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INCORPORATION OF NON-ATTENDANCE EVALUATION PROCEDURES IN THE CHEMISTRY DEGREE PROGRAM

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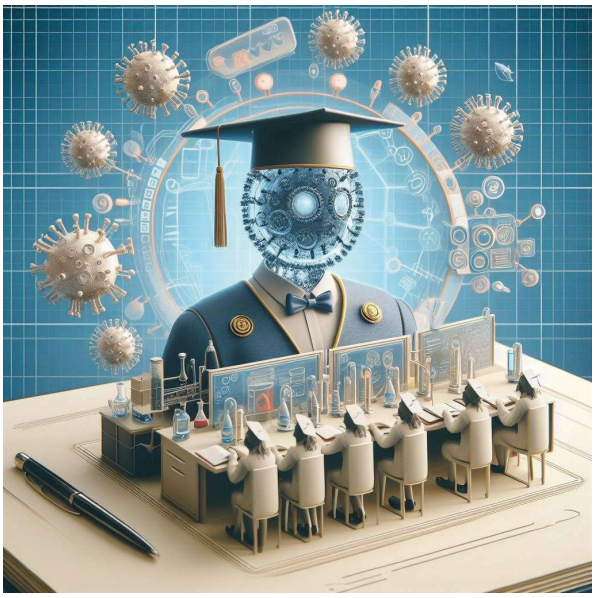

Abstract: The present study defines the design and implementation of different non face-to--face evaluation methods to be used as alternatives to the classical face-to-face evaluation procedures, within the context of the situation generated by the evolution of the teaching and evaluation model in the university environment originated from the COVID-19 coronavirus pandemic in recent years. All this in the academic environment of subjects belonging to the Degree in Chemistry, taught at the University of Huelva (Spain). Likewise, the study of the impact caused by this adaptation of the evaluation model on the different dimensions of the evaluation process within the teaching--learning system is detailed: methodological, normative and technological.

Keywords: non face-to-face assessment, e-learning, competence development, teaching innovation.

INTRODUCTION

Since March 2020, the presence of the COVID-19 coronavirus triggered a series of significant changes in society worldwide. In response, national governments adopted a series of non-standard containment measures to mitigate the spread of the virus and protect public health. These measures included mandatory containment, closure of non-essential facilities and promotion of social distancing. Since then, one of the sectors most affected by these measures has been the educational system, both at school and university level. In the case of Spanish universities, the decision was taken to suspend on-site academic activity as a preventive measure to safeguard the health of students, teachers and administrative staff. This suspension implied an abrupt change in the teaching-learning model, giving way to the implementation of non-face-to-face modalities of education, some of which have been maintained throughout the following years and academic years.

Faced with this scenario, university institutions had to adapt quickly in order to guarantee the continuity of teaching activities. Consequently, as a result this new *status quo*, a series of actions and strategies were developed within the scope of the teaching-learning model to deal with this exceptional situation. These actions include the migration of face-to-face classes to virtual learning platforms, the creation of online educational resources, the restructuring of study plans and the implementation of technological tools to facilitate interaction between professors and students.

In addition to guaranteeing the continuity of academic activity, these measures were also aimed at ensuring the quality of the education provided and compliance with the learning objectives established for each course. Student participation in the teaching-learning process was promoted through the use of innovative teaching methodologies and the en-

couragement of autonomy and self-learning. As the situation evolved, universities continued to adapt their educational strategies and policies to meet emerging challenges and respond effectively to the needs of the university community. The COVID-19 pandemic has been a turning point in the way higher education is conceived and conducted, driving the adoption of new forms of teaching-learning that are more flexible, inclusive and adapted to the demands of the 21st century.

The development of a protocol for adapting face-to-face assessment to a non-face-to--face model has emerged as a top priority in the university education field. This transition does not only imply a change in the modality of assessment, but also the redefinition of processes and criteria to ensure the fairness, validity and reliability of the evaluative process **(BARBOUR, 2018)**. In this sense, it is crucial to maintain the focus on formative assessment as a guiding principle during this adaptation process. Formative assessment not only seeks to obtain information about individual student progress, but also aims to provide meaningful feedback to both students and teachers. It is a dynamic process that promotes understanding of student competencies and progress, while informing the grading process. The importance of formative assessment has been highlighted in the educational literature as a fundamental tool for improving student learning and achievement (**RYAN et al., 2013**). This approach highlights the need for assessment to be not only a means of measuring performance, but also an opportunity for development and continuous improvement. In the context of the transition to non-face--to-face assessment, it is essential to design strategies and tools that enable the collection of relevant data on student progress and performance in an effective manner. This may involve the implementation of various forms of assessment, such as online tests, written assignments, collaborative projects, and participation in virtual forums, among others. In addition, it is essential to ensure academic integrity and fairness in the assessment process, adopting appropriate measures to prevent plagiarism and ensure that all students have equal opportunities to demonstrate their learning. This may involve the use of plagiarism detection tools, the clear definition of expectations and assessment criteria, and the provision of adequate resources and support for students facing particular challenges in this new assessment environment.

Consequently, adapting face-to-face assessment to a non-face-to-face model requires careful planning and consideration of multiple factors, from underlying pedagogical principles to practical and technological considerations. By focusing on formative assessment as the fundamental guide, educational institutions can develop effective strategies that promote meaningful learning and continuous improvement of student achievement in this new educational paradigm. Thus, the development of new and adapted assessment systems represents an opportunity to transform the role of assessment in the educational process. Rather than simply a final event that grades student performance, assessment should be conceived as a dynamic process that influences the direction and shape of learning. This paradigm shift involves adopting a focus on formative assessment, where the primary goal is to provide meaningful feedback that promotes continuous and significant learning **(MORGAN, 2020)**. By considering assessment as an integral component of the teaching-learning process, new opportunities open up to foster types of learning and desirable. This implies designing assessment strategies that not only measure acquired knowledge, but also foster the development of cognitive, metacognitive and socioemotional skills. For example, project-based assessments, case studies, discussions, critical reflections and collaborative activities can be implemented that

promote the practical application of knowledge and creative problem-solving skills.

It is crucial to emphasize that the primary goal of adaptive assessment should be to assess in a fair and equitable manner, regardless of the mode of instruction used. Whether in a face-to-face or non-face-to-face setting, assessment should ensure that all students have the opportunity to demonstrate their learning in an authentic and meaningful way. This may involve adapting assessment instruments, implementing support measures for students with special needs, and creating inclusive assessment environments that respect the diversity of individual learning styles and contexts. In addition, it is essential to consider the integration of educational technologies and digital tools in the assessment process, taking advantage of their potential to improve the accessibility, efficiency and quality of feedback provided to students. The use of online learning platforms, learning management systems, automated assessment tools and data analytics can facilitate the collection and analysis of information on student performance, allowing for a more personalized assessment tailored to the individual needs of students **(WIGGINS, 2012).** Therefore, the implementation of new tailored assessment systems offers an opportunity to redefine the role of assessment in the educational process and promote more meaningful and equitable learning. By focusing on formative assessment, key skill development, and the integration of educational technologies, educational institutions can move toward a more holistic and student-centered approach assessing learning in the 21st century.

With respect to the specific contextualization in the field of chemistry teaching, the integration of non-face-to-face assessment procedures in undergraduate chemistry is a topic of increasing relevance in contemporary higher education. With the rapid evolution of technology and the changing demands of the educational environment, it becomes imperative to explore new assessment methodologies that are both effective and inclusive **(BARBOUR, 2014)**. In this context, the adoption of non-face-to-face approaches offers a unique opportunity to improve quality and equity in the assessment of chemistry students **(CHEN et al., 2009)**. This change not only responds to the need to adapt to changing circumstances, such as the COVID-19 pandemic, but also opens the door to pedagogical innovation and continuous improvement in the training of future professionals in the field of Chemistry. In this context, we will explore the benefits, challenges, and best practices associated with incorporating non-face-to-face assessment procedures in the Chemistry Degree **(HUANG, 2020)**.

Thus, in this study, we propose as a general framework of work and contextualization the adaptation of evaluation procedures of different subjects of the Degree in Chemistry at the University of Huelva to non-attendance evaluation procedures, giving more weight to continuous evaluation procedures. We must consider that there is no universal procedure for non face-to-face assessment defined, and that the design of the new adapted assessment methodologies must have a close relationship between teaching, learning and assessment **(PARKER; LOUDON, 2013)**. Chemistry, being a discipline based on experimentation, analysis and problem solving, has traditionally faced challenges to effectively assess these aspects outside the face-to-face laboratory environment. However, the expansion of educational technologies and access to online resources have enabled the development of assessment methods that can capture students' understanding and practical skills remotely.

The inclusion of non-face-to-face assessments in undergraduate chemistry curriculum offers a number of significant benefits. First, it provides flexibility for both students and educators, allowing assessments to be

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conducted at convenient times and locations without compromising educational quality. In addition, the diversification of assessment forms can better accommodate students' diverse abilities and learning styles, thus fostering a more inclusive and equitable learning environment **(DEKORVER; CHANEY; HERRINGTON, 2020)**. On the other hand, the integration of technological tools can enrich the feedback offered to students, providing more detailed *insights* about their performance and areas for improvement. Despite these benefits, the implementation of non-face-to-face assessments also brings challenges. It is critical to ensure security and academic integrity, avoiding fraud and ensuring that assessments accurately reflect students' knowledge and skills. In addition, there is a need to address potential technology access gaps and ensure that all students have the ability to fully participate in non-face-to-face assessments.

In conclusion, the incorporation of non face-to-face assessment procedures in undergraduate chemistry represents a necessary and promising evolution in university higher education. By leveraging educational technologies and developing innovative assessment approaches, we can improve the quality, equity, and efficiency of chemistry education, preparing students to meet the challenges of the contemporary world. The first step to take should be the analysis of the training activities and the desired learning outcomes in each subject in order to choose appropriate evaluation for each of them to their particularities and learning objectives **(WIGGINS, 2012)**. It will not be possible to apply the same assessment procedure in all subjects. To help facilitate this process, it is suggested to initially align the assessment with the objectives of the subject or degree, indicating that the assessment should be clearly aligned with the aims and objectives of the subject, the content and the teaching and learning activities **(MORGAN, 2020)**.

EVALUATION PROCEDURES

In order to choose appropriate assessment procedures for each subject in the Bachelor's Degree in Chemistry, it is essential to consider the specific learning objectives of each course, as well as the skills and competencies that students are expected to acquire. Some suggestions of assessment procedures that might be appropriate for different types of subjects in Chemistry can be seen in Table 1. These are just some examples of assessment procedures that could be adapted to different types of subjects in the Chemistry degree. It is important to select and design the assessment procedures so that they are coherent with the learning objectives and promote the comprehensive development of students in the field of Chemistry.

Focusing on non face-to-face assessment methodologies, it is worth mentioning that they provide a series of facilities that are not available to the student in traditional educational environments: the level of immediacy, as well as interactions; the possibilities of access to the subjects from any place and time; and the capacity for feedback and discussion that help the construction of learning by the student him/herself. All these facilities must be used for these new assessment models, whose design and development must be coherent with all the aspects indicated above for teaching and learning **(LEACOCK; NESBIT, 2007)**.

The use of non-face-to-face assessment methodologies in undergraduate chemistry offers a number of conveniences that can benefit both students and educators. For example, non-face-to-face assessment procedures allow students to complete assignments at times and locations that are more convenient for them. This can facilitate participation by students with busy schedules or personal and professional responsibilities. In addition, non-face-to-face assessments can be designed to be accessible to students with diverse needs, such as those with physical disabilities or health conditions

Type of Subject	Evaluation procedure
Theoretical subjects	• Written exams: Multiple choice tests, short questions, essay questions, etc., to assess conceptual knowledge and theoretical understanding. • Written assignments: Research reports, analysis of scientific literature, theoretical problem solving, etc., to assess the ability to research and synthesize information. • Laboratory reports: assessing accuracy in conducting experiments, analyzing data, and presenting results Estes, S. L., & Ingram, R. (2001).
Laboratories and practices	• Practical skills assessment: Virtual or laboratory-based practical tests, where students conduct experiments and are evaluated on their technical skills and abilities. • Oral presentations: Presentations of research projects, where students communicate their findings and conclusions through oral presentations.
Research projects	• Written assignments: Detailed reports on the design, execution and analysis of research projects, which assess students' ability to conduct independent and critical research. • Evaluation of group projects: Evaluation of teamwork, collaboration and individual contributions through specific rubrics and peer feedback.
Teamwork	• discussions: Participation in discussion forums or virtual debates on specific topics related to the subject, where participation and argumentation are evaluated.
Synthesis and application subjects	• Case studies: Analysis and resolution of practical problems and real situations, evaluating the ability to apply theoretical knowledge to specific contexts. • Problem-solving tests: that evaluate students' ability to solve practical problems using the concepts and principles learned in the course.

Table 1. Examples of evaluation procedures that could be adapted to different types of subjects in the Bachelor's Degree in Chemistry.

that make it difficult for them to be on campus. Additionally, by eliminating the need for specific physical spaces to conduct assessments and reducing reliance on paper-based materials, non-face-to-face assessments can help reduce the costs associated with the logistics and administration of traditional exams.

On the other hand, non-face-to-face methodologies offer the possibility of using a wide variety of evaluation formats, including online tests, written assignments, research projects, online discussions, among others. This makes it possible to adapt the evaluation to the specific learning objectives of each subject. Through the use of digital tools, it is possible to provide immediate and personalized feedback to students, which can improve their understanding of the assessed concepts and facilitate their learning process. The implementation of non-face-to-face assessment methodologies can encourage the adoption of innovative pedagogical approaches, such as active learning, project-based learning and the use of educational technology, which can improve student participation and engagement. Consequently, the use of non-face-to-face of non-face-to-face assessment in the Chemistry Degree could offer a series of facilities that can contribute to improve the educational experience of students and promote the achievement of learning objectives in an effective and efficient manner, Table 2.

Target improvements
1. Temporal and spatial flexibility.
2. Accessibility.
3. Cost reduction.
4. Wide range of evaluation formats.
5. Personalized and automated feedback.
6. Pedagogical innovation.

Table 2. Facilities resulting from the use of non face-to-face evaluation methodologies in the Degree in Chemistry.

CONTINUOUS EVALUATION

Continuous assessment should be the cornerstone around which a model of non face-to-face assessment revolves. Thus, a set of evaluation processes can be implemented that are adapted to the different programmed training activities, without forgetting, on the one hand, the profile of the subject and, on the

other hand, the students' connectivity context and their requirements in terms special educational needs. We must not forget, and try to avoid, that in online assessment there is a tendency towards traditional forms of assessment (proctored exams and written assignments), as well as few opportunities for variety in assessments and limited development of skills such as problem solving, teamwork, and the like.

Continuous assessment, understood as a regular and systematic evaluation process throughout the teaching-learning period, should be the cornerstone in the design of a non-classroom assessment model in the Degree in Chemistry, obtaining several immediate benefits Table 3. Continuous assessment allows educators and students to have a clear and constant view of learning progress throughout the course. This allows them to identify areas of strength and weakness early, and take steps to improve academic performance. By integrating regular assessments, educators can provide timely *feedback* to students on their performance. This *feedback* can be crucial for correcting misunderstandings, reinforcing key concepts, and guiding the learning process effectively. Ongoing assessment can foster student motivation and engagement by providing frequent opportunities to demonstrate their understanding and progress. This them stay focused on their academic goals and appreciate the importance of continuous learning.

Benefits resulting from the use of continuous assessment in the Degree in Chemistry.

Expected benefits
1. Progress monitoring.
2. Timely *feedback*.
3. Motivation and commitment.
4. Stress reduction.
5. Skills development.

By spreading out the assessment over the term/semester, rather than concentrating it in one or two major events, the stress associated with final exams and other intensive assessment times can be reduced. This type of assessment also provides students with the opportunity to develop effective study skills, such as time management, organization, and self-direction, which are critical to academic and professional success. By building a model of non face-to--face assessment in the Bachelor's Degree in Chemistry around continuous assessment, a student-centered educational approach can be promoted that encourages active learning, participation and the comprehensive development of academic and professional skills.

Finally, the design and organization of a schedule of evaluation protocols is of crucial importance. Just as face-to-face exam schedules are planned in advance based on the physical spaces available, non-face-to-face tests should likewise be planned at the global level of the institution based on the virtual spaces/ resources available (**CHAPARRO, 2016**).

OBJECTIVES

This study aims to consolidate, from the academic year 2020- 2021, within the field of teaching of the Degree in Chemistry at the University of Huelva (Spain), a non-attendance evaluation method, mainly through the use of a collaborative platform such as Moodle, which will significantly enhance the acquisition of transversal competences. The vertical projection of the educational innovation project is already contemplated in the development of the same, since it is intended to be applied in subjects belonging to the different courses of the Degree in Chemistry (from 1st to 4th year), which will allow evaluating the impact of the use of this new evaluation methodology throughout the courses in subsequent years. In the same way, it could imply a horizontal projection, being able to transfer this project to other degrees taught at the Faculty of Experimental Sciences of the University of Huelva, such as the Degree in Geology, the Degree in Environmental Sciences, and

Double Degrees in Geology-Environmental Sciences and Environmental Sciences-Forestry, as a basis for the implementation of future teaching innovation projects.

Based on the above and with the aim of making possible a methodological change that allows the implementation of non face-to-face evaluation tools in various subjects of the Degree in Chemistry at the University of Huelva, it is intended, as General Objectives:

1. To implement non face-to-face evaluation procedures in different subjects of the Chemistry Degree of the University of Huelva.

2. Adapt the face-to-face evaluation scenarios, so far mostly used, by using non-face-to-face evaluation procedures.

3. To carry out a detailed study and analysis of the impact of this change in the evaluation methodologies in the different dimensions studied.

In designing these general objectives for the incorporation of non face-to-face assessment procedures in the Chemistry Degree, it is important to consider both pedagogical and logistical aspects. Therefore, we also set out a series of Specific Objectives:

1. Implement a variety of non-face-to-face assessment methods that reflect the practical, theoretical and analytical skills required in the discipline of Chemistry.

2. Develop and adapt digital educational resources and technological tools to support the delivery of high quality non-face-to-face assessments.

3. Ensure equity and inclusion by offering flexible assessment options that allow all students to participate effectively, regardless of their individual circumstances.

4. Establish clear procedures and policies to protect academic integrity and prevent fraud in non-face-to-face evaluations.

5. Provide timely and meaningful feedback to students on their performance on non-face-to-face assessments, with the goal of fostering continuous improvement in learning.

6. Promote collaboration between teachers and students in the design and implementation of non-face-to-face evaluations, thus fostering a participatory and student-centered approach.

7. Regularly evaluate the effectiveness of non-face-to-face evaluation procedures by collecting and analyzing data on student performance and satisfaction with the evaluation process.

8. Provide ongoing professional development for faculty in the design, implementation and evaluation of non-face-to-face assessments to improve the quality and effectiveness of the process.

9. Constantly investigate and explore new technologies and pedagogical approaches that can enrich and improve the non-classroom assessment experience in the Chemistry Degree.

10. Promote interdisciplinary collaboration and the exchange of best practices with other educational institutions to enrich and strengthen non-classroom evaluation procedures in the field of Chemistry.

DESCRIPTION OF TEACHING EXPERIENCE OR EDUCATIONAL RESEARCH

The work has been implemented in the 2020-24 academic years, throughout the two quarters/semesters of the official teaching period, in the subjects detailed in Table 4, belonging to the two quarters of the course (regardless of the location in the 1st or 2nd quarter/semester of each subject).

Subjects involved in the study, belonging to the undergraduate studies in Chemistry at the University of Huelva.

Designation	Course
Introduction to Chemical Laboratory II	1º
Basic Concepts of Organic Chemistry	1º
Fundamentals of Analytical Chemistry	1º
Organic Chemistry	2º
Organic Chemistry II	3º
Structural Determination of Organic Compounds	3º
Structural Elucidation of Organic Compounds	3º
Agri-Food Analysis	3º
Organic Processes of Industrial Interest	4º
Analytical Chemistry Extension	4º

The educational research work will be organized and developed as a new methodology of evaluation of the learning process in subjects of the Degree in Chemistry of the University of Huelva taught in both semesters. The timing of the study will be carried out according to the chronogram specified in Table 5.

Course Period Academic	Date	ACTIVITY
Quarter 1	October	Meeting of the teaching team to establish the competencies to be developed and the evaluation rubrics.
	October - December	Elaboration of materials (first semester subjects) and description of the academic activity.
	November - February	Application of the new methods of evaluation.
Period of Examinations 1	February	Teaching team meeting for partial evaluation of results
Quarter 2	February - March	Elaboration of materials (subjects second quarter).
	March - June	Application of the new methods of evaluation.
Period from Examinations 2	July	Meeting of teaching equipment for final evaluation of results.

Table 5. Work schedule.

DIDACTIC/RESEARCH METHODOLOGY

Before the beginning of each academic year, the teaching team involved in the innovation work has held a series of strategic meetings to plan and design the evaluation methods to be used in the subjects linked to the project. These meetings have been essential to ensure consistency between the learning objectives and the assessment strategies employed, as well as to guarantee that the specific competencies to be developed by students in each subject are adequately addressed.

During these planning sessions, a detailed analysis of the learning objectives of each subject has been carried out, identifying the key competencies that are expected to acquire and demonstrate at the end of the course. Based on this analysis, the most appropriate assessment methods have been carefully selected and designed to evaluate the achievement of these competencies, taking into account both the content of the subject and the needs and characteristics of the students. It is important to highlight that the design process of the evaluation methods has been collaborative and participatory, involving the entire teaching team in the decision making process. Reflection and exchange of ideas among teachers have been encouraged, in order to make the most of the experience and the diversity of pedagogical approaches present in the team. In addition, special attention has been given to diversifying assessment methods, seeking to provide students with multiple opportunities to demonstrate their learning in meaningful and authentic ways. A variety of assessment tools have been explored and developed, including written exams, research projects, oral presentations, debates, case analysis, peer, digital portfolios, among others.

To ensure the coherence and integrity of the evaluation, a detailed work has been developed that provides an overview of all evaluation me-

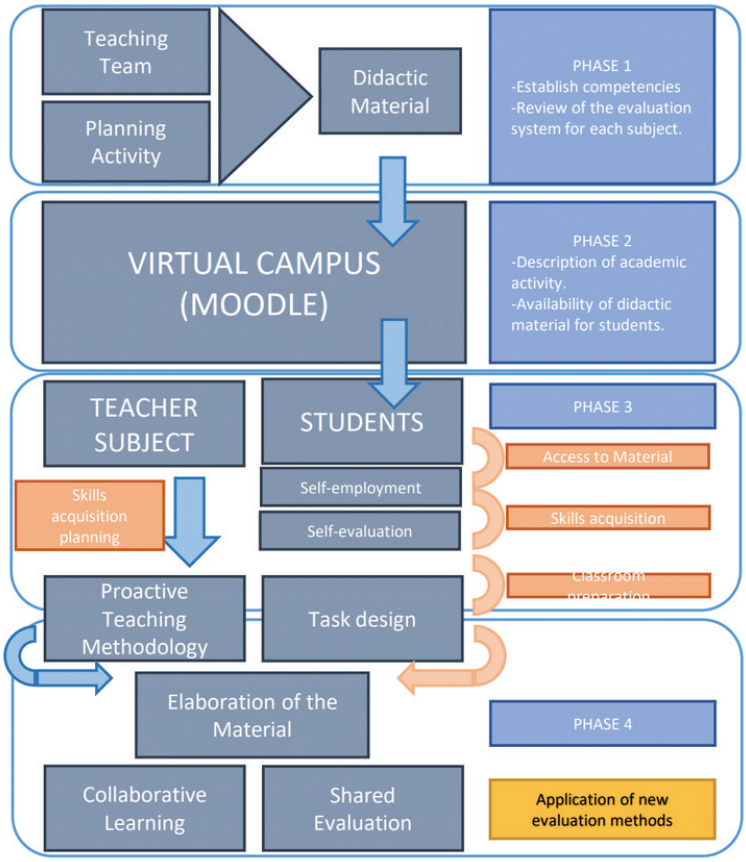

Figure 1. Conceptual map of the experience.

thods used in the different subjects involved in the project. This work program has been captured in a conceptual map, which serves as a visual tool to represent the structure and interconnection between the different components of the evaluation process. The design of the assessment methods in the framework of this innovation work has been a rigorous and collaborative process (Figure 1), aimed at ensuring alignment between learning objectives and assessment strategies, as well as providing students with a diversified and meaningful assessment experience. This comprehensive and reflective approach lays the foundation for a student-centered assessment process geared toward the development of key competencies for academic and professional success.

METHODOLOGICAL STAGES OF THE DIDACTIC/RESEARCH EXPERIENCE

Based on the above, the general methodological stages of the educational innovation methodology can be designed:

1. Review the evaluation system for each subject and clearly specify the changes introduced in the evaluation procedures, in the weight of the total evaluation assigned to each stage of the evaluation and in the established requirements.

2. Adapt the changes in the evaluation system to the specific nature of each subject, its content and the teaching methodology used. Significantly, some type of supervision, follow-up or feedback should be included in all evaluation stages, both for the formative character and for the quality control of the process.

3. Employ a wide range of evaluation methodologies, all of them based on a continuous evaluation system, considering the possibility of dispensing with the final test altogether.

4. Detail to the students the modifications to be implemented in the evaluation system and give precise instructions prior to the performance of the evaluation tests.

The process of selecting non-face-to-face evaluation methods within framework of the project has been a collaborative and meticulous exercise carried out by the subject coordinators in close collaboration with the teaching team. First all, work has been carried out to define the learning objectives and competencies that students are expected to acquire in each subject. This step is essential to establish a solid base on which to build the evaluation criteria and to ensure consistency between the evaluation methods and the educational objectives. Once the learning objectives and competencies have been established, the most appropriate non-face-to-face assessment methods have been selected for each discipline. This selection has been carried out by carefully considering the specific characteristics of each subject, as well as the needs and preferences of the students. A wide range of non-face-to--face assessment options have been explored, from online tests to individual or group projects, reflection activities, virtual debates, case analysis, digital portfolios and multimedia presentations, among others (Table 6). It is important to note that the selection of non-face-to-face evaluation methods has been based on a learning-centered approach oriented to the development of competencies. We have sought not only to evaluate students' theoretical knowledge, but also to promote practical skills, critical thinking skills, problem-solving abilities, teamwork and autonomy learning. Therefore, special attention has been paid to the diversification of assessment methods to provide students with multiple opportunities to demonstrate their learning in an authentic and meaningful way.

The detailed proposal of non face-to-face evaluation methods to be used has been agreed in working meetings of the teaching team, where each option has been analyzed and discussed according to its suitability for each subject and the established learning objectives. The result of this selection process is shown in Table 3, which provides an overview of the evaluation methods proposed for each subject, as well as a detailed description of their implementation and the associated evaluation criteria. Thus, the process of selecting non-face-to-face assessment methods has been an integral component of the innovation work in the project, aimed at ensuring a fair, equitable and meaningful assessment of student learning. This reflective and collaborative approach lays the foundation for an evaluation process that promotes the integral development of students and the achievement of the educational objectives established for each subject.

Methodology Name	Modality	Fundamental characteristic
Exam Oral)	synchronous	They should be designed for that to be developed with a short duration
Test Written Open	synchronous	It is recommended and proposed not to use of this type of tests
Test type test	synchronous/ asynchronous	Of general use, very valid to evaluate a broad knowledge base
Work Academic	asynchronous	Suitable for the evaluation transversal competencies
Projects	asynchronous	Encourage autonomous and work
Problems	synchronous/ asynchronous	Its design is recommended in order to promote autonomous learning, and develop reflection and critical thinking about problems
Forums from discussion	asynchronous	Encourage a critical and reflective spirit

Table 6. Proposal of non face-to-face evaluation methods to be used.

The implementation of this methodology has been carried out through the tools provided by the virtual teaching platform used at the University of Huelva (Moodle). We have mainly used questionnaires (online/offline) as well as discussion forums and all kinds of tasks, all of them included in the virtual space of each of the subjects involved. Two types of questionnaires have been developed for the implementation of the experience: self-assessment questionnaires elaborated with multiple-choice and true/false questions, and exam questionnaires including multiple-choice, matching, short questions and essay-type questions. Likewise, debate forums have been opened for discussion after the presentation of certain topics, either by the teachers or by the students, thus encouraging a critical and reflective spirit. It was decided to evaluate the participation of students in these discussion forums, taking into account the volume of participation, the interest, as well as the quality in terms of content and correct use of language of the interventions.

On the other hand, the completion of the different tasks proposed (which can be considered as specific academic work, depending on the content of each of the subjects involved) will allow the evaluation of the specific competencies, as well as those transversal competencies included and taken into account in the design of these tasks. All the activities that have required the intervention of the teacher for their correction and assessment have been evaluated based on the design of evaluation rubrics.

EVALUATION OF EXPERIENCE

The evaluation of the impact generated by the adaptation of the non-face-to-face evaluation model has been a continuous and reflective process, out at the end of each academic year. For this purpose, a meticulous comparison has been made of the results obtained with those of previous courses in which the evaluation was carried out mainly face-to-face. This comparative analysis has made it possible to identify and analyze the differences in students' academic performance, as well as to evaluate the effectiveness and validity of the non-face-to-face evaluation methods implemented. In addition to the comparison of results, specific surveys have been designed and administered to gather the students' opinion and *feedback* on the new assessment tools and methods used. These surveys have been an invaluable tool to obtain qualitative information about the students' experience with the new evaluation system, as well as to identify possible areas for improvement and adjustment. An example of these surveys is presented in Table 7, which details the questions and items used to gather information on student perception and satisfaction with the non-face-to-face evaluation.

The analysis of the data collected through these surveys has provided a comprehensive view of the strengths and weaknesses of the new evaluation system, as well as suggestions and recommendations for its continuous improvement. Aspects such as the clarity of the evaluation criteria, the accessibility of the resources and tools used, the fairness in the evaluation of the different components of the course, the quality of the feedback provided and the overall satisfaction of students with the evaluation process have been identified. Based on these results and the feedback collected, corrective measures and improvements have been implemented in the design and implementation of the non face-to-face evaluation system. These measures may include revising the evaluation criteria, incorporating new technological tools and resources, conducting training activities for teaching staff, and optimizing the feedback and communication processes with students.

Summary of different items that have guided the work developed in some of the subjects involved.

- **Please answer the following items by checking the appropriate box.**
- **The numerical range for responses is 1 to 5 (not at all - very much).**

	1	2	3	4	5
1. I liked the possibility of receiving the contents in a different way than in the classroom.					
2. The use of videos has allowed me to revisit the content at different times during the quarter.					
3. I have assimilated the concepts better with the FL methodology than with the traditional methodology.					
4. The new methodology has not been useful to me when studying the subject.					
5. Do you consider that the new system is more suitable for the learning of the new generations?					

Personal remarks:

Survey on the Evaluation of the Use of Flipped Classroom as a Teaching Tool

Dear participant,
Thank you for taking a few minutes of your time to complete this survey. Your opinion is very important to us and will help us to improve our teaching practices. This survey is intended to assess your experience and perception of the use of the Flipped Classroom as a teaching tool in this subject. Please answer all questions honestly and completely. Your answers will be kept confidential and used for evaluation purposes only.

Section 1: Personal Information

Age:
Under 18 years 18-25 years
26-35 years old
36-45 years old
46-55 years old
Over 55 years

old Sex:
Male Female
Non-binary / Other

What is your role in this subject?
Student Teacher
Teaching assistant Other (specify)

Section 2: Use of the Flipped Classroom

Have you participated in classes implemented with the Flipped Classroom model in this subject?
Yes
No

If you have participated in Flipped Classroom classes, how often have you used the previous resources provided prior to the face-to-face classes?
Always
Often
Sometimes
Rarely
Never

How would you rate the usefulness of the previous resources (videos, readings, etc.) for your understanding of the concepts prior to the face-to-face classes?
Very useful
Useful
Useful
Neutral
Not very useful
Not useful
At all useful

During the face-to-face classes, did you find the activities and discussions that were conducted based on the previously reviewed concepts useful?
Yes
No
Not applicable (I have not participated in face-to-face Flipped Classroom classes)

Section 3: Perception and Experience

How would you compare your learning experience in a Flipped Classroom classroom to traditional classrooms?
Better than traditional classes
Similar to traditional classes
Worse than traditional classes

Do you think the Flipped Classroom model promotes more active participation and deeper understanding of concepts?
Yes
No
Not sure

Would you recommend the use of the Flipped Classroom in other subjects?
Yes
No
Depends (please explain)

Section 4: Additional Comments

Please share any additional comments you have about your experience with the Flipped Classroom in this subject.
Thank you for participating in this survey! Your responses are highly valued and help us improve our teaching practice.

Table 7. Table of evaluation of the use of one of the tools/tasks used: flipped classroom.

Subject	Preliminary Evaluation Procedure	Justification of the change in the Evaluation Methodology/System	Procedure for Non-attendance evaluation - Current	Methodological details. Impact of new methodology.	Comparative Ratings
Organic Compounds of Interest Industrial	1. 40% Attendance and Active participation 2. 60% Related work with the subject matter of the course. They must get 5 points or more to pass the course.	To increase the weight from the evaluation continuous with respect to the test of to encourage participation and to reduce the number of people who absenteeism and disengagement of the subject	1. 40% Questionnaires related to the concepts taught to the end blocks of topics 2. 10% Attendance and participation 3. 50% Related work with the subject matter of the subject	At the end of each block of topics resolution is requested from a questionnaire asynchronous online to incentivize the attendance and attention at class and la active participation in the same. In a situation online the disconnection and absenteeism can be found at see increased.	Increase in number of final approvals. Better ratings in work and questionnaires. Very high success rate in assistance and participation. Very high success rate in questionnaires. Very high success rate in jobs.
Basic Concepts of Organic Chemistry	1. 30% Periodic delivery of problem bulletins 2. 70% Final written examination in person. A grade of at least 5 points is required in order to pass the course	To increase the weight from the evaluation continuous with respect to the final evaluation test. Promote so the study more continued from the subject	1. 50% Delivery of 4 problem bulletins, one at the end of each block of topics 2. 50% Final exam of the subject with no minimum grade required to pass the subject	The new methodology increases the value of labor The daily work and promotes the continued study of the subject. The exam final no is It is conclusive to pass the course and has the same value as the continuous evaluation.	Increase in number of final approvals. Very high success rate in problem bulletins.
Organic Chemistry	1. 15% Resolution of 3 problem bulletins 2. 15% Presentation of laboratory work 3. 70% Final exam of the course	Increase the weight of the continuous evaluation with respect to the final evaluation test. To promote a more continuous study of the subject.	1. 40 % Resolution of 3 problem bulletins 2. 10% Presentation of laboratory work 3. 50% Final exam of the course	The new methodology increases the value of daily work and promotes the continued study of the subject. The final exam is not conclusive to pass the course and has the same value as the continuous evaluation.	Very high success rate in problem bulletins. Very significant increase in the number of final passes.
Introduction to Chemical Laboratory II	1. 40% Active participation of the student in the laboratory 2. 40% Examination on practices 3. 20% Laboratory report	Increase the weight of the completion of a more elaborate lab notebook in which the student can demonstrate understanding of the practicals.	1. 50% Report of the practices developed in practical laboratory classes 2. 50% Synchronous online test	The new methodology increases the value of daily work and promotes continued study of the subject.	Increase in the number of final approvals. Very high success rate in grading internship reports.

The evaluation of the impact of the adaptation of the assessment model has been a comprehensive and multidimensional process, involving the comparison of quantitative results, the collection of qualitative *feedback*, and the implementation of corrective actions to continuously improve the assessment system. This reflective and evidence-based approach lays the foundation for an assessment process that promotes quality, equity and effectiveness of student learning in the context of higher education. A summary table of these items in some of the subjects involved is shown below (Table 8).

CONCLUSIONS

It has been possible to implement the innovative experience described in all the subjects, each of them belonging to the Degree in Chemistry of the University of Huelva, proposed to participate in this experience of teaching innovation. In most these subjects it has been possible to successfully modify the evaluation procedure that existed previously, based on the objectives proposed in this innovative work. Likewise, it has been possible to implement a complete methodological justification of the change in the methodology and/or evaluation system, which has been completely agreed upon by the teaching team involved in the study, and subsequently explained transparently to the students of the subjects. Subsequently, it has been designed and implemented within each subject involved in the study, different non-attendance evaluation procedures, corresponding to updated evaluation methodologies based on the requirements of non-attendance. It has been possible to successfully transfer to the students of the different subjects involved the methodological details of the innovative work method that was intended to be studied. Based on the success we have been able to detect in terms of the impact of the use of this new work methodology, based on the adequacy of the evaluation systems, we intend to continue working on it in order to evaluate in a more detailed way the impact of this new methodology in the teaching of the different subjects of the degree in Chemistry.

OVERALL ASSESSMENT OF THE EXPERIENCE

The implementation of this experience of changes in the evaluation systems has been, from our point of view, highly satisfactory. In general, students have faced the acquisition of competences and skills in organic chemistry and analytical chemistry through the new work and evaluation methodologies, without any major difficulty, and focusing their efforts on the acquisition of knowledge. This type of teaching-learning protocol could be specifically useful in advanced theory and laboratory teaching, where students have to design their own work and experimentation protocol to be developed under the supervision of the teacher.

After carrying out the study and analysis of the implementation of an innovative experience in all the subjects of the Degree in Chemistry at the University of Huelva, significant conclusions can be drawn that reflect the success and effectiveness of this pedagogical approach. Firstly, the innovative experience has been successfully carried out in all the participating subjects, which indicates a commitment and willingness on the part of the teaching team to explore new teaching methodologies.

One of the most outstanding achievements is the successful modification of the evaluation procedure in most of the participating subjects, aligning the objectives proposed in this innovative work. This change has been carried out by means of a complete methodological justification, agreed upon by the teaching team and transparently communicated to the students. This transparency and consensus have been fundamental to guarantee understanding and acceptance by students. In

addition, different non face-to-face evaluation have been designed and implemented, adapted to the updated methodologies in response to the requirements of non face-to-face teaching. This adaptation has been key to ensure the continuity and effectiveness of the evaluation process in a virtual environment.

The methodological details of the new innovative work methodology have been effectively transmitted to the students, which has contributed to their understanding and active participation in the learning process. Based on the success detected regarding the impact of the use of this new work methodology, focused on the adequacy of the evaluation systems, it is proposed to continue working on it in order to evaluate in a more detailed way its impact on the teaching of the different subjects of the Degree in Chemistry. This detailed evaluation will allow us to identify areas for improvement and further optimize the teaching-learning experience in the field of Chemistry.

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