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Motivación personal y autogestión del aprendizaje en estudiantes, como resultado de la transición a cursos en línea durante la pandemia COVID-19
Personal motivation and learning self-management in students, as result of the transition to online courses during COVID-19 pandemic

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Resumen

La pandemia por COVID-19 modificó el curso normal de todas las actividades a nivel mundial, Las medidas implementadas para disminuir el contagio y su impacto en los sistemas de salud provocaron un cambio en la dinámica de la población. En el ámbito educativo, el paradigma de la educación tradicional tuvo que ser cambiado completamente a un ambiente remoto en línea, lo cual representó un reto para alumnos, maestros e instituciones educativas. En este trabajo reportamos la respuesta de los estudiantes a las acciones realizadas por la Facultad de Ciencias Químicas de la

Universidad La Salle México para la implementación de cursos en línea asegurando el acompañamiento estudiantil. Al concluir el semestre, se realizó un estudio cuantitativo-cualitativo a la población estudiantil a través de una encuesta electrónica para conocer la respuesta de los estudiantes a la estrategia. La información se analizó utilizando el software SPSS®. Se registraron 266 respuestas, representando al 44% de la población total. 75.6% de los alumnos reportaron haber tenido buena o excelente disposición al ambiente virtual. De la misma forma, 48.9% reportó una apropiada adaptación al trabajo en línea. El 83.5% de los alumnos reconoció la dedicación y esfuerzo de los maestros. Los estudiantes mostraron desarrollo de habilidades blandas tales como organización del tiempo, autogestión del aprendizaje, así como habilidades de comunicación oral, escrita y digital. Estos resultados sugieren las ventajas percibidas por los alumnos durante la transición a clases en modalidad y virtual en su mayoría orientadas a la autogestión de su aprendizaje y que podrían conformar la base para el desarrollo de nuevas estrategias que pueden ser útiles no solamente en una situación de contingencia, sino también para la estructuración de programas en ciencia innovadores.

Palabras clave: investigación en educación química; aprendizaje basado en problemas; automotivación; autogestión del aprendizaje; pandemia; COVID-19; educación en línea; coronavirus.

Abstract

COVID-19 pandemic has changed the normal course of activities around the World. The measures implemented to slow down the spread of the disease and its impact on the health system have also suggested a change in population dynamics. In the educational aspect, the paradigm of the traditional education had to change completely to a remote environment, representing a challenge for students, teachers, and education institutions. In this work we report the students' response to the actions taken by the faculty of the Chemistry Sciences School of Universidad La Salle México to face online courses ensuring student accompaniment. After the term, a qualitative and quantitative study was performed to the school population using an electronic survey to address the response of students to the applied strategy. Data was analyzed using SPSS® software. 266 responses were obtained, which represents a response rate of 44%. 75.6% of the alumni reported having a good or excellent disposition regarding virtual sessions. Likewise, 48.9% reported adapting appropriately to the remote working modality. Also, 83.5% of students recognize the labor

of the teachers by acknowledging that their effort and dedication was excellent or good. Students showed development of soft skills such as self-time and learning management; written, oral and technological communication. These results suggest the advantages perceived by students during the transition to virtual modality, mostly oriented to self-management of their learning and that could conform the basis for the development of new strategies that can be useful not only for a contingency situation, but also in the structuration and innovation of science programs.
Keywords: chemical education research, problem-solving, computer-based learning, self-instruction, pandemic, COVID-19, online education; coronavirus.

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Introduction

COVID-19 is an acute respiratory disease caused by coronavirus SARS-CoV-2. The disease emerged in Wuhan, China in early December 2019 and spread rapidly worldwide. The World Health Organization (WHO) proclaimed the disease as pandemic on March 11, 2020 (World Health Organization, 2020).

Worldwide, this pandemic made countries take measures such as lockdown, quarantine, and social distancing to avoid uncontrolled spreading, affecting different aspects of human behavior, including communication, personal interaction, and daily activities. In the educational aspect, face-to-face activities migrated to a remote dynamic, suddenly, forcing educators to reflect on the impact that this will have on the teaching-learning process of students and the repercussions on the development of *soft skills* that are generated through formal education.

Higher education institutions had to migrate to a remote dynamic, adopting online learning models and virtual environments in the middle of the spring term. UNESCO estimated as of April 20, that the temporary closure of schools affected 91.3% of the world's student population (around 1,500 million students) (United Nations Educational Organization, 2020). Among the strategies

proposed to complete the lessons, there were asynchronous classes where students can develop activities at their own pace, and synchronous classes, in which interaction can be direct between the teacher and the groupmates at a specific time, mimicking a classroom environment.

In the case of Universidad La Salle Mexico, its infrastructure, including communication platforms, learning management tools, and learning content management, allowed the academic community an easier adaptation despite the technical problems they could face at their homes. Teachers continued the accompanying and monitoring of their students, promoting their self-motivation and self-learning-management, always inspired by the university's educational model, which is based on the socio-cognitive paradigm. This means that the person learns as result of their interaction with others (Universidad La Salle Mexico, 2013).

One of the biggest concerns in the academic field, is the impact, as result of this pandemic, on the teaching-learning process of students, and the development of soft skills, which are believed to be generated through formal education. Recent works affirm that a virtual environment can be even better than a traditional environment, however, it depends on a good planning and the personal disposition of the actors. De Luca, M.P. (2020) proposes that through virtual environments there can exist a pedagogical continuity. She implies that one of the faced paradigms is the deconstruction and reconstruction of the language. The learning experience must not be the same, but it can be good on its own dimension. In the same line, Crisol-Moya, E. et. al. (2020) describes the virtual education as an "education for everyone", which leads to another perspective: besides the traditional skills acquired in traditional education, students are faced to a multicultural, multidisciplinary environment that can be even richer. In terms of soft skills, Myers, t. et. al (2014) report a case of study where students successfully develop communication soft skills in an online learning environment. Techniques such as immediate peer-feedback, and process-oriented guided teamwork give the students practice in these skills and motivation. Finally, Silva-Quiroz, J. (2010) comments that for an online course to be successful, the tutor must acquire the role of guide and mediator instead of a one direction mentor.

Another great concern is the personal psychological aspect. A confinement situation may lead to higher levels of stress and other psychological disorders such as depression and anxiety. According to Fatima and Utsav (2020), almost 70% of students surveyed in their study (which include 500 students of different institutions in undergraduate level), suffered from stress derived from the pandemic situation. Irawan, et. al. (2020) report that students in their college suffered

from different psychological disorders during the first month of confinement. First, students showed lack of interest in their courses and boredom, turning into drastic mood changes and in some cases anxiety. The whole situation may lead to decrease in motivation and lack of interest in school. On the other hand, Bono, et. al (2020) comment that, after performing surveys in which grit and gratitude were evaluated, they observe that these variables were more related to the psychological wellbeing of their students. This would mean that psychological disorders during a stressful situation may be attenuated or avoided with the help of correct guidance.

In this way, academic programs in which teachers play the role of guide and companion of students and their learning process have a better adaptation to an online experience. This hypothesis has been confirmed in courses planned and structured from scratch (Kearns, L. 2012, Gaytan, J. 2004). Students show a better performance in written and oral skills, as well as in time management. However, there is not enough evidence about the advantages and disadvantages that students could present during confinement measures due to COVID-19, or in an intervention of an already planned course. Thus, the purpose of our study is to analyze the impact in the academic performance and personal perception of the students, derived from the actions taken to face the migration of activities to a virtual environment. It is to notice that this study is also focused on students of a chemistry department, where most of the courses are science and applied science related and the personal guidance is not always easy to achieve.

Method

A descriptive cross-sectional study was performed in students at the Chemistry Sciences School at the end of the spring regular term. At mid-term, activities had to be transitioned to distance education due to containment measures to decrease the spread of COVID. The Chemistry Sciences School belongs to Universidad La Salle Mexico and offers undergraduate programs such as: Chemical Engineering, Biology and Pharmaceutical Chemist, Food Chemistry and Environmental Engineering, and graduate programs of Clinical Pharmacology, Food Science and Technology,

Statistics and Project Engineering. The rough population is about 604 students. All students were asked to fill out an electronic self-applying survey. Participation was voluntary and non-remunerated. Students were asked to answer an informed consent in which they were assured all data would be used only for statistical and research purposes. Also, they were not allowed to provide personal or contact information and were able to stop their participation and leave the questionnaire at any stage before the submission process. If doing so, their responses would not be saved. By completing the instrument, participants acknowledged their voluntary approval to participate in this anonymous study in addition to the already signed consent.

Online research by anonymous surveys is a recommended approach to swiftly reach a specific collective, ensuring their safety and promoting adherence to contagion containment measures due this pandemic (Rzymski, et.al. 2020; Geldsetzer, 2020). Thus, data collection was carried out through a structured questionnaire created in Google Forms (Google LLC,Menlo Park, CA, USA), designed by a steering group who integrated 43 items based on a review literature aimed to explore different aspects of the students' performance and adaptation, the accompaniment by their teachers, the (re-)structure of the courses into a virtual modality, as well as questions aimed to identify barriers and advantages that they experienced through this "new" academic process.

The instrument included multiple-choice, yes-no, and open questions to assess quantitative and qualitative variables. Examples of different questions can be addressed in **Table 1**.

Table 1. Examples of questions performed in the survey.

Question	Possible Answers									
How do you feel your adaptation to working on a distance modality has been?	Excellent		Good		Regular		Bad		VeryBad	
How do you consider your disposition to study and academic activities?	Excellent		Good		Regular		Bad		VeryBad	
Select the difficulties you have faced during working online. (Multiple selection)	Not enough resources	Lack of experience	Internet fails	Lack of continuity	Excessive workload	Non-clear objectives	Incongrous material	Dependance of others	No difficulties	Other
Select the situations that could affect your performance. (Multiple selection)	Long schedules	Lack of organization	Concentration problems	Personal conflicts	Physical disposition	Emotional disposition	Other			
Select the advantages of working online (Multiple selection)	Increased grades	Working at my own pace	Learned more skills	More free time	Improved in technology	Less pressure	I understood better	Other		
How do you evaluate the performance of your teachers in this emerging situation?	Excellent		Good		Regular		Bad		VeryBad	
How do you evaluate the planned activities to attend your courses?	Excellent		Good		Regular		Bad		VeryBad	
According to the courses activities, what percentage of time have you been in synchronous sessions?	0% - 20%		20% - 40%		40% - 60%		60% - 80%		80% - 100%	
According to the courses activities, what percentage of them habe been only activities at home?	0% - 20%		20% - 40%		40% - 60%		60% - 80%		80% - 100%	
Do you feel there was a significant change in the course content?	Significant		Partially		Small		Not at all			
Do you feel the classes focused more into problem resolution than theory?	Significant		Partially		Small		Not at all			
Have you performed a final integration project?	Yes		No		Describe:					

To analyze the provided answers, dummy variables were created according to the number of advantages or disadvantages reported. Answers were grouped into categories related to technological, academic, and personal aspects. This was performed in such a way that the binary variables obtained could be quantitatively analyzed.

The anonymous nature of the use of this web-survey does not allow tracing in any way sensitive personal data and obtain more reliable answers. Therefore, the present study does not require approval by Ethics Committee. On the other hand, this tool allowed us to work with a dataset in a spreadsheet that was exported and analyzed using IBM SPSS Statistical Package software version 21.0 ®. Variables of interest were described by absolute values and relative frequencies.

Two groups according to their perception of changes in the structure of the course were organized: those who reported none or minimal changes *vs* those who considered partial and significant changes in the course during the transition to a virtual environment. Comparison tests according to these groups were made by $\chi 2$ or Fisher's Exact Test [13]. For all the analyses a statistical significance was considered from a value of $p<0.05$.

Results

A total of 266 responses were obtained by active students in undergraduate and graduate programs. They were enrolled with an average of 8 courses per semester in undergraduate and 3 courses in graduate. Rate of response represents a 44% of the alumni; of which 52.7% were freshmen and sophomore students of undergraduate programs (1st to 4th semester), 38.7% were senior students (5th to 9th semesters) and 8.6% were students of graduate programs. It is important to emphasize that after 16 weeks, the courses concluded and reported from 75 - 90% of topics reviewed with a low student desertion (<5%).

Regarding the appreciation of their performance under the contingence and on the online courses, 75.6% of the alumni reported having a good or excellent disposition with reference to

virtual sessions, no differences were observed according to their level (p=0.491). Likewise, 48.9% reported adapting appropriately to the remote working modality, with a higher figure in graduate students (p=0.046). 95 of the students (35.7%) perceived few changes in the dynamic of the course, emphasizing resolution of problems and project based learning, without differences according to the level of the students (p = 0.305), their disposition (p = 0.209), their adaptation to the modality virtual (p = 0.678) or the report of difficulties (p = 0.162).

In terms of the methodologies, results indicated that 71.8% of the students considered that the course approach was modified partially or significantly, in the same line, 64.3% of the students noted a partial to significant increase in the amount of problem solving during the classes in comparison to only theoretical concepts and 41.4% of the students mentioned they have developed a project, as stated at the beginning of the course.

Regardless of the disposition and adaptation of students, results of the instrument indicated that 45.8% of the students presented at least 2 difficulties during their learning process. These were classified into categories as technological, academic, and personal ones. The most common difficulties encountered during the process were technological, of which 78.2% of the students reported failures in the internet service, problems with video conferences applications, disruptions during synchronous activities and little or no ability to handle digital or technological tools, and these were presented in a similar way in accordance with their project and problem-based learning perception (**Table 2**).

According to academic issues 69.9% of the surveyed suggested problems as low amount of available didactical resources, an excessive amount of work, or perceived unclear objectives with the didactics and dynamics that the teachers proposed. Likewise, switching to a remote environment, having little or null experience in structuring, and following online courses, and the potential psychological harm the pandemic represents, caused problems during the learning process. According to the survey, 29.3% students report that they faced personal problems such as: discontinuous or prolonged schedules, low or null organization, lack of concentration and motivation and personal and family conflicts. No differences were found when comparing the presence of these problems according to the student level or appreciation of changes of the dynamic of the course, which prioritizes problem and project-based learning. The appreciation was similar regarding students with little or lack of experience in the university environment (freshmen) or students with familiarity with the courses demands.

Table 2. Disadvantages according to students who observed none or minimal changes and students who appreciated partial and significant change to classes with more practice and problems.

Disadvantages	Total N=266	None or minimal changes n=95	Partial and significative changes n=171	p
Without difficulties	31 (4.90)	7 (7.40)	6 (3.50)	0.162
Technological Issues	208 (78.2)	68 (71.6)	140 (81.9)	0.051
Internet service	180 (67.7)	59 (62.1)	121 (70.8)	0.148
Disruptions during synchronous activities	103 (38.7)	30 (31.6)	73 (42.7)	0.075
Video conference applications problems	3 (1.10)	1 (1.10)	2 (1.20)	0.931
Little or null ability for digital or technological tools	42 (15.8)	13 (13.7)	29 (17.0)	0.483
Academic Issues	186 (69.9)	69 (72.6)	117 (68.4)	0.473
Excessive amount of work	159 (59.8)	61 (64.2)	98 (57.3)	0.271
Unavailable material	43 (16.2)	12 (12.6)	31 (18.1)	0.243
Unclear objectives	91 (34.2)	32 (33.7)	59 (34.5)	0.893
Bad communication with teachers	12 (4.5)	5 (5.3)	7 (4.1)	0.660
Personal Issues	78 (29.3)	22 (28.2)	5 (32.7)	0.100
Dependency of group studying	65 (24.4))	18 (18.9)	47 (27.5)	0.120

Learning difficulties	1 (0.4)	0 (0.0)	1 (0.6)	0.455
Home distractors	15 (5.6)	6 (6.3)	9 (5.3)	0.721

Data are presented as n (%); p reported using χ^2 test. Shaded lines correspond to main group classification.

On the other hand, students reported some advantages during their academic process. 99.6% of them stated an improvement in several aspects as working at their own pace (55.3%) an improvement into their technological abilities (51.9%), an enhance of their final grades (43.2%), a better time organization (41.7%), as well as a perceived improvement in the teacher's didactics (30.5%), a decreased stress and pressure from their academic activities (13.9%) and an integral learning (10.5%). Also, 83.5% of students recognize the labor of the teachers by acknowledging that their effort and dedication was excellent or good (**Table 3**).

Table 3. Advantages according to students who observed none or minimal changes and students who appreciated partial and significant change to classes with more practice and problems.

Advantages	**Total N=266**	**None or minimal changes n=95**	**Partial and significative changes n=171**	**p**
Considered at least one advantage	265 (99.6)	94 (98.9)	171 (100)	0.179
Academic Advantages	203 (76.3)	79 (83.2)	124 (72.5)	0.050
Obtained better grades	115 (43.2)	48 (50.5)	67 (39.2)	0.074
Integral learning appreciation	28 (10.5)	8 (8.4)	20 (11.7)	0.404
Improved technological abilities	138 (51.9)	53 (55.8)	85 (49.7)	0.341

Personal Advantages	182 (68.4)	58 (61.1)	124 (72.5)	0.054
Less stress for academic activities	37 (13.9)	13 (13.7)	24 (14.0)	0.937
Autonomous and at own pace work	147 (55.3)	51 (53.7)	96 (56.1)	0.699
Better time administration	111 (41.7)	39 (41.1)	72 (42.1)	0.868
Better teaching dynamics	81 (30.5)	23 (24.2)	58 (33.9)	0.099

Data are presented as n (%); p reported using χ^2 test. Shaded lines correspond to main group classification.

In general, comparing groups according to their perceptions in the changes of the dynamic of the courses, no statistical differences were found when students reported advantages or disadvantages, in fact, almost every student reported at least one improvement in their academic or personal field as well as in a better communication with their teachers during the transition from academic activities to a completely remote modality (**Fig. 1**). Among which, the most important were those related to their academic performance reflected in better grades, a perceived integral learning (application of knowledge addressed in several course) and an improvement in the use of technological tools. In contrast to only 3.5-7.4% of the population who suggested not having any problems during this contingency, while the most common ones where related to technology education besides the limited access and availability to technological tools.

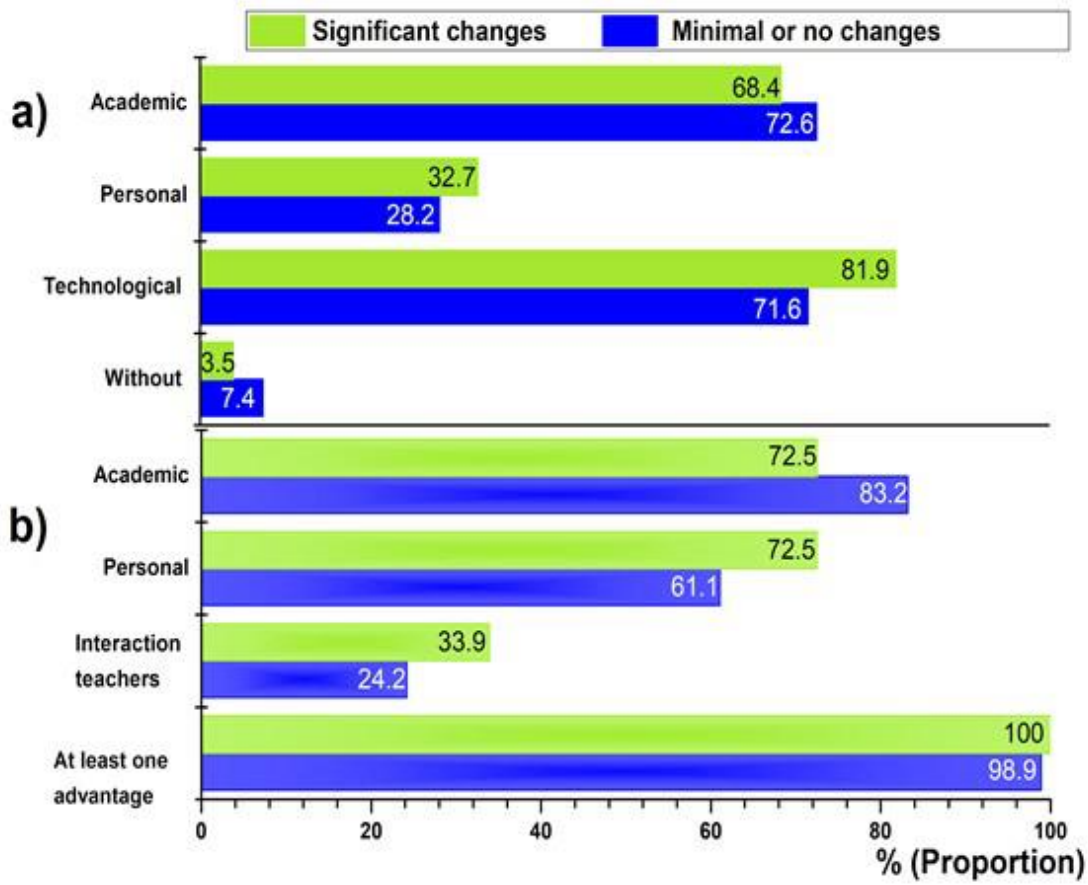

Fig. 1. Perceived advantages and disadvantages reported during the contingency due COVID-19 according to students. a) Disadvantages (top), b) Advantages (bottom)

Discussion

Results show that students do not appreciate a notorious difference in academic development and achievement. This was also confirmed by comparing results between previous terms and present. We observe an increase in self-motivation and clear notion of responsibility in self-management of learning. Students seemed more committed to their learning considering that working at their own pace and organizing their own time gave them more confidence although they faced time

management problems during the transition process. They also thanked the presence of teachers in synchronic sessions, resulting in important support for their learning process.

Regarding the disadvantages, this sample of students reported the expected ones as stated by O'Doherty et. al. (2018), suggesting that the key barriers include time constraints, poor technical skills, inadequate infrastructure at their homes.

It is to notice that most higher education institutions were not prepared to respond to this emerging phenomenon, and that the impact on the quality for the services they offer was mediated through their response capacity, adaptation and their education foundations, processes and methodologies. In the case of the Chemistry Sciences Department of Universidad La Salle Mexico, students were able to migrate successfully to the online environment and expressed an improvement in the development of soft skills, especially communication, self-management of learning and motivation. These results suggest that the Lasallian educational model was preserved through teachers' accompaniment and monitoring during the synchronous sessions, what has been suggested as part of institutional strategies to guarantee a positive attitude amongst all those involved in the development and delivery of online content (O'Doherty, 2018). This reinforces the idea that virtual academic environments are technological tools to generate virtual work communities and establish effective two-way dialogues (Miranda-Díaz,2004), and asserting that online education or any innovation in the academic process are becoming a driving force and a need in higher education, transforming the teaching-learning process (Blackmond, 2013).

Students seemed more committed to their learning considering that working at their own pace and organizing their own time gave them more confidence. They also reported a certain increase in the amount of problem solving and the development of projects, however they did not seem overwhelmed nor represented a burden for them because chemistry-based programs already encourage this kind of activities. This could be attributed to the nature of chemistry-based programs that are designed to encourage students to the resolution of problems and development of projects during their courses.

Teachers accompaniment was priority in developing student's self-confidence and self-time management. As they were not attached to a schedule, students could organize their time in the way they considered better. They could interact with their teachers at any time due to e-mail and took advantage of synchronic sessions to get advice in specific topics. As stated by Wandler and Imbrialle (2017) students self-regulate when the core of the learning process depends on

themselves. The student has the responsibility of his time, he has a clear objective stated at the beginning of the course and has continuous feedback from the tutors.

Students show decrease in stress due to academic activities. We consider this aspect important, because by self-time management and organization, students could face not only their academic performance, but also their personal situation in the face of the pandemic. Finally, students appreciate that they got better grades, which, in addition to having developed a personal learning strategy derived in personal motivation.

Despite the presented study has several limitations, such a low representative of new students in higher education, this was the first study analyzing the improvement of soft skills and the perception of their academic performance during the lockdown period among students of "hard science" like chemistry sciences, where laboratory activities and practical skills are important.

Conclusions

Although chemistry programs seem to have a reputation for being difficult and abstract, these results suggested that despite the expected technological difficulties, students were able to successfully complete their courses during the transition to virtual education due the COVID-19 pandemic.

Advantages in the student’s performance were perceived greater than the reported barriers, especially those related to the improvement of self-motivation and a clear notion of responsibility in self-management of their learning, competencies that are considered as a part of the graduation profiles of the educational programs offered by this faculty. Besides, students perceived a decrease in stress for academic activities and they also appreciated an increase in their grades, which, as result of their personal effort in their learning process derived in motivation.

Furthermore, online modalities allowed maintaining interaction and accompaniment between students and their teachers, and completing the review of the academic contents, as they were planned from the beginning of the course.

Soft skills such as self-time and learning management; written, oral and technological communication skills were achieved by students during the transition to online modalities, this could be explained by an effective adjustment of activities and tutoring and also because of the access to the necessary resources for the adaptation process.

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