Scientific articles

Explorando enfoques educativos: Perspectivas en la enseñanza de Ambientes Virtuales de Aprendizaje

Exploring Educational Approaches: Perspectives on Teaching in Virtual Learning Environments

Explorando abordagens educacionais: Perspectivas para o ensino de Ambientes Virtuais de Aprendizagem

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Resumen

La presente investigación comparó la intervención educativa en los Centros Universitarios del Norte y de los Valles en la unidad de aprendizaje "Desarrollo de proceso de ambientes de aprendizaje" del programa de posgrado en Tecnologías para el Aprendizaje. Se analizaron y compararon las precepciones de los alumnos sobre la enseñanza de los Ambientes Virtuales de Aprendizaje en los dos centros, a través de un enfoque mixto con diseño descriptivo, en donde los participantes fueron 17 estudiantes, 12 del Norte y 5 de los Valles, los datos recogidos fueron de 8 variables, permitiendo evaluar la calidad de la materia, atención docente, sesiones en línea y recursos utilizados. El análisis de los datos se realizó con el software JASP, de manera descriptiva y de varianza para identificar las diferencias significativas entre las respuestas y la satisfacción de los alumnos. Los resultados obtenidos mostraron que los estudiantes valoraron de manera positiva la atención docente y los recursos, sin embargo, se identificaron diferencias en la percepción de las sesiones en línea y las actividades propuestas entre los dos centros. Este estudio permitió una mejor comprensión de las dinámicas educativas y áreas de oportunidad para optimizar la enseñanza y la satisfacción estudiantil.

Abstract

This study examines educational interventions at the Norte and Valles University Centers within the graduate-level course 'The Development of Virtual Learning Environments' in the Technologies for Learning Program. The study analyzed and compared students' perceptions of teaching Virtual Learning Environments at both centers through a mixed-methods approach with a descriptive design. The participants included 17 students, 12 from Norte and 5 from Valles, with data collected on eight variables, which allowed for the evaluation of course quality, teacher support, online sessions, and resources used. Data were analyzed using JASP software, applying descriptive and variance analyses to identify significant differences in student responses and satisfaction levels. The results indicated that students rated teacher support and resources positively. However, differences were identified in their perceptions of online sessions and proposed activities between the two centers. This study provides a deeper understanding of educational dynamics and identifies areas for improving teaching and enhancing student satisfaction.

Resumo

A presente pesquisa comparou a intervenção educativa nos Centros Universitários do Norte e dos Vales na unidade de aprendizagem "Desenvolvimento do processo de ambiente de aprendizagem" do programa de pós-graduação em Tecnologias de Aprendizagem. Foram analisadas e comparadas as percepções dos alunos sobre o ensino dos Ambientes Virtuais de Aprendizagem nos dois polos, por meio de uma abordagem mista com desenho descritivo, onde os participantes foram 17 alunos, sendo 12 da região Norte e 5 dos Vales. de 8 variáveis, permitindo avaliar a qualidade da disciplina, a atenção docente, as sessões online e os recursos utilizados. A análise dos dados foi realizada com o software JASP, de forma descritiva e de variância para identificar diferenças significativas entre as respostas e a satisfação dos alunos. Os resultados obtidos mostraram que os alunos valorizaram positivamente a atenção e os recursos docentes, no entanto, foram identificadas diferenças

Introduction

This study focuses on the Valles and Norte regions of the state of Jalisco, located in western Mexico, bordering Aguascalientes, Colima, Guanajuato, Michoacán, Nayarit, San Luis Potosí, and Zacatecas, with a territorial extension of 78,595.9 km², representing 4.0% of the national surface, divided into 125 municipalities integrated into twelve regions, with a population of 8,348,151 inhabitants (National Institute of Statistics and Geography [INEGI], 2020). The first region has an area of 5,359.95 km², represented by the municipalities of Ahualulco de Mercado, Amatitán, Ameca, El Arenal, Etzatlán, Hostotipaquillo, Magdalena, San Juanito de Escobedo, San Marcos, Tala, Tequila and Teuchitlán; with inhabitants (Planea Jalisco, 2023, pp. 15, 19); and the second by the municipalities of Bolaños, Colotlán, Chimaltitán, Huejúcar, Huejuquilla el alto, Mezquitic, San Martín de Bolaños, Santa María de los Ángeles, Totatiche and Villa Guerrero, with a territorial area of 10,305.66 km² and a population of 84,335 inhabitants (Government of the State of Jalisco, 2020).

For these reasons, the Universidad de Guadalajara operates under a network model consisting of six thematic university centers in the Guadalajara Metropolitan Area, 13 interdisciplinary regional university centers across the state, a High School Education System (Sistema de Educación Media Superior), and a Virtual University System (Sistema de Universidad Virtual), which offers both high school and higher education programs. (Universidad de Guadalajara, 2024).

Currently, the university offers 31 bachelor's degree programs, 138 master's degrees, and 253 graduate programs, - a total of 391 programs with enrollment - , serving a student population of 335,538, as well as 27,812 workers, of which 17,331 are in the academic field and 10,481 are administrative staff (General Coordination of Planning and Evaluation, 2024). Among the graduate programs, there is the Master's Degree in Technologies for Learning (MTA) , which aims to train professionals in the use and application of educational technologies in teaching and learning (MTA, 2024).

In 2000, under opinion number I/2000/1218, of the Joint Committees of Education and Finance, the creation of the MTA was approved to operate in the semi-school and open modality at the Centro Universitario de Ciencias Económico Administrativas (CUCEA, University Center for Economic and Administrative Sciences); likewise, in 2003, the modification to the academic program was approved to be taught at the Centro Universitario de Ciencias Exactas e Ingenierías (CUCEI, University Center for Exact Sciences and Engineering) and at the Centro Universitario de la Costa (CUCOSTA, University Center of the Coast); and in 2014, with opinion I/2014/151, the opening of the MTA was authorized at the Centro Universitario de los Valles (CUValles, University Center of the Valleys) and the Centro Universitario del Norte (CUNorte, University Center of the North), starting with the 2015 A school year (UdeG, 2014 as cited in Ceballos, Cornejo, García and Cárdenas); Likewise, with opinion I/2021/1051 (General University Council, 2021), the curricular update was approved on December 15, 2021, in which the postgraduate program is offered at the Centro Universitario de Ciencias Económico Administrativas, del Norte, del Sur (CUSur, University Center of the South) and de los Valles, with the thematic axes of Design, Teaching and Management.

For the case of this analysis, the learning unit The Development of Virtual Learning Environments was worked on, of 96 hours and 6 credits of the compulsory common basic training area, which was taught in the 2024 A school year, to CUNorte and CUValles students, allowing us to observe the objectives achieved.

The research question for this report was formulated as follows: What are the outcomes of the academic intervention in the course The Development of Virtual Learning Environments at the Centro Universitario del Norte and Centro Universitario de los Valles? Therefore, the objective is to analyze the academic intervention of students in the subject The Development of Virtual Learning Environments at CUNorte and CUValles . Consequently, another objective is to demonstrate the results obtained when teaching the subject at the aforementioned university centers, to evaluate whether the proposed activities provided significant learning.

Likewise, present the results of the satisfaction survey to find out how much students agree with the proposed activities to be carried out and to identify which activities require updating or adaptation.

Based on the above, the following hypothesis was formulated: Differences may arise between the groups despite having similar content, learning activities, and teaching methods.

These contrasts may stem from synchronous sessions and online interaction time. Likewise, the academic performance of the students who took the subject The Development of Virtual Learning Environments at the Centros Universitarios del Norte y de los Valles of the Universidad de Guadalajara may be impacted due to the different academic contexts and conditions, which influences the educational quality and meaningful learning of the students.

Development

With the changes brought about by the COVID-19 pandemic, more teaching methods different from those previously applied have appeared worldwide. Recent methodological proposals combine educational platforms, technological tools, and emerging educational trends with traditional methodologies (Fundación Telefónica, 2022).

In this sense, ICT training for students is essential, the work dynamics are focused on designs, methodologies and techniques that allow achieving the learning objectives, such is the case of the Universidad de Guadalajara, in the various university centers such as the "Sistema de Universidad Virtual", taking as a reference for this research, the work presented by Galindo et al., (2019) which analyzes the importance of ICT training in collaborative learning processes for graduate students, revealing the following findings: a high percentage of training in the use of devices and applications for school work, level of specialized mastery in the use of ICT applications and programs, training contexts in virtual learning environments and the need to rethink the subjects to create creative and collaborative learning environments taking advantage of the students' mastery of ICT. These findings highlight the relevance of ICT in education and the need to continue developing digital skills in accordance with the ways in which students learn today.

For this reason, the growing use of Virtual Learning Environments (VLE) has come to transform educational processes. Nowadays, institutions have had to rely on these for their daily tasks, as Barbosa (2004) mentions, they are spaces of knowledge that refer to a globalization where related interactions are established to satisfy needs and its purpose is to establish environments through the various categories of their environment, they are also considered intermediary artifacts between teachers and students that provide a unique and virtual educational context through interactive processes (Sánchez and Morales, 2012).

In addition to seeking to work with technologies to promote versatile dynamics in students (Barbosa, 2004), AVAs are new forms of change in educational technologies and

pedagogical models in order to generate meaningful learning, as well as quality education, having four main elements for their implementation: a) the structure of the classroom, b) presentation of the study content, c) collaboration and interaction, and d) timely feedback, in order to have new knowledge (Miranda *et al.* , 2020). Another way of talking about the concept of AVAs is through virtual learning environments (EVA) that according to Benavides et al., (2017), are created by teachers for students with the aim of increasing knowledge, that is, they promote meaningful learning, which attributes meaning to the content they learn, in addition to integrating new knowledge from what they already have, facilitating the retention and understanding of information (Romero, 2009).

Conceptual framework

On the other hand, constructivism proposes that meaningful learning occurs when students give meaning to content in such a way that they incorporate new knowledge into previous knowledge. This approach allows information to be retained and understood because it takes into account the subject's interaction with his or her physical and social environment. Likewise, assimilation and accommodation play a fundamental role, highlighting the importance of interaction with the physical world in the development of rational thought. For this reason, Piaget proposed that knowledge is an active construction and not just a reflection of reality, creating more complex cognitive structures as time goes by (Rivero, 2012).

To promote meaningful learning, it is necessary to use educational materials. In this sense, the dialogic interaction between teachers and students based on the use of these materials plays an essential role, since it enables not only meaningful but also critical learning. Likewise, the application of knowledge in other situations is vital to achieve a deep and not merely mechanical understanding (Moreira, 2019). Some tools such as conceptual maps, designed by Joseph Novak based on David Ausubel's theory, are effective visual supports for meaningful learning, aiming to help students see the relationship between concepts and facilitate connected and coherent teaching (Ballester, 2014).

On the other hand, in recent years concepts such as collaborative and cooperative learning have gained strength, processes where students of different levels work together in small groups in search of a common goal, through positive interdependence, individual and group responsibilities, interpersonal skills, face-to-face promotional interactions and group processing, fostering an enriching and cooperative learning environment (Laal , 2012).

In contrast, Pierce's (2015) article highlights the advantages of collaborative learning, highlighting not only the social, psychological, academic and assessment advantages, but also the importance of teachers' skills to carry out this style of learning in the classroom, since the quality of students' interaction influences its effectiveness. Meanwhile, on a broader level, compared to individualistic learning, collaborative learning allows to appreciate a more effective alternative. Hsiung (2012) compares the efficiency of both methods, monitoring the learning process and the time spent in different educational contexts.

It is essential to recognize that cooperative learning is not limited to face-to-face spaces; integration with virtual learning environments (VLE) allows us to see a significant evolution in the way teachers and students interact. Therefore, a learning environment, according to Sánchez *et al* . (2022), is an online space in which, through the use of a set of computer and virtual tools, teacher interaction is facilitated. VLEs are useful tools for students to better understand the content, for this reason, a VLE allows for inverted classes which consist of creating a context close to the face-to-face one, but still maintaining a virtual environment (Delgado, *et al.* , 2021).

Along the same lines, there is instructional design, which is a tool that allows the implementation of a variety of educational materials through pedagogical planning methodologies in order to generate experiences, knowledge, and skills. Instructional design is also a way of planning and includes the assessment of needs and the development of knowledge (Vera *et al.,* 2021). Likewise, it is a systemic, planned, and structured process that is used as a resource to carry out face-to-face or virtual education. It also seeks to help at different training levels, didactic units, or learning units (Agudelo, 2009). Therefore, instructional design is an essential component of learning because it demonstrates the detailed planning of educational activities, regardless of the learning modality, which demonstrates the fundamental processes of the theories of educational disciplines and seeks to have systematic, methodological, and pedagogical structures (Benítez, 2010). Consequently, a variety of stages involving the creation of distance education programs are addressed in instructional design. In addition, it helps to plan objectives to make the stated goals different from reality (Gil, 2004).

Based on the definition of the concepts described above, it can be concluded that for the teaching of Virtual Learning Environments, it is necessary to consider the theoretical foundation to carry out the process; analyze various strategies such as collaborative and cooperative learning; analyze the various digital tools, such as resources, platforms,

applications and devices; in addition to choosing the instructional design methodologies appropriate to the needs of the environment. All this through an optimal process will allow achieving the established educational objectives to achieve significant learning that contributes to students and in the future in their teaching practices.

Methodology

In order to achieve the objectives set for this research, a pragmatic paradigm was selected that "focuses on the problem or phenomenon that needs to be analyzed from various methodological strategies, including quantitative-deductive and qualitative-inductive designs" (Creswell et al. as cited in Bernales *et al.* , 2015, para. 3), guided by the comparative method that for Rus "what it seeks is to prove the validity of arguments using science and the study of similarities and differences." (2020, para. 1), likewise, a non-experimental design, "studies that are carried out without the deliberate manipulation of variables and in which only the phenomena are observed in their natural environment and then analyzed." (Hernández *et al* , 2014, p. 149). A mixed-methods approach was selected, which 'combines quantitative and qualitative perspectives within the same study to enhance the depth of analysis when addressing complex research questions' (Hamui-Sutton, 2013, p. 211), through a multiple integration design (DIM) and longitudinal section. The educational intervention in The Development of Virtual Learning Environments course enabled a quantitative analysis of statistical results and a comparative study of two groups in the MTA program at CUNorte and CUValles. Additionally, a qualitative component was included through a satisfaction survey administered to the students, providing deeper insights into their perceptions.

Given the research conditions and context, comparative education methodology was used. López (2021, para. 1) describes it as a methodology "to compare educational systems, teaching structures, pedagogical theories, plans, programs and educational methods." He also adds that it allows "to define a starting point, identifying the state of the educational systems and choosing where the quality conditions for the development of higher education should be focused, with the purpose of addressing international trends."

Caballero *et al.* (2016, p. 48) describe that this methodology is composed of two moments divided into different phases, as described below: First, the design would be established with the three phases that include the selection and definition of the problem, formulation of hypotheses or starting budgets and the choice of the analysis unit; secondly, the design of the research and its development, through the four phases that make up the

central axis: descriptive, interpretive, juxtaposition and comparative, in addition, as a conclusion, the prospective phase is included, which represents the final stage of the comparative method.

In the comparative analysis, the participants were the MTA groups of the Universidad de Guadalajara, who worked with the aforementioned educational program. The first group was from CUNorte, with 12 fourth-semester students for eight weeks of work, and the second group from CUValles was taught to 5 students for 10 weeks. The topics, as well as the instructional design through the activities, strategies, and tools used were the same, only adapted to the idiosyncrasies of each group. They were taught in virtual mode supported by synchronous sessions via videoconference. In the first case there were five and in the second 10. Although the time period was different, the comparison was in 11 activities.

It should be noted that the study carried out is a comparison between two contexts that work with a collegiate curriculum, that is, no changes or interventions are applied so there is no variability to document, this approach is justified by the levels of satisfaction that both groups have, so it is not considered necessary to influence the conditions involved. For the training process to be successful, one of the most used patterns is the evaluation made of it by the students, allowing to identify the quality of the training, that is, if the students are satisfied with the final product, then the evaluation they give is positive, which can be stated that the product is of quality (Appleton- Knapp and Krentler , 2006 as cited in Ramos, Unda and Pantoja, 2016).

As previously mentioned, the second phase of the methodology leads us to carry out the analysis through the following sections.

1. Results of teaching the subject of The Development of Virtual Learning Environments at CUNorte (descriptive and interpretive phase).
2. Results of teaching the subject of The Development of Virtual Learning Environments at CUValles (descriptive and interpretive phase).
3. Comparative analysis of the results obtained in CUNorte and CUValles (juxtaposition and comparative phase).
4. Analysis of the satisfaction survey.

For data collection, a satisfaction survey was designed through the Google Forms platform , to capture the data of the participants through multiple choice questions based on a Likert scale with the criteria of: 1) Very dissatisfied; 2) Dissatisfied; 3) Moderately satisfied; 4) Satisfied; 5) Very satisfied, in order to know the opinion of the students about the work

that was carried out during the teaching of the learning unit. The survey consists of 36 questions that answered the sections of:

- Theme
- Teaching attention
- Instructions
- Resources
- Activities
- Online sessions
- Learnings
- Generalities.

Three open questions were also designed to assess the students' perception of the organization of the subject; what they liked, what was missing, and general suggestions for improving the subject in general; in addition, to mention the topics of the subject that they have put into practice.

The questionnaire was validated by two experts in teaching in the areas of learning technologies, specifically in work mediated by virtual learning environments, the first with academic training with a Doctorate in Education in Educational Technological Innovation and the second with a Master's Degree in Learning Technologies, who in a particular way analyzed, made observations, made proposals for improvement and validated the wording and relevance of the established questions, aiming to avoid confusion for the participants when answering it.

The analysis was performed using the JASP tool, "whose acronym comes from the English expression Jeffrey's Amazing Statistics Program, in recognition of the pioneer of Bayesian inference Sir Harold Jeffreys. It is a multiplatform open source statistical package" (Goss -Sampson, 2018 as cited in Cornejo, Cárdenas and Frausto, 2023).

Results

The analysis of the results with the teaching of the subject of The Development of Virtual Learning Environments was carried out with the total population, which consisted of 12 students from CUNorte and 5 from CUValles , addressing the topics of the curricular program in mixed modality, having virtual and asynchronous synchronous sessions supported by the Moodle learning platform in both cases, the period for the first case was from January 15 to

March 10, 8 weeks of work and from January 15 also to March 24 in the second, for 10 weeks. Tables 1 and 2 show the activities distributed in the two centers.

Table 1 shows the schedule of CUNorte academic activities for the subject The Development of Virtual Learning Environments, which are distributed over eight weeks and cover various tasks, from preliminary questionnaires, construction of meaningful learning environments, practices in virtual educational environments, to the learning evaluation and the closing of the subject. Each activity is assigned a week in which it must be carried out, with specific dates that indicate the range of days during which it will be carried out.

Table 1. Activities carried out at CUNorte.

Week	Name of the activity	Date
1	Activity 1: Preliminary Questionnaire	January 15-21
	Discussion on the preliminary questionnaire	January 15-21
2	Activity 2: Virtual Learning Environments	January 22-28
	Activity 3: The notion of the learning environment	January 22-28
3	Activity 4: Constructivism and Meaningful Learning	January 29th to February 4th
	Sharing maps from activity 4	January 29th to February 4th
4	Activity 5: Cooperative or collaborative learning	February 5-11
	Forum: Cooperative or collaborative learning	February 5-11
5	Activity 6: Characterization of the learning situation.	February 12-18
	Integration of the Learning Environment	February 12-18
6	Activity 7: Outlining the learning environment	February 19-25
7	Activity 8: Analysis of Virtual Learning Environments	February 26th to March 3rd
	Activity 9: AVA in open environments	February 26th to March 3rd
	Debate: AVA in open environments	February 26th to March 3rd
8	Activity 10: Integrating Product	March 4-10
	Display and feedback of final products	March 4-10
	Activity 11: Final Project	March 4-10

| | Closing the matter | March 4-10 |

Source : Own elaboration.

As can be seen in Table 2, the academic activities carried out at CUValles for the same subject mentioned above are organized into 10 weeks, with specific activities assigned to specific dates. Each week is designed to address different topics, such as the notion of the learning environment, constructivism , different types of learning (collaborative, cooperative and meaningful), the use of virtual environments and the integration of technologies.

Table 2. Activities carried out at CUValles

Week	Name of the activity	Date
1	Activity 1: Preliminary Questionnaire	January 15-21
	Discussion on the preliminary questionnaire	January 15-21
2	Activity 2: Virtual Learning Environments	January 22-28
	Activity 3: The notion of the learning environment	January 22-28
3	Activity 4: Constructivism and Meaningful Learning	January 29th to February 4th
	Sharing maps from activity 4	January 29th to February 4th
4	Activity 5: Cooperative or collaborative learning	February 5-11
	Forum: Cooperative or collaborative learning	February 5-11
5	Activity 6: Characterization of the learning situation.	February 12-18
	Integration of the Learning Environment	February 12-18
6	Activity 7: Outlining the learning environment	February 19-25
7	Activity 8: Analysis of Virtual Learning Environments	February 26th to March 3rd
8	Activity 9: AVA in open environments	March 4-10
	Debate: AVA in open environments	March 4-10
9	Activity 10: Integrating Product	March 11-17
	Display and feedback of final products	March 11-17
10	Activity 11: Final Project	March 18-24

Closing the matter		March 18-24

Source : Own elaboration.

Tables 3 and 4 show the participation of students from the Centros Universitarios del Norte y de los Valles, with the percentages of attendance, assignments submitted, and grades obtained. In the case of CUNorte, an average of 86.7% attendance is shown, 96.97% of assignments submitted, and 94.1% of grades, and in CUValles, an average of 90.4% attendance, 100% of assignments submitted, and 96.4% of grades are indicated . These tables allow us to compare the level of participation and performance of students from both university centers.

Table 3. CUNorte students

Name	Assists (%)	Activities delivered (%)	Qualification (%)
A1	100	11	96
A2	100	11	97
A3	100	11	98
A4	40	10	87
A5	100	11	97
A6	60	11	95
A7	100	11	97
A8	100	11	97
A9	100	10	88
A10	80	11	97
A11	80	11	96
A12	80	9	85
Total percentages	86.7	96.97	94.1

Source : Own elaboration

Table 4. CUValles students

Name	Assists (%)	Activities delivered (%)	Qualification (%)
A1	90	10	98
A2	100	11	100
A3	100	11	94
A4	100	11	100
A5	100	11	98
Total percentages	98.0	98.18	97.9

Source : Own elaboration.

Table 5 presents a comparison of student outcomes at the CUNorte and CUValles campuses, including key metrics such as student enrollment, number of completed activities, attendance rates, and average grades. CUNorte has 12 students who carried out 11 activities, with an attendance percentage of 86.7% and an average grade of 94.10%. On the other hand, CUValles has 5 students who also carried out 11 activities, but had a higher attendance percentage of 98.00% and an average grade of 97.90%. This comparison allows us to analyze the performance and participation of students at both campuses.

Table 5. Comparison of the results obtained by CUNorte and CUValles students.

Name	CUNorte	CUValles
Students	12	5
Activities	11	11
Assists	86.7%	98.00%
Ratings	94.10%	97.90%

Source : Own elaboration

Table 6 presents the descriptive analysis of the variables related to the satisfaction of the survey, to the two groups of CUNorte and CUValles, applied to 12 and 5 students respectively, with 100% of the participants. For each variable, the number of valid observations, the mean, the standard deviation, and the minimum and maximum values observed are described. The variables include aspects such as the subject matter, teaching attention, resources, activities, online sessions, learning and generalities.

- In the case of the thematic variables, teaching attention and online sessions, there are the same number of items in the instrument, having its cut-off point at 15, which represents that in the three variables they were above the average with 23,583, 24,833 and 24,333 in CUNorte and for CUValles 21.8, 25 and 24.2 respectively.

- The instruction and resource variables also coincide with the number of items, for this reason, their cut-off point is 9, also exceeded in the opinion of the students, in CUNorte they stated 13.75 and 14.75 and in CUValles 14 and 15 in the order of the variables.

- For the activities variable, the cut-off point is 21, obtaining 34 in both CUNorte and CUValles.

- Finally, in the learning and general variables the results were also very good, with the average in CUNorte of 19.5 and 19.58, as well as in CUValles of 20 and 19.8, being above the cut-off point of 12.

Table 6. Description of the variables of the satisfaction survey in CUNorte and CUValles students.

		Valid	Average	Standard Deviation	Minimum	Maximum
Theme	CUNorte	12	23.583	1.73	19	25
	CUValles	5	21.8	3.033	17	25
Teachers' attention	CUNorte	12	24.833	0.389	24	25
	CUValles	5	25	0	25	25
Instructions	CUNorte	12	13.75	1.712	11	15
	CUValles	5	14	1,732	11	15
Resources	CUNorte	12	14.75	0.622	13	15
	CUValles	5	15	0	15	15
Activities	CUNorte	12	34	2.216	28	35
	CUValles	5	34	1.225	32	35
Online sessions	CUNorte	12	24.333	1.614	20	25
	CUValles	5	24.2	1,789	21	25
Learnings	CUNorte	12	19.5	1.243	16	20
	CUValles	5	20	0	20	20
Generalities	CUNorte	12	19,583	1.165	16	20
	CUValles	5	19.8	0.447	19	20

Source : Own elaboration

The analysis of variance (ANOVA) presented in Table 7 aims to assess whether there are significant differences in different aspects of the satisfaction survey. For each variable, the sum of squares, degrees of freedom (Df), mean square, F value and P value are provided.

The sum of squares and the mean square indicate the variability within and between groups for each aspect evaluated. The F value is a statistic that compares the variability between groups with the variability within them. Finally, the P value tells us whether these differences are statistically significant; in general, a P value less than 0.05 suggests that there are significant differences. In this table, none of the variables shows a P value less than 0.05, so there was not enough evidence to affirm that there are significant differences in satisfaction between the cases analyzed.

Table 7. ANOVA of the variables of the satisfaction survey in CUNorte and CUValles students

	Cases	Quadratic sum	Df	Root mean square	F	P
Theme	University Center	11.225	1	11.225	2.415	0.141
	Residuals	69.717	15	4.648		
Teaching attention	University Center	0.098	1	0.098	0.882	0.362
	Residuals	1.667	15	0.111		
Instructions	University Center	0.221	1	0.221	0.075	0.788
	Residuals	44.25	15	2.95		
Resources	University Center	0.221	1	0.221	0.779	0.392
	Residuals	4.25	15	0.283		
Activities	University Center	0	1	0	0	1
	Residuals	60	15	4		
Online sessions	University Center	0.063	1	0.063	0.023	0.882
	Residuals	41.467	15	2.764		
Learnings	University Center	0.882	1	0.882	0.779	0.392
	Residuals	17	15	1.133		
Generalities	University Center	0.166	1	0.166	0.158	0.696
	Residuals	15.717	15	1.048		

Source : Own elaboration .

The satisfaction survey also provided qualitative results regarding the perceptions of students at the two university centers. It was considered essential to know in detail their feelings on the following aspects.

1. Regarding the organization of the subject of The Development of Virtual Learning Environments, the students stated to have a positive general perception, ease of understanding, they had initial challenges with the interface when downloading resources, there was a good theoretical-practical connection in the structure of the course, general satisfaction by emphasizing the good organization and the presentation of adequate activities, likewise, they mentioned that the time management of some activities can be improved.

2. To find out the perception of what was liked, what was missing, and suggestions for improvement of the subject in general, students from CUNorte and CUValles expressed high satisfaction with the subject and with the teacher. However, at CUNorte they presented constructive criticism and suggestions regarding feedback and time to delve deeper into the topics. On the other hand, at CUValles they expressed being happy, referring to a more homogeneous and satisfactory learning experience.

3. Regarding the implementation of the topics learned during the teaching of the subject, the students of the two centers showed a commitment to innovation and the improvement of teaching through the implementation of current technologies and methodologies, the planning and customization of virtual learning environments, as well as the use of digital resources, which they consider to be central topics that reflect a trend towards more effective learning adapted to their needs. This positive perception also suggests that the participants are motivated to apply what they learned in their future educational practices.

Discussion

The presented research focuses on the teaching of the subject " The Development of Virtual Learning Environments" at two campuses of the Universidad de Guadalajara: CUNorte and CUValles. The research question seeks to assess the outcomes of this academic intervention, specifically evaluating whether the proposed activities facilitated meaningful learning. Likewise, the findings indicate that although both groups experienced positive learning, the differences in what was worked on in the online sessions and the teaching modality impacted the perception of educational quality, suggesting that each group maximize learning.

The methodology followed a Multiple Integration Design (MID) within a pragmatic approach, addressing the problem from different perspectives. Specifically, a comparative analysis of the two student groups was conducted, allowing for quantification of the results while also capturing their perspectives on the educational experience. The results revealed that although the topics and instructional design were consistent, the educational experience was perceived differently. At CUNorte , five synchronous sessions were held, where students reported greater satisfaction compared to CUValles , where 10 sessions were held. This finding suggests that the quality of online interaction may be more decisive than the quantity of sessions, highlighting the importance of a student-centered pedagogical approach.

Regarding previous research, authors such as Agudelo (2009) and Barbosa (2004) affirm the importance of instructional design in virtual environments, emphasizing that a well-structured design can improve the learning experience. Ballester (2014) also highlights the relevance of meaningful learning in educational contexts, therefore, the results are consistent with these studies, as they provide evidence that an instructional design adapted to the needs of students can positively influence their satisfaction and learning, in addition,

through the research findings, they indicate that the quality of interaction is a fundamental factor.

For future research, it is proposed to further explore the interactive dynamics in online sessions in relation to meaningful learning, that is, to conduct a longitudinal study that examines how variations in instructional design and teaching modality affect academic performance, which will contribute to the creation of more effective and adaptive pedagogical models that respond to the needs of students today.

Conclusions

The importance of this research lies in understanding how academic interventions in Virtual Learning Environments can be optimized to improve the conditions and educational experiences of students. This is why, when comparing the two groups from different university centers, it was possible to see that although the contents and instructional design are similar, the teaching method, as well as the quality of interaction, can significantly influence satisfaction and learning. This analysis not only provides valuable information for teachers and program designers, but also highlights the need to adapt pedagogical strategies to the specific characteristics of each group of students.

In accordance with the objectives of the research, based on the analysis of the academic intervention carried out on students at the two university centers, the findings have a significant impact on higher education today and in the future, especially in the context of distance education. Working with virtual learning environments allowed them to have fundamental elements to design, develop and implement educational practices in accordance with today's needs, in addition to offering diversity in the use of additional technological tools, digital resources and teaching strategies. On the other hand, when evaluating whether the proposed activities allowed significant learning to be achieved, it was generally found that by identifying the variables that affect student satisfaction and performance, educational institutions can implement changes in their programs to promote more meaningful learning. This could enhance student retention and academic performance while increasing acceptance of virtual teaching modalities—an essential factor in an increasingly digital world.

The research provided a great lesson on teaching through Virtual Learning Environments, highlighting the need for accessibility, the importance of student satisfaction and the fundamental use of technological tools, as well as learning platforms embedded in

today's education, facilitating the implementation of more flexible and accessible educational models.

The results of this research highlight the importance of adapting educational strategies based on the specific characteristics of student groups to maximize meaningful learning. However, further research is required to explore differences in the duration of interventions and the educational context in general. It is also recommended to further analyze the dynamics of online interaction and its relationship with meaningful learning, through various methodological approaches that allow a comprehensive evaluation of educational experiences supported by virtual environments.

Finally, the research not only contributes to students' perceptions of virtual learning environments, but also provides a solid basis for educational institutions to make improvements to their programs, aiming to achieve more effective and satisfying educational experiences for students.

Future lines of research

Complementing what was mentioned in the findings both in the discussion as well as in the conclusions of the research, the following investigations are proposed to continue seeking to ensure that students learn independently of the mediations used.

- Social interactions in learning. The aim is to investigate some forms of synchronous and asynchronous interaction to identify the impact on meaningful learning as well as student satisfaction.
- Adaptive learning. Explore how, through the personalization of learning, using instructional designs that meet the needs of the context, it is possible to achieve the objectives established in the training of students based on virtual learning environments.
- Effects of the implementation of Technologies for Learning. The purpose is to analyze the impact of the various technological tools and educational platforms on the teaching-learning processes, through the effectiveness of specific applications, information and communication resources and educational trends such as artificial intelligence.
- Inclusion and access in technology-mediated education. In this aspect, the idea is to investigate strategies to improve inclusion and accessibility to quality virtual

education through virtual learning environments, which allow the training of students with skills to face the world of work.

References

Agudelo, M. (2009). Importancia del diseño instruccional en ambientes virtuales de aprendizaje. En J. Sánchez (Ed.): *Nuevas Ideas en Informática Educativa*, 5(1), 118-127, Santiago de Chile.

Ballester, V. A. (2014). Meaningful learning in practice. *Journal of education and human development*, 3(4), 199-209. https://antoniballester.com/wp-content/uploads/2017/03/Pdf-1.pdf

Barbosa, J. (2004). Los Ambientes Virtuales de Aprendizaje–AVA–. Pontificia Universidad Javeriana. https://cmapspublic2.ihmc.us/rid=1RB2JK70P-2D895RP-2X48/diseno_AVA.pdf

Bernales, M., Cabieses, B., Obach, A., y Maturana, A. (2015). Investigación traslacional en salud: un camino para la investigación pragmática e interdisciplinaria. *Revista médica de Chile, 143, 128-129*. https://www.scielo.cl/pdf/rmc/v143n1/art20.pdf

Benavides, L. R., Villacís, M. y Ramos, J. (2017). El entorno virtual de aprendizaje (EVA) en la generación de conocimiento de estudiantes universitarios. *CienciAmérica: Revista de Divulgación Científica de La Universidad Tecnológica Indoamérica*, 6(1), 57-63. https://dialnet.unirioja.es/servlet/articulo?codigo=6163727

Benítez, M. G. (2010). El modelo de diseño instruccional Assure aplicado a la educación a distancia. *Tlatemoani, Revista Académica de Investigación*, 1(1), 63-77. http://www.eumed.net/rev/tlatemoani/01/pdf/63-77_mgbl.pdf

Caballero, A., Manso, J., Matarranz, M., y Valle, J. (2016). Investigación en educación comparada: Pistas para investigadores noveles. *Revista Latinoamericana de Educación Comparada, 7(9), 39-56*. https://dialnet.unirioja.es/servlet/articulo?codigo=6559980

Ceballos, M. J. D., Cornejo, A. J. F., García, C. L. G., y Cárdenas, G. T. J. (2021) Uso de las TIC en la educación, alumnos de la MTA en el Centro Universitario del Norte. En Ortega, S, R. M., González, J. K. y Villalón, I. E. M. *Educación y Género: Perspectiva de la desigualdad social* (pp. 75-88). MAPorroúa.

Consejo General Universitario (2021). Dictamen de creación. UdeG.

Coordinación General de Planeación y Evaluación. (2024). *Numeralia Institucional*. https://cgpe.udg.mx/informacion-institucional/numeralia-institucional.

Cornejo, Á. J. F., Cárdenas, G. T. de J., y Frausto, L. M. Á. (2023). Impacto educativo en pandemia en alumnos de nivel superior del norte de Jalisco. *Revista de Investigación en Tecnologías de la Información*, 11(24), 1-14. https://doi.org/10.36825/RITI.11.24.001

Delgado, S. R. (2021). Aplicaciones tecnológicas en la educación superior: Un enfoque innovador. *Revista Scientific*, 6(36), 25-38. https://www.indteca.com/ojs/index.php/Revista_Scientific/article/view/656/1368

Fundación Telefónica. (2022) 4 tendencias en la enseñanza para 2023: innovación y método. https://www.fundaciontelefonica.com/noticias/4-tendencias-en-la-ensenanza-para-2023-innovacion-y-metodo/

Galindo G. R. M., Martínez C. N. L., y Ruíz A. E. I. (2019). La Importancia de la formación en TIC en los procesos de aprendizaje colaborativos; en estudiantes de posgrado del SUV. *Revista Electrónica sobre Cuerpos Académicos y Grupos de Investigación*, 6(12). https://www.cagi.org.mx/index.php/CAGI/article/view/199

Gil, C. (2004). Modelo de Diseño Instruccional para programas Educativos a Distancia. *Revista Perfiles Educativos*, 26(104), 93-114. https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0185-26982004000300006

Gobierno del Estado de Jalisco. (2020). *Regiones (Norte)*. https://www.jalisco.gob.mx/es/jalisco/regiones

Goss-Sampson, M. A. (2018). Análisis estadístico con JASP: una guía para estudiantes. https://openaccess.uoc.edu/bitstream/10609/102926/6/An%C3%A1lisis%20estad%C3%ADstico%20con%20JASP%20una%20gu%C3%ADa%20para%20estudiantes.pdf.

Instituto Nacional de Estadística y Geografía [INEGI]. (2020). *México en cifras (Jalisco)*. https://www.inegi.org.mx/app/areasgeograficas/?ag=14#collapse-Resumen.

Hamui-Sutton, A. (2013). Un acercamiento a los métodos mixtos de investigación en educación médica. *Investigación en Educación Médica, 2(8), 211-216.* https://www.scielo.org.mx/pdf/iem/v2n8/v2n8a6.pdf

Hsiung, C. M. (2012). The effectiveness of cooperative learning. *Journal of Engineering Education*, 101(1), 119-137.

Hernández, S. R., Fernández C. C., y Baptista L. M. P. (2014). Metodología de la investigación (6° ed.). México: McGraw Hill Interamericana Editores S.A. de C.V.

Laal, M., y Ghodsi, S. M. (2012). Benefits of collaborative learning. *Procedia-social and behavioral sciences*, 31, 486-490. https://www.sciencedirect.com/science/article/pii/S1877042811030205

López, M. R. E., (2022). Educación comparada como método de comparación desde la perspectiva del modelo colombiano de acreditación de alta calidad. *Revista Dialogus, (7), 108–114.* https://doi.org/10.37594/dialogus.v1i7.452

Maestría en Tecnologías para el Aprendizaje [MTA]. (2024). *Objetivo del programa*. https://mta.udg.mx/objetivo-del-programa.

Miranda, D. R., González, L. A. y Ávila, D. (2020). *La retroalimentación efectiva en los ambientes virtuales de aprendizaje (AVA): Un análisis de las percepciones de los gestores académicos* (tesis de maestría). Universidad EAN. Repositorio Institucional Universidad EAN. http://hdl.handle.net/10882/9868.

Moreira, M. A. (2019). Aprendizaje Significativo. https://www.if.ufrgs.br/public/tapf/tapf_v30n3.pdf

Planea Estatal de Gobernanza y Desarrollo Jalisco [Planea Jalisco]. (2023). *Agenda regional Valles Jalisco*. https://plan.jalisco.gob.mx/wp-content/uploads/2023/06/10-Valles-Agenda-Regional_final-V3.pdf

Pierce, J. (2015). Cooperative learning in classrooms today. *Journal On Best Teaching Practices*, 2.

Ramos, V., Unda, X. y Pantoja, O. (2017). La Teoría de Confirmación-Desconfirmación expectativas para gestionar la motivación en el aula. *Conferencia Latinoamericana sobre el Abandono de la Educación Superior (VI-CLABES).* https://revistas.utp.ac.pa/index.php/clabes/article/download/1409/1912/

Rivero, M. (2012). Teoría genética de Piaget: constructivismo cognitivo. https://diposit.ub.edu/dspace/bitstream/2445/32321/6/Teoria%20de%20Jean%20Piaget.pdf

Romero T. F. (2009). Aprendizaje significativo y constructivismo. Temas para la educación. *Revista digital para profesionales de la enseñanza*, 1(3), 1-7. https://matematicasiesoja.wordpress.com/wp-content/uploads/2021/01/el-aprendizaje-significativo.pdf

Rus, A. E., (2020). *Método comparativo*. https://economipedia.com/definiciones/metodo-comparativo.html

Sánchez, C. A., Tapia, E. G., Águila, O. A. Z., Reyes, A. Á., y Blanco, J. F. M. (2022). Aprendizaje sincrónico y asincrónico: una experiencia en el aprendizaje de las matemáticas en línea. *Revista Estudios de la Ciénega*, 1(3), 19-24. https://revistaestudiosdelacienega.com/ojs/index.php/rec/article/view/36

Sánchez, J., y Morales, S. (2012). Docencia universitaria con apoyo de entornos virtuales de aprendizaje (EVA). *Digital Education Review*, 1(21), 33-46. http://revistes.ub.edu/index.php/der/article/download/11304/pdf

Universidad de Guadalajara [UdeG]. (2024). *Presentación*. https://www.udg.mx/es/nuestra/presentacion.

Vera, I., Fernández, M., y Rodríguez, S. (2021). Modelo de diseño instruccional en e-learning. http://sedici.unlp.edu.ar/handle/10915/120358