# Techno-andragogic Ecosystem Model for Active Learning: digital age learners

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## ABSTRACT

In this era, digital transformation in work processes and new generations such as millennials and centenarians are having an impact of change on organizations. Therefore, it is necessary that those responsible for the training areas look for new pedagogical approaches, such as active learning, for the design of training programs. The traditional instruction, both for e-learning and face-to-face environments, has ceased to have a value in the development of the competencies that promote lifelong learning. The development of competencies based on the lifelong learning concept is part of the agenda for 2030, according to UNESCO, and should also be in the priorities of experts in the design of training programs for adult learners using e-learning environments. The purpose of this document is to introduce a doctoral thesis research plan, and its current status for the creation of a model of a techno-andragogic ecosystem for active learning with diverse architectures integrated into e-learning models that enhance the development of competences. Therefore, the context and motivation of this doctoral thesis is presented, a review of the literature of the primary constructs to be analyzed, the proposal of a mixed method with a sequential concurrent design with predominant approaches in two phases of the investigation: QUAL-QUAN and QUAN-QUAL, which will identify the most effective architectures to promote lifelong learning. The research findings could generate guidelines to incorporate in the design of the ecosystem model to be proposed.

## CCS CONCEPTS

• Human-centered computing • Interaction Design • Empirical Interaction design theory, concepts, and paradigms

## KEYWORDS

Active learning, online, e-learning, training models, training, lifelong, competencies

## 1 Context and Motivation that Drives the Research

The new habits, interests, and preferences of the modern era learners are changing the guidelines in the design of training programs. Also, UNESCO has integrated into the 2030 agenda the development of educational systems that promote lifelong learning opportunities for all [1]. For that reason, the design of training programs should encompass lifelong learning as an inherent component. In terms of online learning, it has been currently studied in the fields of machine learning and data mining [2]. However, the design of courses with these technologies will have a gradual adoption in countries such as Mexico, where it has had significant growth in the business and continuous education areas and which require, more and more,

training in competencies development for the human resource.

In this environment, the need arises to generate learning environments that allow the design of training programs focused on highlighting the new professions of employees and mobility between tasks, jobs, occupations, and industries [3]. Corporate universities and continuing education, in general, require to consider these aspects in the formation of the learners that makes them grow, not only in their skills but in the living conditions. Hence, the interest this research places in the question:

In what way the formative models of e-learning with different andragogic architectures for continuous education allow to develop competencies of the learners and that, at the same time, generate value for the lifelong learning, resolution of problems and creation of higher levels of well-being through active learning processes?

## 2 State-Of-The-Art

### 2.1 Active Learning

Student memorization and teacher transmission of expository knowledge are practices that should remain in the past. This passive learning environment, used in traditional education, is not conducive to the diversity of learning styles [4]. Today, a meaningful design that facilitates the training process is preferred. [5]. Now, students are involved in their learning with practices of doing things and are constantly challenged to think about the things they are doing during their training [6, 7].

The concept of active learning is not new in the educational field. Prince [8] has defined it as a general term for pedagogies focused on student activity and their participation in the learning process. Watkins [9] recognizes it as an act of construction, not just of passive reception; and defines it in a process in five phases: plan, do, review, learn, and apply. The central elements of active learning are student activity and commitment in the learning process [10] and promoting integration actions of observation, experimentation, comprehension, and demonstration [11].

The application of active learning strategies in the design of a course helps to achieve the objectives in a more effective way, and although it is not considered a specific learning method, but a teaching-learning process, the student is able to perform actively, with a specific purpose [12], facilitating the understanding of the information and achieving longer retention of learning [13]. During the process, the aim is to promote an active commitment through the use of materials, resources and ideas in collaboration with others [9], and active awareness, through activities that help them to reflect and create knowledge.

During the process that the student performs, active learning enables the rhythm of study. In the case of face-to-face mode, students regularly measure their own level of understanding in the classroom and have the ability to handle problems that are presented to them in a timely manner [14]. All active methodologies have three common aspects: Cooperation and collaboration between students and teachers improve learning, students must create knowledge, and students must make decisions that involve actions [15].

Although this type of methodologies is not associated with online or blended environments, there are a variety of effective strategies that can be applied, such as virtual debates, work teams, and collaborative environments that encourage and foster a learning community [16].

### 2.2 Online learning

Nowadays, there has been particular interest in online training in the field of adult education. It is considered a teaching model based on a network platform [17], and it has become a tool that supports the teaching-learning processes by integrating it more transparently according to the needs of the learners [18]. It has two modalities [19]: synchronous, in which learning is given face-to-face in virtual environments, and asynchronous, in which students can study at any time and in any place.

Generating a virtual environment suitable for learning is paramount. For that reason, other alternatives help improve the experience of learners [20], such as virtual classrooms, blended learning, web-based training, and the use of micro-content. Also, students with specific learning styles can benefit from the guidance of teachers and peers, through prior discussions or tutorials to select the different e-learning activities that help them achieve optimal learning during their study process [21]. In order to create an environment that generates significant learning, the use of e-learning can facilitate this challenge by incorporating teaching methods that promote participation, which can be the most effective [22].

In this digital age, educational processes have integrated new technologies. So that, the use of Internet technologies will be used in formal and informal learning by leveraging different services and applications [23]. Hence, online courses for organizational training have been widely disseminated with cybernetic innovations, available interaction tools, and digital media [24]. Both online learning and active learning have been an element of study in the fields of machine learning and data mining [25]; an example is the different applications developed to create and adapt the content, in such a way that it is customized to the needs of the learners to accelerate the learning [26]. Also, new technologies have impacted on new models based on the use of social networks, they have introduced different modalities of interaction in a wide range of activities, including practices related to education [27].

### 2.3 Training

Nowadays, anyone who wants to learn about a specific topic looks for different ways to acquire knowledge. One of them is through training, which is a method to improve human performance [28]; although the theories used in recent decades are no longer as effective for new generations [29]. In this way, the andragogic approach, centered on the student, on experience and on problem-solving [30], has been used as a basis for the design.

Therefore, the current need to rethink the way of teaching. UNESCO has integrated into the 2030 agenda the development of educational systems that promote lifelong learning opportunities for all [31]. Today, the lifelong learning concept has become a global competitive strategy that dictates that a person's knowledge must be continually updated [32]. Therefore, the design of programs should include lifelong learning as an integral

aspect, in which the four pillars of learning defined by Delors [33] should be considered: learning to know, learning to do, learning to live together and learning to be.

New digital technologies will create new jobs and replace existing ones; due to this situation, training programs should focus on highlighting the professions of employees and the mobility that will be between tasks, jobs, occupations, and industries [34]. Now the jobs will require professionals to create or judge the relevance of the information; solve complex problems and develop skills such as emotional intelligence, service orientation, as well as the ability to negotiate and collaborate with others [35].

## 3. Hypothesis

In this research work, the following hypothesis is proposed:

**Hypothesis:** If the techno-andragogic architectures are integrated into e-learning models to enhance the active learning process in its phases of planning, doing, reviewing, learning and applying, then the adult learner will develop lifelong competencies, solve problems and generate higher levels of well-being.

## 4. Research objectives/goals

The objective of this research is to assess the impact of the integration of active learning to promote lifelong competences, problem-solving and higher levels of well-being in adult learners, from applying different architectures in e-learning environments of continuing education, with the purpose of proposing a model of a techno-andragogic ecosystem for the active learning of digital age learners.

### 4.1 Specific objectives

- Analyze various e-learning models for the training of adult learners to identify architectures that are effective for active and lifelong learning.

- Define techno-andragogic architectures for each stage of the active learning process, through the evaluation of crucial characteristics and training objectives, to integrate a catalog of architectures.

- Design and implement e-learning training environments that integrate the defined techno-andragogic architectures into their design, through different design and production tools, in order to have prototypes that allow evaluating if they enhance the development of competencies in adult learners.

- Evaluate techno-andragogic architectures in e-learning environments through different training courses in order to identify the most effective architectures to enhance active and lifelong learning.

- Propose a techno-andragogic ecosystem of active learning with diverse architectures integrated into e-learning models that enhance the development of competences in each stage of the active learning process, in order to promote lifelong learning, problem-solving and generation of higher levels of well-being in environments of continuing education.

## 5. Research Approach and Methods

### 5.1 Research Method

The mixed method will be used in this research, which involves the collection of quantitative and qualitative data, integrating both research approaches, including a theoretical framework and assumptions from the state of art. Using this method allows for a complete understanding of the research problem [36].

When designing a mixed method, it is recommended to make two decisions: manage the study within a dominant paradigm or not, or conduct the phases concurrently or sequentially [37]. Therefore, considering the above, a sequential, concurrent design will be carried out [38] with predominant approaches in two phases: QUAL-QUAN and QUAN-QUAL. Figure 1 shows the procedures and instruments that will be applied in each one.
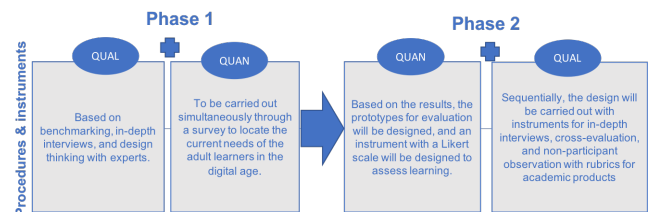


**Figure 1: Procedures and instruments**

### 5.2 Population and sample

Experts in pedagogy, competencies, and educational innovation, as well as participants in e-learning training programs. For the selection of participants, a probabilistic sampling (quantitative study) of approximately 300 participants and a purposive sampling (qualitative study) with 15 participants approximately for the benchmarking sessions and 30 participants for interviews and non-participant observation will be used [39].

### 5.3 Study variables and instruments

The following study variables have been considered

- Active learning. With the five stages proposed by Watkins [9]: plan, do, review, learn, and apply, and with input from Britt [40], learn, remember, and do.

- E-learning models. The different models of learning will be evaluated: construction, contextualized, inquiry, reflection, and digital competencies [41].

- Lifelong learning. The concept integrates contributions from UNESCO that promote lifelong learning opportunities for all [1] and that a person's knowledge must be continually updated [31].

These variables will be analyzed, considering the following instruments and techniques.

Phase 1:

- Benchmarking, in-depth interviews and design thinking with experts in pedagogy, competencies, and educational innovation to locate innovative strategies and training models (Variables: active learning and e-learning models).
- Survey to analyze the current needs of adult learners in the digital age (Variable: lifelong learning).

Phase 2:

- Likert scale questionnaire to assess the learning of adult learners after e-learning training experiences (Variables: lifelong learning and e-learning learning models).
- Interviews with end users to know the level of achievement obtained in training (variables: lifelong learning) and cross-evaluations and non-participant observation, with rubrics, to assess actions and learning products of the participants in the e-learning environment (variable: active learning).

### 5.4 Sources of Information

Participants in e-learning courses, experts in pedagogy, competencies, and educational innovation, as well as products generated in e-learning environments.

Digital material: Scopus and WoS articles, books, e-books, videos, reports, and journals that allow identifying the state of the art of the variables to be involved in this research.

### 5.5 Collect and analyze information

**Phase 1:**
In this phase, the data will be obtained with the benchmarking to different sources (experts and literature), the application of interviews to experts, design thinking with a group of learners and the application of a survey to e-learning course participants.

Based on the results, the data analysis will be carried out to obtain two products: the final report with the participants' profile, training needs in the digital era and the initial catalog of techno-andragogic architectures to be used in the development of the study.

**Phase 2:**
In this phase, the interpretation of the information obtained in Phase 1 will be carried out to design prototypes on e-learning modes. Also, a pilot test and the evaluation of the prototypes will be done. Based on the results, adjustments will be made to prototypes and the application of e-learning training.

With updated prototypes, the participants defined in the sample will be included for the evaluation of the architectures through the Likert scale questionnaire application. Also, in-depth interviews will be conducted, as well as cross-evaluation and non-participant observation at the end of the training for the established academic products.

Once the results have been obtained, the data analysis will be carried out, to develop a report of results that defines the model of a techno-andragogic ecosystem for active learning.

## 6. Results to date and their validity

When using a mixed design, the analysis and interpretation of the results from different points of view is expected, which gives an amplitude and depth to understand and corroborate the obtained findings [42].

In both phases of the study, a triangulation of the data obtained in the different researched sources and the application of the defined instruments and techniques will be carried out. At all times, the data will be assessed from an objective and independent point of view and the ethical code proposed by the British Research Association[42], will be considered, following an ethical guideline for all actions that are integrated into this investigation.

## 7. Media and Resources Materials

This work is developed for the doctorate of Training in the Knowledge Society of the University of Salamanca [43,42,43]. This web portal http://knowledgesociety.usal.es is the main communication tool and visibility of advances [44]. In this web portal will be incorporated all publications, conferences, attendance at congresses and research interns during the course of work.

## 8. Dissertation Status

Currently, the research plan has been defined to be completed in 3 years, and the development of Chapter 2 of the State of the Art has begun with the literature review through a systematic mapping of literature and systematic review of literature of the main topics in which the research is focused: active learning, e-learning, and training.

## 9. Current and Expected Contributions

The contribution to the field of scientific education is the proposal of a model based on a techno-andragogic ecosystem of active learning with diverse architectures integrated into e-learning models that enhance the development of competences in each stage of the active learning process.

The objective of having this ecosystem is to provide those responsible for the design of courses in e-learning environments with the most effective architectures to apply at each stage of the active learning process to promote lifelong learning, the resolution of problems and the generation of higher levels of well-being in training environments for professional updating.

## ACKNOWLEDGMENTS

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