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Flipped Classroom Methodology for Assessment of a Chemical, Clinical, Forensic and Biopharmaceutical Integrator Laboratory

Maritza F. Díaz Gómez*, Alejandro Charmell Jamerson, José M. Delgado Pérez, Fernando Torres Moscoso

Faculty of Medicine, School of Chemistry and Pharmacy, Universidad Andres Bello, República No. 239, Santiago, Chile

***Corresponding author:** Maritza F. Díaz Gómez, Faculty of Medicine, School of Chemistry and Pharmacy, Universidad Andres Bello, República No. 239, Santiago, Chile. Email: maritza.diaz@unab.cl

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Abstract

This article presents a teaching experience in times of pandemic with the application of the Flipped Classroom articulated with Information and Communication Technologies and active methodologies as a pedagogical strategy for the implementation and evaluation of the Integrative Laboratory, in which students must apply and reinforce the knowledge previously covered during the professional career. The main results are presented through three indicators: design analysis protocols, implement analysis and verbal communication, with an outstanding level achieved of 74, 70 and 85% respectively. We conclude that the use of the Flipped Classroom implemented in online mode encourages collaborative work and active participation of students.

Keywords: *flipped classroom, educational methodology, learning, ICTs, laboratory.*

1. Introduction

Education is, in effect, part of an articulated set of capabilities, in which each of them has become an evolutionary achievement of a high degree of adaptive specialization nevertheless, they all depend on each other. In that sense, a good education understands its place in the evolution of humanity, having a high degree of responsibility in its development with the transmission of information and provision of new capabilities and competencies [1].

Competencies have become the cornerstone of educational systems reform, also in university teaching. The concept of competence was used for the first time in the 1970s, because of research focused on identifying the variables that explain job performance. They refer to a set of knowledge, skills, and attitudes that the human being applies to learn, adapt, and perform in the world [2].

Within competencies in Higher Education, the Tuning project has played a role of extraordinary relevance at the international level [3], which has been funded by the European Commission and articulated in Latin America for the ongoing reform of higher education. A relevant aspect that emerges from the Tunnig method is related to focusing learning on students, which attaches importance to the design of study programs for the achievement of new university degrees, focusing on the position of the graduate in society [4].

This work tries to encourage an evaluation system that recognizes the diversity of students, promoting a range of evaluations that include, among others: short evaluations, projects, case analysis, problems, for which the use of evaluation tools is promoted. as rubrics. In addition, you can have an estimate of the student's work time outside the classroom, which must be considered in the development of study programs to apply the Transferable Credit System, which is of great importance for mobility [5].

Due to the Covid-19 pandemic, humanity has faced a global health emergency. In Chile, students have had to undertake their studies at home in online mode, given the impossibility of attending physically the university. Faced with this situation, higher education institutions and teachers have assumed the great responsibility of implementing new strategies that promote learning and effective evaluation of students to continue developing skills through distance education modality.

On this respect, Andrés Bello University began working with the Blackboard platform since 2020, to provide an effective interaction site with the required tools for the development of teaching-learning process, fostering the interaction of students with professors. In this context, the Chemistry and Pharmacy career has taken on the challenge with a clear orientation towards the evaluation and continuous improvement of its training processes [6].

The Integrative Laboratory I: Chemical, Clinical, Forensic and Biopharmaceutical corresponds to an integrative subject developed in the ninth semester of the current curriculum. During the implementation of said curricular activity, students must apply the competences developed in the previous subjects that point to the clinical and forensic laboratory area of the graduation profile, articulating their skills to solve specific cases in the professional field. For its evaluation, levels of achievements, indicators and credits are described. Didactics, evaluation strategies and feedback are also related. This supposes the integration in the students in skills of oral and written expression, knowledge, motivation, attitudes, and behavioral models.

As an educational methodology, the flipped classroom model is proposed [7], where students build their own knowledge, promoting the reinforcement of concepts and the improvement of their learning process, through a collaborative work carried out under the supervision and guidance of the teacher. During the course, different ways for implementing the teaching model

are promoted, based on the contributions of authors such as Piaget, Brunner and Ausubel [8-10].

In addition, technology plays an important role within the flipped classroom methodology, since it provides students with access to contents to develop these skills. For this, the implementation of Information Technology and Communication (ICTs), is introduced, within virtual classrooms as elements of support to previous activities, for better understanding and better development of students in the process to achieving the expected learning results [11].

Considering the above-mentioned information, the objective of this work is to evaluate how the flipped classroom as a virtual educational methodology influences the learning process of students in the Integrative laboratory, through student-teacher and student-student interaction for the achievement of academic results.

2. Methodology

2.1. Actions and activities to implement.

The teaching team implements in the Integrating laboratory, within the flipped classroom modality, the didactic strategy of analysis of practical cases, with the purpose that students have learning experiences to resignify the knowledge acquired prior to the activities online of the subject Laboratory: Chemical, Clinical, Forensic and Biopharmaceutical [12].

The class programming is inserted in the planning carried out for the semester from the syllabus as a permanent learning tool for students and teachers, being the articulation and coherence between the learning results, the general training skills, the performance indicators and the evaluation system used in the subject, all this in a certain context, depending on the teaching-learning methodology selected and the time available [13- 14], in addition, the teacher organizes the activities in order to give the class a certain rhythm.

The Learning Results (LR) to evaluation are shown below:

LR1: Validate analytical techniques in chemical, clinical and forensic laboratories, to ensure the quality and reliability of the results.
LR2: Analyze biological and expert samples to support clinical diagnosis and medical-legal research.

General Training Skill: Critical Thinking and Oral and Written Communication.

The indicators to be developed in the integrative laboratory are listed below: The Performance indicators; Assessment instrument; Weighting and Levels of achievement applied in the Integrating Laboratory.

1. Designs protocols for chemical, clinical, forensic and biopharmaceutical analysis, as a resolution of an analytical problem related to the pharmaceutical industry: (Flow Diagram); Assessment instrument: Qualification Rubric; Weighting 15%.
2. Implements protocols for chemical, clinical, forensic and biopharmaceutical analysis, as a resolution of an analytical problem related to the pharmaceutical industry: (Entry test); Assessment instrument: Qualification Guideline; Weighting 40%.
3. Communicates the results obtained, using formal language: (Results Report); Assessment instrument: (Qualification Rubric); Weighting 40%.
4. Behavior, Assessment instrument: (Check Guideline); Weighting 5%.

It should be noted that the behavior is transversal in the indicators, and the rest of the indicators correspond to scientific skills, giving the final sum associated with each activity, the evaluative percentage of 100 points.

The achievement levels applied to the performance indicators in obtaining the results are the following: Outstanding of 6.0-7.0 points; Proficient from 5.0-5.9 points; Basic of 4.0-4.9 points and Not achieved of 1.0-3.9 points. It should be noted that 7 points is the maximum achievable grade.

2.2. Practical class planning

The practical class, as a flipped classroom in its basic structure, is organized in three stages: beginning, development and closure, which have a clear pedagogical sense: [15].

2.2.1. First stage: at the beginning

The students carry out an entry test, based on the study of the subject carried out in their autonomous and cooperative work hours, facilitated by the guidance of the teachers [11], which it has a duration of 20 minutes and a summative evaluation through a qualification guideline. After that, the professor gives feedback to the group with the results, thus developing the students' competencies through the conceptual and procedural contents of the practical under study [16].

Subsequently, the teacher presents the learning results and the topics to be dealt with in the practical class, recapitulating relevant elements of the practical by reviewing the students' previous learning, through different means such as brainstorming, random questions and projection of videos of interest, among others. In this way, the student's previous study, collection of information and digital skills are verified.

2.2.2. Second stage: development

Implementation of a particular methodology based on planning (case studies), which is informed in advance to students through bibliography and the use of ICTs. These studies develop competencies through a complex real or simulated event that allows students to apply their knowledge and skills to solve the problem [17]. On the other hand, it is also necessary to consider within the rhythm of the practical class the alternation where in some moments the teacher intervenes and others where the students have space to work applying the knowledge.

To begin carrying out the laboratory, students rely on the flow charts prepared by each group [17], where they can present the procedure to follow in the case presented and the diagrams of each analytical technique that must be carried out, in order virtually within the flipped classroom modality. In addition, students respectfully listen to the opinions of all the members of each group, thus developing critical thinking to draw a conclusion and guide the diagnosis.

The teacher accompanies them and always guides the group feedback, thus developing the skills and competencies of the students through the expositions, concepts and procedures related to the clinical case under study.

During the development of the practical, students through collaborative work develop the skills of: Creativity, Communication and Collaboration.

2.2.3. Third stage: closing

Recapitulate the most important points of the practical class (ideally carried out by the students themselves, with the teacher's direction), thus stating the conclusions of the class from the development of critical thinking.

The teacher provides feedback on the elements that present difficulty for the students. On the other hand, the teacher comments that the final report of the practical laboratory must be carry out in groups of two students, for which they must review the grading rubric available on the Blackboard platform.

Finally, the teacher announces the elements and the topics that the students must consider as previous study for the next practical class [18].

3. Development

Laboratory I: Chemical, Clinical, Forensic and Biopharmaceutical has been implemented online, supported by the current interest in skill development. It describes achievement levels with their performance indicators. Didactics, evaluation, and feedback strategies that involve the integration in students of oral and written expression skills, knowledge and behavior are also related.

It should be noted that collaborative work with the application of active methodologies such as case analysis, develop competencies and allow students to apply their knowledge and skills to solve a problem, also integrates the intersubjective processes of affectivity, integrating all the neurocognitive functions of the students [17]. According to Glinz [19] collaborative work promotes emotions and feelings of unity among students that integrate them as human beings.

An important aspect within the teaching-learning strategies that contributes to the development of competences, is the previous knowledge, which promotes meaningful learning where students associate the new information with the one, they already have, readjusting and reconstructing both information. In this process the theory of meaningful learning of Ausubel is opposed to rote learning [10]. According to Piaget, to be able to develop learning, there must be a cognitive break, where the student is building his own learning process, establishing it on top of the previous experience he had because a process of assimilation, accommodation and adaptation has occurred that is finally assimilated in the cognitive structure of the student [18].

Faced with this new form of online learning, the pedagogical mediation of the teacher is necessary, which is also changing the way of generating learning in students. Therefore, the purpose of providing recommendations and contributing to the role as a teacher, proposes distance feedback from students, which will serve as pedagogical support for good remote monitoring.

3.1. Comparison of the expected learning achievement (performance / indicator), with the results obtained in each evaluation carried out.

Table 1, Table 2 and Table 3 report the values of the performance indicator: flow charts, entry tests and final reports related to the 5 laboratory assays. It should be noted that the behavior is transversal in all indicators and that it has reached a score of seven points through a comparison guideline.

Table 1: Results of the Performance Indicator 1. Designs protocols the analysis. (LR1 and LR2).

No. of students	1. Flow Chart					
	Assay 1	Assay 2	Assay 3	Assay 4	Assay 5	Mean
1	7.0	7.0	6.6	5.2	6.6	5.2
2	7.0	7.0	6.6	5.2	6.6	6.5
3	7.0	7.0	6.8	5.0	6.7	6.5
4	7.0	7.0	6.8	5.0	6.7	6.5
5	7.0	7.0	6.7	6.3	7.0	6.8
6	7.0	7.0	6.7	6.3	7.0	6.8
7	5.6	6.5	6.1	5.0	6.6	6.0
8	5.6	6.5	6.1	5.0	6.6	6.0
9	4.4	6.8	5.9	4.2	6.9	5.6
10	4.4	6.8	5.9	4.2	6.9	5.6
11	6.8	6.8	7.0	5.7	6.2	6.5
12	6.8	6.8	7.0	5.7	6.2	6.5
13	6.8	6.8	6.5	5.5	6.8	6.5
14	6.8	6.8	6.5	5.5	6.8	6.5
15	6.8	6.8	6.8	5.7	6.5	6.5
16	6.8	6.8	6.8	5.7	6.5	6.5
17	7.0	7.0	6.6	5.8	6.2	6.5
18	7.0	7.0	6.6	5.8	6.2	6.5
19	6.4	6.6	6.4	5.6	6.5	6.3
20	6.4	6.6	6.4	5.6	6.5	6.3
21	6.4	6.6	6.4	5.6	6.5	6.3
22	5.5	6.8	6.4	4.7	6.5	6.0
23	5.5	6.8	6.4	4.7	6.5	6.0
24	6.8	7.0	6.4	5.6	6.4	6.4
25	6.8	7.0	6.4	5.6	6.4	6.4

26	6.4	6.8	6.4	5.2	6.5	6.3
27	6.4	6.8	6.4	5.2	6.5	6.3
28	5.0	6.0	5.0	4.7	6.2	5.4
29	5.0	6.0	5.0	4.7	6.2	5.4
30	7.0	7.0	6.4	5.6	6.5	6.5
31	7.0	7.0	6.4	5.6	6.5	6.5
Assay 1: Clinical Biochemistry, Assay 2: Toxicology, Assay 3: Microbiology, Assay 4: Molecular Biology and Assay 5: Quality Management and Control						

Table 2: Results of the Performance Indicator 2. It Implements protocols the analysis. (LR1 and LR2).

No. of students	2. Entry Test					
	Assay 1	Assay 2	Assay 3	Assay 4	Assay 5	Mean
1	7.0	7.0	5.7	4.5	5.3	5.9
2	7.0	7.0	5.9	7.0	6.2	6.6
3	7.0	7.0	5.6	4.5	7.0	6.2
4	7.0	7.0	5.6	4.5	7.0	6.2
5	7.0	2.7	4.3	7.0	7.0	5.6
6	7.0	4.5	4.0	4.5	6.1	5.2
7	4.5	7.0	4.9	7.0	2.7	5.2
8	7.0	7.0	4.7	7.0	4.5	6.0
9	7.0	7.0	4.8	7.0	2.7	5.7
10	7.0	7.0	5.0	7.0	1.0	5.4
11	7.0	7.0	5.8	4.5	2.7	5.4
12	7.0	7.0	6.1	7.0	4.5	6.3
13	7.0	7.0	5.4	7.0	4.5	6.2
14	7.0	7.0	6.2	7.0	7.0	6.8
15	4.5	7.0	5.8	7.0	7.0	6.3
16	7.0	7.0	5.3	7.0	7.0	6.7
17	4.5	7.0	6.4	7.0	7.0	6.4
18	7.0	7.0	6.2	7.0	7.0	6.8
19	7.0	7.0	5.5	7.0	7.0	6.7
20	7.0	7.0	6.2	7.0	7.0	6.8
21	7.0	7.0	4.5	7.0	7.0	6.5
22	7.0	7.0	5.0	7.0	7.0	6.6
23	4.5	7.0	5.6	7.0	7.0	6.2
24	7.0	7.0	6.0	7.0	7.0	6.8
25	4.5	7.0	4.1	7.0	7.0	5.9
26	4.5	7.0	6.7	7.0	7.0	6.4
27	4.5	7.0	6.3	7.0	7.0	6.4
28	4.5	7.0	7.0	7.0	7.0	6.5
29	7.0	7.0	6.4	7.0	7.0	6.9
30	4.5	7.0	6.0	7.0	7.0	6.3
31	4.5	7.0	4.8	4.5	7.0	5.6
Assay 1: Clinical Biochemistry, Assay 2: Toxicology, Assay 3: Microbiology, Assay 4: Molecular Biology and Assay 5: Quality Management and Control						

Table 3: Results of the Performance Indicator 3. Communicate the results obtained, making use of formal.

No. of students	3. Reports					
	Assay 1	Assay 2	Assay 3	Assay 4	Assay 5	Mean
1	7.0	5.0	6.8	6.7	7.0	6.5
2	7.0	5.0	6.8	6.7	7.0	6.5
3	7.0	5.0	6.8	6.4	6.8	6.4
4	7.0	5.0	6.8	6.4	6.8	6.4
5	6.8	5.0	7.0	6.7	6.6	6.4
6	6.8	5.0	7.0	6.7	6.6	6.4
7	7.0	6.0	7.0	7.0	6.4	6.7
8	7.0	6.0	7.0	7.0	6.4	6.7
9	5.7	6.2	7.0	7.0	6.9	6.6
10	5.7	6.2	7.0	7.0	6.9	6.6
11	7.0	5.7	7.0	7.0	6.7	6.7
12	7.0	5.7	7.0	7.0	6.7	6.7

13	7.0	6.7	7.0	7.0	6.8	6.9
14	7.0	6.7	7.0	7.0	6.8	6.9
15	6.4	6.5	6.8	7.0	7.0	6.7
16	6.4	6.5	6.8	7.0	7.0	6.7
17	6.4	5.6	6.8	7.0	7.0	6.6
18	6.4	5.6	6.8	7.0	7.0	6.6
19	6.6	5.6	6.6	6.5	7.0	6.5
20	6.6	5.6	6.6	6.5	7.0	6.5
21	6.6	5.6	6.6	6.5	7.0	6.5
22	6.8	6.1	6.8	7.0	6.7	6.7
23	6.8	6.1	6.8	7.0	6.7	6.7
24	6.8	5.6	6.8	7.0	6.7	6.6
25	6.8	5.6	6.8	7.0	6.7	6.6
26	5.9	6.5	6.8	6.0	7.0	6.4
27	5.9	6.5	6.8	6.0	7.0	6.4
28	6.1	5.6	6.6	7.0	7.0	6.5
29	6.1	5.6	6.6	7.0	7.0	6.5
30	5.5	6.0	6.1	6.8	6.7	6.2
31	5.5	6.0	6.1	6.8	6.7	6.2
Assay 1: Clinical Biochemistry, Assay 2: Toxicology, Assay 3: Microbiology, Assay 4: Molecular Biology and Assay 5: Quality Management and Control						

The learning results are evaluated through three indicators, for a total of 31 students who complete 5 essays that take five subjects that are prerequisites for the Integrative subject (Clinical Biochemistry, Toxicology, Microbiology, Molecular Biology and Quality Management and Control). and for the analysis of achievement levels, the following indicators are considered, shown in Table 4.

Table 4: Achievement levels obtained from each performance indicator in the two learning outcomes.

Performance indicators	Achievement level (%)			
	6.0 - 7.0	5.0 - 5.9	4.0 - 4.9	1.0 - 3.9
1. Designs protocols for chemical, clinical, forensic and biopharmaceutical analysis, to solve an analytical problem related to the pharmaceutical industry. (LR1 and LR2)	74	21	5	-
2. Implements protocols for chemical, clinical, forensic and biopharmaceutical analysis, as a resolution of an analytical problem related to the pharmaceutical industry. (LR1 and LR2)	70	9	18	3
3. Communicate the results obtained, making use of formal communication. (LR1 and LR2)	85	15	-	-
Outstanding 6.0 - 7.0; Competent 5.0 - 5.9; Basic 4.0 - 4.9 and Not Achieved 1.0 - 3.9				

As a result of the implemented actions, it is evident that the students, in general, achieve satisfactory compliance with the proposed indicators. The teaching team implements the didactic strategy of analysis of practical cases, with the purpose that students have learning experiences to resignify their knowledge prior to the online activities of the Integrator I course: Chemical, Clinical, Forensic and Biopharmaceutical.

For the first indicator "Design protocols for chemical, clinical, forensic and biopharmaceutical analysis, as a resolution of an analytical problem related to the pharmaceutical industry", an evaluation Rubric is applied to different Flow Diagrams in correspondence with the five assays developed, with the purpose of demonstrating the students' knowledge in relation to the design of practical laboratories according to the bibliography consulted. The criteria descended by 5% in the basic level, mainly obey the results of the practical laboratory linked to the subjects of Clinical Biochemistry and Molecular Biology.

For the second indicator "Implements protocols for chemical, clinical, forensic and biopharmaceutical analysis, as a resolution of an analytical problem related to the pharmaceutical industry", evaluation guidelines are applied corresponding to each entry test in the five practical laboratories. The criteria descended to 18% show performances associated with a basic level of achievement. It is important to specify that the lowered criteria are mainly due to the results of the five practical laboratories linked to the 5 subjects. In addition, 3% of the students obtain a level "not achieved" corresponding to the application of the knowledge developed in the subjects Toxicology and Management and Quality Control. The foregoing shows that some students are unable to develop the theoretical aspects of some subjects on which the practical is based.

For the third indicator "Communicate the results obtained, making use of formal communication", an evaluation rubric corresponding to each report is applied in the five practical laboratories. To demonstrate and evaluate the resolution of a problem, or to decide with foundations that allow to sustain positions and ideas making use of formal written language, 85% of the students achieved an outstanding achievement level and 15% a proficient level of achievement.

Based on these quantitative results based mainly on the learning results used by the students and on the teacher's performance, the teacher observes that his students, despite the adversities in their work, demonstrate their desire to learn, having an average attendance of the 100%, with a general average academic result of 6.5, highlighting the active participation of students, enabling an optimal learning climate, which can be improved.

The results that have been obtained collaboratively through the implementation of ICTs, contribute to the understanding and development of students to achieve the expected learning [17, 20], In this way, different learning (knowledge, skills and aptitudes) is integrated and mobilized to face situations and problems in specific contexts [21]. In addition, significant learning is achieved according to Ausubel, when what it is about learning is related to what is already known with relevant and pre-existing aspects of its cognitive structure, promoting meaningful learning instead of rote learning [10].

3.2. Actions developed in the evaluation of student learning: Feedback.

One of the active learning methodologies that has been favored with the flipped class is the laboratory, since for its realization it is required to have previous knowledge and to deepen certain skills for handling materials and equipment, which students generally they do not bring.

During the implementation of the 5 virtual laboratories through distance education, priority was given to summative and formative evaluations, focusing efforts on providing feedback to students, through available mechanisms such as the virtual classroom. The evaluation is carried out based on the evidence of the students' learning through the flipped classroom, reversing the order of the traditional evaluation, where the students build knowledge. The teacher is in charge of providing feedback to the student in a timely manner regarding their achievements and difficulties during the practical. It should be noted that during the semester students are more autonomous in their learning, improving their oral and written communication skills, which corresponds to the 3 indicators studied.

On the day of the practical, the teacher analyzes the responses of the entry test through reflective feedback or feedback by discovery, in a group and timely manner, where reflection is promoted from the student's own reasoning so that they identify the origin of their conceptions or errors and learn from them, providing the student with mechanisms to help they to use the responses to deepen their learning and knowledge on the subject, which is of great importance for the evaluation process and also for the teaching-learning process [16].

The teacher also performs the feedback of the laboratory reports according to the descriptive, written feedback, in a timely manner and information elements are given to improve the students' work, the successes and difficulties are described, suggesting in detail what to do to improve, to through mechanisms and strategies to help discover the student response [16].

The student, with the help of the teacher, shows the self-progress of their learning and the development of competencies that promote their practical application. The teacher must rely on reflective or descriptive feedback. In this last strategy, he uses the rubric as an evaluation instrument through which he will let the students know what they have learned, their successes, their errors, the level of achievement of the competences they have reached in relation to the established learning purposes, being more autonomous, who gives more opinion in classes and regulates their learning process [22].

3.3. Challenges and actions to develop to assess student learning.

In relation to the evaluation of student learning and the analysis of the results, the following actions are proposed for improvement:

Carry out an initial diagnostic analysis that shows the state of learning that students have and that they must apply in the integrative subject. Based on this analysis, resort to ICTs, to place bibliography in the virtual classroom and train students through study guides.

Hold working meetings with the teachers of the subjects in which the students have had difficulties, reaching agreements with them to establish improvement in the level of teaching of the subject.

Conclusions

In general, the observed results show the effectiveness of the teaching-learning process in the subjects that point to the development of competencies required to solve the practical cases implemented in the integrating laboratory. This approach is based on the analysis of the general average result achieved by the students corresponding to 6.5 points.

The implementation of the online flipped classroom with the application of the case analysis methodology linked to the use of the Flow Diagram tool, in the Integrative Laboratory I: Chemical, Clinical, Forensic and Biopharmaceutical has been effective, the observed results entail that educational tool has fostered the articulation and application of the students' previous learning during the execution of the practical works of an experimental nature from the proposed performance indicators:

Indicator 1: "Design analysis protocols" the results obtained indicate that this design allows greater ease for students to learn from the application of the Flow Diagram tool, an experimental procedure that they elaborate and present collaboratively from ICTs, which they execute at their own pace. In addition, to respectfully listen to the opinions of the teacher and other students, thus developing logical and critical thinking to draw up a conclusion and guide the diagnosis.
Indicator 2: "Implements analysis protocols" This indicator is the lowest in its level of achievement, which shows that some students are not able to develop the theoretical aspects of some subjects on which the practical ones are based, which can be improved through of prior knowledge of these subjects in their cognitive structure, promoting meaningful learning.
Indicator 3: "Communicate the results obtained, making use of formal communication" 100% of the students correspond to the Outstanding and Proficient levels, which shows that students are more autonomous in their learning, improving their communication skills of oral and written expression, critical thinking, knowledge, motivation, attitudes, and behavior.

It is evident that the active methodology used arouses the interest of the students, which is demonstrated in an average attendance of 100%, also highlighting the active participation of the students, allowing an optimal climate in the teaching-learning process.

Feedback allows the development of students' skills and competencies through the conceptual contents and procedures of the practical or clinical case under study through the constructive and reflective analysis of the results and their contrast with the solutions proposed in the evaluation instruments.

Finally, it is evidenced that the implementation of the flipped classroom as a pedagogical strategy allows students to build their own knowledge, be more autonomous and improve their oral and written communication skills.

Conflict of Interest: The authors declare no competing interests.

Author contributions: The conceptualization of the research was carried out by MSc Fernando Torres, MSc Juan Manuel Delgado and Dr. Maritza Díaz. The validation of the data was carried out by MSc Alejando Charmell and Dr. Maritza Díaz, the writing of the article was carried out by Dr. Maritza Díaz and its final editing was carried out by MSc Alejandro Charmell. The final review of the article was carried out by all authors.

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