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Teacher Evaluation Module for Continuous Improvement in Higher Education

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Abstract: This research is dedicated to the design and development of the teacher evaluation module for the Instituto Superior Tecnológico La Maná, a higher education institution in Ecuador. The purpose is to improve the evaluation process in higher education by leveraging advanced web technologies. This module consists of self-evaluation, co-evaluation, and hetero-evaluation to provide an objective assessment. The resources used include PHP, HTML, CSS, JavaScript, and SQL, which helped speed up processing and improve data accuracy for presenting results through interactive dashboards. The tests conducted demonstrated the system's ability to overcome resource limitations and foster a culture of continuous improvement. The results reflect a positive impact on educational quality by promoting a more collaborative environment.

Keywords: *Automatización, evaluación docente, mejora continua, retroalimentación, tecnologías web.*

1. Introducción

In recent years, the evaluation of teaching performance has become a central factor in improving the quality of education offered by higher education institutions (1) (2). In this sense, it is of utmost importance to note that it is not a formality or administrative procedure but that its implementation establishes a direct correlation between the quality of teaching and the comprehensive education of students. However, the old methods followed in most HEIs are rather restrictive, especially regarding providing accurate, objective and timely feedback. As a result, the effectiveness of the evaluation processes that teachers value and the development of professionalism that such systems promote are likely to be compromised (3).

However, the traditional methodologies used by many higher education institutions remain quite limited, especially in the ability to provide accurate, objective, and timely prepared feedback (4). As a result, the usefulness of evaluative processes as appreciated by faculty members these strategies support may be negatively affected.

The lack of an adequate technological system for the teacher evaluation process in Cotopaxi, Ecuador, has created a need for innovative solutions. Therefore, the teacher evaluation module developed for the Instituto Superior La Maná overcomes the precariousness and provides a comprehensive alternative for collecting, analysing, and presenting data effectively.

This module optimises the time spent on evaluation and ensures the generation of more accurate information, allowing for decision-making based on concrete and reliable data. In addition, an article on new assessment techniques and tools mentions that online educational platforms are key to providing more interactive assessments. These tools encourage continuous assessment and allow educators to make informed decisions based on concrete data about academic performance (5).

The module integrates advanced web technologies, such as PHP for the backend, HTML, CSS, JavaScript for the front end, and MySQL databases. These tools allow for the automation of the different stages of the evaluation process, including self-evaluation, peer and management co-evaluation, and hetero-evaluation by students (6).

An outstanding aspect of the module is its ability to present results through interactive dashboards. These dashboards provide an understandable view of teaching performance, facilitating its interpretation for managers and teachers. The module's scientific and technical foundations ensure its applicability in various institutional contexts (7). Tests conducted in a case study in the province of Cotopaxi evidenced its ability to adapt to environments with limited resources and overcome common challenges in evaluative processes, such as resistance to change or the difficulty of consolidating dispersed information.

These tests demonstrated the system's effectiveness as a management tool and as a catalyst to foster a culture of continuous improvement in the educational environment.

Thus, the teacher evaluation module directly impacts academic management and teaching practice. On the one hand, it allows institutions to identify specific areas for improvement through objective data, which contributes to the design of more effective continuing education strategies. On the other hand, it provides teachers with detailed feedback that allows them to reflect on their teaching methods and strengthen their pedagogical skills. Furthermore, including students in the evaluation process encourages active participation in improving educational quality and reinforces their commitment to learning.

This comprehensive approach makes the module a versatile tool, capable of adapting to the specific needs of different higher education institutions. Its technological design ensures efficient and secure data management, while its modular structure allows it to incorporate improvements or adjustments according to the demands of the

educational environment. Beyond the operational benefits, the module redefines the paradigm of teacher evaluation by positioning technology as an essential means of ensuring the objectivity, accuracy and usefulness of evaluative processes (8).

By integrating process automation with detailed analysis, the module offers an effective solution to one of the most critical challenges of educational management. Its implementation demonstrates that it is possible to transform traditional processes into robust and reliable systems, ensuring that academic decisions are based on high-quality information, focusing on continuous improvement and strengthening educational standards.

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The module effectively solves one of the most critical challenges of educational management by integrating process automation with detailed analysis. Its implementation demonstrates that it is possible to transform traditional processes into robust and reliable systems, ensuring that academic decisions are based on high-quality information, focusing on continuous improvement, and strengthening educational standards.

2. Methodology

The methodology applied in this study was designed to comprehensively analyse the teacher evaluation module's implementation and impact on higher education. By adopting a mixed approach, quantitative and qualitative techniques were integrated to allow an evaluation of the system's performance (9). This approach is based on the need to ensure that the tools developed meet the required technical standards and respond to educational institutions' pedagogical and organisational needs (10).

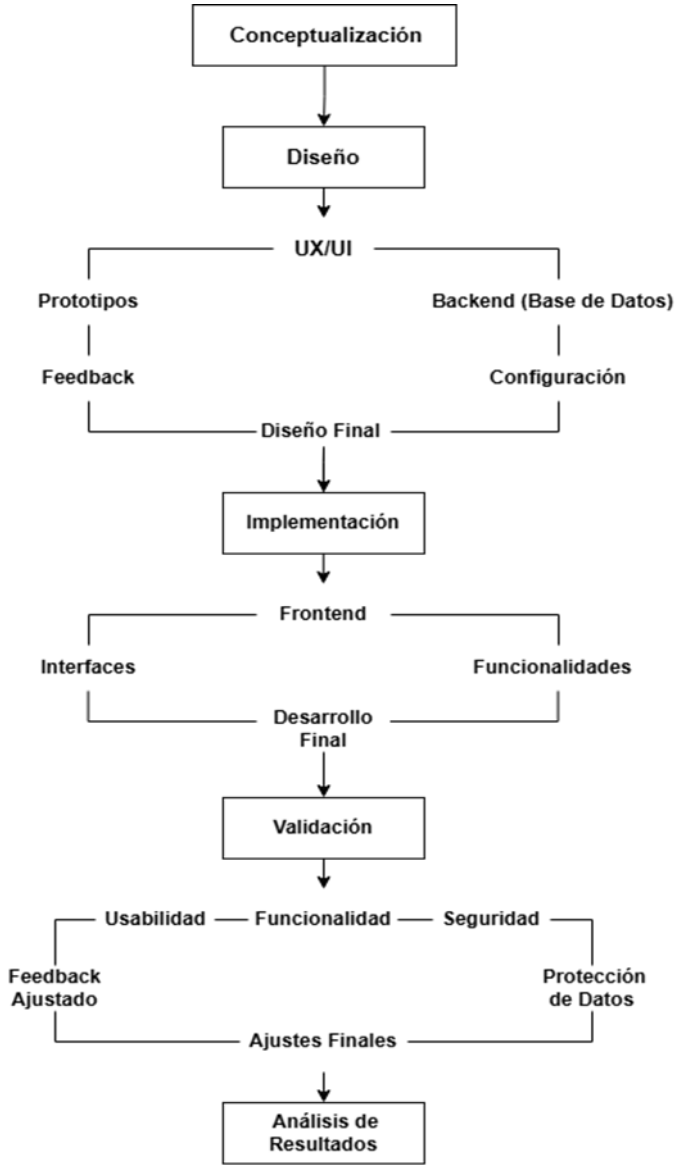

Fig SEQ Fig * ARABIC 1. Esquema general del proceso metodológico.

The module was designed as an innovative solution to overcome the limitations of traditional teacher evaluation methods. These primarily manual methods often lack objectivity, making it difficult to generate reliable results. In this sense, the research was structured to cover the key phases of the module's development, from its conceptualisation and design to its implementation, validation, and analysis of results, ensuring its applicability in diverse educational environments.

2.1 Study Approach

The study is exploratory and descriptive, designed to understand the dynamics associated with using the module and user perceptions (11). The research was framed in a cross-sectional and constructivist design, in which data were collected at a specific time, ensuring a timely but representative analysis of the system's functionality. This constructivist approach emphasises the interaction between the actors in the educational process and the technological tools used, generating a basis for continuous improvement.

According to a recent study, research with an exploratory and descriptive approach is fundamental to understanding the dynamics of technological tools in education. This approach allows a detailed

analysis of user perceptions and system functionality. This type of design, situated in a constructivist framework, emphasises the interaction between the actors in the educational process and the technological tools, generating a solid basis for continuous improvement in teaching and learning (12).

2.2 Population and Sample

The study population consisted of 27 teachers and 415 students from the Instituto Superior Tecnológico La Maná. This group provided relevant information about their experience using the module, including perceptions about the system's ease of use, usefulness, and reliability. Non-probabilistic convenience sampling was used, and participants were selected based on their availability and the relevance of their contributions. This strategy enabled the study to capture a diversity of opinions that enriched its findings (13).

2.3 Conceptualization and Module Design

The teacher evaluation module was conceptualised as a tool that integrates three main approaches:

Self-evaluation allows teachers to reflect on their pedagogical practices and detect areas for improvement. This process not only fosters professional self-awareness but also contributes to the continuous improvement of educational quality. According to a recent study, self-evaluation is considered an essential tool for educators to recognise their strengths and weaknesses in the pedagogical field, allowing them to adjust their teaching methods to maximise student learning (14) (15).

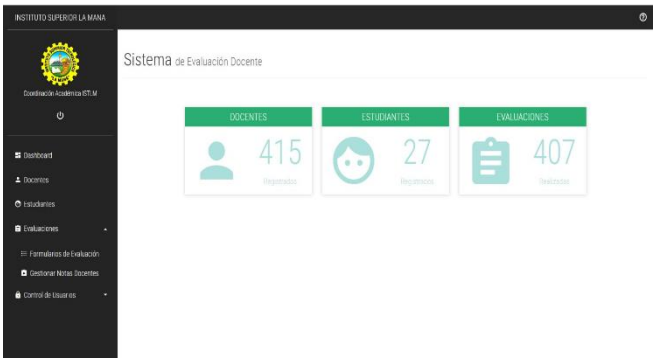

Fig 2. Administrative Dashboard.

Co-evaluation encourages the exchange of feedback between peers and managers, promoting collaboration in the educational environment. This practice engages teachers in a mutual evaluation process, strengthening interpersonal relationships and teamwork. Recent research indicates that co-assessment can significantly improve the quality of learning by allowing students and teachers to share perspectives on the educational process, resulting in a richer and more collaborative learning experience (16).

Heteroassessment allows students to evaluate the effectiveness of teaching methodologies and give feedback on their teachers' pedagogical strategies. This type of evaluation is fundamental for developing more effective educational practices. A recent study highlights that hetero-assessment not only empowers students by making them participants in the educational process but also helps teachers adapt their pedagogical approaches to their students' real needs.

These three approaches combine to provide a comprehensive and objective teacher performance assessment.

The module's design was based on usability principles, ensuring that the interface was intuitive and accessible to different types of users. Modern technologies such as Bootstrap were used to create a responsive design that adapts to devices of various characteristics.

In the development of the module, web technologies widely adopted in the industry were used, such as:

PHP (PHP Hypertext Preprocessor) is an open-source programming language widely used for server-side web development. It allows the creation of dynamic and secure applications, facilitating interaction with databases and user session management. Its relevance in web development lies in its ability to generate dynamic HTML content and its integration with various databases, making it a popular choice for building interactive websites and complex applications. A recent study highlights the importance of PHP in web application security, analysing specific vulnerabilities and proposing strategies to mitigate risks associated with its use, such as the exploitation of common extensions (17).

HTML (HyperText Markup Language) is the standard for structuring content on the web, while CSS (Cascading Style Sheets) defines the visual style and presentation of that content. HTML and CSS are fundamental to creating attractive and functional user interfaces. HTML provides the basic structure, such as headings, paragraphs and links, while CSS allows you to customise colours, fonts and layouts. This combination ensures users have a visually pleasing experience when interacting with web applications. However, no specific article addresses only HTML and CSS in the requested context; their use is widely recognised in web development literature.

JavaScript is an essential programming language for front-end development, enhancing the interactivity of web applications. It facilitates DOM (Document Object Model) manipulation, allowing developers to create dynamic experiences and respond to user actions without reloading the page. At the same time, jQuery is a popular JavaScript library that simplifies everyday tasks such as DOM manipulation, event handling, and animations, making development more efficient.

2.4 System Architecture and Security

The module was developed using a modular web architecture designed to guarantee scalability, robustness, and ease of maintenance. PHP interacts with a MySQL database in the backend to efficiently manage the evaluation information.

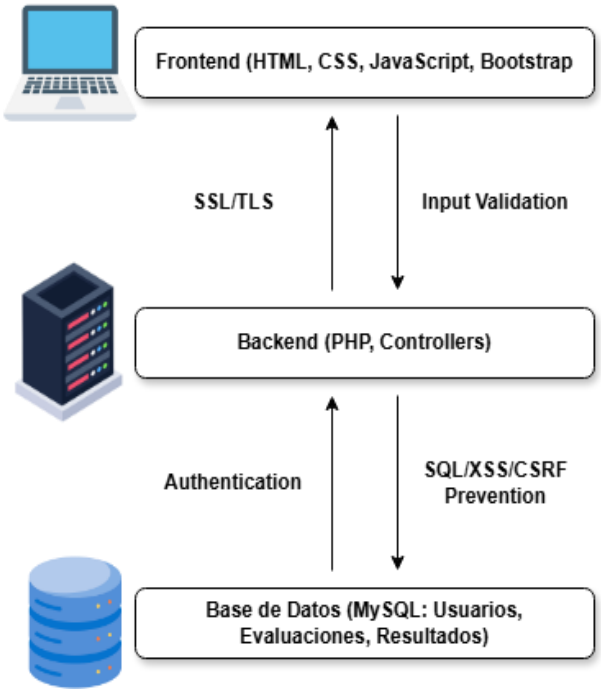

Fig 3. General system architecture diagram.

The teacher evaluation module implements an authentication system based on clearly defined roles, which ensures differentiated access and efficient use of the system. The established roles include:

The administrator is in charge of the comprehensive management and control of the system. This user has full access to the functionalities, including user administration, system configuration and report generation.
Teachers, on the other hand, are evaluated within the module. They can access their profiles to view their grades and performance analysis, promoting self-evaluation and continuous improvement in their educational practice.
Students are the principal evaluators of teachers. This role allows students to access a simplified interface to evaluate the teachers assigned to them according to their career and academic program. This design ensures a transparent and objective approach to data collection.

The authentication system ensures that each user accesses only the functionalities corresponding to his/her role, preserving the integrity of the data and the confidentiality of the evaluations. This approach reinforces the system's efficiency and promotes an adequate use of technological resources within the Instituto Superior Tecnológico La Maná.

Also, to protect sensitive information during storage and transmission. Data encryption is a process that transforms readable information into an encoded format, ensuring that only authorised parties can access it. This mechanism is essential to protect sensitive information during storage and transmission, especially in web applications, where critical data is handled, and unauthorised access is to be prevented. Encryption ensures data confidentiality and contributes to data integrity and authentication, essential to maintain user confidence and comply with data protection regulations (18).

2.5 Validation and Performance Testing

Performance tests were performed using specialised tools such as JMeter to evaluate the module's effectiveness and stability. These tests simulated different scenarios of intensive use, identifying possible bottlenecks and optimising system performance.

Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(ms)
Modulo principal	1443		8648	445	232	114
Modulo principal	1599		8648	445	386	268
Modulo principal	854		8648	445	212	110
Modulo principal	1261		8648	445	207	104
Modulo principal	1556		8648	445	334	216
Modulo principal	1609		8648	445	387	268
Modulo principal	1165		8648	445	206	104
Modulo principal	1364		8648	445	208	104
Modulo principal	1067		8648	445	207	104
Modulo principal	971		8648	445	211	104
Modulo principal	676		8648	445	226	123
Modulo principal	656		8648	445	207	104
Modulo principal	655		8648	445	207	104
Modulo principal	647		8648	445	207	105
Modulo principal	316		8470	445	103	0
Modulo principal	649		8648	445	208	103
Modulo principal	313		8470	445	103	0
Modulo principal	659		8648	445	208	105
Modulo principal	317		8470	445	103	0
Modulo principal	650		8648	445	209	105
Modulo principal	317		8470	445	106	0
Modulo principal	315		8470	445	103	0
Modulo principal	645		8648	445	210	107
Modulo principal	325		8470	445	105	0
Modulo principal	321		8470	445	107	0

Fig 4. System performance tests.

In addition, usability tests were conducted with teachers and students to measure the interface's clarity and the functionalities' effectiveness. The results allowed adjustments to be made to improve the user experience.

2.6 Implementation of the Scrum Methodology

The module's development followed the principles of the agile Scrum methodology, which allowed the work to be organised in two-week sprints. This iterative and incremental approach facilitated the incorporation of continuous feedback and the delivery of a functional product at the end of each iteration.

Table 1
Application of the Scrum cycle in the development of a teaching evaluation module

Scrum Component	Description	Application in the Teacher Evaluation Module
Roles		
Product Owner	Defined priority functionalities.	Determined key elements such as self-assessment, heteroassessment and reporting.
Scrum Master	Facilitated Scrum and resolved roadblocks.	Oversaw agile progress of dashboards and calculation algorithms.
Development Team	Implements system functionalities.	They developed the module using PHP, SQL, HTML, CSS, and Bootstrap.
Artifacts		
Product Backlog	List of requirements and functionalities.	Included were evaluation algorithms,

		interactive reports, and evaluation forms.
Sprint Backlog	Tasks selected for each Sprint.	Focused on evaluation forms and database connections.
Increment	Deliverables at the end of each Sprint.	Functionalities such as operational self-assessment and interactive dashboards.
Events		
Sprint Planning	Sprint priority tasks planning.	Development of the evaluation and reporting algorithm.
Daily Scrum	Daily meetings to update and resolve issues.	Backend progress, testing and bug fixes.
Sprint Review	Review of work completed in the Sprint.	Presentation of reports and features ready for use.
Sprint Retrospective	Reflection for process improvements.	Identification of improvements in testing and dashboard design.
Sprint Duration	Two-week work cycles.	Each Sprint delivered functional parts such as visualisation modules or integrated forms.

The table shows the practical application of the Scrum framework in developing a teaching evaluation module, highlighting how its roles, artefacts, and events contribute to agile project management. The product owner prioritises key functions such as self-assessment and reporting, while the Scrum Master monitors and resolves impediments to the maintenance workflow. The development team implemented the technical solution using PHP, Bootstrap and other technologies. Product Backlog and Sprint Backlog artefacts allow tasks to be organised, and feature increments, such as dashboards and operational algorithms, are delivered each two-week Sprint. Planning, review and retrospective activities ensure efficient progress and identification of improvements and bug fixes, resulting in a robust module aligned with end-user needs.

2.7 Ethical Considerations and Limitations

The study was conducted following ethical principles such as data confidentiality and informed consent of the participants. However, the use of convenience sampling and the limitation of the study to a single academic setting represent restrictions that should be considered when extrapolating the results.

3. Results

The results obtained after implementing the teacher evaluation module reflected a positive and significant impact on optimising the evaluation processes at the Instituto Superior Tecnológico La Maná. This study focused on analysing how the module facilitates data collection, processing, and analysis related to teaching performance, promoting informed decision-making that contributes to the continuous improvement of educational quality.

To ensure the validity of the results, a representative sample of 206 participants, selected from a total population of 443 individuals, composed of 27 teachers and 415 students, was determined. This calculation was made using a 95% confidence level and a 5% margin of error, ensuring that the data collected accurately reflected the perceptions of the academic community. This approach allowed us to obtain robust findings based on a statistically sound methodology.

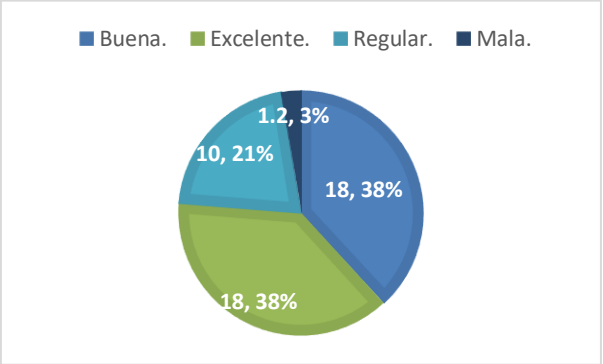

Fig SEQ Fig ARABIC 5. Performance of the teacher evaluation module.

The module's implementation was evaluated through surveys and direct user feedback, highlighting key indicators such as ease of use, interface clarity, and functionalities' usefulness. The results showed that most participants rated the user experience as 'excellent' or 'good'. This highlights that the system's intuitive design allowed users to quickly adapt and facilitated its integration into regular evaluation processes. A particularly noteworthy aspect was the module's ability to simplify previously complex tasks, such as collecting and consolidating assessment data. This allowed teachers and students to focus on interpreting results and effective feedback, key elements for pedagogical improvement.

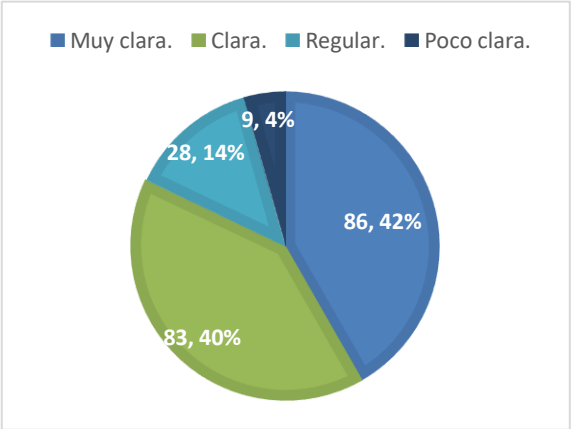

Fig SEQ Fig ARABIC 6. Clarity of the information provided by the teacher evaluation module.

The clarity and usefulness of the information presented by the module were among the aspects most highly valued by users. The interactive dashboards, designed to visualise and tabulate the results of the evaluations graphically, significantly facilitated the interpretation of the data collected. Teachers highlighted that the presentation of the results allowed them to identify specific areas for improvement in their performance. At the same time, academic managers found these visualisations to be a valuable tool for evidence-based decision-making. This level of accessibility and accuracy of information not only strengthened the users' perception of the module's effectiveness but also contributed to its widespread acceptance as an innovative and necessary tool.

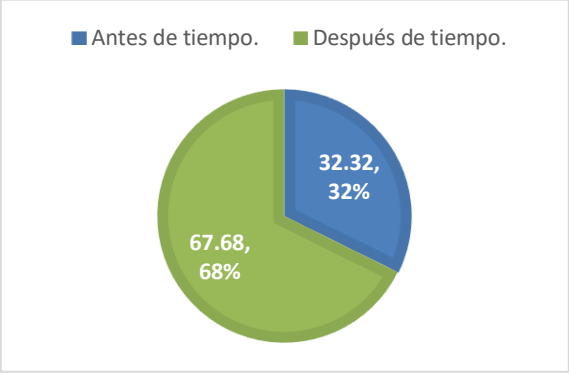

Fig 7. Comparison of processing times before and after implementing the module.

Before the module's implementation, the evaluation processes were highly dependent on manual methods, which were prone to errors and demanded considerable time and resources. With the automation introduced by the module, the time required to consolidate data was significantly reduced, allowing a more agile and accurate analysis. The system optimised operating times and improved the quality of the results by minimising human error and ensuring more excellent reliability in the reports generated. This process transformation represented a structural change in the way in which teacher evaluations were managed, aligning the practicesinstitucionales con los estándares actuales de eficiencia y calidad.

3.1. User Perceptions

The overall perception of the module was highly positive. Teachers highlighted that the system provided them with structured and actionable feedback, helping them identify strengths and areas for improvement in their pedagogical performance. Students valued the module's transparency and fairness, mentioning that this increased their confidence in the evaluation processes and the results' objectivity.

This consensus among the different educational actors highlights the module's potential to strengthen the relationship between teachers and students, promoting a more collaborative and results-oriented learning environment.

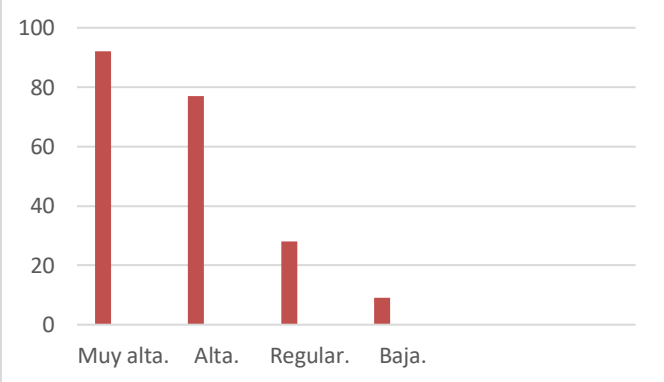

Fig 8. The proportion of users satisfied with the impact of the module.

3.2. Impact on Educational Quality

The results were analysed and showed a general improvement in the indicators related to educational quality. Teachers indicated that the clarity of the results allowed them to adjust their pedagogical strategies more precisely and effectively. At the same time, students reported a greater sense of involvement in the evaluation process.

This strengthening of the educational dynamics contributed to constructing a more dynamic and participatory learning environment, where evaluations not only fulfil an administrative function but become a tool for the integral development of the academic community.

4. Conclusión

Implementing teacher evaluation modules has proven essential for modernising the evaluation process in higher education. Developed using advanced web technologies with a clear focus on usability, the system automates tasks previously performed manually, significantly reducing processing time and increasing data collection and analysis accuracy. Its ability to integrate self-evaluation, co-evaluation and hetero-evaluation facilitates a more comprehensive assessment of teaching performance so that strengths and areas for improvement can be identified. In addition, the results presented through interactive dashboards provide greater transparency and accessibility, promoting evidence-based decision-making and improving transparency throughout the evaluation process.

The impact of this module is not only limited to optimising administrative processes but also increases teacher motivation and encourages teachers and students to actively participate in building a more collaborative and effective educational environment. Teachers emphasised the system's usefulness for reflecting on their practice and adopting innovative strategies. At the same time, students valued the fairness and objectivity of the process, which increased their confidence in the evaluation. This research shows that when technology is oriented with clear objectives and adapted to actual needs, it can continuously drive higher education institutions to improve and enhance the quality of education.

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