

## Integration of Virtual Classrooms of Learning in the Educational Processes Oriented by Teachers of Engineering Faculties

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**Abstract:** Once the Information and Communication Technologies (ICT) adhere to various educational spaces, a large number of teachers start a vertiginous race to make use of them, trying to involve the largest amount of virtual tools in their teaching practices as a new educative resource; undoubtedly, this allows the creation of new methodological strategies. Many resources are found on the network and may be used by teachers; particularly, there is one that has been gathering strength because of its great number of activities and elements that can be used as it allows the teacher to have administrative control of it; it is the virtual classroom of learning. The study describes the results obtained in the second phase of the doctoral thesis: “referentes pedagogicos para el uso y apropiacion de las Tecnologias de la Informacion y Comunicacion (TIC) al interior de los procesos educativos planeados y desarrollados por los docentes de educacion superior” (Pedagogical references to the use and appropriation of Information and Communication Technologies (ICT) inside of the educational processes planned and developed by higher education teachers). This research sought to evaluate the use that teachers of engineering made of virtual classrooms of learning resident in the moodle platform in the various educational processes that they guide. The methodological approach to this part of the study was qualitative making use of the inductive method; the direct observation technique was used through the implementation of a checklist considering three main aspects which in the view of the researchers should be displayed in all virtual classrooms of learning: formal aspects, didactic and pedagogical aspects and technical aspects; all of them indicating quality classrooms. The results show the lack of clarity that teachers of engineering faculties have about the adequacy of quality virtual classrooms of learning. Finally, the study evidences the urgent need to create a model to serve as a guide for engineering teachers regarding the adequacy of virtual classrooms of learning with total quality.

**Key words:** Moodle, virtual classroom of learning, virtual tools of learning, ICT, education, didactic

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### INTRODUCTION

The vertiginous rise of the Information and Communication Technologies (ICT) inside the different fields of human knowledge has allowed new challenges in the educative area, both pedagogical and didactic also design and technological, opening to new methodological approaches. Now a days, we have a variety of methodologies for developing university studies mediated by ICT: e-Learning, b-Learning, m-Learning. Below, we analyze the domain of each one of them:

**e-Learning:** This methodology tends to be confused with distance-learning education but it differs among other reasons in that e-learning is based on internet use, that privilege it as the main way to its existence. e-Learning mode puts aside any physical contact,

so virtual interaction leads the educational development-virtual university, virtual classrooms, virtual educational material, virtual students services, etc. By this way teachers become tutors or mediators of learning, privileging meetings and debates, so any educational process turns into virtual; moreover, this does not happen to distance-learning education even it also uses internet- because that is not the essential means for the normal performance of the educational processes.

**b-Learning:** This methodology allows the use of activities and virtual resources immersed in the face-to-face educational processes. It is the preferred methodology by on-site educational teachers. Every day, teachers find many virtual tools on the internet that, undoubtedly, contribute to expanding their didactics to facilitate mediation in the educational process. Due to the existence of simulators, virtual laboratories, learning

management systems and researchers tools for the creation of educational material, it is given a new air to face-to-face education that means more dynamic classes, that results in higher-quality classes.

**m-Learning:** This methodology is quite new but it has been growing up exponentially; undoubtedly, it will become the most popular one in a short time-period. This situation will facilitate a simple and economical way of publishing and have access to any educational content. Mobile computation will be the most used means at educative spaces mediated by ICTs.

Any methodology that appears here needs a platform that allows the administration of the different resources and activities involved in the teaching-learning process set out there; these platforms are denominated “learning management system” which abbreviation is LMS. These platforms allow the creation of virtual classrooms of learning for the development of Virtual Learning Environments (VLE). The VLE is understood as learning environments mediated by technology: a place in which the students interact under propitious physical, human, social and cultural conditions and circumstances in order to generate sense and significant learning. These experiences are the result of activities and dynamics proposed that are accompanied and oriented by a teacher. VLE transform the educative relationship, since the technological action facilitates the communication, processing, management and distribution of the information, adding new possibilities and limitations for learning to the educative relationship. We will focus in this stage as the teachers make use of the Moodle LMS and their educational practices are mediated by virtual tools of learning concentrated in virtual classrooms of learning.

**Research background:** The use of virtual classrooms of learning has been an object of many investigations so far. Initially, at this stage of our investigation, it becomes necessary to list the article “Buenas practicas de aulas virtuales en la docencia universitaria semi-presencial” (“Good practices of virtual classrooms in blended university teaching”) by Moreira in which they present the results of the study developed in 2009 at the University of La Laguna (ULL) that was destined to identify good practices in virtual classrooms in university teaching, these were developed under blended learning modality or blended teaching. In this study, there were selected six examples of virtual classrooms classified by scientific areas and characterized by the incorporation of resources of information, communication and experiential

learning. This research shows big results that are fundamental in our investigation: it goes back to the study of area and Adell, that in 2009 proposed three great models about the use that the teachers do to the virtual classrooms; they are the following:

- Model of face-to-face teaching with the internet-virtual classroom as a complement or support resource
- Model of blended teaching-virtual classroom as a space combined with the physical classroom or blended learning
- Model of distance teaching: virtual classroom as the only educative space

That study sought to find virtual classrooms that were an example of good practices as also highlight some specific practices where pedagogical innovation could be visualized, serving as a reference for teacher training. The instrument suggested for such aim evaluated eight aspects: identification data of the classroom, contents and resources of information, learning activities, resources of communication, educational organization, assessment, graphic elements and pedagogical model. The study manages to highlight some virtual classrooms that surpass the reductionist models that some teachers tend to make of them, only using it to post notes or as repository exercises. This study is essential for the research phase that we socialize in here.

Miratia and Lopez proposed the strategy DPIPE: *diseño, producción, implementación, publicación y evaluación* (design, production, implementation, publication and evaluation). The work that they socialize allows to guide teachers who want to make use of virtual tools in all regarding to the design and creation of virtual classrooms and/or online courses. This study is essential to the extent that permits a deep enough guide to emulate a design model of online courses in the same way, it permits to understand the basic elements that should be considered in an online course. The researchers propose an excellent matrix for planning the course in which the competitions (objectives), contents, the media or resources, activities (interaction) and evaluation must be considered.

Another study that we think is important to mention is the one developed by Paloma Moreno in the University of Valencia, entitled: “análisis del uso universitario de plataformas de gestión del aprendizaje. Estudio de caso en la Universitat de Valencia” (“Analysis of the university use of platforms of learning management. Case study in the University of Valencia”). This doctoral thesis

mainly analyzes two aspects mutually related: first, the evolution that the platform virtual classroom has as well as its main tools developed, since its implementation in the University of Valencia; second, the influence that this platform use has had to educative innovation and the quality indexes of the university. The results obtained, maintain the investigator will establish future evaluation mechanisms that could be used by the planning of the university and to have an impact on the aspects of innovation or even on the LMS (Learning Management System) with the aim always to improve the quality of education. Similarly, the results and conclusions of the thesis will propose amendments and additions to the own technological platform, taking advantage of its open source, adaptability and extensibility features. The central objective of this work has been the analysis of e-Learning and its application to the university level, from a technological and pedagogical point of view, determining the relationship between its mode of use and the education quality that it generates, particularly in the University of Valencia. Furthermore, the analysis will determine the changes and developments that the LMS platform needs in order to contribute effectively to improve teaching-learning processes.

In the same vein, although with a more practical approach, it is the study reviewed by Colorado and Navarro in their study “Usabilidad de TIC en la practica educativa” (“ICT usability in educational practice”). Its main purpose is to analyze “the usability of the ICT from the perspective of educational practice” and to focus on “the acquisition of new meanings when establishing the interaction between the binomial technological resources-teaching and how knowledge is constructed based on this experience” (Aguilar and Navarro, 2012). In other words, the study wants to call attention to the need to reflect on the pedagogical utility of ICT, making a reasonable and disciplined use of it; this according to improve on both teaching and learning processes as well as to contribute to the integral formation of the individuals. In addition, the researchers emphasize that the usability of ICT refers “to the analysis of use of different technologies” by the teacher who is ultimately responsible for assessing what type of resources can be “incorporated into the educational process on the basis of the pedagogical models on which” each one base “his/her own teaching task” (Aguilar and Navarro, 2012). This perspective on the didactic and pedagogical use of ICT entails an ongoing reflection on the objectives and scope of its use for educational purposes as the possibilities offered by the virtual platforms and technologies of information should always be taken as a means not as an end in itself. Therefore, the researchers suggest a series of questions

that we consider relevant in the field of education mediated by ICT use as it can be seen: “which resources exist and can I use in my educational work? How do I use ICT within my didactic planning and when developing class? Are there appropriate technological resources to use as tools to generate knowledge in my students?” Undoubtedly, these concerns will always be generated by teachers when trying to implement virtual tools in their face-to-face spaces.

## **MATERIALS AND METHODS**

**Objective:** The present investigation was developed in three Colombian universities formed by a private and a public one and also a public technological school. On the stage that we describe in this study, we proposed the following objectives:

- To specify the pedagogical strategies that teachers design in their course planning through the use of ICT in their educational practices
- To identify the different tools-activities and resources that are used by teachers to enhance their educational practices by making use of the virtual classrooms of learning created in moodle

The methodology of the present research stage is framed by a qualitative approach. The used method is the direct observation of the sample teacher’s syllabus and of the virtual classrooms of learning. The technique used for the evaluation of the virtual classrooms of learning was the application of a checklist composed of three main categories: formal, pedagogical and technical. Each one of these had a series of components that enable to make an objective assessment of each element that should be displayed in any quality virtual classroom. The corresponding components (Table 1 and 2):

- Formal aspects
- Pedagogical aspects
- Technical aspects

Each item evaluated had two possible options: yes or no regarding the possible response for each one of them; this ensures the fulfillment of each one regardless the intensity experienced in the virtual classroom(s) evaluated. The implementation was developed in the Engineering faculties from the District University Francisco Jose de Caldas, University of La Salle and the Technological School “Central Technical Institute”, all of them located in Bogota, Colombia. The instrument was applied on the following dates (Table 3):

Table 1: Components that integrate the evaluation category: formal aspects

Components	Categories
Mark	The classroom displays the name of the course or subject using a banner or title that permits to know the general location of the user. In the same way, each section has also a title or banner that let the user locate the central thematic of each one of them, depending on the course format: by date, theme or tabs
Context	It can be found in the first section of the course, depending on the format chosen (by date, subject or tabs). It shows a welcome greeting, the introduction of the teacher, the methodology to use, the evaluation system (can be an informative element) and a forum in which it is developed the presentation of the participants (Jaramillo, 2011)
Labels	Each resource (files, books, pages, URLs, videos, presentations, etc.) and activity (questionnaire, forum, glossary, playful activity, chat, tasks, etc.) is delimited by a label as an introduction tool
Syllabus or teaching guide	Depending on the format chosen (by date, subject or tabs) in the first section of the course it is located its syllabus: (Identification, the number of credits, schedules, justification, objectives, competencies, synthetic program, strategies, resources and bibliography)
Motivation	It must be an informative document or object (Distrital <i>et al.</i> , 2014)
	The virtual classroom (adequate) allows end-to-end hook and connect the student with the teaching-learning process; its suitability creates interest as a learning tool. (Bryndum and Jeronimo, 2005)

Table 2: Components that integrate the evaluation category: pedagogical aspects

Components	Categories
Objective or competence per section	At the top of each course section is the related target or competence, depending on the format chosen (by date, subject or tabs); in there, the element is consistent with the subject and is clearly defined (Barbera and Badia, 2005)
Content by section	Depending on the format chosen (by date, subject or tabs), the contents by section are presented in granular or structured forms in all sections without converting them into a repository of documents such as links, compressed files, videos, simulations, etc., stating clearly a didactic sequencing
Communication	It is proposed real-time meetings to reinforce topics or to introduce additional content, making use of chats and video conferencing systems (Skype, Adobe Connect, WizIQ, Lync, etc.) enhancing the communication between the actors in the educational process
Formal activities	In each section of the course, depending on the format chosen (by date, subject or tabs), there is a task given (an activity) an evaluation (another activity) and other proposed activities (forums, workshops, wikis, etc.) that do not overdo its own use (Barbera and Badia, 2005)
Recreational activities	Recreational activities are proposed (Hot Potatoes, Game Moodle, Educaplay, etc.) as a pretext for the learning of the subject (s) treated or to reinforce the topic (s) studied
Methodology	The methodological proposal presented in the classroom is high quality, consistent and fully cohesive allowing to view a pedagogical model or models that guide the management of resources and activities proposed. The methodology is presented widely in a classroom section (Dominguez, 2011)
Instructions	Each resource and activity is introduced by a written statement that help the user to understand What? How? and What for? About each one of the proposed activities and/or resources
HELP	There are presented some support elements to the user: (all-time) support forum, support chat, videoconference system and virtual support to the teacher where he or she can find a way to clarify doubts that arise from the educational process as well as technical questions (Benitez, 2014)

Table 3: Components that integrate the evaluation category: technical aspects

Components	Categories
Usability	Navigation inside the virtual classroom is intuitive and agile; the user can easily scroll through the elements that compound the virtual classroom (Aguilar and Navarro, 2012)
Interactivity	The virtual classroom allows a continuous interaction between the user and the displayed elements. There is full access to all the information available in each course section depending on the format chosen (by date, subject or tabs)
Accessibility	The virtual classroom has the Accessibility module to allow any user to customize it based on their visual needs and also to provide an aural version of the contents. It is taking into account a careful management of accessibility for images, links, texts, tables and videos that are displayed in each course section (Yonaitis, 2002)
Design	The virtual classroom has a pleasant presentation in each course section depending on the format chosen (by date, subject or tabs); there is no visual recharge for the user. It is observed a suitable color management as well as image and multimedia material use. (Mestre <i>et al.</i> , 2014)
References and copyright	In all the elements, depending on the format chosen (by date, subject or tabs), it is made a clear reference to the material owned by other researchers. There is an authorship reference in images, documents, multimedia material used and all those susceptible to respect copyright
Additional blocks	There are additional blocks (such as calendar, messages, people connected, progress bar, users online, quick mail, etc.) as well as educational and technical support for the users of the virtual classroom
Icons	There is a particular use of Iconography in all course sections, allowing the user to quickly orient her/himself in the virtual classroom regarding the resource or activity proposed by the teacher (Mestre <i>et al.</i> , 2014)

- District University's virtual classrooms evaluation began on 15/12/2014 and finished on 15/05/2015
- University of La Salle's virtual classrooms evaluation: started on 20/06/2015 and finished on 20/09/2015
- Central Technical Institute's virtual classrooms evaluation: began on 15/10/2015 and ended on 15/02/2016

For making these reviews the researchers had the collaboration of the LMS managers of each university, so they could enter to the platform using the administrator role; this allowed them to select the sample without any trouble.

**Validation of the instrument:** The instrument was evaluated by a panel of experts on platforms and VLE who

reviewed it in three different versions. Initially, the evaluation of each item or component was thought as numerical with a scale between 0 and 100 points for each one; however, the panel of experts suggested that this proposal could encourage the evaluator's subjectivity. Thus, a second version was presented, proposing an evaluation rubric with a numerical scale between 1 and 5; nevertheless, the experts thought that it would not be an objective assessment either, therefore they recommended to convert the variables in dichotomous (yes or no) to ensure a high objectivity. That is consistent with the objective of diagnosis and identification that was intended to assess virtual classrooms of learning.

**Sample size:** At this stage of the investigation, it was necessary to observe both the syllabus and the virtual classrooms of learning used by teachers. The sample selected for the syllabus observation was of 30 teachers who guided courses at the time of the stage development; this sample was selected taking into account the teachers recognized in the faculty of engineering because of their ICT use in their in person classes also verbally confirming this information. The 10 Syllabus were selected from each one of the three universities previously mentioned. Having said that for making the sample selection of the virtual classrooms observed, the criteria were: evaluation of currently active virtual classrooms, i.e., virtual classrooms that the teacher was using as a support for in person processes no inactive classrooms. Another criterion was to observe classrooms containing resources and/or activities no empty classrooms. The number of classrooms selected in each subsample was based on the number of engineering programs offered by each participating university at this point, the criterion was to take a sample of different subjects and types of engineering that are offered by the universities. Additionally, the number of classrooms selected was proportional to a number of courses displayed on their respective platforms (LMS Moodle) in each faculty of engineering. Based on the above criteria, it was observed 40 virtual classrooms of the District University, 20 virtual classrooms of the University of La Salle and 20 virtual classrooms of the Central Technical Institute.

**Sample characterization:** The syllabus reviewed belonged to the following subjects: cartography, project formulation, economic engineering, e-Mancipation information and knowledge management in digital society, Human and Physical Geography, Differential Equations, Land, Energy Transport, Topology and Network Cadastre, Basic Programming, English 1, Electrical Machines, Administration elective-Project Management, Programming 4, Research Project 1, Materials Strength, Introduction to the Systems, Software

Design 1, Research Project 2, Project Planning and Management, Digital Animation, Quality and Safety in the Meat Industry, Calculus 1, Accounting fundamentals, General Chemistry, Marketing and Logistic, International Economy, Population Genetics, Identification of Environmental Chemical Contaminants, Advanced Animal Breeding. The virtual classrooms observed were the following:

**District Universidad Distrital Francisco Jose de Caldas (UDFJC):** Photogrammetry, Lecture "Democracy and Citizenship", Topographic Drawing, Databases, Basic Programming, Spherical Astronomy, Introduction to Remote Sensing, Interface-based Programming, Object-oriented Programming, Circuits 1, Energy Quality, Dynamic Systems, Energy 3, Transport of Energy, Linear Algebra, Clean Production, Differential Equations, Technological Management, Object-oriented Programming, e-Commerce, Graduation Project, Industrial Logistics, Emphasis 1, Graphic Theory, Operation Management, Operation Management 2, Emphasis in Production, Ergonomics, Occupational Health and Safety, Engineering Drawing, Ethics and Bioethics, Telematics 3, Humanities 4, Transformers, Motors and Generators, Telematics 3, Computer Architecture 2, Geomatics 1, Multimedia, General Systems Theory.

**At De La Salle University (UNISALLE):** Environmental Pollution, Linear Programming, Statistics, Engineering in Context, Sizing of Equipment, Factory Design, Power Systems Analysis, Biotechnology, Retaining Wall Design, Mass and Energy Balance, Introduction to Hydrology, Operations Research, Scientific Modeling, Mobile Robotics, Advanced PLC, SLU Construction, Digital Systems 2, Thermodynamics, Tunnels and Underground Works, Clean Technologies.

**Technological School "Central Technical Institute" (ETITC):** Computer Architecture, Databases 2, Differential Calculus, Dynamics, Electronics, Work Studies, Physics 2, Physics 1, Fundamentals of Technological Research, Quality Management, Industrial Hygiene and Safety, Humanities, Environmental Impact, Artificial Intelligence, Introduction to Computer Science, Professional Practice, Industrial Processes, Object-oriented Programming, Networks, Environmental impact.

## RESULTS AND DISCUSSION

The obtained results were the following.

**Study syllabus review:** It was sought to establish whether teachers wrote in their micro curriculums or assignment programs about their use of ICT; the results are shown as

Table 4: Syllabus involving ICT

Formal aspects	Yes	No
In the document "Syllabus" or "Microcurriculum", the teacher states their use of the ICT in their subject taught	26	4

follows. From the 26 syllabus where it is confirmed the ICT use, it can be indicated that this use happens through specific programs such as simulators, graphing machines, spreadsheets, software management for the elaboration of topographic and thematic maps, specialized software for cartography, graphing calculators, software for programming, use of databases, web pages and e-Mail and a specialized software for Mathematics. Some teachers expressed that they will do virtual work but they do not specify how they will. In addition, only 5 of the 26 teachers previously mentioned making clear their use of virtual classrooms of learning into their educational practices (Table 4).

**Virtual classrooms of learning observed:** As previously indicated and described in Table 1-3, the observed classrooms assessment was based on 3 major categories from which it was taken a series of components that in the researcher's view make an essential part of what it should be considered when adapting a virtual classroom of learning. The virtual classrooms took in this study make use of the moodle platform (LMS) but it is important to notice that the instrument designed to achieve this evaluation objective could be used in other LMS. The results obtained in each component were the following (Fig. 1-20):

- Formal aspects
- Pedagogical aspects
- Technical aspects

On the first category, it is important to notice the following aspects: The virtual classrooms that the sample teachers adapt have an opposite role than the one they may have intended when making use of it; undoubtedly, they have considered them as a support in their educational practices but findings also show that it can become a torture, that is unacceptable in their educational growth. The above statement is based on having classrooms with no location that may enable students to establish in which subject she or he is moving through the virtual environment; thus, establishing whether it is the one that corresponds to their teacher's instructions. They are silent, cold classrooms that say nothing to the student about finding a significant value to their educational process; they do not indicate what the user should do; neither has it been clear what the teacher pursue with them. In addition, classrooms are hardly recognized as an extension of in person meetings, given that there is a complete fracture as if there were two

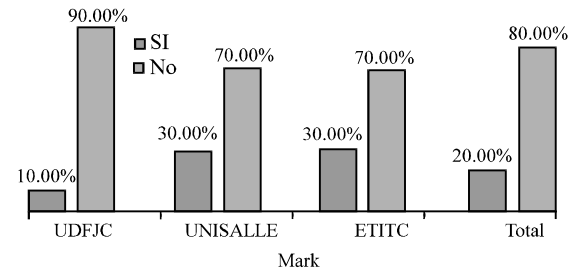


Fig. 1: EvDSDSF evaluation results of the virtual classrooms of learning in the mark component, formal aspects category

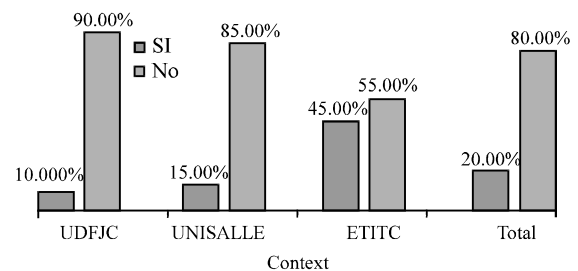


Fig. 2: Evaluation results of the virtual classrooms of learning in the context component, formal aspects category

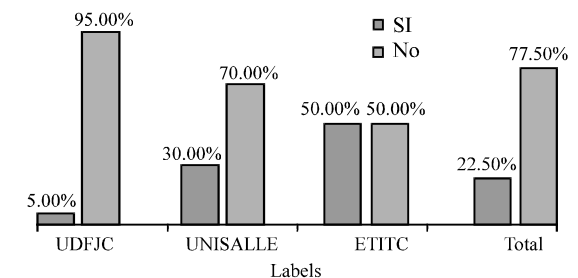


Fig. 3: Evaluation results of the virtual classrooms of learning in the label component, formal aspects category

different teachers: an in person one and a virtual one. There is no doubt that in this category, teachers demonstrate poorly knowledge compared to what they should have when adapting virtual classrooms: they do not think about its final user, that is no other one than the in person student.

In the second category evaluated, it was established that teachers do not have a clear goal of what they place: the classroom becomes a document or activities repository instead; the expected content in the

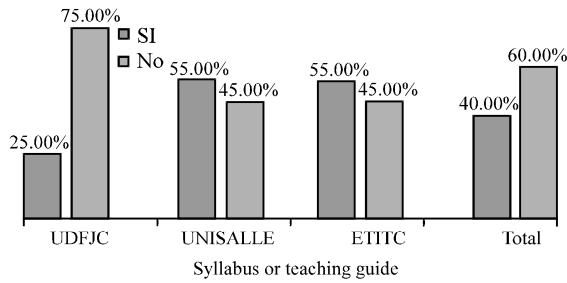


Fig. 4: Evaluation results of the virtual classrooms of learning in the syllabus or teaching guide component, formal aspects category

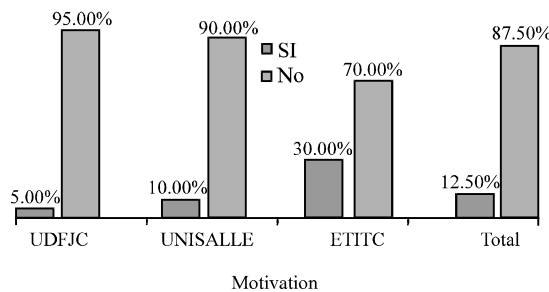


Fig. 5: Evaluation results of the virtual classrooms of learning in the motivation component, formal aspects category

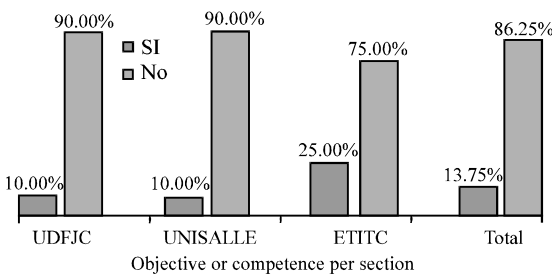


Fig. 6: Evaluation results of the virtual classrooms of learning in the target or competences per section component, pedagogical aspects category

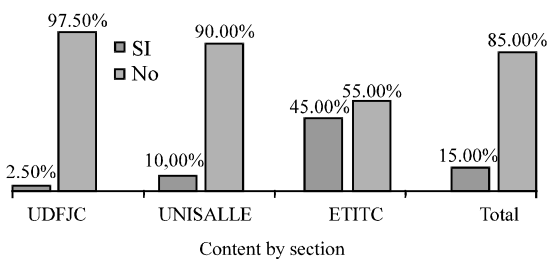


Fig. 7: Evaluation results of the virtual classrooms of learning in the content by section component, pedagogical aspects category

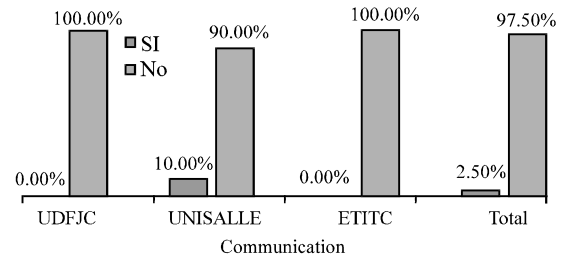


Fig. 8: Evaluation results of the virtual classrooms of learning in the communication component, pedagogical aspects category

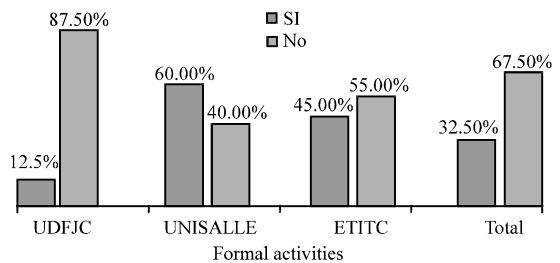


Fig. 9: Evaluation results of the virtual classrooms of learning in the formal activities component, pedagogical aspects category

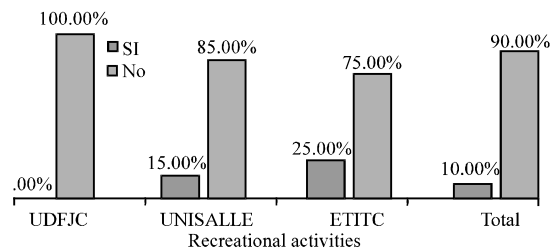


Fig. 10: Evaluation results of the virtual classrooms of learning in the recreational activities component, pedagogical aspects category

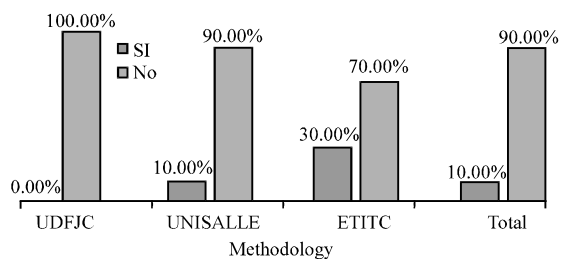


Fig. 11: Evaluation results of the virtual classrooms of learning in the methodology component, pedagogical aspects category

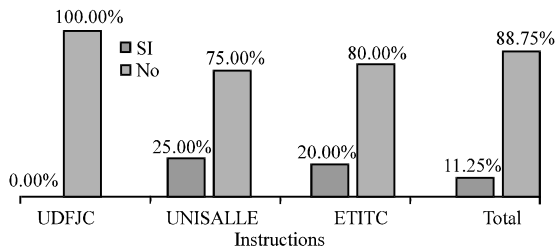


Fig. 12: Evaluation results of the virtual classrooms of learning in the instructions component, pedagogical aspects category

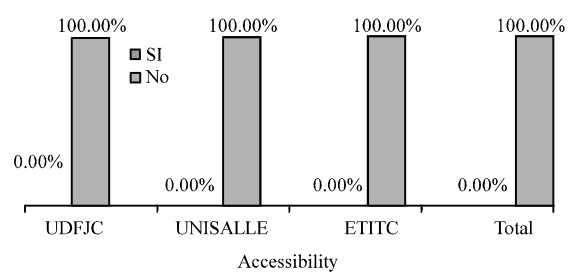


Fig. 16: Evaluation results of the virtual classrooms of learning in the accessibility component, technical aspects category

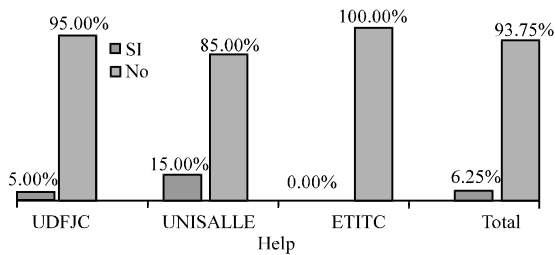


Fig. 13: Evaluation results of the virtual classrooms of learning in the help component, pedagogical aspects category

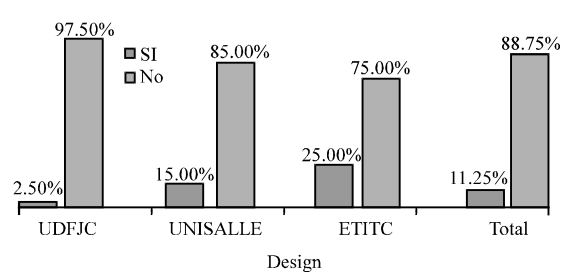


Fig. 17: Evaluation results of the virtual classrooms of learning in the design component, technical aspects category

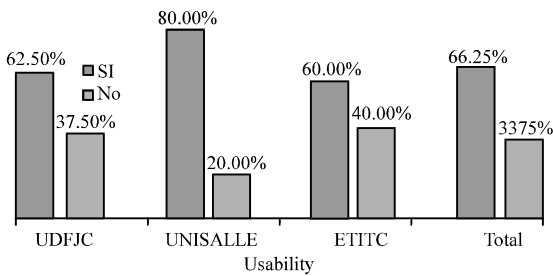


Fig. 14: Evaluation results of the virtual classrooms of learning in the usability component, technical aspects category

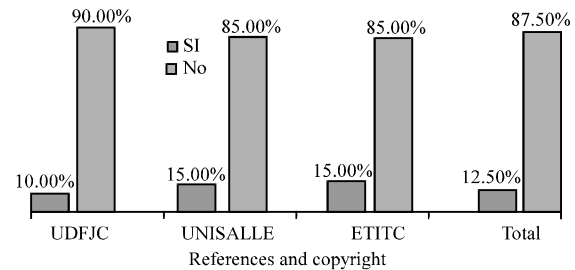


Fig. 18: Evaluation results of the virtual classrooms of learning in the references and copyright component, technical aspects category

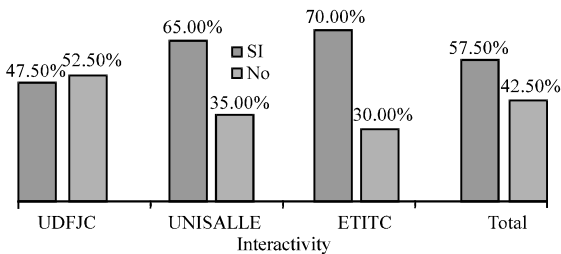


Fig. 15: Evaluation results of the virtual classrooms of learning in the interactivity component, technical aspects category

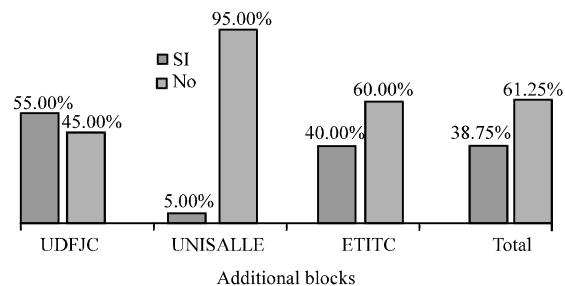


Fig. 19: Evaluation results of the virtual classrooms of learning in the additional blocks component, technological aspects category

classroom is quite low in each section set. There are null communication channels among teacher-student and



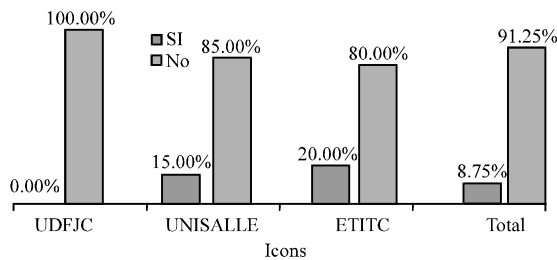


Fig. 20: Evaluation results of the virtual classrooms of learning in the icons component, technological aspects category

student-student that makes impossible to interact in other spaces than the face-to-face ones. Either, in respect of task management, evaluations and discussion activities, it can be evidenced a very low use of elements that enables the building of knowledge in a collaborative way as well as the teacher's low creativity for proposing flexible activities, so playful aspects are not taken into account as a learning pretext. As it was evident in the diagnostic phase of this research, the engineering teachers have poor knowledge about pedagogical models that is even more evident in the virtual classrooms observed; there is not even a displayed teacher's style that differentiates between face-to-face and virtual modalities. Very few teachers indicate the student what they need to do which the task is, what is the reason for placing one or other resource. Finally, it was found that the vast majority of evaluated classrooms do not have aids to find first-hand solutions that help students to solve problems quickly while navigating on it.

In the third category evaluated, it was found that the navigation in the virtual classroom is very easy to do; there are no problems of navigability that entangle the student's processes on it; this could be because there are few elements in them as indicated above. A failure detected is the low interactivity among the elements placed in the classroom as a consequence, this brings monotony to the navigation and therefore, low reinforcement in the concepts that students should handle by making use of the virtual classrooms. Classrooms observed are null regarding accessibility, that is a serious matter as they exclude a large number of the population: blind, deaf students or with low vision, etc., this should not happen at the present time, since everything that is available on the web should be granted to everybody. One aspect that should be taken into account when building virtual classrooms is to make a graphic and instructional design (Belloch, 2011) that be highly attractive; thus, it catches student's eye and

attention, making them feel comfortable when navigating in the classroom, developing the activities displayed and consuming the various resources provided. In this observation exercise, it can be seen that the design aspect is almost null as teachers do not take it into account not even to handle icons that remind to the users about the materials. Another element that worries to the researchers is the low respect for what others have done, written or worked as it does not appear a referencing or authorship declaration of the displayed elements. Finally, there is a measured handling of the additional blocks in the platform that would allow the teacher to make an adaptation of the virtual classroom being more enriched in pursuit of student's benefit. Unfortunately, all of the above converges in poor quality (9126-1, 2001-1061) from a technical point of view.

It is important to notice that a high percentage of professionals who serve as teachers in the engineering faculties focuses the use of virtual classrooms of learning as a tool which serves to support their educational practices; nevertheless, the main problem that arises is that they are being used in a technical way in general; that is to say teachers do not take into account key elements for the integral formation of their students such as the pedagogical and didactic ones, thus confirming what was found by Martinez and Gonzalez at the initial stage of this research. Additionally, in this phase it continues to replicate the results found by Moreira: incredibly, the results obtained in this study are very similar to theirs, after several years of their study: results demonstrate that teachers go through the ICT educational use path in the dark without a lighthouse to orientate them without following a guide that allows them to know first-hand experiences gained by other researcher teachers about the proper use of the virtual tools. This confirms what suggested: there is a need for training teachers in models that guide them in the proper use of virtual classrooms; undoubtedly this will redound to the improvement of the teaching-learning processes as said. In addition, it cannot be denied that most of the teachers who orient educational processes in the Engineering faculties have no training in pedagogy, didactics and methodological strategies; however, this cannot be a pretext to forget that these aspects should be considered when being teachers and that there must be a constant reflection about the best educational practices as affirmed by Luz and Colorado. Moreover, this reflection should be extrapolated to the proper use of ICTs inside all of the teacher's educational practices which used in a responsible manner would give great products in the academic results obtained by their students.

## CONCLUSION

There is a large gap from the pedagogical, educational, technical and design both instructional and graphic- point of view, regarding the adaptation of virtual classrooms of learning done by the teachers of the Engineering faculty. This emptiness must be filled with the creation of a method that may serve as a guide when adapting virtual classrooms of learning, regardless of the LMS used but maintaining the highest standards of quality.

There is a total break between what happens inside the on-site classroom and what occurs in the virtual one; this can be checked in the virtual classrooms observed in the absence of a model or a better, clearer pedagogic style that distinguishes the teacher and serves as a common thread that brings together all the resources and activities proposed in the virtual classroom of learning.

Virtual classrooms of learning should not be seen as a support to what happens in the on-site classroom; they should be considered as an extension of what happens in the face-to-face meetings among teachers and students. It must be transparent to the student the movement among one to another place from both virtual and in person modalities; this must result in the possibility of having a single learning environment which uses a variety of spaces, resources and tools.

Teachers should consider with much precision the creation or adaptation of differentiated virtual classrooms of learning; in more profound sense, they should be meaningful classrooms, virtual ones that enable the student to feel the living and active presence of his professor in these new environments; thus, classrooms that speak for themselves, captivating ones, that caught the attention of the student and motivate them to stay in there enjoying all the resources, materials and activities that the teacher has placed. In this way, the student will experience a steady progress in her/his professional growth.

It is essential that teachers know the LMS at a greater length, recognizing all its resources and all the activities that can be performed with it. Similarly, the teacher must

be ready to search for other external resources to the LMS used, making more robust and with a differential value his/her virtual classroom. The above actions to ensure that the classrooms adapted by the teacher are qualified as dynamic classrooms that are also updated to the various changes that the environment could require.

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