

Towards the Design of a Conceptual Model of an Intelligent Tutorial Device for Adult Training: Analytical Approach

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ABSTRACT

The development of all online adult learning devices must draw its conceptual and methodological foundations from the theories, principles and models of adult learning. Our research work lies in this synergistic alignment of learning strategies and adult learning strategies. In a hypothetical deductive approach, and adopting the method of meta-analysis of data from the literature specialized in adult learning, we propose a conceptual model of intelligent tutorial device (DTI) that brings into interaction dynamic adult learner, Learning situation and computer and multimedia environment. This work constitutes a draft of a doctoral project for scientific and andragogical reflection on the integration of new information and communication technologies into adult lifelong learning, including in literacy situations.

KEYWORDS: Design, adult education, conceptual model, intelligent tutorial, analytical approach.

Introduction

We are witnessing today a strong explosion of knowledge and knowledge, and a rapid evolution of societies towards the industrialization of knowledge, information and computer technologies. The professional or even life requirements become more and more enormous requiring the individual to master a large number of knowledge and skills so that he can make sound judgments and make reasonable decisions in all aspects of his life. This knowledge has become essential for his quality of life requiring continuous training and which must continue throughout his life.

The issues of adult education and training are not new today. The interest taken by societies in adults and in their education dates, back to the times of Confucius in China then to the times of the Greek philosophers, Aristotle, Plato..., [1; 2]. Adulthood is now more associated with continuing vocational training or recently with lifelong learning [3; 4].

The university as training operator and pole of competence par excellence of training has taken on its shoulders this complex task which is to set up adult training systems whether in a formal, informal or non formal. The world conference on higher education held in Paris in 1998 defined new missions for higher education [5]. From now on, the 21st century University must offer an open space for continuous training and lifelong learning, by setting up flexible and open access training systems, making reference to the different configurations of the online training:

distance learning, e-learning or Massive open Online Course (MOOC), distance learning environment and blended learning.

This work therefore constitutes a draft of a doctoral project of scientific and andragogical reflection on the integration of new information and communication technologies in the training of adults throughout life including in literacy situations and post literacy training, as part of a partnership agreement between the Abdelmalek Essaadi University (UAE) and the National Agency for the Fight against Illiteracy (ANLCA). It is also a follow-up to the initiative of the UNESCO Institute for Lifelong Learning (UIL) relating to the creation of regional doctoral training involving the 12 countries integrating the RAMAA II project.

Problematic

The education and training of adults have been the subject of numerous theoretical and pragmatic researches, researches on the development of the concept of andragogy and the underlying models. Henschke and his collaborators presented an interesting synthesis on the description, the development and the evolution of the concept of andragogy as well as the emergence of related models [6]. Other researchers have focused their work on modelling adult learning through the description and comparison of different theories, and different principles and models [7; 8; 9; 10; 11]. Other research has focused on the application of theoretical models and principles of adult learning to the implementation of online training [12; 13].

Sharan professor and specialist in adult education at the University of Georgia- believes that today we have enough data on adult learners, on their specific characteristics, on the way they learn, on the role that the factors non-cognitive in their learning processes, on the determining role of the context of their learning [10]. This leaves us optimistic about the issue of the use of online training technologies and the contribution of the university to the development of lifelong learning spaces.

It is certain that the development of computer programming associated with multiple multimedia technologies makes it possible to envisage on-line training devices favouring the exercise of a takeover by the adult learner over his own training, an adaptation to profile and needs of the learner. The use of information and communication technologies in adult online training has been the subject of much research to show the place and the importance and future prospects of these technologies in training. Most research has focused on the roles of user and tutor, design and modelling of digital content [14; 15; 16]. But very little research has concerned the problem of the alignment of training strategies adopted in training systems and adult learning strategies as they are revealed by the foundations of adult learning.

In fact, the major problem of these digital systems or devices lies in their andragogical and didactic relevance. If formal teaching practices are based on theories and models of learning, there is no reason why the design of online adult learning devices should not be based on theories and models, of adult learning.

Our research is also part of this perspective of developing training systems for adults in continuing education or in lifelong learning, bringing together theoretical and practical areas related fields namely, cognitive sciences, neurosciences, educational sciences on the one hand and the fields of computer sciences, multimedia technologies on the other hand and the fields of pedagogical / andragogical and didactic engineering.

We agree with Louise Marchand that adult training requires new, flexible, adaptable and less formal training approaches [17]. We add that the implementation of training systems themselves must be based on approaches, theories and underlying models of adult learning.

The work that is the subject of this paper is a first contribution to the study of the problem of training alignment. Its objective is to predict a conceptual model for an intelligent tutorial training device for adults. We answer two major research questions:

1. What are the theories and models integrating adult learning?
2. How to use these models to set up a basic conceptual model for the implementation of a tutorial and intelligent device for adult training?

Methodology

Our research is part of a hypothetical-deductive approach which consists of three phases: the conceptualization phase which consists of defining the problem (alignment of the adult learner model and the model of the tutorial and intelligent training device) , to analyze the data from the literature (theoretical and pragmatic research) and to deduce the hypothetical and predictive model (object of this research). The other two phases of the process's research (implementation, experimentation and validation phase) will be the subject of future publications.

For the analysis of the literature, we adopted the method of meta analysis which according to Gueguen and his collaborators, it is essential like the method most used to synthesize a whole of research relating to the same topic, the same process... [18]. We have analyzed data from several research articles dealing with the theories, models, principles and characteristics of adult learning to deduce the main components on which we will build our conceptual and hypothetical model.

Learning in Adulthood: Theories, Principles and Models

The specific principles of adult learning draw their origins from various psychological, sociological, cognitive and humanist theories [19]. These principles also come from various practices in the field of adult education and training. The former serve as conceptual models and the latter relate to teaching and training strategies.

In 1926 E.L. Thorndike, by studying adult learning skills, already raised the need to think of pedagogies specific to adult education. For his part, Lindeman, inspired by Dewey's ideas, carries out work on adults and leads to write and publish his famous work "The meaning of adult education" where the concept of the adult learner constitutes the central object of the study [20].

It was therefore only at the beginning of the 20th century that researchers in various fields related to learning began to take a serious interest and concern in matters of adult learning and teaching. We are therefore witnessing from the 1960s to the present day an emergence of theoretical and pragmatic studies relating to adult learning and training, which will consequently generate several theories and models of learning, but also different methodological frameworks for adult training practices. These works gave rise to many basic principles and hypotheses mainly those attached to the andragogical model of Malcolm, to the self-Directed Learning model, the model of transformative learning (Transformative Learning) and the model of situated cognition (or Context Learning) described by Sharan B and which we will analyze in this article in order to deduce components for our hypothetical model of the online training system [10].

The basic Theories

Although the classical theories of learning, namely behaviourist and cognitivist, do not distinguish between the

child learner and the adult learner, they still constitute the foundations of all pedagogical and didactic models until today. Adopted in our teaching / training and therefore can be an inspiration for the development of principles and models related to adult learning.

The behaviourist current considers learning as the product of the interaction of the stimulus with the response that results from it. According to Watson and his adopters of the behaviourist current, the behaviour synonymous with learning occurs in the presence of a definite event in the environment, which is called "stimulus". The stimulus is simply what is in the environment, determines the response, so it can take different forms (text, image, sound, video etc.).

Unlike the behaviourist approach, cognitive, constructivist, socioconstructivist and recently connectivist approaches to learning focus on the factors of the internal processes of knowledge acquisition and transformation in the brain. These approaches consider learning as an active knowledge-building process; recognize the presence and role of prior knowledge, the value and importance of social interactions, the determining role of the learner in the construction of his own learning and in the mobilization of its prerequisites in the treatment and resolution of life's problem situations.

Cognitive approaches are concerned with the organization and structuring of knowledge in the learner's memory. Information processing theories describe learning as a series of information transformations in the human brain, highlighting the determining role of different memories (long term, short term and working memory, but also the role of the situation and the context in the development of meaningful and maintainable learning.

Adult Learning: Birth of Andragogy

The term "Andragogy" originated in 1833 from the German educator Alexander Kapp. [21] This concept then evolved into a theory of adult training thanks to the work of the American Malcolm Knowles in the 1950s. Andragogy considered by some as a concept, by others as a theory or a new paradigm, by others, such as a series of hypotheses or principles or simply a method or the art of teaching adults, pretends, in fact, to distinguish the child learner from the adult learner [22; 23].

According to Elias and Merriam, andragogy draws its principles from several philosophical currents mainly the classical and contemporary humanist currents, the behaviourist and cognitivist currents and the radical and analytical currents [24].

In 1980, Malcolm Knowles made 4 hypotheses concerning the characteristics of adult learners. Later in 1984, he added a fifth hypothesis: These hypotheses totally intersect with those proposed by Lindeman (1926) who, according to Mannin, constitutes the foundation of modern theories of adult learning [25].

- The concept of self: in adulthood, the learner no longer sees himself as a dependent person. He tends towards an independent person, responsible for his learning
- The experience of the adult learner: with age the adult accumulates a reservoir of experiences and errors which constitute an internal source for future learning.
- Willingness to learn: Adults are more interested in learning that has ties to their daily lives.
- Orientation of learning: In their professional or even social life, adults constantly confront authentic situations which they are called upon to deal with and resolve. His learning therefore tends towards situations rather than content.
- The motivation to learn: With age, the motivation to learn of adults becomes internal.

We deduce from this model that we find in most works in andragogy () that the "motivation" factor is essential in the learning of an adult, to the extent that will be determining in the installation and reinforcement from autonomy to learning. Learning through situations appears to be the most relevant approach for adult training as it will allow adults to exercise and develop their pool of pre-acquired knowledge and their accumulated experience. The authentic situation in our opinion becomes a source of motivation and interest for meaningful and functional and lasting learning for adults.

The Theory of Self-Directed Learning

According to Sharan, andragogy and Self-Directed Learning (SDL) are the pillars of adult learning. The Self Directed Learning concept emerged around the same time as Malcolm Knowles introduced his concept of andragogy in which, moreover, the concept of self or the tendency towards autonomy constitutes the first hypothesis. You could say that this stream of directed learning is just an extension of Knowles' thinking. The SDL owes its emergence as a major theory in adult learning and training practices, to Tough's research on the self-determined learning projects of Canadian adult learners. [26]. The numerous research studies on self directed learning as a conceptual theoretical principle [10; 27]. Or as an education or training strategy testify to the importance of this concept in understanding adult learning [28]. Sharan points out that SDL is omnipresent in the life of an adult, particularly in the area of interest to our research, which is adult online learning or training.

According to Garrison, the concept of self directed learning is central both in the understanding of adult learning and in the design of training practices for adults [28]. Mezirow argues that the concept of self-directed learning is the most critical in defining adult education [29]. Knowles describes self directed learning as a process in which the learner takes the initiative, with or without the help of others to diagnose their learning needs, formulate their objectives, identify the

resources to learn, choose and implement the appropriate learning strategy and assess for themselves the effects of their learning [30]. Still, according to the founder of andragogy, self directed learning is more in line with our natural processes of psychological development [29; 31]. Knowles also sets out five key assumptions that underlie self-directed learning:

- Self-directed learning supposes that the human being acquires more and more capacities allowing him to direct and direct his learning;
- Self-directed learning assumes that learners' experiences become an increasingly rich learning resource;
- Self-directed learning assumes that individuals are ready to learn what is necessary to accomplish their evolving life task or to face their life problems more adequately;
- Self-directed learning supposes that the natural orientation of individuals is centered on the task or the problem;
- Self-directed learning assumes that learners are motivated by internal incentives such as the need for self-esteem.

Garrison, on the other hand, offers an SDL model with three fundamentally linked dimensions which is decisive in the development of the self directed learning process [28]. Figure 1 illustrates the Garrison model.



Figure 1: Dimensions of Self-Directed Learning Garrison model [28]

Self-management consists of the management and control of learning tasks. It will therefore depend on the external activities associated with the learning process (objectives, learning methods, communication tools, reinforcement, support, and.).

Self-monitoring deals with cognitive and met cognitive processes. It consists of controlling and managing the learning process (knowledge structuring, coding and information transformation process, problem solving algorithm, etc.)

Motivation, on the other hand, plays a very important role in initiating and maintaining learning efforts and in achieving cognitive goals. "we do know quite enough to be certain that motivation al factors have enormous practical influences on the kinds of cognitive activities that underlie human learning" [32].

The long years of research in theory of Self-Directed Learning, have led Hiemstra and Brockett to a three-dimensional SDL model (PPC: Person, Process, Context) which is none other than updating and adapting their 1991 model (PRO: Personal Responsibility Orientation), to evoke the decisive role of the context in his vision of the SDL model [33]. Figure 2 illustrates the PPC model.

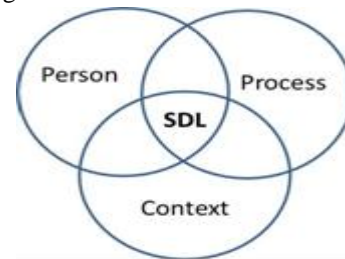


Figure 2: The Person, Process, Context (PPC) Model

We deduce from these different models of Self-Directed Learning that motivation and context are inseparable and are decisive in the implementation by adults of a self-learning or self-management strategy, of these cognitive, met cognitive and socio-emotional processes.

The Transformative Learning Theory

Another model of adult learning that is in high demand in the literature specializing in education, adult learning and training is the transformative learning model. This theory was originally developed by Jack Mezirow in the late 1990s, to account for and describe how individuals construct, validate, modify, reconstruct their ideas and representations gained from their life experiences [33]. Inspired by the constructivist current of learning, Mezirow claims that the way in which learners interpret and reinterpret their sensory experience is decisive in the construction of meaning and therefore of learning [34].

This theory is based on four fundamental principles:

- Adults present two types of learning: instrumental (emphasizes learning through task-oriented problem solving and determining cause and effect relationships) and communicative (involves how individuals communicate their feelings, their needs and wants);
- Learning involves a change in meaning structures (representations or cognitive structures);
- The change in the structure of meaning occurs through a reflection on the content, the process;
- Learning can include: refining / developing representations, learning and integrating new knowledge, transforming representations, etc.

We deduce from this theory that the adult learner has an affinity for learning by and // in action, by putting his prerequisites (of life experience) into practice in solving problem situations, and adopting reflective practices.

The Theory of Situated Cognition: The Role of Context and Action in Adult Learning

Being all cantered on the way in which adults learn, andragogy, self-directed learning and transformative

learning do not explain the nature, the model or even the effect of the situation or context of learning, while numerous studies have highlighted the importance and the determining role of the context of learning by focusing on the concept of situated cognition or situated learning.

Situated cognition is a theory which postulates that knowledge is inseparable from action, therefore from its cultural and social context in which it was learned [35]. According to Cobb, P, cognition is an internal process of information processing which will certainly depend on the tools, artefacts and social interactions used for learning [36]. For Lave, learning is a function of the learner's activity, the context in which he appears, the culture from which the learner comes and from which learning appears [37].

The importance of the learning context is that the learner builds knowledge from complex learning situations these situations are close to those encountered in everyday life they contain authentic problems, they contain problems to be solved, different nature (methodological, cognitive, affective...)

For Merrain, three factors in context condition the constructive learning of an adult, namely, the people in the context, the tools available and the learning activities themselves [10]. Illeris offers a model of learning in the workplace integrating three dimensions: the content dimension (knowledge, skills, attitudes, etc.), the incentive dimension (feelings, emotions, motivation) and the interaction dimension (communication, cooperation, collaboration) [38].

We then deduce that the context then represents the way in which we give meaning to the experience by distinguishing what is relevant from what is unimportant. We agree with Mandl, and Reinmann-Rothmeier, by stressing that the learning environment and context must provide the adult learner with authentic situations allowing him to build his knowledge individually or in a group by appropriating new content, new cognitive and metacognitive strategies allowing him to solve problems related to his professional or social life [39]. In the case of online training, it must be said that new technologies offer immense possibilities for developing very rich learning contexts.

In this sense, the theory of experiential learning seems important to us to better understand the role of the situation or action. Many authors have explored the processes of experiential learning. In Mucelli Rogers' andragogical model, motivation for training closely depends on the characteristics of the adult and the situation being learned. [40] Berni Mc Carthy's (1985) model emphasizes the important role of action in adult learning: adults learn by doing [41]. He joins the experiential model of Kolb who claims that the dynamics of learning is anchored in concrete and immediate experience which goes through observation and conscious reflection and then through abstract production [42]. Jarvis (1987) offers a model of learning involving a dynamic interaction between situations, practical

experiences, memorization and reasoning [43]. Shon's model focuses on reflective practice in action: act first, think afterwards. For him, the chain of actions must be considered from action to reflection [44].

In conclusion, this theory highlights the important role of the context (or environment) of learning but especially the value of the authentic situation, anchored in the daily, professional or social life of the adult learner. A problem situation inviting the adult learner to develop and generate cognitive, metacognitive and emotional processes, thus promotes meaningful, functional, transformable and transferable learning. We agree with Lave and Werger (2005) that knowledge must be presented in an authentic context or situation, made up of clear, precise and organized knowledge but also requiring processes of transformation calling on mental activities that generate meaning.

Conclusion and Summary

By way of synthesis and conclusion, we propose our conceptual and hypothetical model of intelligent tutorial device for online adult training. Indeed, adult learning is a very complex phenomenon. No single theory can explain how an adult learns. Adult learning integrates several behaviourist, cognitivist, humanist, social, technological, etc. dimensions.

Cross-analysis of data from the cited literature allows us to assume that adult learning can only be done in a dynamic and interactive perspective between the adult himself - with its different characteristics: cognitive, metacognitive, social, emotional... and the context of learning represented by the training environment, the triggering situation of learning.

We present in Figure 3, our compact model of the tutorial device, based on 4 components in dynamic interaction:

- The adult learner: at the centre of training;
- The multimedia environment: interface; interaction and learning tools;
- The training situation: anchored in the experience of the learner;
- The tutor: the learning facilitator.

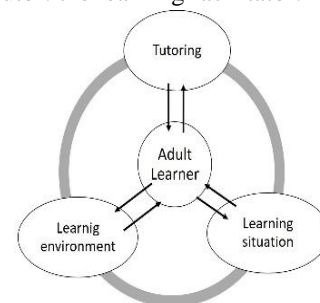


Figure 3: DTI Compact model

The motivation of the adult learner to training / learning is the main engine capable of managing the different forms of learning, self-directed, transformative; social ... The situation in turn can stimulate such motivation. It should

then be structured around the experience (professional or social) of the adult learner, integrating useful and functional knowledge, internal transformation processes.

The adult learner, like the situation or the context of learning being integral parts, of the tutorial and intelligent device of the online training. This system should integrate databases on the adult learner: cognitive (representations and structuring of knowledge), metacognitive (transformation process, regulation...), emotional (what he likes, what he needs, what he feels ...), but also a database on the learning situation (structure of knowledge internal to the situation and call to memory; structure of transformation processes to generate ...

The device must have all the tools necessary for learning: communication, self-assessment, self-monitoring, progress tracking. In our opinion, two management engines are essential that of static data management (learner profile and situation profile) and a process management engine (those generated by the adult learner and those generated by the situation). Meaningful learning is essentially based on the intelligence capacity of the device to align the training strategy (external) and the learning strategy (internal). Figure 4 illustrates our exploded model of the design of said device in the theoretical and modelling perspectives analyzed in the previous part.

According to this model, effective and lasting learning for the adult learner results from their interaction with the triggering or authentic situation. The STI system, through these two knowledge management engines and transformation processes, will guide the adult learner in solving these learning tasks (or problem-solving tasks) by offering them the necessary suggestions.

In this model, each authentic learning situation carries a set of data: problem data (internal data), data to be restored from memory (external data) and data from the various transformation processes.

For the adult, the context of learning is decisive in motivation to learn insofar as this motivation will trigger in the learner a self-learning directed by the learner himself, a functional learning which will serve in his daily or professional life.

In response to our research questions, all the theories that served as the basis for explaining and modeling adult learning intersect in the importance of the interaction between the adult learner and the object situation. training. Any strategy for designing an e-learning device must take into account the affinity of adults for self-directed and transformative learning. Depending on the model of the situation, the tools available to him and the quality of the tutoring will depend on his motivation, his emotions and his attitudes towards training.

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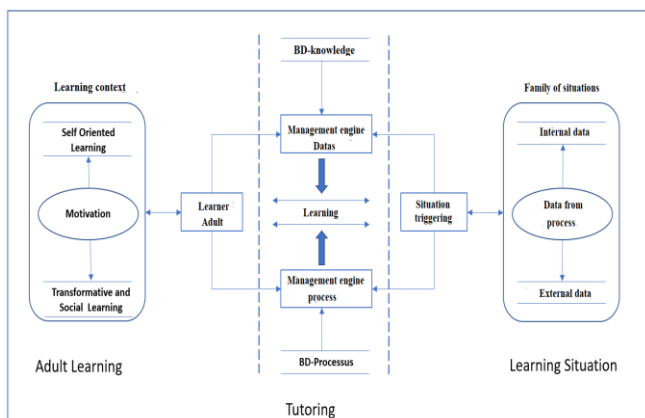


Figure 4: DTI Exploded model

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