Intelligent Learning Ecosystem in M-Learning Systems

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Abstract. This article refers to the background of Education and educational technology; To understand, they are theoretical-explanatory links in the teaching-learning process in today's networked society. The configuration of the learning environment and the development of experiences that generate learning by integrating the monitoring of real-time experiences into ecosystems that guide the learning outcomes common to all and desirable. The epistemological approach is an "alternative" proposed by [1], it facilitates the construction of new knowledge and the method is a research action of analysis the exchange of mixed studies mediated by mHealth in the thematic of the pathological oral anatomy. Data were obtained through focus groups to students; The data analysis was performed in MaxQd v 2018 from the analysis categories. The results are organized according to the analysis categories for students, a saber: dialogue; interaction with teachers, interaction with peers, perceived learning; Mediation with applications.

Keywords: Digital learning ecosystem · Intelligent learning · Learning interaction and m-learning

1 Introduction

The current information society poses an environment in which ICTs play a strong role in all areas, including education [2]. This demands the establishment of pedagogical models aimed at both the design of educational materials in digital format and their mode of application [3] In this sense, higher education institutions have been forced to adopt strategies to respond to new trends in information and communication by competing with a greater advantage among their peers; by offering alternatives to access knowledge different from traditional forms, which require the convergence of teacher and student time-space. The use of information and communication technologies (ICT) offers a wide variety of tools in the educational process, consequently, by themselves, they do not guarantee appropriate learning, which is why the importance of pedagogical strategies that support the learning of learning is evident. Collaborative way

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Identifying student learning at any time is important, on the one hand, because of prior learning conditions the construction of new learning and, on the other hand, because of monitoring, both by the same apprentice and by whoever oriental is a fundamental condition for its control and direction. This dimension of research requires the application of measurement methods and statistical procedures [4].

The use of intelligent learning systems with analytical methods in online education focuses on the collection, analysis, and reporting of data on student online actions [5]. The learning analysis has aroused the interest of academic institutions and teachers by displaying information that was not available before, allowing them to better understand how students learn and, therefore, to take actions with information to support the process [6]. Advances in technology in recent years have changed student learning behaviors and teaching methods with new environments and ubiquitous resources methodologies. Consequently, our goal is to provide a theoretical and analytical understanding of the pedagogical model and its implications in teaching and learning. The analysis of the pedagogical model and didactic sequence (thematic of basic sciences in oral pathology anatomy) is implemented by generating interactions with students in the new m-learning environments, which integrate students into learning outcomes common to all and desirable. The m-learning education allows both teachers and students to connect through their mobile devices generating communicative interaction.

This article reveals how technological mediation is generated in learning, from a trans and interdisciplinary perspective, by establishing relationships between knowledge. This is possible because the authors root their discourse in an epistemic framework and an objective that makes all knowledge common, through reflexive and dialogical analysis.

2 State of the Matter

The technology has offered a line of advancement to the attention in intelligent learning and the creation and efficient use of intelligent learning environments mediated with ubiquitous technology.

2.1 Ubiquitous Learning and Intelligent Learning

The rapid advance of the networks of communication wifi, 4 g, 5G .., and the use of the Smartphone have allowed the students to access digital resources and interact with computer systems without being limited by location and time. This has been investigated in this perspective by [7], and with criteria based on learning by [8]; The authors call this learning approach that uses mobile and wireless communication technologies, “mobile learning” [9] or “ubiquitous learning” [8]. The other pillar is the detection technologies: GPS (global positioning systems), RFID (radio frequency identification), QR (rapid response); they have allowed the learning systems to detect the real-world locations and contexts of the students [10] and the recommendation systems [11, 12].

Various studies have evidenced these approaches and have emphasized the relevance that students learn from the real world with access to digital resources they use in

their activities and are assisted by their teachers in technology-mediated learning and web-based learning, towards mobile learning and especially "ubiquitous context-aware learning" [13].

2.2 Reference Framework of the McLuhan Tetrad

McLuhan Media Laws are based on the idea that all artifacts have an effect on people and the society that adopts them. From this perspective, each new tool that is introduced becomes an extension. The word "extension" refers to the idea that, by building new things, humans increase their bodies and these changes are, in the long term, transforming the social and physical environment. We need an answer to a fact, the transit of the intelligent university (intelligent learning systems); through analysis based on experiences and interaction in learning ecosystems (m-Learning).

The data sources used in the learning analysis tools can come from a variety of academic systems, such as student information, library services, learning management systems, student admissions and grades [5]. Among those sources, research on learning analysis has tended to focus on the possibilities of using data in LMS learning management systems. According to Vernet, the potential uses of learning analysis are related to the following areas: (1) prediction of student performance and student modeling, (2) suggestion of relevant learning resources, (3) increased reflection and awareness, (4) improvement of social learning environments, (5) detection of undesirable learning behaviors and (6) identification of student emotions.

The research field of learning analytics is interdisciplinary, consequently, it combines aspects of educational data mining, social network analysis, artificial intelligence, psychology - theory and educational practice. In educational research, it is important to define two related areas: learning practice and organizational development. Both use educational data, although with different interests. While, in the practice of learning, the analyzes focus on improving student success, in organizational development the pressure has been on productivity and business solutions. In the domain of the organization, the analysis combines student information with institutional data to improve administrative efficiency [14].

The literature on learning analysis tools also suggests that it can be used to address data from a variety of perspectives. Some of the most prominent are social networks, discourse analysis [15, 16], content analysis [17, 18], disposition analysis [19] and student-centered analysis [20], among others. In all of them, learning analysis tools are expected to improve teaching and support student success.

2.3 Cognitive Sciences

From the cognitive sciences, including neurosciences and their relationship with psychology, anthropology and information sciences, innumerable contributions are made to the understanding of m-learning teaching and learning. How people learn using digital media, how information processing is carried out, how perceptual, associative and integrative processes carried out in the brain are involved, what are the best ways to teach from the functioning of the nervous system, or As meanings are built and skills are acquired, they are some of the questions to which cognitive sciences can contribute to answer.

2.4 Learning Analysis Tools

There are multiple definitions of the concept of "learning," and these depend on the epidemiological position on which it is based. For this article, the conceptualized one of [21] has been selected, who sees learning as A persistent change in human performance or its potential for performance, which must be the result of the subject's experience and interaction with the world

Based on the McLuhan axiom, all media are extensions of people, we analyze how the tools of learning analysis broaden our senses as human beings. Learning analysis tools reveal "hidden" information, it connects with the idea of a sixth sense, in this case to perceive learning behaviors that are not visible. By displaying this data, the learning analysis allows another view of what happens when students participate in online learning. The expectations of the learning analysis go beyond having a different view on teaching and learning. In this sense, education professionals and academics have expressed their hopes in the learning analysis by predicting learning performance and identifying learning models. Customize learning, control the activity of teachers, as well as the performance of the institution, understand social interaction and participation and engage students in their learning processes.

The prediction of student success or failure in learning, particularly in e-learning, has received considerable attention. Research in this area has led to the definition of profiles to model different types of learners, as well as the identification of different learning styles. Personalization is the core of many approaches to learning analysis; The data collected on students' online behaviors inform decisions about what type of learning resources or activities are most significant, given the student's current skills and knowledge on a given topic. Taking into account individual aspects, the tools of learning analysis improve a broader vision of learning that recognizes the importance of building prior knowledge and skills of students.

Learning analysis tools seek personalization, are based on the idea of how students learn, therefore, to ensure that students acquire the desired skills, teaching practice must adapt to the diversity of needs and challenges faced by students.

In many learning analysis tools, in addition to individual performance, data on group activity is also available. This feature intensifies the comparison between the individual and the group and indirectly pushes students to work harder when their activity falls below the group average. Educational institutions have used learning analysis to recruit students [22] and sometimes speculate on the possibility of human resources in the analysis of future learning. This scenario forces people to compete to guarantee access to the university or the labor market.

Nowadays societies need collaboration and cooperation instead of competition, the idea that educational institutions need to prepare students to work in a competitive society has been described as myth [23]. One of the main effects of Competition is homogenization: people need to share the same objectives and rules to compete [23]. In learning, standardization implies that everyone must learn the same in the same period. Continuous monitoring and pressure to meet academic expectations can create anxiety and distrust among those interested in education. [24] has studied these phenomena in learning in the workplace, and has concluded; in the monitoring of the online learning activity negatively affects the collaboration of workers, communication and knowledge

sharing. Although formal education differs from learning in the workplace, the stress on students caused by fulfilling their curriculum on time while staying at the same level as the group does not support creativity and innovation [24]. Therefore, to the extent that the tools of learning analysis do not recognize the value of experimentation and risk-taking, they intensify a vision of learning based on the efficiency in which failure is penalized.

Digital data has become a key element in management techniques that are "evidence-based." Educational institutions are subject to a logic similar to that of contemporary organizations, which are based on the use of data and information. A good example of this trend can be found in the university and the school, in which the emphasis on the indicators has been questioned, therefore hiding good practices in teaching and learning. From this perspective, the most critical voices They affirm "the analysis of learning, especially the academic analysis, intensifies the management culture in education" [25], some sectors of the academic community affirm that the analyzes can improve the understanding and performance of the students [26] For teachers, the possibility of accessing the data generated by the students allows them to reflect on the ins design and management of the courses they teach. In this case, the learning analysis is presented as a tool that promotes the knowledge and reflection of educators about some aspects of their professional practice.

Learning analysis is part of a trend based on decision-making informed by data. From this perspective, automatic collection and analysis of student behavior data are assumed to be relevant and reliable, or at least more reliable than subjective perceptions. The trust dedicated to computer algorithms is not exclusive to learning analysis, and similar attitudes towards data in business, medical care, social services, sports, etc. can be found. Although stakeholders in education recognize that learning analysis enriches teaching and learning, we could question the extent to which learning analysis is affecting the credibility we give to personal impressions. In a data-driven society, can we rely on subjective and qualitative data collected through individual experiences?

The learning analysis modifies certain aspects of the role of teachers, especially in online education. Here, we could say that the confidence in the data of the learning analysis is closely related to the emergence of educational programs online. As Mazza and [27] point out, in e-learning courses, students face related challenges such as loneliness, technical problems or loss of motivation [28]. In these cases, the lack of visual guidelines from teachers that help them recognize when students are poorly motivated, anxious or overwhelmed is compensated through learning analysis. In mixed learning scenarios, the learning analysis affects the teacher's ability to perceive group feedback, as there is a growing tendency to rely on the information collected through the back channels during large conferences. The ultimate goal of these efforts is to improve adaptation and improve teaching. But as McLuhan and McLuhan [29] pointed out, the simultaneous effect is the disappearance of certain practices. In this case, the praxis that is being relegated is the ability of certain teachers to detect individual and group behaviors.

2.5 Interactions

The pedagogical design currently proposed by the traditional education system requires the adequacy of the design of competent and individualistic producing minds that accommodate an industrialized social context. This learning structure based on the mass production paradigm seeks to retake the "feed-feed" model within the educational processes; a model that uses different pedagogical practices of collaborative interaction that involve technological and virtual communication scenarios [30].

This type of learning scenarios generally considered communication devices are centralized in the development of participatory cognitive structures within the social and educational environment, with the support of convergent interactive technologies to articulated languages for different purposes [31]. This technological accompaniment from the constant interactivity of individuals within a currently techno-mediated environment [32], arises amid the need to create new collaborative relationships of dissimilar transmissions.

The manifestation of these transmissions based on interaction relationships forms a connective knowledge based on autonomy, diversity, openness and connectivity/interactivity [31]. For Badillo, these interactions arise from the dialogue and argumentation of individuals, which allows the reciprocal exchange of different opinions, perspectives, and reconstruction of meanings, where new technologies are fundamental in collective interaction, differentiators in the reorganization of mental functions; they assign the meaningful concept of learning and enable the basic principle of knowledge transfer to real situations [31].

2.6 Mobile Learning

The new century is going through an era where information and knowledge are accessible from anywhere and at any time. It can be said that this is a society saturated with information influenced by technology and science available to the world. A society that is characterized by the variety of autonomous contexts differentiated by resources, willing to take on technological innovation challenges to improve their development, it can be said that this society is going through the phenomenon of ubiquitous training [33]. The current society adapts to the new mediated techno ecosystem [32], must emerge from its traditional roots to establish an educational system that integrates new models of quality, knowledge, and resources [34].

This is a challenge that the current educational model must take with care and responsibility, which goes through an outdated stage that refers to the beginning of its development before the emergence of information and communication technologies [34]. The current model, based on the face-to-face design of traditionalist practices [31], is aimed at educating a certain segment of the population. Therefore, it is important that training begins to be restored from the educational model of teachers; adapt them to the modern education system that includes technology among its practices.

We must not forget the work that these devices play in formal education since they are considered excellent administrators of academic material. They provide valuable and interactive multimedia learning content for educational purposes [35]. Also,

learning strategies appropriate to this context can help educators facilitate the mobile learning process and reach their educational goals. Likewise, when these materials are properly adapted to their educational formats, the student can take full advantage of spaces that until now were not part of the learning time [36].

It is necessary to analyze the options for adapting training content (which are generally considered robust) to mobility scenarios, that is, transferring learning methods to a mobile context-based on flexible and interactive styles that are not difficult to grasp [37]. The use of technology alone does not directly include improvements in training. Cañizares points out through the author [38], artificial intelligence theorist and learning expert, the skepticism about a large part of the courses offered online; It considers that there is no sample of changes in the educational models and they are conditioned to offer the same materials as always. Schank is committed to learning based on experience. As a student of the human mind, he states that mental processes evolve greatly from experience, given that he faces real situations. Contrary to what happens with conventional learning, based on questions and answers outside the real context and far from the individual's praxis [36].

Education should examine how educational resources are designed and delivered and take into account the needs and characteristics of the new student generation. For example, in the delivery of improved technology to the student, what is the purpose of the tool at the educational level? Does it fit the current training needs? The current generation of students uses this technology in continuous transformation, such as mobile devices, which require the support of teachers as well as information and timely feedback. It must be taken into account that these changes occur according to the training needs supported by current technologies that arise in a society with high information demand [39]. The educational system must rescue informal learning practices adapted to the new connective and flexible world in the use of mobile technology, which is aimed at the autonomous and collaborative learning of students. Without a doubt, this is a knowledge society that must be willing to take on the challenges associated with communicative and informational technologies [40].

3 Research Design

Information and communication technologies (ICT) represent each, new challenges and possibilities in the educational field. The term educational technology acquires a new meaning that refers to the incorporation of ICT in teaching and learning processes. This emerging field called technological mediations in education supposes its epistemological status, supported by positioned epistemic tendencies, which reveal cognitive configurations that focus its interest in categories such as learning and collaboration, privileging interactivity, under the assumption that it gives meaning to experience and applicability of the contents learned to real-life situations.

Following the reflections of [41], it is possible to overcome the false dichotomy between quantitative research and qualitative research in the social and human sciences, for which he postulates an integrative vision called "alternative research". "The two types of techniques need each other most of the time … every existence or

phenomenon has quantitative and qualitative attributes … Consequently, some authors propose overcoming this false dichotomy."

4 Research Method

The Research-Action (I-A) Lewin's work in the period immediately after World War II. Lewin identified four phases in I - A (planning, acting, observing and reflecting) and imagined it based on the principles that could lead "gradually towards independence, equality, and cooperation" [42]. Throughout these years, the I-A method has been configured based on numerous contributions from different geographical and ideological contexts. The great diversity of conceptions that currently exist around I-A, both from a theoretical and experiential perspective, makes it less than impossible to arrive at a unique conceptualization. However, there are many common features in which most authors are coincidental. In the first place, it is worth highlighting the preponderant nature of the action, as defining this research method. This dimension is specified in the active role assumed by the subjects who participate in the research, which takes as a start the problems arising from educational practice, reflecting on them, breaking in this way with the separatist dichotomy theory/practice. "Action research is a form of research carried out by practitioners on their practices" [43].

5 Hypothesis

There is a significant transformation of the preconceptions that, on oral pathology, periodontics students bring, under the use of the mHealth application.

6 Techniques and Instruments for Information Gathering

In the present investigation, the following instruments will be used for the collection of the information: script of questions for focus group (qualitative analysis) and the questionnaire (pre-test) in the mobile application (quantitative analysis).

7 Population and Sample

The target population is heterogeneous and is made up of the academic program of Specialization in Periodontics and Osseointegration existing in the Cooperative University of Colombia, Bogotá headquarters; attached to the Faculty of Dentistry, which has informed consent or voluntary acceptance of participation in the project. The number of residents 15, enrolled according to Helmsman in the second and fourth semester in the second half of 2018.

8 Consent to Participate in the Study

In line with internationally accepted standards to ensure the ethical treatment of people involved in scientific research, an informed consent form was developed. The document will explain to the research participants in the focus groups the nature of the study, its objectives, as well as the right not to participate or to suspend their participation at any time and the confidentiality of the information provided to the participants.

9 Data Analysis Plan

The proposed methodology is complementary (quantitative and qualitative), the analysis of the data obtained according to their nature will be performed. For the processing and analysis of quantitative data, the statistical software SPSS (statistical package for the social science), version 20 for Windows, was used. As recommended by various authors such as [44], first the descriptive statistics will be kept, including frequencies, calculation of measures of central tendency (mean, median and mode) and dissension (variance and standard deviation). The analysis is performed between differences of groups (T students test for independent samples and analysis of variance of a factor) and the degree of association or relationship between the variables (Pearson's correlation coefficient and chi-square tests).

The qualitative information collected will be analyzed with the MaxQda software, version 2018. The interviews are made recorded in audio format and subsequently transcribed and incorporated into the software for the organization and classification of data, summarize and tabulate them (data reduction). It will be done following the inductive method, based on the information obtained, the analysis categories will arise. Therefore, following the suggested methodology, qualitative data will pass to an analytical description to extract relevant information, from coding to the interpretation of its meaning and importance [45].

The preparation of qualitative data includes: The transcription of interview recordings, observation and field notes (computer programs for optical recognition of OCR characters and voice recognition).

Thematic coding and categorization: coding is a way of indexing or categorizing the text to establish a framework of thematic ideas.

Narratives: storytelling or storytelling is one of the fundamental ways people organize the understanding of the world. In the stories, people make sense of their experience and share their experience with others. Therefore, careful analysis of the themes, content, style, context, and narrative reveals people's understanding of the meaning of events in cultural contexts.

Comparative analysis: the coding provides the shorthand synthesis between different people, objects, scenes or events (situations, actions, stories or experiences of the members), data of the same people, scenes, objects or types of events, some matches with others.

Typology: a typology is a way of classifying things that can be multidimensional or multifactorial, can be based on two (or more) different categories of things.

Quality of analysis and ethics

10 Data Analysis of Focus Groups with Qualitative Analysis Techniques

In the present study the classic content analysis will be used, it implies the creation of small pieces of data (Chunks) and the subsequent assignment of a code to each one of them. However, instead of creating a theme from the codes, these are placed in similar groups and then accounted for. Using the three-element coding framework there are only three ways to use classical content analysis with focus group data: a. the analysis can establish if each participant uses a given code; b. the analyst can determine if each group used a given code; c. the analyst can identify all instances in which a certain code appears [46]. Researchers should not only provide information on the frequency of each code (that is, quantitative information) but also complement it with a description of each code (qualitative information); which will create a mixed modality of content analysis [47].

11 Analysis of Quantitative Data

11.1 Interpretation of Pre Test Results

Regarding the content of m-learning educational applications by students, the results show a 30% difference between women and men. 40% of women contain educational applications on their mobile devices, unlike 70% of men. However, the data show the lack of good use of the mobile device in educational contexts by men, because women predominate communicative and interactive participation in different learning environments.

Although the methodology used by the teacher has shown good results, it is important to clarify that from the technological - pedagogical perspective, there is a need to include information and communication technologies (ICT) in their training processes. The study shows low rates about the use of the mobile device in the educational field, as well as the management of mobile educational applications. Therefore, the support of ICT, specifically mobile devices (m-learning) for the teaching-learning process, is undoubtedly the opportunity to transform formal education into a mobile and ubiquitous context applied to the reinforcement of knowledge in the subject of pathological oral anatomy.

11.2 Post-test Analysis

Once the pedagogical - technological and communication model has been implemented, the interaction - gender variable continues to stand out the intervention of women in terms of conditions of a teacher-student relationship, synchronous and asynchronous technological interaction), active participation in the subject, and the Access to resources on the platform.

The analysis of the comparative statistical results of the pre-test and post-test shows in the study of interactions in collaborative learning environments, mediated by m-

learning, a significant difference is reported in the present comparative study. Figure 1 shows a before and after the m-learning test between the two samples.

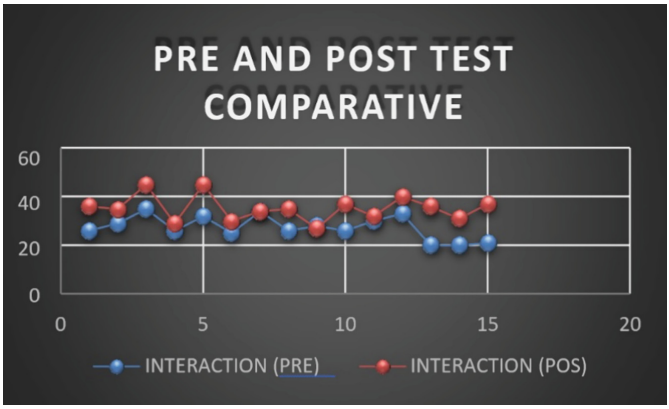

Fig. 1. Pre test and post test behavior. *Source own elaboration*

The behavior of the graph demonstrates the changes obtained once technological mediation has been applied in periodontics residents, due to the fact that a high frequency of technological and social interaction is evident. The average score that marked the difference between pre and post was 7.86.

Technique: T-Student Test for Related Simples
The t-student test was applied, to calculate and know the values of the mean, standard deviation and the standard mean error of the sample, as shown in Table 1.

Table 1 Paired samples 1. *Source own elaboration*

Paired sample statistics					
		Half	N	Standard deviation	Mean standard error
Pair 1	INTERACTION (PRE)	27,40	15	4,837	1,249
	INTERACTION (POS)	35,27	15	5,244	1,354

The results show a difference of the average between the pre and post-test at a 7.867 higher in the result of the evaluation of the interactions that the post-test throws. For the standard deviation, the dispersion of the data is more significant in the post-test with a score of 5,244 compared to 4,837 that produced the pre-test; This is due to atypical data presented within the post-test results.

Regarding Pearson's linear correlation (Table 1), in this case, it is 0.100. As this value of significance is greater than the value of alpha (0.05), it can be statistically deduced that the scores in both registration conditions do not correlate, that is, there are differences in their results.

Table 2 Paired samples 2. *Source own elaboration*

Matched sample correlations				
		N	Correlation	Sig.
Pair 1	INTERACTION (PRE) & INTERACTION (POS)	15	,440	,100

To know if there is a significant statistical difference in the results obtained, the difference between the P-value (0.000) and the value of alpha (0.05) was calculated. In this case, since P-value is less than alpha, it can be deduced that the statistical difference between the tests is significant (Table 2). Another condition for complying with this theory is shown in the relationship between the lower limit and the upper limit of the confidence interval is not 0 (Table 3).

Table 3 Paired samples 3. *Source own elaboration*

Test paired samples					
		Half	Standard deviation	Mean error are-given	95% difference confidence interval
Pair 1	INTERACTION (PRE) - INTERACTION (POS)	−7,867	5,343	1,380	−10,826
		95% difference confidence interval			
		Higher	t	gl	Sig(bilateral)
Pair 1	INTERACTION (PRE) - INTERACTION (POS)	−4,908	−5,702	14	,000

It can be concluded that there is a significant difference in the means of the interaction variable before and after the technological mediation because P-value (level of significance) is less than 0.05 (alpha), so the test m -learning has significant effects on student interaction.

11.3 Qualitative Analysis

In qualitative research, the categories of analysis are dynamic and are built throughout the process, therefore general categories are established, derived from the research question. The initial proposal of analysis categories was based on theoretical revision and conceptual construction for the study.

11.4 Data Analysis

Concerning the interpretation and discussion of the data, it was done by contrasting the experiences of students and teachers with m-learning, dialogue, interaction, and learning. The information collected was analyzed based on categories with the help of the MaxQA 2018 software program. The method includes data reduction, coding, theoretical sampling. The principle of qualitative information analysis was that of

"saturation", thus the cyclical analysis of the information comparing data to form categories, relating them to each other and resorting to new data and informants to confirm, modify or reject them, special attention was given to even a saturation point, that is, the new cases will not provide new information, which indicated that at that time the analytical process should conclude.

11.5 Interpretation of Qualitative Results

Analysis Category: The function of the dialogue with classmates and teachers

The dialogue functions are congruent with the predominant use of discussion forums. in m-learning, when conducting debates, exchanging perspectives among students and raising doubts with teachers. The possibility of contrasting opinions and interacting with other people with different experiences is positively valued by students, as it contributes to the development of professional skills.

The characteristics of the dialogue with codes were: communication is very important, respect and trust in the interaction, dialogue with peers are enriching, large and heterogeneous groups generate communication, communication with peers is fluid, communication with the teacher is fluid and generates feedback.

In general, the dialogue is perceived as relevant, respectful and enriching; Highlights the recognition by students of the importance of communication, as well as the elements of respect and trust, which are part of the very concept of dialogue. On these aspects, in a dialogical relationship, the student affirmed:

"Dialogue in apss-mediated learning, with respect and confidence in the fulfillment of acquired commitments."

Interaction with Teachers: What is the degree of interactivity between students and teachers? What is the quality of the interaction? And How does it take place?

The analysis of this category, derived from the focus groups, was broken down into four sets of codes: tools used to interact with teachers; functions of interaction with teachers, frequency of interaction with teachers, quality of interaction with teachers. About how interaction with teachers takes place, the most frequently used media were the asynchronous discussion forums, as well as email.

Interaction with Students: How is dialogue between students encouraged? and what role does it play in the student's learning process?

The analysis of the information provided by students in the focus groups resulted in code groups: tools used when interacting with peers, frequency of interaction, functions of interaction with peers, quality of interaction with peers. Then a representative appointment of the forms of communication used: "We communicate through telephone messages and emails. Communication through electronic messages and emails is given to share opinions about the course and organize better group work, interact constantly, even more than in the classroom.

12 Discussion of Results from the Conceptual Framework

Dialogue. In terms of dialogue, the virtual courses analyzed, from the perspective of the students, have an appropriate level of dialogue, understood as a bidirectional, horizontal, respectful and learning-centered relationship, between students and teachers and between the students themselves. The intensity of the dialogue is variable, although none of the courses presented a major difficulty that prevented the learning process. The availability of technological tools allows an acceptable level of dialogue.

Structure. Students perceive that the courses have an appropriate level of structure: course program, reading material, support material, links and activities scheduled according to a schedule. However, sometimes the lack of structure is a factor that negatively affects students' perception of teacher performance and the degree of perceived learning.

Direct instruction is exercised by teachers asynchronously, through a "mediated dialogue", as previously seen; They use written materials available on the platform, as well as announcements and messages to intervene in the presentation of content. However, students must assume their understanding of the material by reading and evacuating doubts at the time required, mainly with the use of the question forums and email.

13 Conclusions

A current trend in the "teaching-learning system", as opposed to the pedagogical practice of the teacher; Currently, teaching is less interesting than learning, and less interesting what the teacher presents and more what the student learns (training focused on learning).

It was found that students generally demonstrated an adequate level of satisfaction in m-learning, by separating the analysis between the best-rated courses was the discussion forum, the exchange of opinions and experiences with classmates were assessed as teaching-learning strategies.

Learning in collaborative or cooperative environments allows greater reception in educational settings. The student these learning options is in the ability to make decisions about their process and identify their own needs, specifically in the subject of networks which presents a high degree of student dropout.

Collaborative learning allows each student to develop their creative thinking, self-learning, commitment and responsibility of their peers, and their participatory spirit, achieving group growth.

The present investigation demonstrated the effectiveness of peer interaction generates skills in the subject of networks and stimulates cognitive improvement; At the time of exchange, we establish a relationship between the interacting subjects, motivations, and interests.

Interaction with peers has the function of coordinating tasks in group work or projects, as well as exchanging opinions and learning from the experiences of others. The degree of interaction is adequate but depends largely on the design of the activities. The teacher's role remains important as a promoter of the interaction in the group.

The main contribution of this research is the approach of three elements directly related to the positive perception of pedagogical presence by students, namely: feedback, academy, and socialization. In general, both students and teachers consider the contribution that peer interaction makes learning as important.

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