Didactic, technological and communicational considerations for EVEA design

Consideraciones didácticas, tecnológicas y comunicacionales para el diseño de un entorno virtual de enseñanza aprendizaje

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Abstract

In this research we determined the didactic, pedagogical, technological aspects as well as the learning methodologies which should be considered in order to develop an VTLE that guarantees a quality learning. For this purpose, we used the qualitative approach supported by the design of the grounded theory with the purpose of generating theories, concepts or hypotheses from the analysis of the interviewees' points of view and the contrast with the literature previously analyzed. In this sense, we interviewed 8 experts in the subject of design and implementation of VTLE and the data obtained were analyzed by means of the software ATLAS.TI 8, following the model of the emergent conception.

According to the results obtained, we determined that in order to design a VTLE the instructional design ADDIE should be used, the resources of the VTLE should be varied to assist the diversity of learning styles and the contents should be up-to-date, the activities should be focused to solve problems of the professional context of the students and they should promote the autonomous and collaborative learning, the andragogical foundations of the students must be also considered, and finally the use of the B-Learning approach and the Flipped Classroom methodology so that they use ICT tools to support the teaching and learning processes.

Keywords

Virtual teaching and learning environment, ADDIE, andragogy, Moodle, ICT.

Resumen

En la investigación determinamos los aspectos didácticos, pedagógicos, tecnológicos y metodologías de aprendizaje, que se consideran para desarrollar un Entorno Virtual de Enseñanza Aprendizaje (EVEA) a fin de garantizar un aprendizaje de calidad. Para ello utilizamos el enfoque cualitativo apoyado del diseño de la teoría fundamentada con el propósito de generar teorías, conceptos o hipótesis a partir del análisis de los puntos de vista de los entrevistados y el contraste con la literatura analizada previamente. En este sentido, entrevistamos a 8 expertos en la temática de diseño e implementación de EVEA y los datos obtenidos se analizaron mediante el software ATLAS.TI 8, siguiendo el modelo de la concepción emergente.

De acuerdo a los resultados obtenidos determinamos que para diseñar un EVEA se debe utilizar el modelo instruccional de Análisis, Diseño, Desarrollo, Implantación y Evaluación (ADDIE), los recursos del EVEA deben ser variados para atender a la diversidad de estilos de aprendizaje y sus contenidos deben ser actuales, las actividades deben estar enfocadas a resolver problemáticas del contexto profesional del estudiantado y deben fomentar el aprendizaje autónomo y colaborativo, se deben considerar los fundamentos andragógicos del estudiantado, y finalmente el uso del enfoque de aprendizaje híbrido (b-learning) y la metodología de la clase invertida (flipped classroom) de modo que utilicen las TIC como apoyo al proceso de enseñanza y aprendizaje, y se aproveche el tiempo de clase.

Palabras clave

entorno virtual de enseñanza aprendizaje, ADDIE, andragogía, Moodle, TIC.

1. Introduction

From the advent of the Internet to the present day, its growth has been massive. By the year 2020, 61% of the world's population has access to the Internet, and in Latin America its penetration reaches 71% of the population (Internet World Stats, 2020). As a consequence, there has been an easy access to a great amount of information and allowing direct communication from anywhere in the world.

In this sense, educational institutions cannot remain on the sidelines of its use, isolating themselves in obsolete and traditional educational practices. In the field of education, the Internet offers several possibilities, in this regard Tesouru and Puiggalí (2004) refer that it allows: a) providing information to strengthen students' knowledge; b) providing a wide variety of tools (simulators, games, videos, etc.), making the acquisition of knowledge more enjoyable.) making the acquisition of knowledge more enjoyable; c) provide numerous sources of information such as databases, academic search engines and articles for research work; d) allow the training process through courses found on the network; e) provide the possibility that the educational process is not face-to-face because it facilitates that students can participate in the development of the course anywhere, and; d) break the barriers of distance by facilitating synchronous and asynchronous communication with anyone no matter where they are. As we have observed, the incorporation of Information and Communication Technologies (hereinafter ICT) in the educational field has allowed for a new vision of the scenarios where the teaching and learning process takes place.

In this sense, the Virtual Teaching and Learning Environments (hereinafter EVEA), become an effective tool to favor the aspects mentioned above. Because they facilitate the development of the curriculum through content and training activities, in addition to encouraging participation and communication between its actors (students and teachers) synchronously and asynchronously, they allow student evaluation and the optimization of the teaching-learning process in any face-to-face, online, distance or blended learning

educational modality (Colina and Gutiérrez, 2013; Belloch, 2010; Salmerón, Rodríguez, and Gutiérrez, 2010; Salinas, 2012).

It is evident to observe how in the last decades online education has obtained a constant growth. Studies by Online Business School (OBS, 2014) state that, by 2019, about 50% of the world's higher education was delivered through E-Learning. Furthermore, according to the report 'Turning Point: Higher Education in Latin America and the Caribbean', published by the World Bank, e-learning has grown by 900% worldwide (WB, 2017).

However, in Latin America the situation is alarming. The Organization for Economic Cooperation and Development (OECD, 2015) in its studies determined that in Latin America only 19% of educational institutions focus on distance education or virtual education. Based on our context according to data obtained from the portal "Current offer of the Higher Education System" of the Higher Education Council (CES, 2020) of the 60 universities and polytechnic schools that exist in Ecuador, only 10 of them, i.e. 16.66% offer professional master's degree programs and non-medical specializations under the online modality. And of the 60 universities and polytechnic schools that exist in Ecuador, only 17 of them, i.e. 28.33%, offer third level degrees in the online modality. Aware of this problem, the research determined the didactic, technological and communicational aspects that are adequate for the design of an EVEA, as well as the instructional designs for the development of virtual platforms that allow guaranteeing quality learning, in order to be projected in virtual education.

The research is structured as follows: in section 2, the literature review and theoretical foundation related to the aspects to be considered for the design of EVEA are presented; in section 3, the approach, scope and design of the research are described, as well as the population and sample, techniques and instruments for data collection and the way in which they were analyzed; in section 4, we present the analysis and interpretation of the results obtained from the interviews applied to experts in the different areas; in section 5, we discuss the results by contrasting them with authors referring to the research topic; finally, in section 6, we describe the conclusions derived from the research process.

2   Literature review

2.1 Virtual teaching and learning environments (VLEE- EVEA)

Paz-Florio (2015) mentions that an EVEA "are computer platforms whose purpose is to guide pedagogical communication among participants involved in the educational process and create spaces or communities organized around learning" (p.1). In this sense, an EVEA is a virtual space designed to complement and strengthen the teaching and learning process through the integration of activities (autonomous and collaborative) and interactive resources developed through different web 2.0 and 3.0 technological tools. Among the most important features of EVEA we have:

- Provide participants with easy access to learning resources and activities.
- Allow greater flexibility in carrying out learning activities.
- Facilitate communication between teachers-students and students-students through synchronous and asynchronous communication tools.

2.2.   Didactic aspects for the design of an EVEA

2.2.1.   Instructional design

Belloch (2013) refers that "instructional design is focused on creating a learning environment and materials, clear and effective, that will help the student to develop the ability to solve specific tasks" (p.5). In this sense, we establish that instructional design refers to a scheme which involves the processes involved in the design, implementation and

evaluation of a learning environment with the objective of planning the training process, selecting the most appropriate tools and, more importantly, adapting the activities and resources to the needs of the students addressed by the course.

2.2.2.   Instructional design models

For Belloch (2013) "Instructional Design Models serve as a guide for professionals, systematizing the process of developing training actions" (p.2). Thus, the instructional design model contains the description of the rules, roles, and resources to be used for the development of learning environments.

There are several instructional design models, such as the Gagné and Briggs model, the Dick and Care model, the ASSURE model, the ADDIE model, etc. However, for the development of the research, the ADDIE instructional model was chosen because it presents greater flexibility for the development of quality educational environments at the university level, and in recent years it has been used in the Faculty of Philosophy, Letters and Educational Sciences of the Universidad Central del Ecuador, where the research was conducted.

2.2.3. ADDIE instructional model

The ADDIE instructional model is a model that serves as a reference for the development of learning environments; its name is an acronym of its phases which are Analysis, Design, Development, Implementation and Evaluation; and its objective is to guide the student to the construction of knowledge in a learning space.

For Castillo (2009) the phases of the ADDIE model are based on a "systemic, efficient and effective methodology for the production of educational resources. The strength that the ADDIE Model has gained in recent years comes from the fact that it is assumed to be a generic model" (p.4). The following is a detailed description of each of its phases:
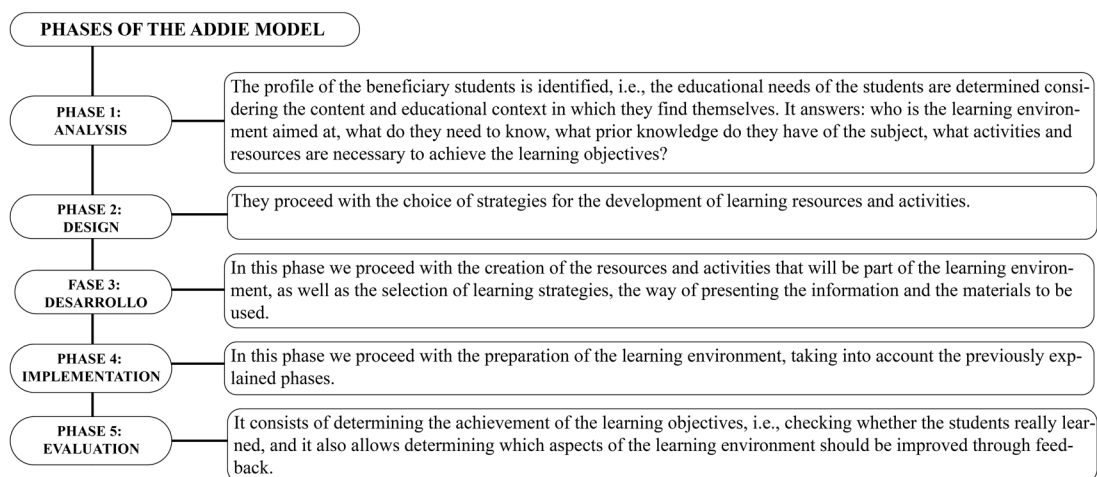

PHASES OF THE ADDIE MODEL

PHASE 1: ANALYSIS — The profile of the beneficiary students is identified, i.e., the educational needs of the students are determined considering the content and educational context in which they find themselves. It answers: who is the learning environment aimed at, what do they need to know, what prior knowledge do they have of the subject, what activities and resources are necessary to achieve the learning objectives?

PHASE 2: DESIGN — They proceed with the choice of strategies for the development of learning resources and activities.

FASE 3: DESARROLLO — In this phase we proceed with the creation of the resources and activities that will be part of the learning environment, as well as the selection of learning strategies, the way of presenting the information and the materials to be used.

PHASE 4: IMPLEMENTATION — In this phase we proceed with the preparation of the learning environment, taking into account the previously explained phases.

PHASE 5: EVALUATION — It consists of determining the achievement of the learning objectives, i.e., checking whether the students really learned, and it also allows determining which aspects of the learning environment should be improved through feedback.

Figura 1. Fases del Modelo ADDIE

2.2.3.   Design of digital activities

Online learning activities place the student in a much more active role than conventional learning activities, where the student plays a leading role and his participation is the key to success in his learning process. Cabero and Román (2006) refer to the fact that learning activities should help the student to understand, analyze, synthesize and evaluate the proposed contents with the objective of converting the raw information into a set of knowledge, skills and attitudes related to the subject being worked on. That is why the

design and selection of activities is one of the most important tasks and they should answer questions such as: Which activities are more meaningful, which activities are more usual or important according to the subject matter of the course, through which activities can the different capacities of the students be developed, which activities are better suited to the characteristics of the students, and which activities are more motivating.

In this sense, one way to classify activities is the use of Bloom's Taxonomy where activities are classified by knowledge, comprehension, application, analysis, synthesis and evaluation. Finally, among the aspects that should be considered for the design of activities, Cabero and Román (2006) state that the following should be considered:

> a) clearly specify the context and the environment where the activity will be carried out; b) determine the time limits for its realization and delivery; c) determine the form in which it will be sent; d) explain the resources that students may use for its realization; e) establish the number of students that may carry out the activity, as well as their mode of participation; f) explain what behaviors are considered desirable for the development of the activity; g) clearly establish the criteria for evaluating the execution of the activity, and; h) establish how the final product will be presented (writing, type of material, length, etc.) (p.40).

2.2.4. Design of digital educational resources

The use of EVEA in the educational context has gained much strength in recent years. It is therefore necessary to create, search for and select quality educational resources in accordance with the demand and the academic offer in its different modalities and that respond to previously defined quality standards. Thus, for a resource to be of quality, the following conditions must be met: a) the resource creator must have a very broad knowledge of the subject; b) teaching-learning objectives must be established with the purpose of delimiting content; c) an ICT resource must be chosen to present the resource; d) methodological procedures must be proposed that will allow the student to approach the object of study, and; e) the educational digital resources according to the desired level of cognitive development namely (Zapara, 2012). Referring to item e) it is convenient that:

- For the formation of concepts: resources should be used that allow the student to explore information with the purpose of expanding and acquiring knowledge about a topic of study.
- For understanding, association and consolidation of learning: it is important to use resources that allow interaction with the objective of understanding processes and integrating knowledge.

2.3. 2.3. Technological aspects for the design of an EVEA

2.3.1. ICT tools for the development of EVEA activities and resources with Moodle

ICT tools to develop learning activities with Moodle: the following is a description of the tools included in the Moodle platform for the development of activities and their use within an EVEA:

Activity	Definition	Use
Forum	• The forum is a virtual space for social and academic interaction in which one can argue and introduce interpretations of a specific topic.	• Promote critical thinking.
Chat	• It is a synchronous communication tool that consists of simultaneous conversation between two or more people connected to the network.	• Create spaces of opinion among several people where they can form a criterion on the topic discussed.
Videoconference	• A communication tool that allows synchronous communication between the teacher and the students.	• Generate ideas and arguments through collective dialogue on a specific topic to enrich knowledge.
Task	• A tool that allows planning, organizing and grading evidence requested for the development of an activity.	• Discuss, analyze collectively, ask questions to teachers or students and receive advice.
Questionnaire	• Evaluation tool that allows to design questionnaires in a very simple and flexible way.	• Construct and share information synchronously among several students to build new knowledge.
Wiki	• It is a web site that allows the construction of knowledge collectively with other users.	• Provide visual and audio explanations from experts to facilitate the understanding of the different topics of the course.

Table 1. Activities in Moodle

2.3.2. ICT tools to develop resources with Moodle:

The following is a description of the tools integrated in the Moodle platform for the development of resources:

Resource	Definition	Use
Archive	• Resource that allows you to attach text documents, images, videos and audios.	• Share support or study material.
Folder	• Tool that allows you to host different types of files.	• Organize information on a specific topic.
Url	• Tool that allows linking internal or external websites.	• Share different types of resources in an organized way.
Book	• Resource that allows presenting topics as a book, i.e. by chapters or subchapters.	• Create a portfolio of evidence.
Page	• Resource that allows inserting web pages within EVEA.	• Provide external links of interest.
Tag	• Resource that allows inserting any multimedia file or text inside the EVEA.	• Link resources found within EVEA.

Table 2. Resources in Moodle.

2.4.   Autonomous learning

Autonomous learning is understood as the faculty that allows the student to regulate his or her own learning by making sound decisions (Monereo and Castelló, 1997).
Crispín (2011) refers to autonomous learning as a process where a person self-regulates his or her learning and becomes aware of his or her cognitive and socio-affective processes.
From the above definitions we determine that, in autonomous learning, the student establishes his or her own learning pace through the appropriation of learning strategies that allow him or her to articulate the knowledge.

2.5.   Collaborative learning

Gunawardena, Lowe and Anderson (1997) refer to collaborative learning as a process in which each person learns more than he or she would learn on his or her own, through interaction with the members of the group. Thus, we can understand collaborative learning as a process where the student generates a more efficient construction of knowledge through interaction with his or her work group, the contrast of each member's point of view and the cooperation of its members.

It is important to mention that in learning "subjects work together", being possible the spontaneous division of labor, in addition to the fact that participation is horizontal and roles can change permanently, unlike cooperation, where the division of labor is "vertical"

and "fixed" (SUMMA, 2019). Collaborative learning is created when there is a well-defined interdependence among group members. Johnson and Johnson (1999) refer that some of the principles for collaborative learning are: collaboration, responsibility, communication, teamwork and self-evaluation. Each of the phases is detailed below, according to the aforementioned author.:

- Collaboration: support among the members of the group to acquire knowledge of the subject of study, at this stage all resources, achievements and goals are shared.
- Responsibility: each member of the group must be responsible for the percentage of work assigned. And all members must remain involved in the task of each member to support each other in times of difficulty.
- Communication: consists of sharing relevant information, supporting each other efficiently, providing feedback to optimize the work and analyzing the conclusions of each member in order to obtain better quality results.
- Teamwork: consists of solving problems together, developing organizational, planning, communication, leadership and problem-solving skills.
- Self-evaluation: each member of the group evaluates his or her performance individually and collectively, in order to rectify errors and improve work dynamics.

2.6. Andragogy, characteristics of the adult learner

Throughout his professional career Knowles (1975, 1978, 1980, 1984, 1989, 1990) put forward 6 andragogical principles, in this sense we have:

- The need to know: This principle is based on the assumption that adults need to know why they must learn something before undertaking the learning and using it in their real life, which is why adult learners need information on how they are going to learn, what they are going to learn and why it is important. In this regard, Tough (1971) refers that when a student decides to learn by himself, he inquires about the benefits he can obtain from such learning and the negative consequences of not acquiring it. In this sense, the teacher must make the students aware of the need to know, so that they can access knowledge by themselves in a timely manner and produce meaningful learning.
- Self-concept: It is important to take into account that the adult student has the self-concept of being responsible for his own decisions, of being a self-directed and autonomous person. As a person matures, his or her self-concept changes from being a dependent person to being a self-directed human being. Knowles and Kolb (2005) emphasize that the teacher must identify, guide and respect decisions about the level of autonomy of the adult learner. Considering these characteristics, it is important that the teacher avoids creating situations that cause the adult learner to feel that he/she is trying to impose or order him/her, since this could cause discomfort or resistance.
- The role of experience: It should be considered that adult students come to the educational activity with a high level of experience, needs, interests and objectives, which is why emphasis should be placed on individualized teaching. Thus, Sanchez (2015) in his doctoral thesis entitled "The Andragogy of Malcom Knowles: Theory and Technology of Adult Education" mentions that: "some of the techniques that take advantage of the adult learner's experience are discussion groups, simulation exercises, problem solving, case studies, laboratory methods and peer help activities" (p.97).
- Readiness to learn: This principle assumes that adult learners are prepared to learn what they need to cope with situations in their daily lives. Knowles

(1980) refers that it is possible that this disposition does not come naturally, so he recommends using strategies such as professional orientation or simulation exercises. Taking into account the aforementioned aspects will allow the development of the student's disposition towards learning.

- Learning orientation: Unlike pedagogy where learning is focused on the accumulation of content to be promoted to a higher level, in andragogy the learning orientation is focused on life, task or problem. Adults are motivated to the learning process when they perceive that it will help them to perform tasks or face problems that arise in their context; for this reason, they learn more effectively when knowledge is presented in the context of the application of everyday life situations. Knowles (1980) refers that not taking into account this characteristic has been the main cause of adult students dropping out of literacy courses as well as university courses. For this reason, teachers should orient the learning process to situations of the students' context.
- Motivation. Although adult learners respond to external motivators such as: better jobs, salary increases, promotions, etc., Knowles (1980) refers that the most efficient motivators are internal pressures, such as: increasing job satisfaction, quality of life, self-esteem, etc.

2.7. Learning styles

There are several models and theories on learning styles, even though these have a different classification, they have similarities in common that allow understanding the behaviors of individuals and how they relate to the way they learn in order to determine which action may be more effective at any given time.

The following is a description of the model used in the research:

2.7.1. Bandler and Grinder's Neurolinguistic Programming Model

This model refers to the way in which the learner understands information through the senses. Bandler and Grinder (1982) also called this model visual-auditory-kinesthetic, referring to the fact that information can be represented visually, auditorily and kinesthetically. The following is a description of each of the characteristics of the systems proposed by these authors:

- Visual representation system: students who fall into this category learn best when information is represented visually. The visual representation system makes it easier for the student to absorb large amounts of information quickly.
- Auditory representation system: students in this system remember information in a sequential or orderly manner, learn best when they receive oral explanations and when they have the opportunity to explain the information to another person. The auditory system, unlike the visual system, does not allow us to relate or elaborate abstract concepts with ease; however, it is fundamental for learning languages or music.
- Kinesthetic representation system: this system refers to the ability of individuals to process information by associating it with their sensations or movements, it is used more frequently when learning a sport, this system is slower than the visual and auditory system, students who are located in this system need more time than others, because they learn differently. Students in this system learn best when they are involved in laboratory experiments or projects.

In addition, the aforementioned authors mention that 40% of individuals use the visual system, 30% auditory and 30% kinesthetic.

2.8. Active learning methodologies for the virtual world

2.8.1. Flipped Learning

There is confusion between the terms Flipped Classrom and Flipped Learning, so it is important to mention that, in 2014 the Flipped Learning Network (hereafter FLN), which is a learning network dedicated to providing knowledge, skills and resources for its implementation, modified the term Flipped Classrom (inverted classroom) to Flipped Learning (inverted learning). FLN (2014) mentions that, although both terms are correct, however, the second is more comprehensive due to the fact that inverting a classroom does not necessarily reverse learning. In this sense, inverted learning is defined as:

A pedagogical approach in which direct instruction is shifted from the group learning dimension to the individual learning dimension, transforming the remaining group space into a dynamic and interactive learning environment in which the facilitator guides students in the application of concepts and in their creative engagement with the course content (FLN, 2014, p.1).

According to the aforementioned considerations, we establish that Flipped Learning is a pedagogical model where the traditional class is inverted, to a class that involves the active learning of students, allowing the exposure to focus on the student and not the teacher, based on the information previously transmitted by the teacher through technological resources reviewed by students outside the classroom.

3. Methods and materials

3.1 Approach

The research was based on the qualitative approach. In this regard Sampieri et al. (2014) states that qualitative research is based on an interpretative perspective focused on the understanding of its participants.

3.2 Scope

The research had a descriptive scope because we carried out a description of the didactic-pedagogical, technological and methodological aspects required to develop an EVEA, according to Monje-Alvarez (2011) this scope allows us to:

> Gathering the results of the observation in an exposition of the features of the phenomenon under study, according to criteria that give coherence and order to the presentation of the data, in order to arrive at the formulation of hypotheses. At the descriptive level, no hypotheses are put forward; the purpose of the descriptive stage is to generalize in order to arrive at the formulation of hypotheses (p. 95).

3.3 Design

The research was based on the grounded theory design, about this design Sampieri et al., (2014) states that through its application the researcher produces a general explanation or theory regarding a phenomenon, process, action or interactions that apply to a specific context from the perspective of participants, to develop hypotheses and variables or concepts that integrate it through a representation or visual model, which will later be contrasted with the previously analyzed literature.

3.4 Population and sample

In the research we used the "expert sample", with the purpose of generating more accurate hypotheses. Regarding the size of the sample Sampieri et al (2014) states:

There are no defined or precise parameters, inasmuch as the decision of the number of cases that make up the sample is the researcher's, as long as he/she takes into account the following factors:

- Operational capacity for collection and analysis (the number of cases we can realistically handle and according to the resources we have).
- The understanding of the phenomenon (the number of cases that allow us to answer the research questions, later referred to as "category saturation").
- The nature of the phenomenon under analysis (whether the cases or units are frequent and accessible or not, whether collecting the corresponding information takes little or a lot of time) (p. 384).

Taking into account the aforementioned aspects, the research sample consisted of 8 experts on the subject of EVEA design and implementation, as follows:

Interviewees	Years of experience in EVEA construction	Function
Expert 1	15 years	PhD. in Computer Science. Professor UCE. Professor PUCE
Expert2	10 years	Master in Higher Education Doctorate in Education. Teacher at UCE.
Expert3	5 years	PhD. in Educational Research. Lecturer UCE. Director of the Pedagogy of Experimental Sciences and Computer Science Department.
Expert4	10 years	Master in New Technologies Applied to Education. Specialization in Virtual Learning Environments Teacher UCE
Expert5	7 years	Master in systems Teacher UCE
Expert6	6 years	Master in Systems Computer scientists Educational. UCE teacher.
Expert7	7 years	Instructional Designer. Academic Development Directorate UCE.
Expert 8	5 years	Instructional designer. Teacher.

Cuadro 3. Docentes expertos entrevistados

3.5 Research techniques and instruments

The technique used for data collection was the "qualitative interview" which according to Sampieri et al., 2014 is defined "as a meeting to discuss and exchange information between one person (the interviewer) and another (the interviewee) or others (interviewees)" (p. 403). In addition, the type of interview we selected for the research was semi-structured with the purpose of offering the interviewees a guide of questions, and that the researcher has the freedom to introduce additional questions to clarify concepts or obtain more information. Finally, for the choice of the types of interview questions we used the classification of Mertens (2010) and from this classification we selected knowledge and opinion questions.

3.6 Validity of the instruments

The validation of the instrument was carried out by means of the judgment of three experts specialized in the proposed subject matter (construction of EVE).

3.7 Dependency criterion

In qualitative research, dependence, also called logical consistency, represents "quantitative reliability", and refers to the fact that the data collected are reviewed by different researchers and their interpretations should be congruent, i.e., the results should be equivalent (Sampieri et al., 2014).

In this sense, to ensure that the research meets the criterion of dependence, the interviews were analyzed by two experts in the field, so that the categories obtained from the analysis were equivalent as follows:

Categories expert 1	Categories expert 2
Considerations for selecting an instructional design for the construction of EVEAs	Importance of instructional design in EVEAs
Didactic criteria for developing virtual educational resources and activities.	Design of virtual educational activities
Design of virtual educational resources
ICT tools for the construction of activities and resources in EVEAs	ICT tools for learning support
Elements to consider when designing the interface of an EVEA	EVEA navigation interface
Teacher's role for adult learners	Characteristics of adult learners
Strategies to address learning styles	Learning styles
Autonomous learning	Autonomous learning
Collaborative learning	Collaborative learning
Considerations for selecting active learning methodologies in EVEAs	Selection of active learning methodologies in EVEA

Table 4. Interview dependency criteria

3.8 Data processing techniques

For data processing we used the ATLAS.TI 8 software, because this software allowed us to carry out foreground coding (open coding to form categories) and background coding (axial coding) of the data obtained in the interviews and to build theory by relating concepts, theories and themes.

3.9 Data analysis techniques

Taking into account that for the development of the research we relied on the qualitative approach and the grounded theory design, the steps we followed for the data analysis were those of the emergent conception. Sampieri et al. (2014) states that, in this design, data analysis is carried out by means of open coding to generate categories, which are connected to each other to produce theory, and which is represented graphically to then be contrasted with the previously analyzed literature. The following is a graphic description of the process followed by the research for the analysis of the data collected.

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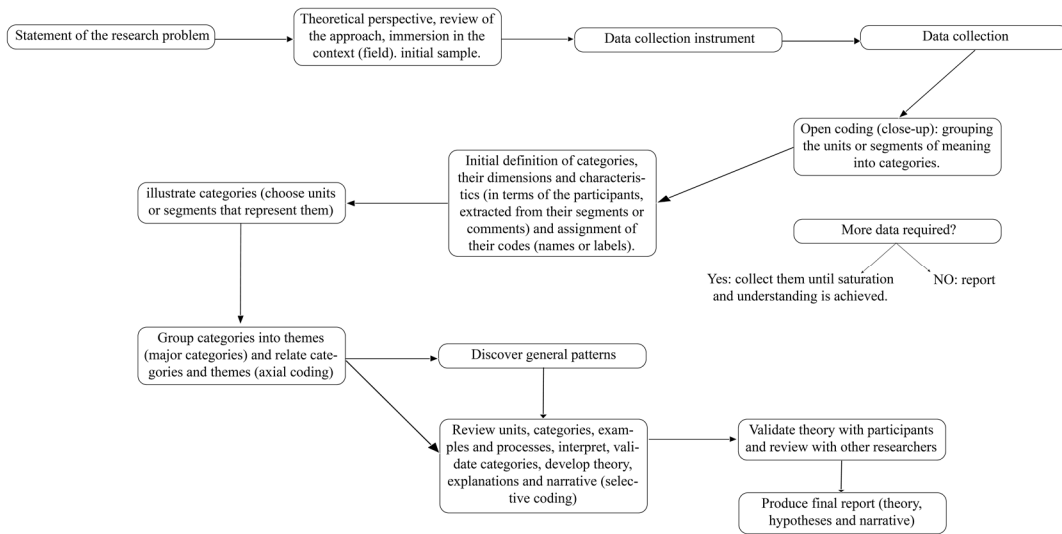
Figure 2. Process of Qualitative Research Based on Grounded Theory Design under an Emergent Conception.
Source: (Sampieri et al, 2014)

4. Results

4.1 Category: Didactic Aspects
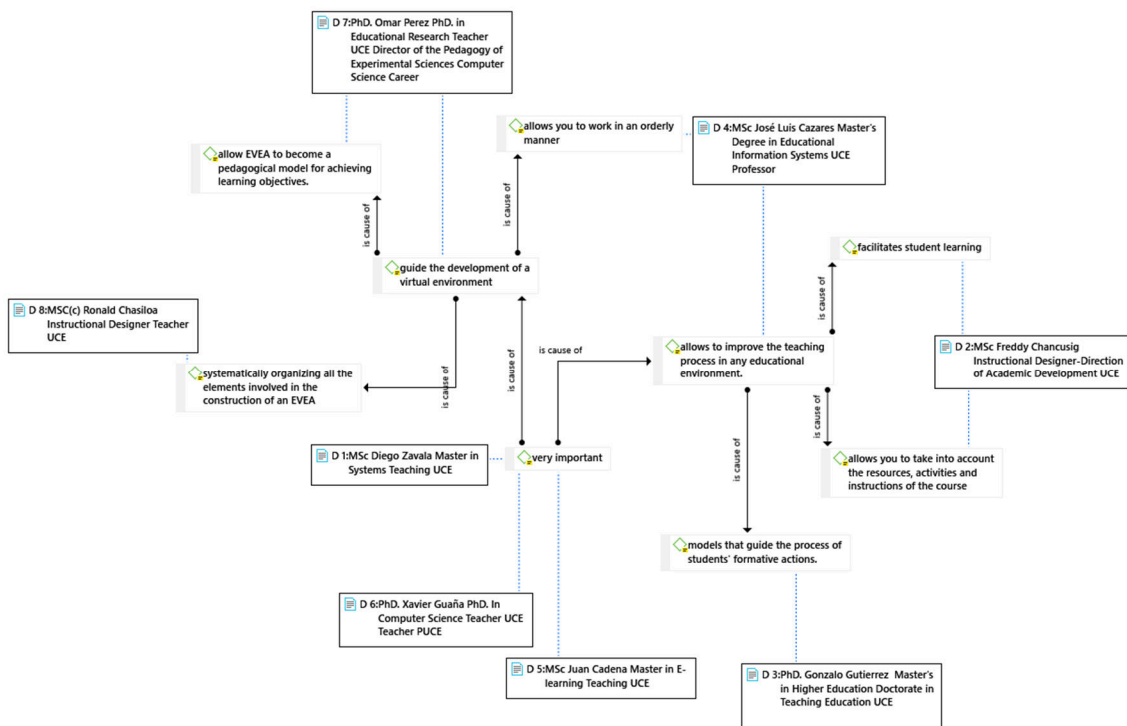
4.2 Subcategory: Instructional Design

Figure 3. Conceptual network: importance of instructional design in EVEA

For the development of EVEA, the use of instructional design is extremely important because its use guides its development since it allows the organization of all the elements implicit in the construction of an EVEA such as resources, activities, and course instructions. Faryaid (2007) asserts that instructional design allows the teacher to conceptualize and

design, create and implement resources and activities that will allow the training process to be carried out adequately. In addition, Belloch (2013) states that instructional design allows the construction of clear and effective learning environments, resources and activities.

Regarding the selection of an instructional design model, the experts interviewed agree on the use of the ADDIE instructional model due to its flexibility and "the strength it has gained in recent years because it is a generic model" (Castillo, 2009, p.4). According to the interviewees, its phases allow building quality EVEA because they take into account all the implicit elements that will be part of the EVEA such as the application group, contents, activities, technological features, learning strategies, evaluation processes and follow-up strategies to determine whether the proposed learning outcomes have been achieved.

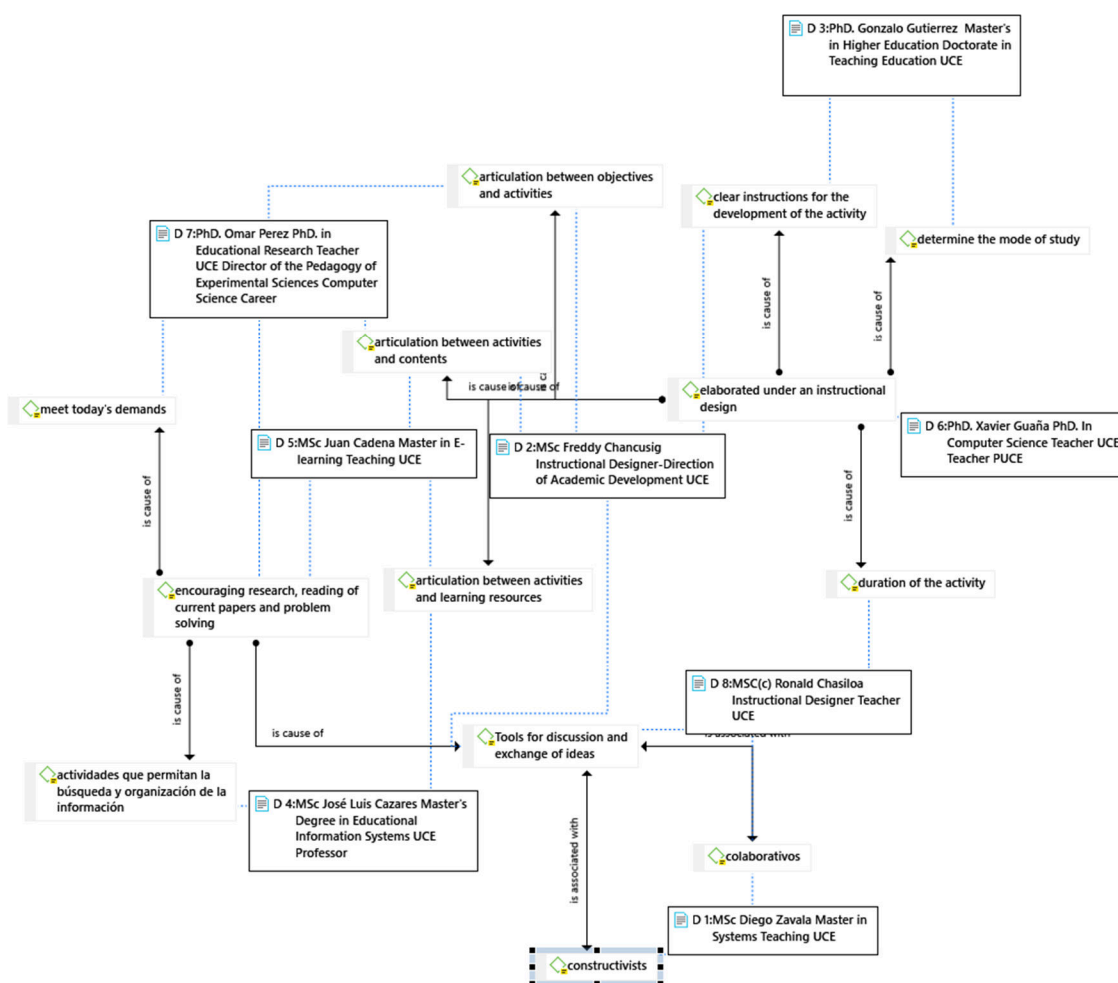## 4.3 Subcategory: Design of virtual educational activities

Figure 4. Conceptual network: Didactic criteria for the design of activities in EVEA.

For the design of activities, the interviewees agree that there must be an articulation between the contents, objectives, resources and the activity, as well as the duration of the activity and the instructions for its completion, in addition to encouraging the exchange of ideas, debate, research, reading and problem solving. Cabero and Román (2006) strengthen this approach since they assert that the most important aspects for the design of virtual activities are: specifying the instructions for carrying out the activity, determining the limits for its realization, determining how it will be sent, establishing the resources to be used for its realization and determining the evaluation criteria of the activity, as well as the author

mentions that the activities should be oriented to the resolution of problems in which the students are involved. In reference to the type of virtual activities to develop higher mental capacities in students, it is recommended to use collaborative work (forums, wikis, workshops); and autonomous work (essays, homework, projects and graphic organizers). Churches (2009) refers to the use of Bloom's digital taxonomy to select virtual activities according to the capacity to be developed in the student body

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4.4 Subcategory: Design of virtual educational resources.
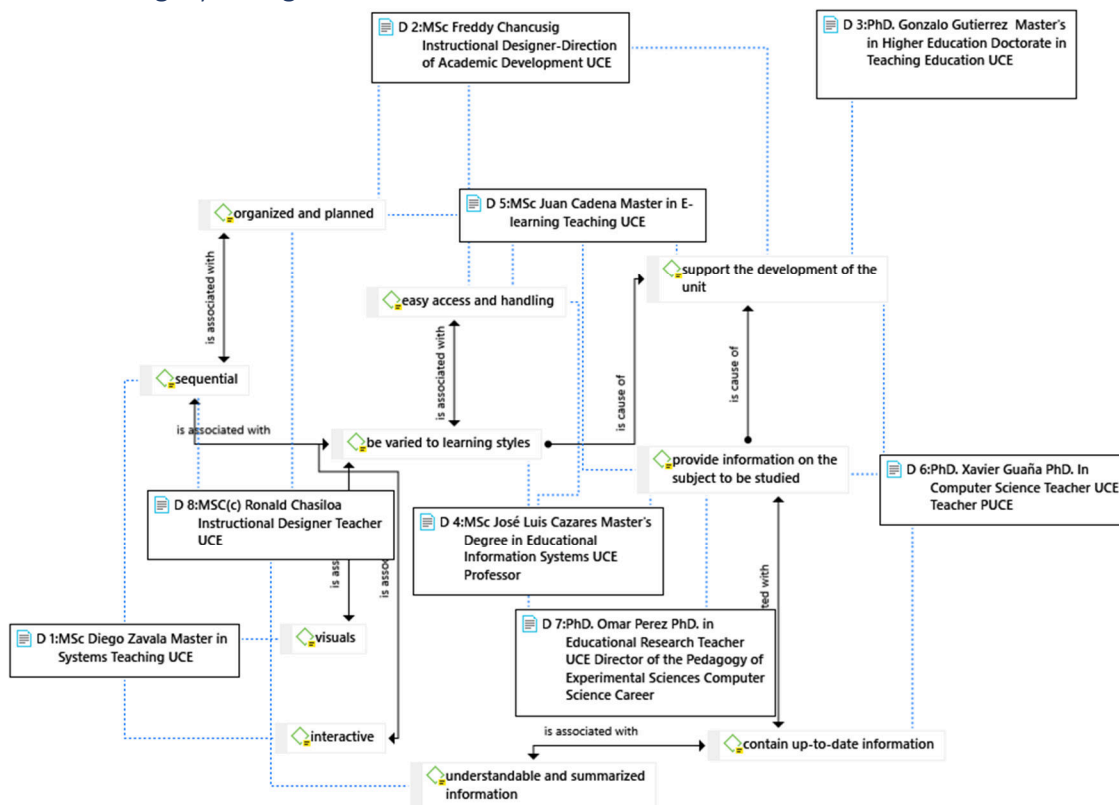
Figure 5. Conceptual network: virtual activities to develop higher mental capacities in students.

For the design of virtual educational resources, the interviewees agreed that they must meet the following characteristics:

a) Be varied (text, audio, images, videos) due to the different learning styles of students.
b) They should be sequentially elaborated.
c) They should be easily accessible.
d) They should support the development of the unit.
e) They should contain updated, summarized and understandable information on the topic to be studied.

Among other characteristics, Zapara (2012) states that in order to develop educational resources it is necessary to establish their objectives to delimit the contents that will be part of them and recommends supporting their presentation through ICT tools. Finally, he recommends using digital educational resources according to the cognitive level, so that if you want to explore concepts, the use of documents, hypertexts and audiovisual resources is recommended, and for the consolidation of learning, the use of simulators or educational games is recommended.

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4.5 Category: Technological Aspects

4.6 Subcategory: ICT tools external to the Moodle platform for learning support.
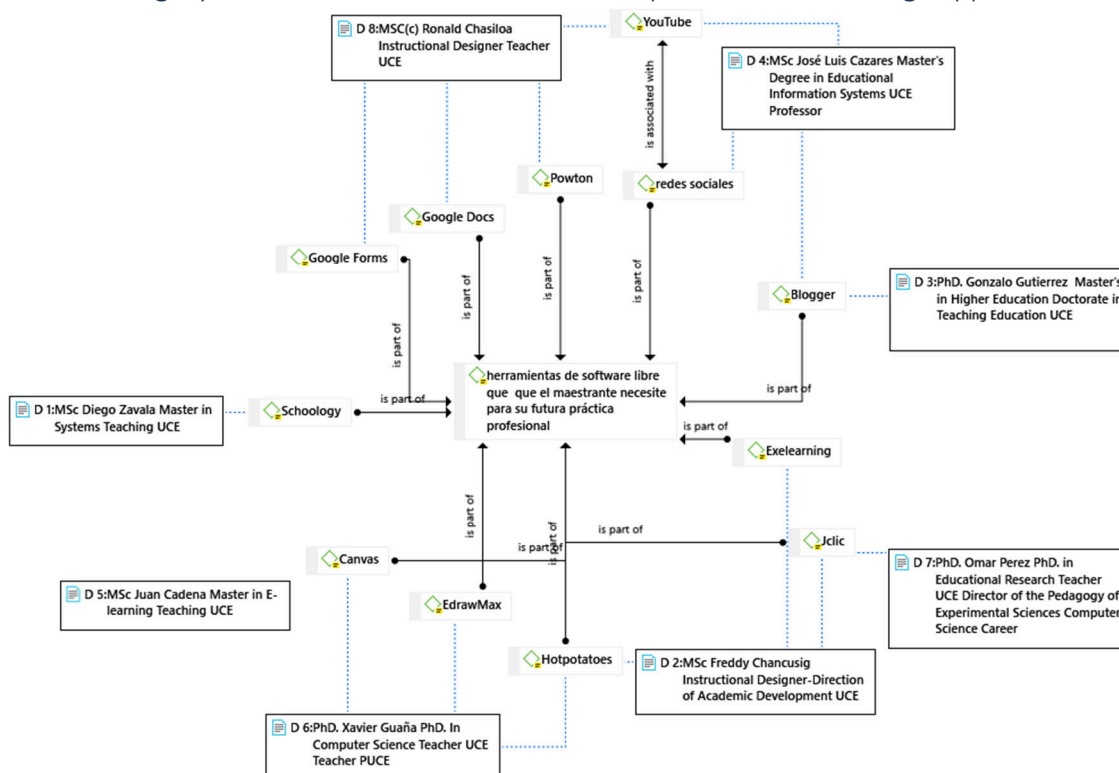

Figure 6. Conceptual network: ICT tools external to the Moodle virtual platform for the construction of activities and resources.

As ICT tools external to Moodle that allow teachers to build activities and resources, the interviewees suggest the following tools:

a) Social networks such as: YouTube and Blogger
b) Evaluation tools such as: HotPotatoes and Jclic
c) Interactive presentation tools such as: PowToon
d) Easy-to-use graphic design tools such as: Canvas
e) Diagramming tools to make flowcharts, flowcharts, mind maps, network diagrams, etc. such as: EdrawMax.

Tools that facilitate collaborative work such as: Google Docs and Google Forms.

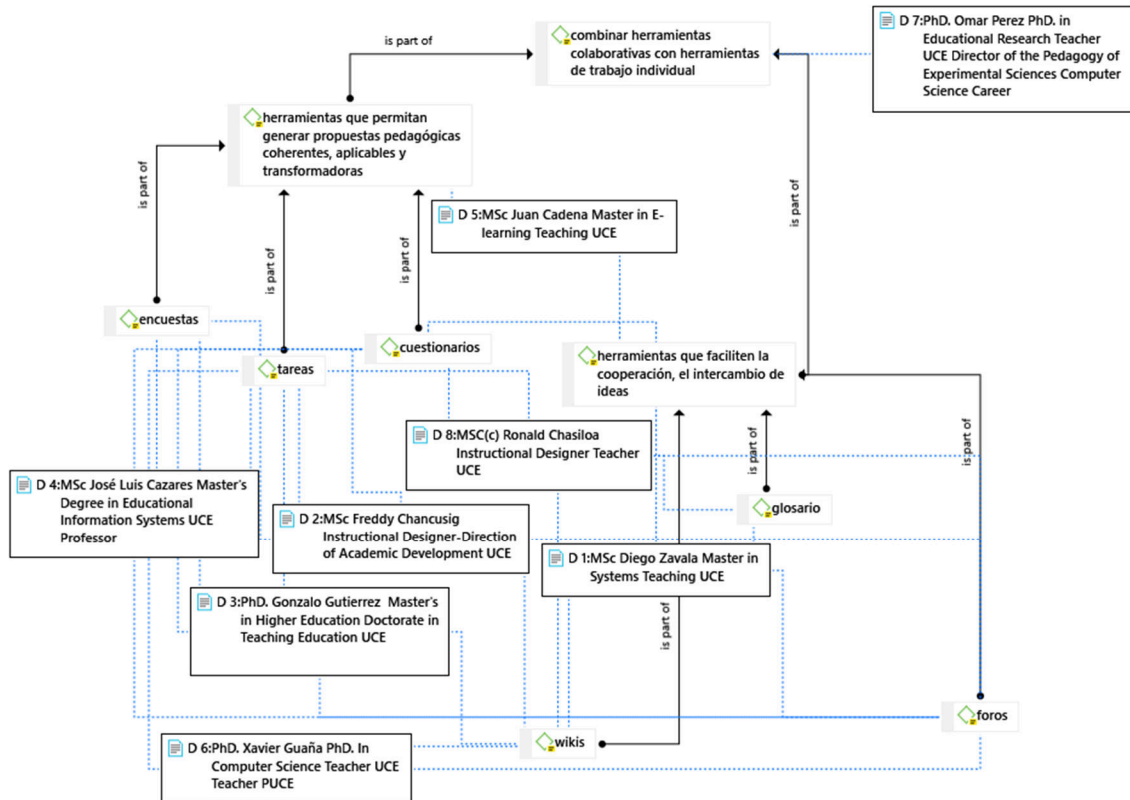## 4.7 Subcategory: Moodle ICT tools for learning support

Figure 7. Conceptual network: ICT tools of the Moodle virtual platform for the construction of activities and resources.

As the most recommended ICT tools of the Moodle platform for teachers to build activities and resources, the interviewees suggest using tools that allow the development of autonomous and collaborative work.

Among the tools for autonomous work, they suggest the use of the Tasks activity as long as they are focused on generating coherent pedagogical proposals, applicable to reality and innovative. Finally, among the tools that facilitate collaborative work and exchange of ideas, they recommend the use of: Wikis, Forums and Glossaries.

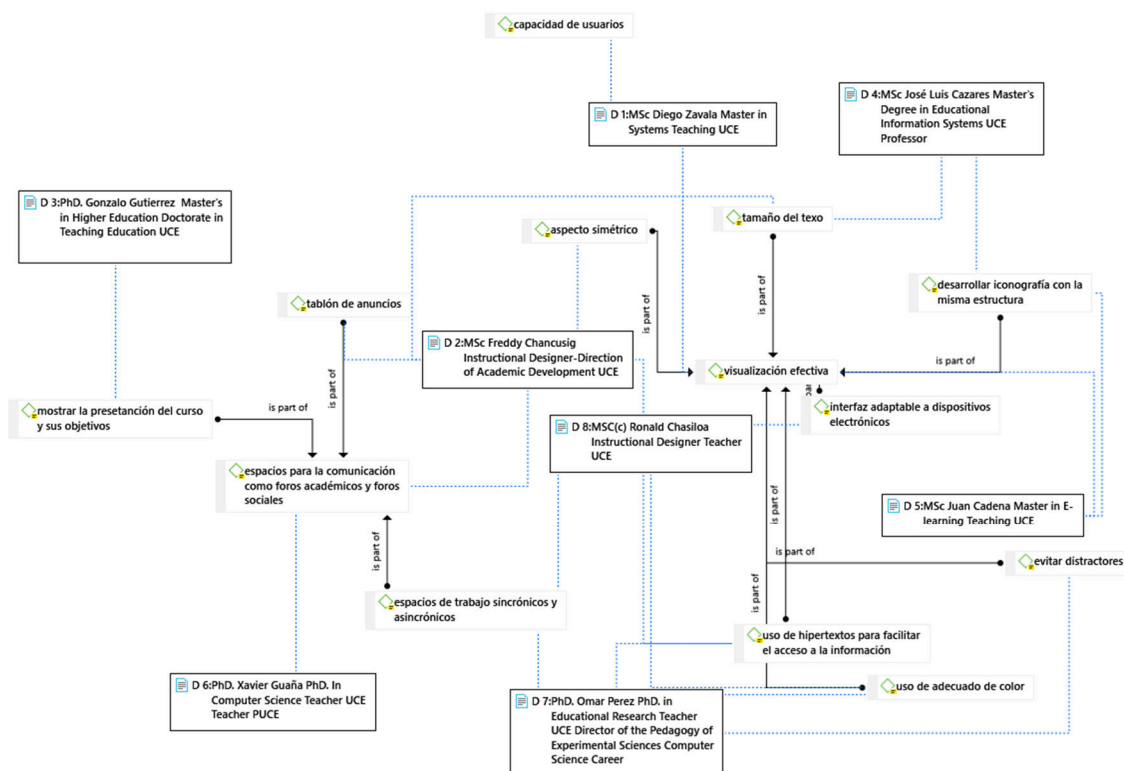## 4.8 Subcategory: EVEA Navigation Interface.

Figure 8. Conceptual network: technical aspects for the design of an EVEA.

Among the technical considerations to be taken into account in the construction of an EVEA, the interviewees mentioned the following:

a) Construction of spaces for academic and social communication such as:
   - Bulletin board with relevant course information.
   - Synchronous and asynchronous workspaces..
b) Effective visualization, i.e.:
   - Use of hypertext to facilitate access to information.
   - Appropriate use of color and text size.
   - Develop a uniform iconography within the course.
   - Avoid distracting.

Rivera (2005) affirms that, in EVEAs, the graphic interface design is fundamental and must provide students with the necessary elements to make the communication of content effective, provide the necessary visual character and expose the content according to the type of users to whom it is addressed. In addition, González (2004) asserts that the interface must support, help and guide the user, so it must: a) avoid saturation and unnecessary placement of elements; b) organize the information in a logical and hierarchical way to access it easily and locate it effectively; c) be consistent in all sections of the platform, graphics and text size, and; d) with regard to resources and activities, the text and graphics used must be related to each other; e) be consistent in all sections of the platform, graphics and text size, and; f) be consistent in all sections of the platform, graphics and text size, and; g) in terms of resources and activities, the text and graphics used must be related to each other, and; h) be consistent in all sections of the platform, graphics and text size.

4.9 Category: EVEA Learning

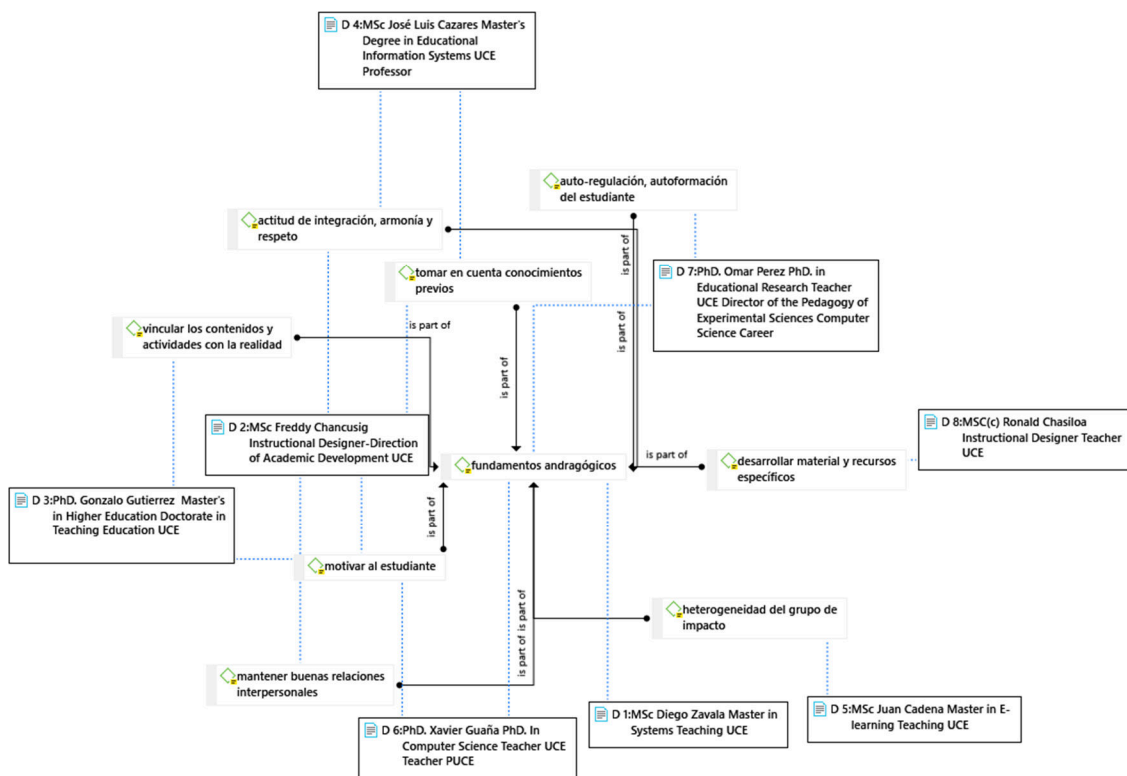## 4.10 Subcategory: Characteristics of adult learners (andragogy).

Figure 9. Conceptual network: andragogical aspects

Among the aspects to be considered in the student learning process, the interviewees refer to the andragogical foundations and state that the following should be taken into consideration:

a) Motivate students to encourage self-regulation and self-education.
b) To link contents and activities with real-life problems.
c) Develop good interpersonal relationships between teachers and students.
d) To take into account the heterogeneity of the group in terms of learning styles, through the development of varied educational resources.

Knowles (1984) concerning adult learning or andrology supports the statements of the interviewees and states the following:

a) Consider aspects such as making the student aware of the need for learning, so that he/she can find out for him/herself the benefits that can be obtained by acquiring such learning.
b) Carry out activities that are oriented to face problems in their context to awaken their interest and learn more effectively.
c) Avoid creating situations in which the student perceives that the teacher is imposing or ordering. Knowles and Kolb (2005) affirm that the teacher must respect the decisions about the level of autonomy of the adult students. Considering these aspects will help to avoid situations of resistance to learning.
d) Consider the diversity of the student body in terms of learning styles, needs and objectives.

Furthermore, according to the experts interviewed and the contrasted information of the authors cited above, the teacher should assume the role of guide in the teaching process, becoming a motivator and intermediary of knowledge, in addition, for a better practice of the teaching process and to apply the considerations mentioned above, the teacher should be an expert in the subject so as to provide students with: a) current knowledge that will allow them to strengthen their professional practice; b) appropriate scientific material for their analysis, and; c) outline the students to lines of research.

Finally, with regard to the role that students should assume in the learning process, it is mentioned that they should be active participants, critical and aware of the need for learning. Tough (1971) asserts that when a student decides to learn by himself, he inquires about the benefits he can obtain from such learning and the negative consequences of not acquiring it. Therefore, much attention should be paid to these aspects in order to maintain a constant learning attitude and provide ideas for problem solving.

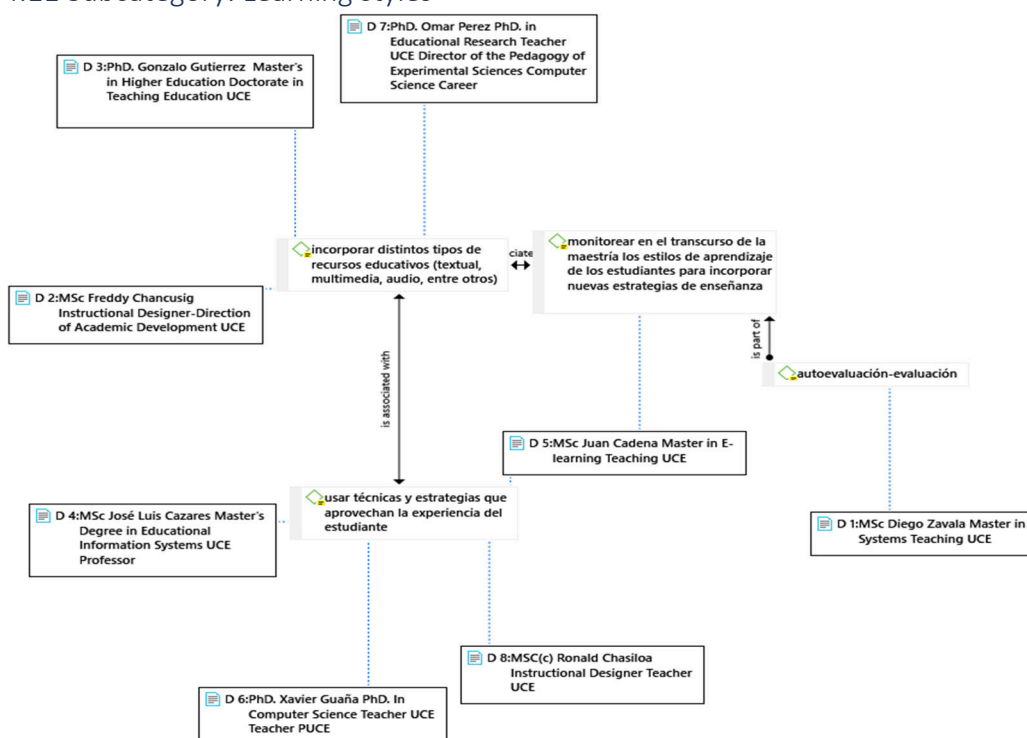## 4.11 Subcategory: Learning styles

Figure 10. Conceptual network: strategies to address the different types of student learning.

The following strategies are suggested to address the different types of student learning styles:

a) a) Incorporate different types of educational resources (texts, images, audios) in the EVEA. Bandler and Grinder (1982) assert that information can be represented visually, auditorily and kinesthetically and that people learn 40% visually, 30% auditorily and 30% kinesthetically. Therefore, it is necessary to develop resources that allow learning in the aforementioned ways.

b) b) Use techniques and strategies that take advantage of the student's experience. In this regard, Sánchez (2015) mentions that "some of the techniques that take advantage of the adult learner's experience are discussion groups, simulation exercises, problem solving, case studies, laboratory methods and peer assistance activities" (p. 97).

It is important to take these two strategies into account when designing activities and resources within the EVEA.

Finally, it is emphasized that the teacher should continuously monitor how the students perform during the course in order to make the necessary adjustments in the activities, resources or teaching strategies.

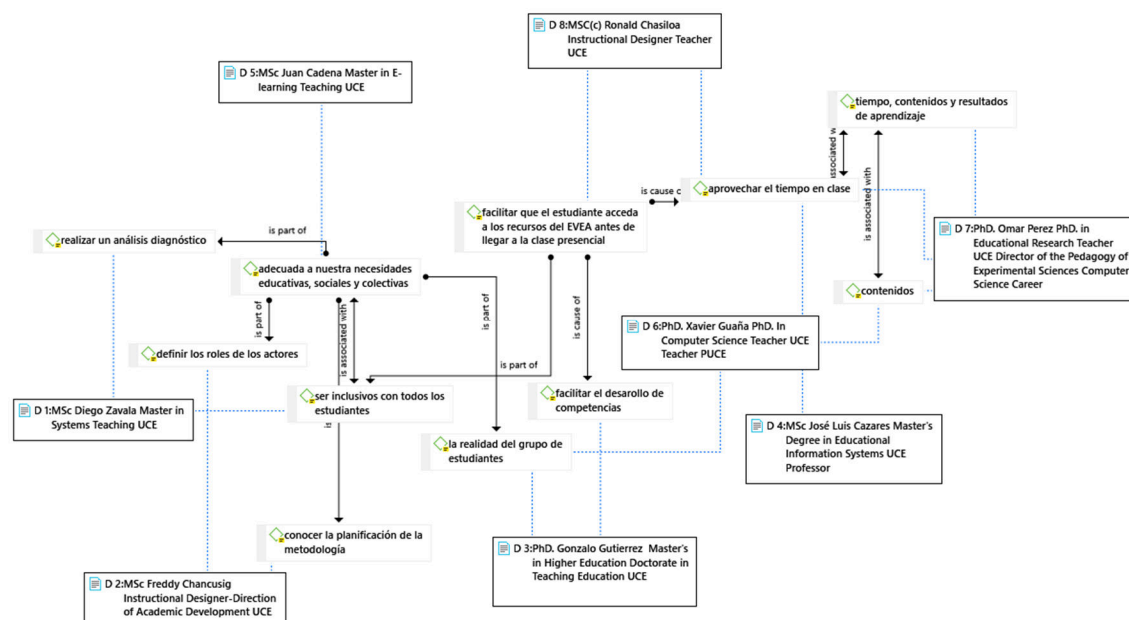## 4.12 Subcategory: Active learning methodologies

Figure 11. Conceptual network: factors for selecting an active learning methodology in EVEA

Finally, in terms of criteria for selecting active learning methodologies, the interviewees refer to the following areas:

a) a) Select methodologies that are adapted to the educational, social and collective needs: considering the group of students to whom the module is addressed and being inclusive with them.
b) b) Take advantage of class time: in this regard, students should be given access to the EVEA resources so that they can analyze them before coming to the classroom..

According to the criteria of the experts interviewed, emphasis is placed on the use of ICT with face-to-face teaching practice, in this sense, the use of the technological approach to B-Learning is recommended. Bartolomé (2008) strengthens this approach since he affirms that this approach allows taking advantage of the benefits of ICT and face-to-face training providing:

> a) equal learning opportunities through flexibility and adaptability; b) facilitate student access to learning resources and activities; c) offer students a greater variety of resources and activities to face diverse learning situations; and, d) allow the articulation of the needs of the actors involved in the learning process (p. 18).

Finally, in order to optimize class time and take into account the characteristics of adult students analyzed above, the use of the active learning methodology Flipped Learning is recommended, because in this methodology the students have a more leading role in the classroom, since they analyze the contents provided by the teacher through technological resources and take advantage of class time by applying the knowledge previously acquired

with the guidance of the teacher, through the solution of problems oriented to their professional practice and solution of real situations. FLN (2014) asserts that the application of this methodology allows: a) taking into account the learning styles of students by offering varied activities; b) making the student become the protagonist of learning by assuming the responsibility of analyzing the resources, interacting with the teacher and classmates and contributing with ideas for problem solving; c) selecting activities and resources according to the learning objective; and, d) having the teacher assume the role of facilitator to provide feedback, follow-up and continuous evaluation.

5. Conclusions

In order to build an EVEA to guarantee quality learning, the research reached the following conclusions:

a) For the construction of an EVEA it is extremely important to start from an instructional design in order to conceptualize, design, organize, create and implement the activities and resources that will be part of the EVEA, to achieve the learning achievements.

b) Although there are a great variety of instructional design models, we recommend the use of the ADDIE model because it is a virtual didactic methodology at the university level according to the MOODLE platform, it fits in any educational environment and its phases take into account all the implicit elements that will be part of the EVEA such as the students to whom the course is addressed, technological characteristics, contents, activities, learning strategies, evaluation processes and follow-up strategies to determine if they have achieved the proposed learning outcomes.

c) The activities that are part of EVEA must be related to the objectives and content of the module and/or subject, and must also be focused on encouraging debate, exchange of ideas, research and problem solving in the professional field in which the students work. In order to design them: a) provide clear instructions for their realization; b) establish the time for their realization; c) provide additional resources for their realization; and, c) make known the criteria for the evaluation of the activity.

d) In reference to the type of activities that will be part of an EVEA, the use of collaborative work (forums, wikis, workshops) and autonomous work (essays, homework, projects) is recommended, based on the use of Bloom's digital taxonomy, which mentions the type of activity that can be developed according to the capacity that is desired to develop in the students and the level of complexity.

e) The virtual educational resources must contain updated and understandable information to support the development of the unit, they must also be varied to meet the different types of learning styles of students, the use of text, audio, images, videos, etc. is recommended and all the facilities must be provided for the student to access them according to their learning styles.

f) It is suggested to use ICT tools that allow the development of autonomous and collaborative work, as tools for the development of autonomous work it is recommended the use of tasks focused on generating coherent pedagogical proposals, applicable to reality and innovative, and as tools to strengthen collaborative work tools that allow the exchange of ideas and encourage dialogue such as: Wikis, Forums and Glossaries.

g) Among the technical considerations to be taken for the design of an EVEA are: a) the creation of a bulletin board with relevant information of the module; b) the use of hypertext to facilitate access to information; c) adequate use of color and text size; development of a uniform iconography within the course; and, e) avoiding the unnecessary use of visual elements or resources in the EVEA.

h) Among the aspects to be considered in the student learning process are the following:
  - Make students aware of the need to learn in order to motivate them in the learning process.
  - The activities carried out by the students should be oriented to the resolution of problems of their professional context to awaken their interest and learn more effectively.
  - The autonomy and experience of the students should be taken into account in this sense the teacher should avoid situations in which the student feels that the teacher is imposing or ordering, so as not to cause resistance to learning.
  - Take into account the heterogeneity of the group in terms of learning styles.

i) Regarding the roles of the teacher and the students:
  - The teacher must assume the role of guide in the teaching process, becoming a motivator and intermediary of knowledge. In addition, they should be experts in the subject matter to provide students with: a) current knowledge that will allow them to strengthen their professional practice; b) current contents; and c) outline the students' research lines.
  - The role of the students in the learning process should be active, participatory, critical and aware of the need for learning, providing ideas for the solution of problems.

j) In order to cater to the different types of student learning styles, different types of educational resources should be incorporated in the EVEA, in addition to using activities that take advantage of the student's experience, such as discussion groups, simulation exercises, problem solving, case studies, etc.

k) For the selection of active learning methodologies that are part of the EVEA, the following should be used:
  - o Select methodologies that are adapted to the educational, social and collective needs.
  - o Consider the group of students to whom the module is addressed.
  - o Be inclusive of all students in order to serve a diverse world.
  - o Select methodologies and approaches that make the best use of class time.
  - o Strengthen the teaching and learning process with ICT tools.

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