that arises between them as equals. From instruction, peer assessment can be considered to work on support in a constructive way. Content support is based on instructional design. This includes the didactic sequence, didactic strategies, and formative and evaluation resources (Holmberg, 1999). Teaching support is one which is dynamic and variable according to the rhythm of the sessions, explanations, activities and it is focused on the achievement of the students' learning. It's common for distance students to encounter greater difficulties to continue with their process, but some studies affirm that the support of classmates, the teacher and even the role of the institution favor a commitment to learning, self-control and self-efficacy. Continuous tutoring and follow-up support during a course are motivational factors that increase retention and completion rates (Barberà et al., 2018).

2. Design

Today, our students present a learning profile differentiated by their ability to obtain information from various digital sources and the ability to contextualize these sources to the pedagogical interest. For this, we must integrate different pedagogical methodologies, which allow us to involve students in improving the socialization of learning, reflection, discussion of solutions as well as facilitating a more inclusive and dynamic learning.

The objective of this research is to improve academic performance by 5% (increase) and the failure rate by 15% (decrease) by implementing methodologies focused on cooperative learning and the support of digital and interactive applications for learning.

The study sample consists of 251 higher education students from the region of Antofagasta (Chile). This total corresponds to two academic courses and two parallel groups in each course. They are students of the subject Finance I, which is mandatory in the Commercial Engineering course, Mining Business mention of 6 credits. All students have worked with the academic coordinator of the subject. It is important to highlight that the time of research was divided into 2 biannual periods, two academic courses with on-site modality (2018-2019) and two academic courses with virtual modality considering the pandemic context that forced in the years 2020-2021 to the implementation of it.

The research method used correspond to the QUAN-qual deductive-sequential methodology (Cresswell & Clark, 2011), first analyzing the quantitative part and then understanding the comparison of both modalities (on-site and virtual) through observation. The data and instruments used are:

Quantitative data:

- Grades: record of grades for the last four years obtained from the Universidad de Antofagasta's Curricular Registry database, average of the grades of each group and comparison of results at the end of each course.

The analysis of quantitative data is descriptive applying the values and percentages of grades for each course and period.

Qualitative data:

- Documentary analysis of secondary sources: the study plan and the Curriculum of the subject.
- Direct observation of the participants: In this case, the research conducts a direct participant observation, the observation is on the field, given that it considers the events in the time and context in which it happens, both on-site and virtually. A Direct Observation Guide is used.

The observation of documents and behaviours are categorized by emergent categories (Taylor & Bogdan & DeVault, 2015) considering the focus of each instrument.

The analysis of the quantitative and qualitative data is shown in Table 1.

Instruments	Sources Used	Focus	Anylisis
Document analysis	Course Program	• Subject Planning	Objectives of Learning (Emergent categories)
	Learning Guide	• Resources and activities	Didactic Strategy (Emergent categories)
	On-site/Virtual Class Observation	• Scope of learning objectives • Type of activities performed • Consulted resources • Student participation • Teamwork • Motivation in class	Direct Observation Guide (Emergent categories)
Grades of students	Universidad de Antofagasta's Curricular Registry Base	• Grades obtained by students of Finance 1	Statistical analysis With regard to grading, a statistical review of 251 students in 4 consecutive years was carried out, using averages, growth rates, failure rates and grade distribution intervals. The first period was used as a control, in on-site situation, while the second one was in charge of the innovation in an off-site modality.

Table 1. Summary table of data collected

2.1. Description of the Innovation in the Subject

The purpose of this innovation is to define and implement a didactic strategy adjusted to the profile of the new student, characterized by his ability to obtain information from various sources, contextualizing them through the relationships between his own experience, application to real situations and contents guided by his own orientation towards problem solving and creativity, then, innovation in resources and activities can make students:

- Are committed to their work in the classroom.
- Be interested and concerned about their learning process.
- Become problem solvers.
- Develop as empathetic and understanding people.
- Be able to strive to achieve their goals.
- Learn to work as a team in search of a common goal.

To carry out the innovating intervention, a virtual classroom is presented with didactic resources and evaluation activities that allow each student to self-regulate his or her learning process. As a way of innovating the didactic act in the subject the teacher incorporates the use of constructionist methodologies of high participation, called active teaching methodologies or teaching support methodologies.

The changes introduced in the innovation proposal are about to the modality of student participation and interaction and the modality of resources used. During the innovation, students carry out classroom and continuous assessment activities that are group activities, some of them from individual deliberation and others collaborative, but with peer and immediate interaction in-class sessions. Tables 2, 3, 4 and 5 show the teaching planning, evaluation activities, the learning resources and the type of assessment offered in each of the teaching modalities (face-to-face lessons for period 1 and virtual for period 2).

The new classroom activities have three main components: a sense of learning community, flexibility, and student involvement. It is intended that students share the learning objectives and the methodology and process to achieve them. In this sense, transversal activities such as discussion forum, role playing and a

closed social network in radio format are planned to create learning links, identity of the same group-class and parity among them. As main activities of the course, students created videos and an audiobook to deepen the content and share it with the class group (see Table 3).

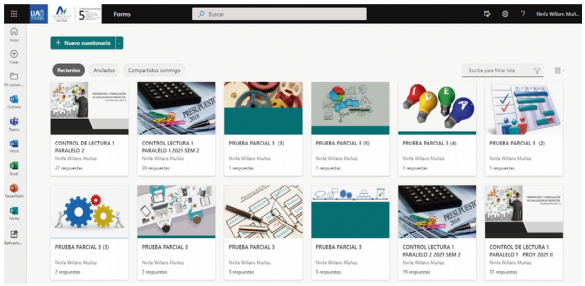
Teaching Plan		
Period 1 Face to face classroom	**Period 1 At virtual Classroom**	**Evidence of the innovation**
Learning Objetives Compliance	Learning Objetives Compliance	
04 weekly teaching hours	04 weekly teaching hours	
Classroom	Tele-study	
Class Sequence (I, D, C)	Class Sequence (I, D, C)	

Table 2. Comparison of the Teaching Plan between period 1 and period 2

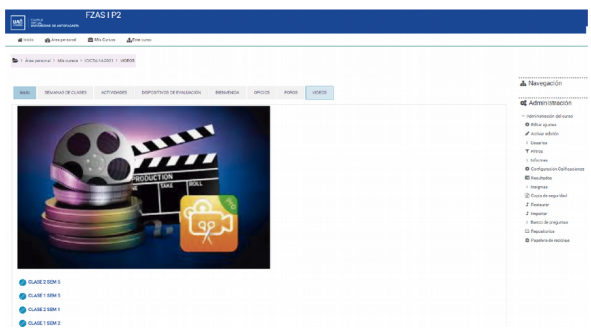
Activities		
Period 1 Face to face classroom	**Period 1 At virtual Classroom**	**Evidence of the innovation**
Expository Presentation (PPT)	Financial Concepts Videos	
Text	Audiobook	
Discussions	Virtual Forums, Controversial Discussion	
Dissertation	Role Playing	
Expository dialogue	Chat Room	
Copybook	Digital Portfolio	
Participatory Dialogue	Closed Social Network	

Table 3. Comparison of the Activities between period 1 and period 2

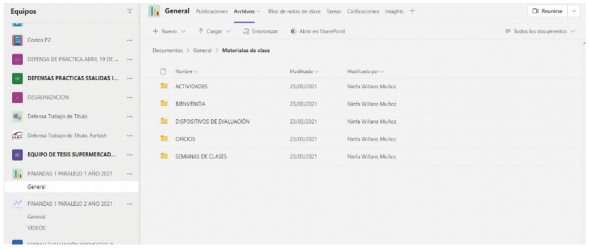
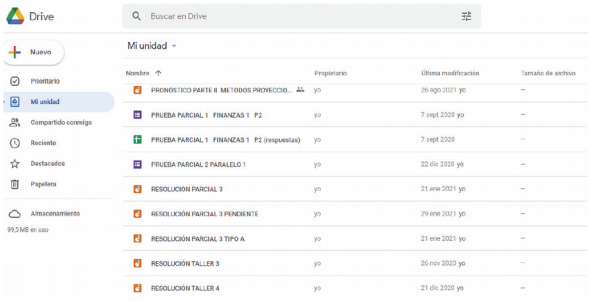
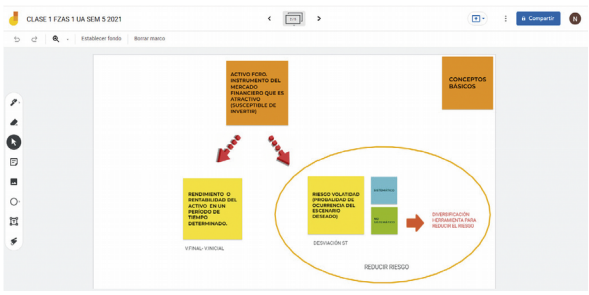
Resources		
Period 1 Face to face classroom	**Period 1 At virtual Classroom**	**Evidence of the innovation**
Library	Virtual Library	
Classroom	LMS & Digital communication tools: Moodle, Teams, Zoom & Meet.	
Printed Guides	Digital resources (released GSuite)	
Chalkboard	Jamboard	
Class to class printed guide	Flipped Learning	
Flipchart	Infographic	

Table 4. Comparison of the Resources between period 1 and period 2

The resources commonly used in the subject were tangible in their materiality and with a traditional and contextualized connotation in the university institution: located classroom, printed material from the beginning of the course, use of the blackboard (and therefore ephemeral annotations) and a printed guide. In order to facilitate the availability of the materials and include inclusive resources, it was decided to use digital resources such as: editable slides in Jamboard with images, videos, audios, material shared at Google Suite tools and to offer bibliography from the virtual library. On the other hand, the course sessions are transferred to the digital space with several platforms such as Teams, Zoom and Meet that allow interaction with students, attendance from anywhere and integration of interactive online activities in synchronous mode. The teacher's disposition is maintained to enhance the interaction and the support to the students by the LMS, Moodle, where is centralized the information, activities, and resources (see Table 4).

The value of flexibility, motivated by innovation and at the same time conditioned by the pandemic context, translates into the adaptation of students' involvement through the Flipped Learning methodology. This is one of the advantages found when carrying out activities on digital platforms that enable participation in synchronous and asynchronous mode (such as Edpuzzle, Google Forms, Quizzes...). The weight of the evaluation has shifted from the traditional written exams to online tests, interactive online activities and a case study solved by teamwork. An example of the use of digital resources is with the Edpuzzle application (https://edpuzzle.com/) which allows the student to watch a video and individually answer contextualized questions. In this case, the teacher receives the answers and can give feedback to each student and the large group. Another example is the case of Kahoot, widely popular, in which all students answer at the same time and can even compete in teams. It should be clarified that in the innovation proposal no gamification measures have been adopted but some elements of this methodology have been adopted (Table 5).

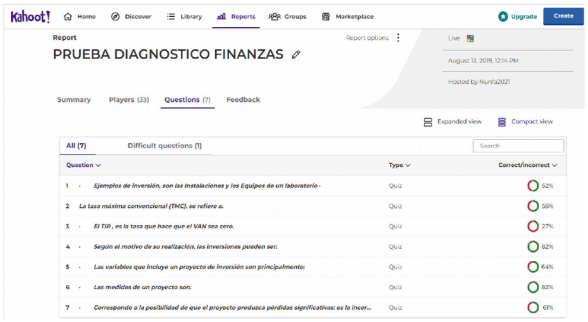
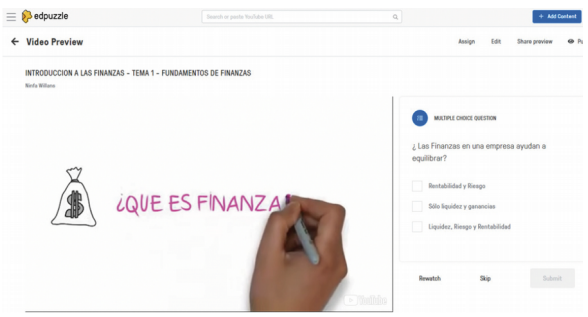
Assessment		
Period 1 **Face to face classroom**	**Period 1** **At virtual Classroom**	**Evidence of the innovation**
Diagnostic evaluation (written)	Diagnostic evaluation on Google Forms	
Formative Evaluation (written)	Use of; E-Puzzle, Google Forms, Kahoot, Quizzies & Checklist	
Summative Evaluation (written)	Case Resolution (standard rubric) Cooperative Learning	

Table 5. Comparison of the Assessment between period 1 and period 2

Although, it is included in the course activities the elaboration of a digital portfolio (see Table 3) as a part of the formative and continuous evaluation of the course. This is a transversal activity with the focus on the evidence of learning through the presentation of activities and the reflection. It is encouraged that these reflections derive from individual and group activity.

3. Results

Following the mix method Quan→Qual, firstly, are presented the quantitative results that correspond to academic performance and secondly, the qualitative results that explain the quantitative results.

3.1. Academic Performance

Once the course of each academic year has been reviewed, the grades obtained are analyzed.

Overall student performance in the subject Finance 1 per year, grade point average (Table 6).

Strategy	Year	Total students	Apr	Rep	Drp	% Apr	% Rep	% Drp	Prom Apr	Prom Gral
On-site	2018	86	76	5	5	88%	6%	6%	4.72	4.64
On-site	2019	59	43	3	13	73%	5%	22%	4.55	4.48
Virtual	2020	64	58	2	4	91%	3%	6%	4.96	4.90
Virtual	2021	42	37	1	4	88%	2%	10%	4.85	4.80

Table 6. Summary table of performance by year

Apr: Approved, students who obtain a grade higher than or equal to 4.0.

Rep: Reproved, students who obtain a grade higher than 3 and lower or equal to 3.9 (they take all the evaluations).

Drp: Dropouts, corresponds to students who fail 1 or 2 evaluations, and who leave the course informally (they do not regularize administratively).

%Apr: Percentage of Approved, sample of students with a grade higher than or equal to 4.0 out of the total number of students taking the course.

%Rep: Percentage of Reproved, sample of students with a grade higher than 3 and lower or equal to 3.9 of the total number of students taking the subject.

%Drp Percentage of dropouts, sample of students who drop the subject out of the total number of students taking the subject.

Prom Apr: Grade point average of passing students (considers passing students only).

Prom Gral: Overall course average (considers apr-rep students).

There is an annual dispersion in the number of students. To counteract this dispersion, it was decided to work with approval and reproval percentages. For the study, it was decided to consider the annual periods 2018 and 2019 (on-site modality) and 2020 and 2021 (virtual modality).

We can see how in the 2020 course the % of pass rate grows in the first course in relation to the classroom mode while in the 2021 course it remains the same with respect to the 2018 classroom course. Even so, the % of failed students is lower than in 2018. The dropout rate in 2020 and 2018 are the same even though it is much lower than in 2019. In the following year, 2021, although the % of pass rate decreases, the dropout rate also increases (from 6 to 10%) although the total number is the same, 4 students.

Table 7 shows the growth rate of the subject Finance 1 (positive or negative), the percentage ratio between periods according to the pass, fail and dropout rates per period.

Strategy	Period	Apr	Rep	Drp
Mixed	2018-2021	85%	4%	11%
On-site	2018-2019	81%	5%	14%
Virtual	2020-2021	89%	3%	8%
Growth Rate		11%	-49%	-43%

Table 7. Summary table of growth rate by period

It is verified that there is an increasing pass rate between periods. It is verified that there is a decreasing failure rate when comparing periods. We can verify that there is a decreasing dropout rate between periods.

The course grades range from 1 to 7, this being the highest possible grade, and from here the levels of achievement are established (see Table 8).

Interval	x <= 3	3 < x < = 4	4 < x < = 5	5 < x < = 6	6 < x < = 7
Level of accomplishment	Very low Final status of dropouts or fulfills up to 43% of the course objectives.	Low Final status of reproved, meets up to 56% of the subject objectives.	Sufficient Final status for approved, meets up to 71% of the course objectives.	High Final status for approved, meets up to 86% of the course objectives.	Very High Final approved status, meets up to a 100% of the course objectives.

Table 8. Summary table of level of achievement

We verified a change in the distribution of the students in the grading intervals, improving the level of achievement, in other words, with higher grades (Table 9).

Strategy	Year	X <= 3 Very low	3< X < = 4 Low	4< X < = 5 Sufficient	5 < X < = 6 High	6 < X < = 7 Very high
On-site	2018	6%	16%	57%	15%	6%
On-site	2019	22%	15%	54%	8%	0%
Virtual	2020	6%	6%	47%	41%	0%
Virtual	2021	12%	2%	50%	29%	7%

Table 9. Anual performance table

If we look at the level of achievement by periods, we find the following (see Table 10).

Control Period: years 2018-2019 period with classroom training and traditional methodology.

Implementation period: years 2020-2021 period with training based on collaborative learning and virtual classroom.

Mode	Period	X <= 3	3< X < = 4	4< X < = 5	5 < X < = 6	6 < X < = 7
On-site	2018-2019	14%	16%	56%	12%	3%
Virtual	2020-2021	9%	4%	48%	35%	4%
Period Average		12%	10%	52%	23%	3%

Table 10. Comparative table of performance by period and type of Strategy

There is a change in the distribution of students in the grade intervals, according to period, improving the average grades of each period.

Table 11 shows an improvement in the distribution of students in the low-grade intervals, according to educational strategy and corresponding periods. Decrease in the number of reproved and dropout intervals.

Mode	Period	X <= 3	3< X < = 4	4< X < = 5	5 < X < = 6	6 < X < = 7
On-site	2018-2019	14%	16%	56%	12%	3%
Virtual	2020-2021	9%	4%	48%	35%	4%
Improvement		-5%	-11%	-7%	23%	1%

Table 11. Improvement summary table

Visually, we see how the ratings are higher in the period when virtual training is done (Figure 1):

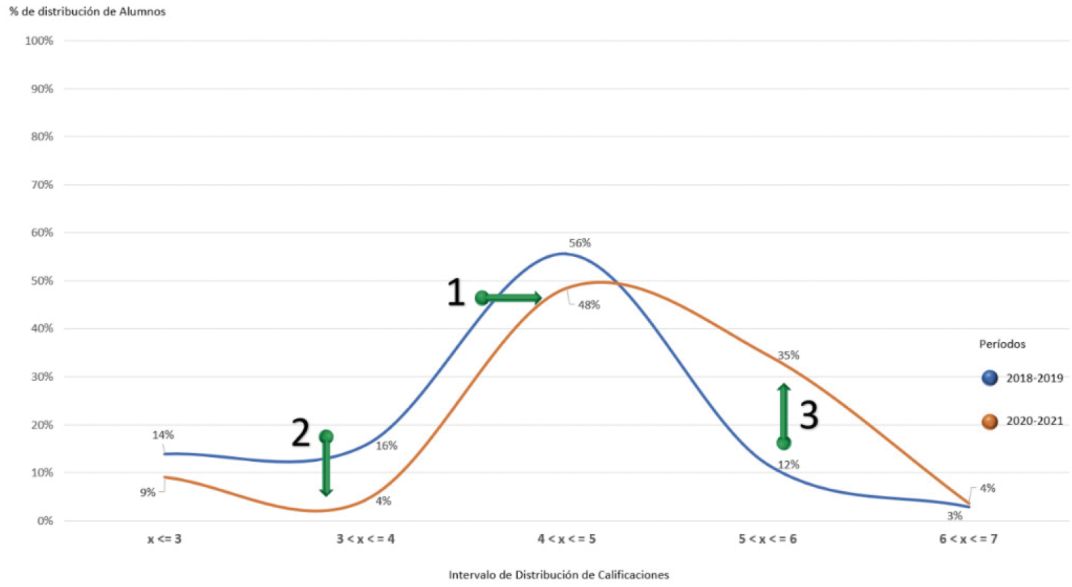


Figure 1. Interval of the distribution of ratings in the 2018-2019 and 2020-2021 periods

The percentage distribution of students is the sample of students in a grading interval, relative to the total number of students in the period.

Example:

$$\text{Student distribution percentage} = \frac{\text{Number of students belonging to the Interval 4 <X <= 5 (2018-2019)}}{\text{Total students of the period (2018-2019)}}$$

$$\text{Student distribution percentage} = 56\%$$

In horizontal reading (1), there is a shift in the distribution of students in the grading intervals to the right, that is, there is an improvement in the frequency of students, evaluated as a percentage of students per year, who score in the high and very high intervals.

In vertical reading (2) there is a decrease in the distribution of students in the low and very low-grade intervals, that is, there is an improvement in the frequency of students, evaluated as a percentage of students per year, who fail or drop out of the subject.

In vertical reading (3) there is an increase in the distribution of students in the high and very high-grade intervals, i.e., there is an improvement in the frequency of students, evaluated as a percentage of students per year, who pass, distributed in intervals of better grades.

Through these data we can see how in the transition from the on-site to the virtual modality, both the teacher and the students have made changes in planning and participation and that these have allowed a greater achievement in learning in the group-class and in retention.

3.2. Documentary Analysis of Teaching Plan

The changes made in each period for the on-site and virtual modalities in relation to planning, learning activities and learning support resources offered are shown (Table 12).

Item	Review 2018-2019
Planning	Planning carried out according to pedagogical hours adapted to the learning objectives in a collaborative manner, in the classroom and according to the sequence of classes (I, D and C).
Activities	Audiovisual presentation (based on their own presentations and prepared lecture materials-guides) • Exhibition Presentation (PPT) • Directed reading and puzzle techniques • Dissertation • Expository dialog • Physical notebook • Participatory dialog
Resources	• Physical library • Classroom (Layout) • Concrete material • Whiteboard/Blackboard • Printed guides
Item	**Review 2020-2021**
Planning	Planning carried out according to; pedagogical hours, adapted to the learning objectives in a collaborative way, in remote study and according to the sequence of classes (I, D and C).
Activities	Audiovisual presentation (based on their own presentations and prepared lecture materials-guides) • Financial concepts videos • Audiobook • Virtual forums/engaging discussion • Role-Playing • Digital Portfolio (student performance evolution) • Closed social network(radio)
Resources	• Virtual Library • Plataforms: Teams – Moodle (virtual classroom) – Zoom - Meet • Digital Material (GSuite Release) • Jamboard • Flipped learning

Table 12. Summary table of data collected

Between the two periods we find that the activities and resources go from being physical to digital enabling the self-regulation of each student as well as interactivity, self-assessment, team collaboration and review of resources anywhere and at any time.

3.3. Observation of the Learning Process, Teacher and Students in Each Course

The main observations for each course (2018, 2019, 2019, 2020 and 2021) regarding teaching and student activity in the classroom sessions are shown (Table 13).

Events	Observations 2018
Event 1	• The teacher complied with the planning provided, in terms of stating the learning objective of the class in a clear and precise manner. • The activities were adjusted according to the concepts and skills that students should learn. • Applied didactic sequence and used the resources stated in the planning (power point presentations and guides).
Event 2	• The activities developed during the class sought to motivate the students by making them both entertaining and didactic. • Resources stated in the planning were used, such as; creation of collaborative presentations (infographics), which resulted in a great participation and enthusiasm on the part of the student.

Table 13. Summary table of data collected in 2018

Events	Observations 2019
Event 1	• The teacher conducted the class according to the planning presented. • The teacher included activities of a collaborative nature and oriented to the achievement of the class objectives (CO).
Event 2	• The activities developed during the class sought to motivate the students by making them entertaining and didactic, through the creation of videos, which resulted in great participation and enthusiasm from the students. • The activities developed during the class sought to motivate students by making them collaborative, through the creation of forums. • A collaborative digital whiteboard was used as a declared resource in the planning.

Table 14. Summary table of data collected in 2019

In the period 1, the class have a medium level of participation and about the engagement in the activities proposed.

Events	Observations 2020
Event 1	• The teacher constructed and shared materials and homework assignments via Teams platform. • The plan was fulfilled and the activities to be developed during the class were defined at the beginning of each class. • The teacher included a 100% virtual activity, a demonstration of the Santiago Stock Exchange (stock market), which ensured the achievement of the objectives of the class (CO). • The activities developed during the class sought to motivate students by making them build their own learning by appropriating knowledge through videos, infographics, puzzles, Kahoot, construction of collaborative dictionaries, among others.
Event 2	• Only 80% of the classes were carried out within the scheduled time. 20% exceeded the time limit assigned and declared on the planning.

Table 15. Summary table of data collected in 2020

As emerging facts observed in period 2 are the better handling of digital tools and higher commitment and participation in the activities.

Events	Observations 2021
Event 1	• The teacher constructed and shared materials and homework assignments via Teams platform. • The plan was completed and the activities to be carried out during the class were defined at the beginning of each class. • The teacher included a 100% virtual activity, a demonstration of the Santiago Stock Exchange (stock market), which ensured the achievement of the objectives of the class (CO).
Event 2	• The activities developed during the class sought to motivate students by making them build their own learning by appropriating knowledge through videos, infographics, puzzles, Kahoot, mind maps, construction of collaborative dictionaries, among others.

Table 16. Summary table of data collected in 2021

In addition, there is a high level of participation and commitment of the students in the interactive activities carried out.

4. Conclusions

Academic achievement is a complex issue, which demands a permanent and challenging work from the academy. That is why, in order to understand its multifactorial nature, this research was carried out considering the pedagogical variables associated with the forms and methods used to teach in compliance with the fundamental role of teachers. Thus, the didactic strategy was adapted and modified in relation to the activities and resources to achieve the predefined objectives of this research.

In relation to the analyzed data, it can be concluded that the efforts in adapting the activities and resources of the didactic strategy made possible to satisfy the objective of improving the performance of the Students of the Commercial Engineering Career Mining Business Mention, in the subject of Finance 1. In terms of performance, it increased by 6%, and regarding the reproval Rate decreased by 49%, during the analyzed periods ("2018-2019 and 2020-2021"). In addition, the dropout rate decreased by 43% between the periods.

From the above it can be seen that the didactic strategies applied and adapted to the virtual modality have been positively evaluated by the students as a standard for the rest of the subjects. For this, it will be necessary to continue with training for the modeling of the didactic strategy consistent with its use in the virtual classroom. The resources used for class follow-up have components of self-evaluation and collaboration, which helps students to strengthen the identity of a learning community in the classroom and to feel a greater accompaniment of their achievements. Also, the fact that the resources and activities are in digital format instead of physical materials helps students to bring learning closer to their daily habits.

The innovation should also serve to design training strategies for modeling the didactic strategy that is consistent with its use in the virtual classroom, learning patterns and defining a didactic strategy design standard. This experience will take part in a design based on research to stabilize the innovation for, almost, two years more. Continuing the research, the key factors are the teacher support with different methodologies and communicational abilities, the educational relationship between student-teacher and between peers… interest and motivation from the teacher to teach, etc. Contextualizing the innovation in the university, a techno-pedagogical help service for students and teaching teams is also recommended.

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