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*Artículos científicos*

# SEEVA para posgrados de la Universidad Santo Tomás, seccional Bucaramanga

## *SEEVA for postgraduate studies of the Universidad Santo Tomás, Bucaramanga section*

## *SEEVA para pós-graduação da Universidade Santo Tomás, seção Bucaramanga*

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## Resumen

Los entornos virtuales de enseñanza-aprendizaje (EVA) son recursos ampliamente utilizados en la educación en línea. Para garantizar su efectividad, es esencial que estos sean de alta calidad y sometidos a evaluación. Sin embargo, a pesar de la disponibilidad de diversas herramientas y sistemas de evaluación, aún no existe un enfoque integral que englobe aspectos pedagógicos, técnicos y organizativos. Por eso, en el presente trabajo se propone el Sistema de Evaluación de Entornos de Aprendizaje (SEEVA), el cual fue creado para los EVA de los programas de posgrado de la Universidad Santo Tomás, seccional Bucaramanga. Este se basa en la integración de criterios provenientes de sistemas como HEODAR, minería de datos, FLOE y LORI. Para desarrollarlo, se llevó a cabo un diagnóstico exhaustivo y una valoración de los criterios usados en los referidos sistemas. El resultado generó un marco de evaluación que abarca las tres dimensiones (aspectos pedagógicos, técnicos y organizativos) con criterios y subcriterios detallados. El objetivo

fundamental del SEEVA es proporcionar a los EVA un plan de mejora personalizado, lo cual permitirá actualizarlos y optimizarlos según las necesidades específicas del contexto educativo y las últimas tendencias en herramientas digitales.

**Palabras clave:** sistema de evaluación, entorno educacional, programa de enseñanza, aprendizaje, interacción.

## Abstract

Virtual teaching-learning environments (VLE) are resources widely used in online education. In order to ensure their effectiveness, it is essential that they have high quality and be evaluated. However, despite the availability of various evaluation tools and systems, there is still no comprehensive approach that encompasses pedagogical, technical and organizational aspects. For this reason, in this work the Learning Environment Evaluation System (SEES, as in spanish) is proposed, which was created for the VLE of the graduate programs of the Santo Tomás University, Bucaramanga section. This is based on the criteria integration that comes from systems sucsh as HEODAR, data mining, FLOE and LORI. To develop it, an exhaustive diagnosis and evaluation of the criteria used in the aforementioned Systems were carried out. The result generated an evaluation framework that covers three dimensions (pedagogical, technical and organizational aspects) with detailed criteria and sub-criteria. The fundamental objective of SEEVA is to provide EVAs with a personalized improvement plan, which will allow them to be updated and optimized according to the specific needs of the educational context and the latest trends in digital tools.

**Keywords:** Assessment system, learning environment, Instructional programmes, learning, interaction.

## Resumo

Os ambientes virtuais de ensino-aprendizagem (AVA) são recursos amplamente utilizados na educação online. Para garantir a sua eficácia, é essencial que sejam de elevada qualidade e sujeitos a avaliação. No entanto, apesar da disponibilidade de diversas ferramentas e sistemas de avaliação, ainda não existe uma abordagem abrangente que englobe aspectos pedagógicos, técnicos e organizacionais. Por este motivo, neste trabalho é proposto o Sistema de Avaliação de Ambientes de Aprendizagem (SEEVA), que foi criado para o EVA dos programas de pós-graduação da Universidade Santo Tomás, seção Bucaramanga. Isto se baseia na integração de critérios de sistemas como HEODAR, mineração de dados, FLOE e LORI. Para desenvolvê-lo foi realizado

um diagnóstico exaustivo e avaliação dos critérios utilizados nos referidos sistemas. O resultado gerou um quadro de avaliação que abrange as três dimensões (aspectos pedagógicos, técnicos e organizacionais) com critérios e subcritérios detalhados. O objetivo fundamental do SEEVA é dotar os EVAs de um plano de melhoria personalizado, que permitirá a sua atualização e otimização de acordo com as necessidades específicas do contexto educativo e as últimas tendências em ferramentas digitais.

**Palavras-chave**: sistema de avaliação, ambiente educacional, programa de ensino, aprendizagem, interação.

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# Introduction

In the teaching-learning process, the use of various tools and strategies is required to ensure effective training, such as virtual learning environments (VLE), which must usually be evaluated to determine the level at which the set objectives have been achieved. An example of this is the work of Gordillo *et al*. (2014), at the Polytechnic University of Madrid, who proposed a set of pedagogical quality metrics based on LORI. The results demonstrated the effectiveness and security of these metrics for ranking search results based on quality.

On the other hand, in Argentina, Ferrari and Mariño (2014) emphasized the evaluation of the usability of EVAs, for which they proposed the creation of a virtual environment aimed at supporting learning (EVEA) that integrates data mining tools. in higher education, either as part of regular or refresher courses. Additionally, Orozco Rodríguez and Morales Morgado (2016) carried out a study at the University of Salamanca, Spain, to analyze the results of the psychometric test of the HEODAR instrument (reusable educational learning objects evaluation tool).

Adame Rodríguez (2015), for his part, analyzed the findings of the adaptation of quantitative indicators to the instrument to evaluate LORI learning objects. This work sought to contribute to education by measuring, reporting, communicating, acting and monitoring the quality of digital educational resources, from their design and development to post- implementation.

Another relevant investigation is that of Acuña (December 26, 2021), who focused on the need to evaluate educational resources with quality, which is why he considers three evaluation systems, including LORI. Likewise, Ballesteros Román *et al*. (2013) carried out a study on data mining focused on educational management. They highlighted that this tool is reliable for teachers to evaluate their practices and methodologies implemented with their students, regardless of

whether intelligent tutor agents, virtual education systems or active learning strategies are used in the classroom.

Finally, Rosado Gómez and Verjel Ibáñez (2017) investigated how the necessary characteristics for data processing in the educational context can be identified, while González Calleros *et al*. (2019) affirm that technology is helping to create tools that have allowed us to improve evaluation in educational processes. In summary, these investigations highlight the importance of understanding the evaluation of EVA and its impact on learning, a crucial element for current education.

## Methodology

The research approach adopted in this study was mixed in nature. According to what was stated by Hernández Sampiere *et al*. (2014), this is characterized by combining systematic, empirical and critical processes that involve the collection and analysis of both quantitative and qualitative data. Specifically, an exploratory research was designed with the purpose of understanding the perception of teachers, students and thematic experts on virtual learning environments (VLE) in the different postgraduate programs offered by the Universidad Santo Tomás, Bucaramanga section.

To do this, three phases were carried out: first, the opinions and evaluations of the content designers, students and tutors involved in these programs were collected; Then, an exhaustive analysis of the collected data was carried out, separating the responses of each group of participants, to identify the specific needs that should be evaluated in the VAS; Finally, a system was proposed that evaluated the pedagogical, technical and organizational aspects through criteria and sub-criteria.

### Assessment

According to Onetti Onetti (2011), evaluation is a continuous and systematic process that serves to improve teaching and learning. This is applied in a wide range of contexts in people's lives and its main objective is to gather objective evidence that can guide and improve the evaluated activity effectively. In the educational field, it constitutes a fundamental tool that not only has a positive impact on institutions, but also influences the individual growth and development of each person, which generates a real effect for training. Educational evaluation is supported by the collection of both quantitative and qualitative data related to student performance that are carefully

interpreted to formulate value judgments that contribute to the analysis and improvement of the educational process as a whole.

## Virtual teaching-learning environment

Díaz Zelada (2020) defines EVAs as web-based educational sets that have proven to be especially beneficial in higher education, which are composed of computer tools that facilitate didactic interaction between teachers, students and learning materials. This dynamic interaction is carried out through the use of digital technologies, which makes it possible to carry out educational activities remotely. The relevance of VLEs lies in their flexibility in terms of time and space, which allows working in diverse virtual environments that include elements such as videos, presentations, movies, group chats and forums that encourage the active participation of students.

## Evaluation systems

To evaluate and improve virtual teaching-learning spaces, it is essential to consider a series of criteria. For example, those proposed by different systems can be taken into account, such as LORI (Nesbit *et al*., 2009), HEODAR (Morales Morgado *et al*., 2008), data mining (Hernández *et al*., sf) and FLOE (Vargas-Lombardo, 2007).

The LORI system focuses on pedagogical and usability aspects, while HEODAR considers educational data, the user-oriented approach, the collaborative approach (expert-teacher) and the integrative approach (student-expert-teacher). For its part, the data mining system contemplates the scenario of positive, negative, delivery and training quality.

Table 1 presents the criteria proposed by each of these systems. From these criteria, those that are most relevant to the system being proposed will be selected with the objective of determining whether training needs are met at different levels and types of learning, as well as whether resources and tools are kept up to date.

**Table 1.** Compilation of evaluation system criteria

| LORI | HEODAR | Data mining | FLOE evaluation system |
|---|---|---|---|
| Content quality | Pedagogical | Educational data | Positive quality scenario. |
| Feedback and adaptability | Usability | User-oriented approach | Negative quality scenario. |
| Adequacy of learning objectives | - | Collaborative approach (expert-teacher) | Delivery scenario. |
| Motivation | - | Integrative approach (student-expert-teacher) | Training quality scenario. |
| Presentation design | - | - | - |
| Interaction Usability | - | - | - |
| Accessibility | - | - | - |
| Standards Compliance | - | - | - |

Source: Own elaboration based on Nesbit *et al* . (2009), Morales Morgado *et al* . (2008), Marulanda *et al* . (2017)and Ortega and Vargas (2007)

For the development of this study, the following question was formulated: how does an evaluation system allow improvement in the EVA of the postgraduate programs of the Universidad Santo Tomás, Bucaramanga section, taking into account the criteria of the HEODAR tools, data mining? data, FLOE system and LORI?

## Results

The system to evaluate the EVA, which is proposed as the evaluation system for virtual learning environments (SEEVA, as in spanish), is structured into pedagogical, technical and organizational aspects.

## Pedagogical aspects

Ministry of National Education of Colombia (sf) is taken into account:

> The pedagogical component privileges the communicative interaction that is established between the teacher and the students in specific contexts; It seeks to create a learning environment that provides opportunities for students to build concepts, develop thinking skills, values and attitudes.

Taking the above into account, the evaluation is made in criteria and sub-criteria ( Table 2).

**Table 2.** Criteria and subcriteria of the *pedagogical component*

| CRITERIA | SUB-CRITERIA |
|---|---|
| Suitability of objectives | They indicate what is expected to be learned |
| | The evidence of learning, content and feedback provided are articulated with the declared objectives. |
| | It is enough for students to achieve learning |
| Learning (time) | Presents sufficient and appropriate information at the educational level |
| | Promotes learning discovery |
| | Different alternatives are offered to acquire knowledge |
| Creativity | Promotes development and initiative and autonomous learning |
| | Promotes innovative and contextualized activities in the environment to achieve the proposed objectives. |
| | Promotes learning discovery |
| Curriculum didactic | Ability to achieve learning outcomes |
| | Integrate new information into pre-existing knowledge |
| | Reinforcement of knowledge through individual and group activities to be self-assessed and co-assessed. |
| Conceptual design: structure of contents | Adapt the contents to the proposed objective |
| | The contents are adapted to the student's level of training. |
| | It includes a complete pedagogical structure from competition to evaluation. |
| | The content can be applied in any type of learning context |
| Presentation design for learning | The presentation is attractive and original |
| | They present information in different formats (text, audio, etc.). |
| | Clearly presents the expected competencies and learning outcomes to be achieved |

| | |
|---|---|
| | The content is free of errors and is presented without bias or omissions |
| | Presentations minimize visual search |
| Assessment | Presents evaluation and practice activities |
| | Establish the level of quality and achievement of the objectives established in learning. |
| | It is consistent with the stated objectives |
| Interactivity | Content is interacted through links |
| | There is a good level of interaction allowing feedback to the user |
| | It offers good interactivity and a good visual impression |
| Motivation and attention | Motivates student participation |
| | Stimulates interest so that students participate |
| | The content, resources and activities used are highly motivating. |
| Technical-aesthetic | The part is aesthetically pleasing and striking. |
| | The texts, images and audios are clear and legible |
| | It does not present grammatical, syntactic or spelling errors. |

Note: The criteria and subcriteria of the HEODAR, data mining, FLOE and LORI evaluation systems are compiled

## Technical aspects

In this aspect, the accessibility, interactivity and interaction of the academic community with the resources available on virtual platforms must be taken into account in the teaching-learning process through a learning management LMS (*learning management system*). For this aspect, the criteria and subcriteria found in Table 3 are evaluated.

**Table 3.** Criteria and subcriteria of the *technical component*

| CRITERIA | SUB-CRITERIA |
|---|---|
| Accessibility-availability | It has good accessibility to classroom products. |
| | Any user can access the products and tools |
| | It is adapted for students with sensory and motor dysfunctions |
| Interface design | The structure allows any navigation alternative. |
| | Allows adaptability of the user interface. |
| | UI behavior is consistent and predictable |
| Navigation layout | It has a flexible structure that allows the user to control its navigation. |
| | The user knows where they are at all times |
| | The pages are simple, they are not overloaded with advertising, animations, etc. |
| Technological specifications | A data translation is evident pointing to related ontologies |
| | Metadata is in accordance with IEEE LOM 1484 standard |
| | They provide tagged code within the object and are presented on a page available to users |
| Functional | It has easy access, does not obstruct the training process |
| | It contains several hyperlinks or buttons and they all work |
| | Navigation is easy, intuitive and without excessive delays |
| Presentation | Information presented is reliable and determines the language used |
| | Image and audio are presented clearly |
| | Presents the main content areas of the site with hyperlinks to access it |
| Technical-aesthetic | Multimedia contents are integrated |
| | Colors and fonts provide information by themselves |
| | Font is legible and of appropriate size |
| | It attracts the user and highlights relevant things |
| Usability | The degree of concentration of the data allows reusability in different learning contexts. |
| | Use hypertext to divide extensive information across multiple pages |
| | Use multimedia appropriately and when necessary to contribute something |
| | Informs the characteristics of the audio file before downloading |
| Transfer speed | Measures information in kbs |

| | |
|---|---|
| | Cursor timing within the environment is appropriate |
| | Uses resources when the user accesses the object: RAM, disk space, CPU usage time |

Note: The criteria and subcriteria of the HEODAR, data mining, FLOE and LORI evaluation systems are compiled

## Organizational aspects

We work on the integration of the pedagogical and the technical in order to have the respective feedback, security and compliance with the rules in the generation of interaction spaces in the teaching-learning process. To do this, it is necessary to know the perceptions of the academic community in the criteria and sub-criteria shown in Table 4.

**Table 4.** Criteria and subcriteria of the *organizational component*

| CRITERIA | SUB-CRITERIA |
|---|---|
| Authorization and validation | Object has tools that protect it against unauthorized modifications |
| | Status of the connection port with the server and connection time |
| Compliance with standards (norms) | Complies with some relevant international standards and specifications |
| | Learning standards object Metadata, and technical guidelines developed by IMS, IEEE, TAW, WAI, DOM, SCORM and W3C. |
| | Adopts content aggregation and packaging according to standards (SCORM, AICC). |
| Impact | Personal benefit obtained by the participant |
| | Access via assistive and highly portable devices |
| | Simulate phenomena under study in response to the differential contribution of the student |
| Feedback | Provides feedback to the activities carried out by the user. |
| | Adaptation of messages to give instructions for the development of activities according to the specific needs or characteristics of the student |
| Security/confidentiality | Layout of tools for any user |
| | Identify invasive *software* or editing elements |
| | Requires identification to access the classroom (username and password) |
| Respect for intellectual property | Object has tools that protect it against unauthorized modifications |
| | Appropriately cite the information used |
| | Bibliographic references are evident |

Note: the criteria and sub-criteria of the HEODAR, data mining, FLOE and LORI evaluation systems are compiled

## Design

The learning environment evaluation system (SEEVA) was built taking into account some criteria and subcriteria of the LORI, HEODAR, FLOE and educational data mining systems in order to know the perceptions that each of the members of the academic community of the educational digital spaces offered by institutions.

The system is divided into the pedagogical aspects found in table 2, the technical aspects described in table 3 and the organizational aspects in table 4. Each of them has criteria and subcriteria, and the latter are given a value between 1 and 5, which will generate a grade that corresponds to the average of the criterion. Depending on the results, you will be asked to generate an improvement plan: in the short term if the result is between 1 and 3 (including); in the medium term if it is in the range of 3.1 to 4.4 (inclusive); and in the long term if it is 4.5 to 5 (inclusive).

On the other hand, with the results obtained in each of the criteria, the average of the aspect is taken. Depending on the rank, an improvement plan is requested; Finally, having the value of all aspects, the general average is taken in which the range in which the valuation is located will be identified and what type of plan should be generated.

Table 5 shows in general terms how the system looks. First, the value is assigned to each subcriterion, then the value is averaged to be put in the column that has its own name, which allows identifying what type of action should be performed per criterion. At the end of each aspect, you have the average of the criteria and the action to take. The above is done for the pedagogical, technical and organizational aspects, which make up the SEEVA, and from there the evaluation result of the EVA can be obtained.

**Table 5.** Assessment of the criteria and sub-criteria of the SEEVA evaluation system

| Aspect | Criteria | Subcriteria | Note | Criterion value | Action to take |
|---|---|---|---|---|---|
| A1 | 1 | 1.1 | | | |
| | | 1.2 | | | |
| | 2 | 2.1 | | | |
| | | 2.2 | | | |
| AVERAGE A1 | | | | | |
| Aspect | Criteria | Subcriteria | Note | Criterion value | Action to take |
| A2 | 1 | 1.1 | | | |
| | | 1.2 | | | |
| | 2 | 2.1 | | | |
| | | 2.2 | | | |
| AVERAGE A2 | | | | | |
| Aspect | Criteria | Subcriteria | Note | Criterion value | Action to take |
| A3 | 1 | 1.1 | | | |
| | | 1.2 | | | |
| | 2 | 2.1 | | | |
| | | 2.2 | | | |
| AVERAGE A3 | | | | | |
| TOTAL VALUE | | | | | |

Note: Author's own

## Discussion

The study was carried out in three phases. The first involved the analysis, for which the definition of Ibáñez Peinado (2015) was taken into account, so an analysis of the evaluation criteria of the virtual learning environments HEODAR, data mining, FLOE and LORI was carried out. These criteria were compiled through structured interviews carried out with content designers from the Universidad Santo Tomás, who had a wide variety of academic profiles, such as engineers with master's degrees in various disciplines, social communicators with master's degrees in education,

business administrators with postgraduate degrees in different areas, lawyers with various specialties, economists with various postgraduate degrees and architects with postgraduate studies.

The collected data was analyzed using the *software* Nvivo 12, which allowed the creation of nodes and references based on the participants' assessments. For example, it was highlighted that the EVAs have a learning route in each of their sections, where the purposes of each section are reflected and the activities and processes that will be carried out during the corresponding weeks are assigned. This includes criteria related to the presentation of information, its relevance to achieving the expected learning outcomes, and the guidance provided for learning.

In this sense, the importance of conceptual appropriation was highlighted through previous readings and thematic and novel updating of the assigned subjects. In addition, it was mentioned that there is a solid design of the teaching method, including the didactics used to transmit knowledge effectively. Reference was also made to assessment and feedback strategies, which seek to enable students to deepen their knowledge and address any deficiencies in their understanding.

In the second phase, the HEODAR, data mining, FLOE and LORI criteria were evaluated in the EVAs of several virtual postgraduate programs at the Universidad Santo Tomás, Bucaramanga section. To carry out this relevance evaluation, a questionnaire was applied to students and tutors of the following programs: Specialization in Social Security, Specialization in Safety and Health at Work, Specialization in Public Finance, Specialization in Global Business and Innovation, Specialization in Management of Business Internationalization, Specialization in Sports Administration and Master in Project Direction and Management, Specialization in Statutory Audit and External Audit, Specialization in Construction Intervention and Supervision, Master in Reconciliation and Coexistence and Master in Tax Law. The information collected was tabulated using the Nvivo 12 tool.

To analyze the results obtained in the surveys, the perceptions of students (available at https://acortar.link/YZvbal) and tutors of virtual modality programs at the Universidad Santo Tomás, Bucaramanga section (available at https: //acortar.link/iN0GYI) regarding digital classrooms. This was done considering the criteria of the HEODAR, data mining, FLOE and LORI systems, which were evaluated using a rating scale.

In the case of the HEODAR system, the pedagogical, curricular didactic, usability and navigation design criteria were analyzed with the following rating scale: “Don't know”, “Very poor”, “Poor”, “Acceptable”, “High”. ” and “Very high.” In the pedagogical criterion, motivation, attention, interactivity and creativity were evaluated, aspects that allow promoting autonomous learning and the development of metacognitive skills. Regarding the pedagogical didactic criterion,

the participants mention the importance of coherence between the training proposal and the results achieved, taking into account that the information is presented in different ways. In the usability criterion, the need to evaluate the text, image, animations, multimedia, sound and video was perceived, which served to know how relevant the content of the files is, the type, size and color of the files. lyrics, and whether the audios, videos and animations are appropriate to keep the user's attention. With the last criterion it was possible to know how pertinent it is to present to the user the objectives that are intended to be developed, as well as the flexibility of the structure and navigation interface.

For the data mining system, the criteria related to the user-oriented approach, the collaborative approach and the integrated approach were evaluated. The scale included categories such as “Extremely disagree,” “Disagree,” “Neither disagree nor agree,” “Agree,” and “Extremely agree.” The first criterion allowed us to evaluate aspects such as the quality and structure of the contents to specify how relevant they are and what their effectiveness is in the learning process. The second criterion was useful to know the capacity of the virtual learning object (VLO) in terms of achieving the objectives and the design of the contents. Ultimately, it allowed us to specify the structure of the contents and the technological specifications (Ballesteros Román *et al* ., 2013).

The FLOE system evaluated criteria such as positive, negative, delivery and training quality scenarios, using a rating scale from 1 to 5 (1 represented the lowest value and 5 the highest). With the first criterion, both the number of movements and the time of use of the cursor in the digital environment can be evaluated. Additionally, the quality of the interaction and how it contributes to a visually pleasing experience. In the second criterion, attention was paid to the writing style, the way in which references are made, how the resources available in the system are managed, and the permissions granted to modify digital tools. Regarding the third criterion, the ease with which users can access the virtual environment, the layout of the tools and the presence of invasive *software* or editing elements that may affect the user experience were evaluated. Finally, in the fourth criterion, an assessment of the training action provided by the digital environment, the level of academic training that the students have acquired and the benefit that each one obtains was considered.

LORI was then reviewed, a tool that evaluated eight criteria: quality of content, adequacy of learning objectives, feedback and adaptability, motivation, presentation design, usability of interaction, accessibility and compliance with standards, with a scale ranging from -1 and -5 for negative ratings, and 1 to 5 for positive ratings. In the first criterion, the importance was highlighted that the content was free of errors, that the presentations highlighted key parts and transmitted ideas

clearly, and that the contents were appropriate for various learning styles. The second criterion emphasizes that learning activities, content and assessments must be aligned with the objectives in an effective way, and that these activities must be sufficient to achieve these objectives. In the third it is evident that the instructional messages and activities are adapted to the specific needs of each student. Regarding the fourth criterion, the ability of the tool to maintain motivation among users is observed, as well as the availability of interactive activities. The fifth criterion focuses on the efficiency of learning provided by the tool through visual resources with clear and concise writing, free of errors, as well as the appropriate use of color and an aesthetically pleasing design. Furthermore, the graphs and tables used are considered appropriate (Adame Rodríguez, 2015). In the sixth criterion, the aim is for the user to be able to navigate in a simple and intuitive way through all the hyperlinks or buttons present in the digital spaces. The seventh criterion focuses on ensuring that the material is accessible to people with sensory and motor disabilities, in addition to ensuring that it can be accessed from any device, complying with the guidelines established by the W3C. In the eighth criterion, it is verified that the virtual spaces comply with the standards proposed by IEEE Learning object Metadata and technical guidelines established by the learning management system (LMS), the Institute of Electrical and Electronics Engineers (IEEE), Shareable Content Object Reference Model (SCORM) and World Wide Web Consortium (W3C). This ensures compliance with all relevant international standards and specifications.

Finally, in the third phase, a system was designed that related the HEODAR, data mining, FLOE and LORI criteria to evaluate the EVAs. Then, based on the results obtained, an improvement plan is developed in the short, medium or long term, depending on the rank achieved in the evaluation (Frascara , 2000).

## Conclusions

To ensure effective training, educational institutions must constantly evaluate the strategies and resources used, including virtual teaching-learning environments (VLEs). Unfortunately, EVA assessment is not adequately carried out in many institutions due, in part, to a lack of knowledge about the relevant tools and systems.

Therefore, this project sought to find answers to the following question: how can an evaluation system contribute to the improvement of the EVA of the graduate programs of the Universidad Santo Tomás, Bucaramanga section, taking into account the HEODAR criteria, mining of data, FLOE and LORI?

To this end, the project established three specific objectives. Firstly, diagnose the HEODAR, data mining, FLOE and LORI criteria in the aforementioned EVA with emphasis on the relevance of the design. In this sense, the results suggest the need to evaluate virtual spaces based on the aforementioned criteria, since this allows a better understanding of training scenarios, considering aspects such as objectives, the impact of the environment, the structure, the quality of the content, presentation, teaching orientation and coherence between activities and objectives, as well as methodology and feedback.

Secondly, we sought to assess the HEODAR, data mining, FLOE and LORI criteria in the EVAs themselves in order to evaluate both their relevance and their design. For this, tutors and students were consulted about how they would evaluate them in relation to the criteria and sub-criteria of the mentioned systems. The responses indicate a general agreement on the importance of carrying out an evaluation of these virtual spaces, considering aspects such as clarity of objectives, suitability of materials, interactivity, student motivation, presentation of information, the coherence of the activities with the objectives, the impact of the material, creativity and the promotion of autonomous learning, in addition to compliance with learning management regulations (LMS).

Thirdly, the objective was set out to structure an evaluation system for virtual teaching-learning environments that integrates the criteria of HEODAR, data mining, FLOE and LORI in order to improve pedagogical, technical and organizational aspects (Ferrari and Mariño, 2014). This objective arises in response to the needs expressed by tutors and students, hence the SEEVA system has been developed, which allows the evaluation of pedagogical, technical and organizational aspects through a series of sub-criteria that are grouped in specific categories.

Regarding pedagogical aspects, SEEVA evaluates criteria that cover the adequacy of objectives, learning in terms of time, creativity, curricular didactics, conceptual design (content structure), presentation design for learning, evaluation, interactivity, motivation and attention, as well as technical-aesthetic aspects.

For technical aspects, the system evaluates accessibility and availability, interface design, navigation design, technological specifications, functionality, presentation, technical-aesthetics, usability and transfer speed.

Regarding organizational aspects, SEEVA evaluates authorization and validation, compliance with standards and norms, impact, feedback, security/confidentiality and respect for intellectual property.

Based on the results obtained, it can be indicated that improvement plans should be generated in the short, medium and long term with the aim of optimizing the EVA and meeting the needs of both tutors and students.

## Future lines of research

Currently, we have a wide variety of tools to build the inputs that make up virtual learning environments (VLE). However, it is crucial that an evaluation of these resources be carried out to determine their relevance in the context of the program, the level of training and the corresponding educational modality. To this end, the implementation of the Learning Environment Evaluation System (SEEVA) is proposed, which analyzes pedagogical, technical and organizational aspects.

Furthermore, it is important to consider the possibility of proposing other complementary systems or tools that focus on additional aspects, such as usability, design, quality, functionality, effectiveness, flexibility, interactivity, among others, essential elements for guarantee quality educational experiences.

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