Implementation of an e-learning system for in-service teacher training in response to the current pandemic situation: From conceptualisation to implementation of a system model

Anajar Abdelhak[1]

[1](Laboratoire Recherche de Veille pour les Technologies Emergentes VETE, Faculty of Science and Technology FST, University Hassan 1st, Morocco)

Abstract:
Background: Today, the expansion of new technologies can serve more than ever before in driving the relationship between teaching and learning. Indeed, the global pandemic situation requires opening up to opportunities for the dissemination of knowledge; in order to respond, in a first objective, to the spatiotemporal constraints required by the barriers of social distancing, and also, in a second objective, to the specific circumstances and considerations of the learners. A real transformation of training in Morocco is taking place, accompanied by a political will to make e-learning a success with the means and budgets available in new technologies. The present work consists in verifying whether the distance training mode is appropriate to the context of teachers within the framework of continuing training, their needs, and expectations. Thus, the objective of this work is to show to what extent the mode through the installation of a distance training, could promote the success of teaching, the professionalization of teachers, the development of virtual communities, based on knowledge, saving time, and finally better managerial efficiency in the management of teaching.

Materials and Methods: The present work consists in verifying whether the distance training mode is appropriate to the context of teachers within the framework of continuing train-ing, their needs, and expectations or if, on the contrary, the appropriate mode would rather be a hybrid/blended learning mode. we will focus on the interest of e-Learning for the development of training. We will mainly address the interdependent relationship between the human, the technology, and the organization, based on the theory of symbiosis developed by Brangier. This theoretical framework will help us to clearly formulate the problematic and the hypotheses of our research. Then, to specify the context of our study, so as to account for the place occupied by continuing education, new technologies and e-Learning experiences in Morocco. Finally, the experimental part of this work will allow us to analyse the impact of e-learning on a group of teachers and learners in continuing education, consisting of seventyactors within the IT-Learning Center of the Faculty of Science and Technology FST, as well as certain important aspects related to this mode of training.

Results: Despite the innovative nature of the system put in place, which requires real change management as well as time for the appropriation of the tools and teach-ing aids implemented, the responses of the respondents show that, in general, it was possible to adapt to this training method (e-learning). Observation of the participants' attitudes highlighted that the objectives achieved go beyond the simple acquisition of knowledge and affect the attitudes and behaviours of the learners, preparing them to evolve effectively in their professional environment.Among the main problems faced by the trainees, the majority of them emphasized the technical problems associated with mastering the functionalities of the platform used (70%), as well as their own availability for training (65%: difficul-ty in reconciling professional, family and training time). Others, fewer in number (34%), felt that collaborative work was not easy given the difference in work pace, skills, motivation, and availability of each team member.

Conclusion: Our research work concluded that the effectiveness of e-learning depends on three important conditions, all linked to the respective commitment of:
- of the institution: involve the various actors;
- of the learner: to trigger in him a feeling of "affiliation", self-efficacy and "self-determination";
- the trainer: his driving role helps to maintain the motivation of the learner.

Key Word: E-learning system, Assessment, Technical teacher training, Online and laboratory learning, Information Technology IT, E-learning Model, Tutoring.

I. Introduction

Today, the expansion of new technologies can serve more than ever before in driving the relationship between teaching and learning. Indeed, the global pandemic situation requires opening up to opportunities for the dissemination of knowledge; in order to respond, in a first objective, to the spatiotemporal constraints required by the barriers of social distancing, and also, in a second objective, to the specific circumstances and considerations of the learners.

A real transformation of training in Morocco is taking place, accompanied by a political will to make e-learning a success with the means and budgets available in new technologies, but with the consideration of certain constraints: Firstly, constraints from certain teachers who, are opposed to a top-down national approach, remain sceptical and hesitant about any educational innovation. Secondly, there are organizational constraints in addition to logistical problems relating to the implementation of training programs. These difficulties can significantly impact the quality process as well as the objectives and challenges of training.

E-learning refers to a distance learning process based on multimedia resources, favouring both accessibility and flexibility for both the learner and the teacher. Thus, open and/or distance learning is a flexible training system organized according to individual or collective needs (individuals, companies, territories). It includes individualized learning and access to local or remote resources and skills. It is not necessarily carried out under the permanent supervision of a trainer[1].

From this definition, it can be said that e-learning, because of its flexible nature, is the training mode that would seem best suited to the context of continuing education and to individual and institutional needs. Moreover, it is a training method which encourages the learner's autonomy and ability to self-train and learn at his or her own pace, anywhere and at any time. These advantages fit perfectly with the specificities of continuing training which, for its part, assumes a permanent relationship with training, while promoting, among trainees, adaptation to the change and innovation introduced in the workplace as well as the possibility of career advancement. At the institutional level, continuous training contributes to the performance of the organization and to better knowledge management, even to economic, cultural and social development. This is emphasised in the following two definitions of continuing education and the e-learning system.

a. Continuing education is part of lifelong learning. Its purpose is to enable workers to adapt to changing techniques and working conditions, to promote their social advancement through access to the various levels of culture and professional qualifications and to contribute to cultural, economic and social development[2].

b. An open and distance learning system is a system that is organized, finalized and recognized as such by the players, which takes into account the singularity of people in their individual and collective dimensions, and is based on complementary and plural learning situations in terms of time, place, resources, educational, human and technological mediation[3].

The present work consists in verifying whether the distance training mode is appropriate to the context of teachers within the framework of continuing training, their needs, and expectations or if, on the contrary, the appropriate mode would rather be a hybrid/blended learning mode. Thus, the objective of this work is to show to what extent the mode through the installation of a distance training, could promote the success of teaching, the professionalization of teachers, the development of virtual communities, based on knowledge, saving time, and finally better managerial efficiency in the management of teaching. To do so, we consider, on the one hand, individual determinants of the adoption of new technologies such as attitude, motivations, perceptions and degree of satisfaction, and on the other hand, socio-organizational aspects such as the context of integration and the support of the institution.

Of course, taking up the challenges of continuing education, the introduction of the e-learning mode makes it possible to manage the problems of availability of learners engaged in the professional world as well as to help them update their knowledge and improve their skills. However, it is worth pointing out that setting up an e-learning system is technically, educationally, and organizationally complex, and requires expertise that brings together different skills.

On the one hand, it is necessary to make a choice of tools and technical supports in particular e-learning platforms or content management platforms, which are not only adapted to the objectives but also to the training strategy. On the educational level, the very design of the content and the scripting of the training must take into consideration the reference educational models. Thus, several possibilities are offered: choose a type of support (called tutoring) and appropriate follow-up or, on the contrary, promote self-training, schedule face-to-face grouping sessions or provide the training completely online.

Another educational challenge of e-Learning consists in promoting individualized courses taking into account the singularity of learners in their individual and collective dimensions, and at the same time, are suitable for a wide audience. As for the organizational aspects, experience with e-learning has shown that successful management depends on three essential phases: diagnosis of needs, clarification of players and procedures and support for change.

This article is structured as follows: first, we will focus on the interest of e-learning for the development of training. We will mainly address the interdependent relationship between the human, the technology, and the organization, based on the theory of symbiosis developed by Brangier. This theoretical framework will help us to clearly formulate the problematic and the hypotheses of our research. Then, to specify the context of our study, so as to account for the place occupied by continuing education, new technologies and e-Learning experiences in Morocco. Finally, the experimental part of this work will allow us to analyse the impact of e-learning on a group of teachers and learners in continuing education as well as certain important aspects related to this mode of training.

The value of e-learning for the professional development of teachers and learners

The research literature clearly highlights the crucial role of continuing education in the process of professionalizing teaching practices. According to Glickman, the globalization of production, the pressure of international competition, changes in the nature and organization of work linked to demands on skills, and the emergence of the information society make training a determining factor in economic and scientific progress and the future of individuals and societies[4].

Other research (Huberman, Charlier) has made it possible to specify the conditions favourable to teachers' professional development, namely the organization of training around a collective project, the reflection on one's own learning (metacognition) and the integration of training into one's professional career. These conditions imply recourse to action (Yinger); interaction with peers (Huberman) and reflection on one's practices (Zeicher & Schön).

Also, among the current characteristics of e-Learning, which we believe can have a positive impact on in-service teacher training, we highlight accessibility which, through teaching-learning situations that consider the various spatial, temporal, technological, psychosocial and socio-economic constraints, and enable the learner to access knowledge (Jaquinot). The flexibility (Karsenti) encouraged by e-Learning systems also makes it possible to make training and teaching organizations more flexible by using approaches that allow the learner to combine training time, personal time and working time.

Another benefit can be derived from this form of training. This is the professional development of teachers, fostered by their participation in virtual communities (Daele). In this regard, for Lazar and Preece, a virtual community is formed when a group of users who communicate through a computer-mediated communication system and who have common interests, shared goals, and shared resources[5]. It is within these learning communities that a privileged relationship is created between the "non-initiated" and the "initiated" (Savoie-Zajc). Donnay, J. and Charlier, E., on the other hand, looked at the analysis of the role and attitudes of the "reflective companion" to account for the socio-cultural nature of the professional development process as a dynamic and recurrent process throughout a career, in this case, of the teacher.

a.   Individualization of learning and autonomy of learners in e-Learning

Today, e-learning is increasingly centred on the learner, who now has a variety of means at his or her disposal to take ownership of and control the evolution of his or her course. As part of a general approach to research, adapting the training system to the needs of the learner, the individualization of training can also be defined as tailor-made training offering learners the possibility, from a placement (or entry) test, of following different learning paths according to their individual needs and objectives.

Another definition developed by Afnor (French Association of Normalization) particularly emphasises the possibility of adapting training to the personal needs of learners. The individualization of training is part of a general approach to seeking to adapt the training system to the learner's needs. It can also be defined as tailor-made training. More specifically, individualization refers to the possibility for learners, based on a positioning system at entry, to follow different learning paths according to their needs and personal objectives. It is a question of being able to progress at one's own pace and to avoid working on skills that have already been acquired.

In terms of educational engineering, the individualization of the training pathway takes into account several parameters :
- the pace and organization of work.
- profiles and learning methods.
- content according to levels, interests and expectations.
- a learner-centred approach.

Furthermore, the individualized nature of e-learning also makes it possible to encourage self-training and self-directed learning, which are intricately linked to the context of continuing education. In this respect, it would be interesting to highlight the change that has taken place in recent years in the learner's relationship with knowledge and the teacher, particularly following the development of IT and the evolution of the Web. Based

on Lisowski's famous educational triangle[6], which he developed in 2010, this paper presents an account of the current decompartmentalization of the relationship to knowledge.

Fig. 1: Lisowski's educational triangle
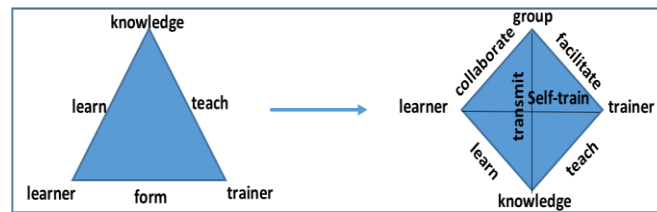
However, if this new distribution of roles in the learner's relationship to knowledge affects the process of individualization, the change in the roles of the other actors, in particular the teacher, must also be considered.

b. The place of tutoring and facilitation in e-learning
We cannot address the issue of distance without talking about tutoring, which is the cornerstone of e-learning. It is true that the quality of distance tutoring can have an impact on the motivation, creativity and performance of students and reduce the drop-out rate, particularly in the context of continuing education, which is not exempt from the constraints of professional commitments. Thus, Gagné refers students' satisfaction with e-learning supervision to three factors: support at the start of the course, support for motivation and cognitive support.

In fact, with the evolution of educational technologies and the emergence of new training methods, the teacher is increasingly entrusted with new missions that are more related to support and supervision. According to Denis, the transition from face-to-face training to distance learning (e-learning) is upsetting all the roles of the actors (designer, trainer, learner, etc.). In addition, new players are emerging, including the distance tutor[7]. Indeed, moving from being a transmitter of knowledge (in traditional training) to being a facilitator of knowledge construction in e-learning requires a whole change of the professional identity of the trainer, because he is no longer the main agent who deals with imparting knowledge but rather a catalyst. The emergence of these new functions of the teacher has been addressed by several researchers including Jacquino, Basque and Deschryver who all recognize the new role of facilitator and mediator.

However, far from being diluted, the functions of the teacher are rather consolidated, and his role has simply evolved in distance learning to adapt to the requirements of this mode of training and to be able to assume other functions of mediation, animation and coordination. To do this, they must acquire, in addition to cognitive skills, other computer, technical, methodological, and organizational skills.

Thus, faced with the different types of distance learners - determined, disarmed, independent - the tutor becomes a "one-man band" (Glikman), required to perform different functions of supervision, motivational support and assessment. Denis, for his part, goes so far as to involve the tutor in the process of developing cross-disciplinary skills in e-learning students. It is therefore up to the supervisors (including the tutor) to help develop these cross-disciplinary skills in the learners. In order to do this, they will have to ask for the production of behaviours that reflect these skills, such as searching for information, defining a project, making decisions, planning, the ability to collaborate with others, etc.

Finally, although tutoring is unlikely to become a recognized profession, as Jacquinot points out in his definition a key element and yet a poor ally of distance learning systems and devices[8], we will give it an important place in this research.

II. Material And Methods
1. E-learning at the crossroads of several theoretical fields
Given the specificity of our research topic, we believe that several theories are particularly complementary and relevant to support it. This involves in particular recalling the various theoretical currents that seek to explain the phenomenon of adoption of information technologies from both an individual and social perspective, in order to better understand the elements that influence the acceptability of an innovation, in this case the use of new technologies and e-learning. Indeed, these elements are all important to guide our research, especially in the case of Moroccan teachers, for whom one of the major obstacles to the integration of new technologies remains the lack of mastery of computer tools. We have therefore selected the main theories dealing with this phenomenon, putting the technology acceptance model (TAM) into perspective with other types of approach, such as Brangier's symbiotic model, that we already mentioned, or the satisfaction-based model.

a. Technology Acceptance Model (TAM)

In sociology, the notions of acceptance and resistance to change in the use of new technologies are widely discussed. Nielsen explains that the acceptability of a product refers to a combination of:

- Social acceptability which refers to whether the use of a technology meets social norms within a given group.

- Practical acceptability, which refers to numerous aspects such as technique, cost, reliability, the notion of "usefulness" (associating functional capacity and usability).

De Rosnay insists rather on the potentially parasitic nature of technologies. As for Brangier and Barcenila, the acceptability of a system may, according to them, depend on the relationship between the functionalities it offers and its ease of use.

Designed in 1986 by Davis[9], the TAM is one of the most widely used models in the field of information systems management. It aims to explain the degree of user acceptance of a given information technology. The TAM justifies the use of new technologies based on two essential concepts:

- Perceived Utility (PU): defined as the degree of awareness that a person has of the value of using a system and of its impact on improving performance.

- Perceived Ease of Use (PUP): refers to the degree to which aperson is aware that a system is easy and 'flexible' to use and therefore can be easily accepted and adopted.

However, although adopted empirically by several other researchers (Venkatesh, Morris & Brown), the TAM model would gain relevance if combined with other theories such as the user satisfaction model or Brangier's symbiotic approach.

b. Models based on user information satisfaction

A great deal of research, mainly from the Anglo-Saxon countries, has focused on the study of the construction of user satisfaction in information technology. Thus, DeLone and McLean believe that user satisfaction is a key measure of the success of an IT system. On this issue, the literature distinguishes between two definitions: "user satisfaction" and "user satisfaction with information". The former is defined by Doll and Torkzadeh as the user's opinion of a specific computer application, which he uses.

As for "user satisfaction with information", Ives et al. define it as the extent to which users believe that the information system available to them meets their information needs[10]. Mullany, Tan and Gallupe, on the other hand, try to define user satisfaction based on memories of past use of an information system. Mullany, on the other hand, states that it is based on beliefs about future use of the system.

Furthermore, in order to find out whether certain factors influence user satisfaction, the study conducted by Yaverbaum revealed that people who use their computer irregularly tend to be more satisfied than regular users. These results seem surprising because it is known that the more one uses new technologies, the more one acquires the ability to handle them easily, which reassures the user and contributes to strengthening the degree of satisfaction. In this sense, Mullany conducted a study to determine the link between computer users' satisfaction and cognitive style. He was able to show that during the life of a system, user satisfaction increases as their experiences with the system increase.

c. Brangier's symbiotic approach

Of course, the use of e-learning implies the weaving of a relationship between the human and the technology. To measure this relationship between the human, the technology, and the organization, Brangier used the symbiosis model to show that humans live in a lasting symbiosis with technology. If technologies appear as extensions of humans since humans evolve by making technology evolve in their image, for Brangier, the challenge is to put the technical functionalities of a system at the service of the individual. Symbiosis is sought to optimize the characteristics of the technical device and make them compatible with human activity.[11]

Furthermore, to measure the acceptance of systems, the approach considers two new important dimensions: the quality of the system and the quality of the information. According to Brangier, these two criteria jointly affect system use and user satisfaction. In other words, the use of technology itself produces its own impacts which, in turn, modify the relationship to the technology[12]. The aim is, on the one hand, to improve the quality and performance of the functionalities of the device put in place and to guarantee its ease of use (usability); and on the other hand, to improve the forms of appropriation, rejection or social innovation associated with the implementation of the technical device in the organizational environment. This last recommendation by Brangier is of interest to us because it implicitly suggests that the institution should have an internal plan for managing the change that has taken place.

2. Framework for experimenting with the e-learning project

As a result of this desire to generalize the use of IT in education in Morocco, and following the current state of health, e-learning activities have multiplied and accelerated this year, both at the level of universities

and training centres and at the level of public administrations and private organizations. These institutions and organizations, aware of the contribution of this type of training to the professional development of civil servants and employees, as well as the organizational and financial advantages it offers at institutional level, have begun to set up online training systems, either self-taught or with student support.

At the level of the Ministries, the initiatives undertaken in terms of the development of e-Learning and its generalization aim, in particular, to meet the needs of continuing training, while ensuring:

- Ensuring access to new technologies,
- Promoting lifelong learning,
- Providing financial support for organizations embarking on an e-learning project so that they can allocate the necessary human resources,
- Providing financial support for university e-learning research centres,
- Developing cross-sectoral cooperation and collaboration initiatives.

The use of e-learning is therefore linked to important educational and political issues, such as the quality of training provision, the democratisation of access to information and knowledge and the response to globalization. This was revealed, for example, by the needs survey conducted by the Ministry of Communication[13] in 2012, before launching its major e-learning project for the benefit of all its members (350,000 in total). Almost 90% of them are interested in distance learning and more than 80% request the creation of virtual community spaces.

However, despite this favourable context for the development and adoption of e-Learning, digital culture is not sufficiently anchored in practices evidenced by the results of the first e-Learning barometer in Morocco[14]. Indeed, according to this survey conducted in 2011, face-to-face training represents 72% of the training provided, while online training and blended learning (training alternating face-to-face and distance learning) only represents 18%.

Among the concrete initiatives to set up e-learning systems in the public sector, we can cite the ambitious e-learning and Online Community project set up by the Mohamed VI Foundation for Social Works, which has set up a community portal for skills development for the benefit of all its teachers and professors, offering cross-disciplinary content (IT and new technologies, project management, personal development, etc.) in self-training.

In the same perspective, the COLLAB project, initiated by the Ministry of National Education in partnership with USAID in 2014, also aims to initiate middle school teachers to produce educational multimedia content.

At the level of higher education, the Moroccan Virtual Campus (CVM) is intended to federate and pool resources and e-learning programmes in public universities in order to develop distance learning courses for the three levels: basic licence, professional licence and specialized master. Other international cooperation actions tend to reinforce Moroccan efforts in terms of e-learning development, such as the European program EUMEDIS, which has enabled the realization of distance learning modules (via cooperation projects such as Avicenne, Medforist and MedNetU). In addition, continuing education centres from Moroccan universities have taken up the challenge of integrating themselves into this dynamic by offering completely remote degree courses, such as **the IT-LEARNING continuing education centre from the FST of Hassan II University, which will be the focus of our experience:**

In this sense, to contribute to the integration of new technologies at the service of the continuing education of professionals, IT-LEARNING has piloted a research-action-development project, with the objectives of producing digital scientific content, and at the same time, assess the impact of new technologies on improving the teaching / learning of scientific and technical subjects. This project has given rise to a university training course (which has become distance learning) at Master's level and with different specialities. We will focus on the MIAGE speciality: Computer Methods Applied to Business Management, whose team includes ten teacher-researchers from the University, six professional computer engineers and a team of administrative managers, responsible for developing the educational content of IT teaching.

However, from the start of this training in January 2020 and following a needs assessment, a flagrant heterogeneity in the levels of appropriation and integration of IT was revealed among these teachers. To remedy this, a face-to-face training course to upgrade to the distance learning platform has been scheduled by the centre and by the management of the FST school.

However, with a view to strengthening coordination and collaboration within the team, we have set up, in an exploratory approach, an e-learning system aimed at contributing to the professional development of the teachers involved in the project, through a pilot module on peer support techniques (called peer-coaching). Our mobilizing idea is in line with the interest in introducing an innovation, as expressed by Peraya & Deschryver[15]: innovation must offer a short-term gain and must be perceived as complementary to what already exists in terms of values, needs and lived experiences. To be accepted, an innovation must therefore present a relative advantage for the user over existing concepts and situations.

Thus, the objectives of this e-learning project, the object of our experimental study, can be summarized as follows:
- To make interactive communication possible via peer-coaching.
- To introduce the target audience to e-learning.
- Create a strong and supportive community of practice.
- To promote the sharing of good practices and educational resources.
- Overcome the geographical distance (grouping constraints) as the beneficiary professionals come from different Moroccan cities, with a major population in the city of Casablanca, 48 km from the IT-LEARNING centre's headquarters.

3. Formulation of the problem and methodological choices
a. Research issues

Training students via IT involves the articulation of two main issues : That of the content and objectives of the training: What skills (educational, technological, or transversal) to be developed via e-learning, are likely to motivate the student population? The training method: How can the techno-educational tools used n e-learning courses promote the continuous professional development of teachers?

Several research questions arise from these issues. We classify them below by level.

- Educational level: What changes in new teaching/learning strategies? How are these changes, brought about by IT in general and e-learning in particular (absence of face-to-face contact, high degree of learner autonomy, construction of knowledge, etc.), perceived and managed by learners? What new profiles and attitudes should the key players in e-learning (teacher and learner) develop?
- Technological level: Can an e-learning course be easily successful when the main training medium is based on technology and the latter represents the main source of blockage for the distance learner? How can we prevent mediatization from becoming a source of isolation, or even of the learner dropping out?
- At the organizational level: How can one manage one's continuing education without first having transversal skills such as collaborative work or the management of different times (training, personal, family, professional, etc.)?
-

b. Research hypotheses

Our first hypothesis is based on the low level of integration of IT by Moroccan teachers. It is assumed that the use of e-learning would be a particularly suitable response to the problems of continuing education. However, it would be prudent to introduce this method of training gradually, by preparing teachers to become more familiar with e-learning systems, starting by offering them face-to-face training, supplemented by distance sessions.

The second hypothesis concerns student satisfaction with continuing education based on IT. In our opinion, most studies conducted on user satisfaction have approached the definition of satisfaction by focusing mainly on the attributes of the system. However, little attention has been paid to the attributes of the user or the organizational context in which the use of the system occurs. This is why it seems relevant to us to combine characteristics of the user, the organization and the technological support. This hypothesis, which affects different dimensions of e-learning, ranging from the educational to the organizational, deserves to be verified at several levels:

i/ First, the success of an e-learning system for the benefit of students would depend as much on the quality of the training offer (mode, content, tools) as on the determined commitment of the learners themselves (degree of motivation, feeling of personal efficiency in the face of the results and recognition of the institution).

ii/ Next, on the educational level, we assume that it would be necessary to ensure quality supervision covering motivational, educational, cognitive, technical and organizational aspects. Also, contrary to Glikman who asserts that there is no "ideal model applicable to all types of students", our objective would be to develop a "versatile" profile of the tutor, capable of assimilating the heterogeneity of learners' needs.

iii/ Furthermore, considering the tendency of teachers to share their practices, their successful experiences and their teaching resources, the role of peers and social interactions would constitute an essential element in the construction of knowledge and skills.

iv/ Finally, would institutional support, together with an effective change management plan, not be guarantees of success and/or challenges to be met in the context of e-learning in continuing education?

c. Methodological approaches and justification

The study that we present in this article is part of action research and relates to one of the current aspects of adult education, associating the sciences of education and IT. We conducted it from an exploratory perspective. **The e-learning system that we designed, tested, and evaluated at the IT-LEARNING Centre**

enabled us to observe a public of teachers and students in continuing education and to define their representations of e-learning. The sample we chose is relatively small, consisting of seventy actors (an audience of women and men aged between 29 and 52, very heterogeneous in terms of experience, IT skills, etc.), all of whom were involved in the project to develop digital resources in science.

This is probably the limitation of our research. But from this limited number, we had the advantage of controlling the research process, starting with the phase of diagnosing training needs, passing through the awareness-raising and training of the various actors, up to the qualitative and quantitative evaluation of the e-learning project. It should be noted that obtaining a 100% response rate is, in our opinion, another advantage to be considered for the validation of our research.To have a better understanding of the issues which are the subject of our research and to strengthen the relevance and validity of the study conducted, we opted for the methodology of triangulation (methodological pluralism). This involves implementing several approaches to collect data to study the behaviour of an audience engaged in e-learning. The multi-method approach thus attempts to reach the complexity of the behaviour and attitudes of the beneficiaries towards the new training tools and approaches.

On the one hand, the qualitative approach, chosen in the exploratory phase of a relatively new research subject in Morocco, here is an inductive process. In fact, the direct observation of the participants and the semi-directive interviews that we conducted allowed us to gather in-depth, sometimes even unexpected information. On the other hand, in order to overcome some of the limitations of the qualitative approach, in particular the time required for individual interviews, and in order to enrich the data collected, we used the evaluation survey as a verification strategy. For this purpose, we favored the use of a questionnaire, based on general questions (prior perceptions of e-learning, level of mastery of IT, motivations for e-learning, etc.) and other more specific ones (related to the appreciation of the various aspects of the system put in place, the contributions of e-learning, the constraints experienced, and the benefits perceived by the trainees).

III. Result and discussion

Despite the innovative nature of the system put in place, which requires real change management as well as time for the appropriation of the tools and teaching aids implemented, the responses of the respondents show that, in general, it was possible to adapt to this training method. Observation of the participants' attitudes highlighted that the objectives achieved go beyond the simple acquisition of knowledge and affect the attitudes and behaviours of the learners, preparing them to evolve effectively in their professional environment.

1. Benefits of e-learning

In order to gather the general impressions of the respondents, a question on the benefits of the training was included in the questionnaire distributed online. In the various interviews conducted with trainees and other institutional actors, the training showed that its benefits are twofold in the case of teachers in continuing training:

For the target audience:

- At the technical level: use an e-learning platform and use synchronous and asynchronous communication and sharing tools,

- At the educational level: analyze a new teaching situation, experiment with new uses, soak up the spirit of group work, learn through problem situations and promote the sharing of knowledge and resources,

- In terms of meta-skills: take charge of your own training and motivate yourself for lifelong training,

- At the cognitive, social and relational level: acquire know-how linked to the requirements of flexibility, adaptation and collaboration associated with the implementation of an innovation,

- At the organizational level: being able to manage your time, work in a team, etc.

For the institution (IT-LEARNING):

- Reduce the expenses for travel and accommodation for students during continuing education,
- To promote the development of communities of practice and sharing,
- To be a pioneer in the field of e-learning for professional development,
- Formalize knowledge and educational acts,
- Consolidate the quality approach,
- To increase the skills of teachers,
- Implement new scenarios and teaching approaches,
- Develop a flexible and modern IT-based distance education system.

In general, the two main intentions that guided our choice to set up this training method have been fulfilled. On the one hand, it is a question of involving teachers in their professional development and encouraging the emergence of a community of practice; and on the other hand, of being able to train this geographically dispersed public while optimizing training costs.

2. Main difficulties encountered

Among the main problems faced by the trainees, the majority of them emphasised the technical problems associated with mastering the functionalities of the platform used (70%), as well as their own availability for training (65%: difficulty in reconciling professional, family and training time). Others, fewer in number (34%), felt that collaborative work was not easy given the difference in work pace, skills, motivation, and availability of each team member. In the table no 1, we have tried to capture the essence of the responses by classifying them by type of difficulty.

Table 1: Difficulties encountered by students

Difficulties	Nature
Cognitive	Linked to the understanding of the courses. This is where the tutor can take up certain course points, direct the documentary research
Methodological	Often students do not know how to perform exercises, ignore effective working methods.
Organizational	Often learners have a problem managing their training time, both personal and professional.
Psychological	Linked to a feeling of isolation specific to e-learning, hence the dropout which sometimes leads to abandonment.
Technical	Linked to the use of the platform's tools by students but also to difficulties in accessing the Internet.

To remedy the technical difficulties, the challenge for designers is to make the technical features of an e-learning system available to learners, in particular by choosing a platform that is simple and intuitive to use. Let us recall Brangier's quote in this regard, symbiosis is sought to optimise the characteristics of the technical device and make them compatible with human activity. In addition, training in the use of technical tools goes a long way towards reducing the rate of blockages among learners while facilitating the tutor's subsequent task.

We were incredibly pleased to note that the grouping organized at the start of the training course helped to prepare the participants for the appropriation of the platform's functionalities and for collaborative work, based on synchronous and asynchronous exchange and sharing tools.

During the training, it is important to provide effective online support, making it possible to intervene, not only in a reactive manner when, for example, a technical difficulty arises for the learner, but also in a proactive manner, by encouraging the trainees. In this case, the recommended tutor must show continuous patience and availability.This strong intervention of the tutor is also recommended to solve the cognitive, methodological, and socio-motivational problems of the distance learners. Thus, the tutor is required to present the objectives of the course, to explain its content and instructions and to provide methodological guidelines for carrying out the required activities.In addition to their role as a resource person, tutors must provide regular motivational support, particularly for those who show symptoms of discouragement or dropping out.

Finally, the contribution of peers at all levels of student training should not be overlooked. From a social learning and knowledge-building perspective, the notion of peer-coaching becomes meaningful. The respondents themselves, who had to work in teams to carry out collective activities, appreciated the support of their cognitive companions both on the pedagogical and motivational level.

3. Technical and educational aspects

While the current trend in the e-learning market seems to favour economic interest and the power of multiplication over educational efficiency, we propose to look more closely at its educational advantages.

When asked: What aspects of the e-learning system did you appreciate most? respondents put tutoring first (90%), which is the most highly regarded aspect of e-learning. When asked during informal interviews about the reasons for this choice, most trainees thought that the tutoring had helped them to overcome the various obstacles encountered during the training, particularly those related to technical aspects. This confirms previous studies on the important role of tutoring in e-learning.

Thus, learners' assessments of the main aspects of the system put in place highlight the contribution of the human mediator (36%) and the construction of knowledge (29%), followed by aspects relating to the flexibility (20%) and interactivity (15%) of e-learning. As for media coverage (10%), it does not seem to attract the respondents so much.

These responses are in line with the results of Gagné's study on a sample of 900 remote students, which highlighted the quality of tutoring as the primary factor of satisfaction in an e-learning system. Indeed, the perceptions of the respondents were grouped as follows:

1- Positive perception of the tutor's motivating attitude: 89% satisfaction
2- Initial contact made: 83%.
3- Great satisfaction with the quality of the tutor's responses: 82%
4- Great ease in contacting the tutor: 82%.

5- Main role played: motivational support: 78%
6- Main role played: content expert: 74%.
7- Great satisfaction with the content of the feedback: 70%
8- Main role played: proofreader: 55%.
9- Main role played: source of administrative information: 47%.

4. Towards new roles and profiles of key actors: teacher and learner

For our part, we have attempted to outline the profile required of an e-learning tutor. To do this, we conducted a semi-structured interview on the different qualities and skills expected of the teacher-tutor. The Table no 2 summarizes the main points.

Table 2: Profile required of the e-learning teacher-tutor

Knowledge of andragogy		
Motivational support	technical support	proactive tutoring
metacognitive and methodological support	Availability and regular feedback	Relational management and communication
cognitive support (resource person)	Reactive tutoring	Evaluation

While the effectiveness of tutoring in a distance learning process is mainly measured by the ability of tutors to establish quality contact, at a regular pace and in response to the specific needs of the learners, the motivation and commitment of the learners are also important. This is what we found when we observed learners' attitudes and reactions to learning activities. Thus, e-learning seems to require a new learner profile, bringing together skills and attitudes in the table no 3.

Table 3: Required student profile in e-learning mode

E-learning culture		
Intrinsic motivation	Peer support	spirit of collaborative work
Extrinsic motivation	Attraction to content	knowledge building
Autonomy		

5. Managing innovation: from blended training to e-Learning

Admittedly, the e-Learning device that we have set up is presented as a reliable indicator of educational innovation in the sense that Garant attributes to the latter centered on the proposal to introduce in a voluntary way a new practice with a view to greater efficiency in responding to an identified problem ;

Similarly, in order to tame this innovation, we were inspired by Pelletier's approach, which can be summarized in five recommendations:

a. Take into account current practices;
b. Recognize that there is no real innovation without transforming practices;
c. Seek to be better equipped in the fields of disorder management and the management of complex situations;
d. Recognize that trial and error gives rise to resistance, but that this is inherent in any real change process;
e. Approach innovation as a commitment to a collective approach in which the direction of change is built gradually.

However, the introduction of e-learning as a method of teacher training on a national scale should above all be carried out in a participatory approach based on regular change management support activities, in order to win the support of the various actors to be involved, including the institution.

Our formal and informal interviews with respondents revealed an important revelation: they would have liked to meet the teacher and other participants face-to-face; discuss the content of the training face-to-face; express themselves more easily than online; etc. This need for physical presence is also explained by the regular use of the personal telephone or Skype software to exchange information about the training, considering the platform's synchronous and asynchronous tools to be deficient (e-mail and instant messaging, forum).

All these findings confirm our first research hypothesis, according to which the choice of a mixed training, alternating virtual and face-to-face training sessions, is quite relevant for teacher training. We are thinking precisely of the semi-face-to-face mode with a large part of the training provided online.

6. E-Learning between economic advantages and quality

There are several factors contributing to the development of e-Learning in continuing education, in particular the response it could provide to the needs of a particular public (military, disabled, sick, prisoners, people at home, etc.). In the context of our research, continuing education is motivating more and more civil servants and employees seeking to acquire new skills to meet the changing demands of the professional world.

In view of all these motivations, the economic factor seems particularly important for companies and institutions seeking a better return on investment. Indeed, IT encourages mass distribution and standardization of the offer. Consequently, fixed costs (materials and production costs), which are often high, are reduced as the volume of training increases.

However, making it possible to reduce the logistical costs that the organization of face-to-face training would entail and to facilitate access to an unlimited number of learners should not constitute the sole motivation of those responsible for training. They need to be more concerned with ensuring the quality of the remote training offered while ensuring that mass training and individualization are reconciled, a paradox which still accompanies e-learning.

IV. Conclusion

Although technology remains an important vehicle for the transmission of information, the introduction of IT in adult education is changing both the way we teach and the way we learn. Our research work concluded that the effectiveness of e-learning depends on three important conditions, all linked to the respective commitment of:

- of the institution: involve the various actors;
- of the learner: to trigger in him a feeling of "affiliation", self-efficacy and "self-determination";
- the trainer: his driving role helps to maintain the motivation of the learner.

Furthermore, our initial hypothesis is confirmed: the use of educational technologies, particularly e-Learning, represents a solution for ensuring the professional development of teachers, particularly in terms of integrating IT, while reducing the constraints linked to the increase in the number of students, the lack of availability, the inadequacy of training provision, regional disparities, inequality of access and the growing need for lifelong learning.

However, this training mode must combine characteristics relating to the user, the organization and the technological support. We propose a "soft" introduction of e-learning in the form of hybrid training, alternating presence and distance, before switching to the "all online" mode. Indeed, the results of our action research confirm that taking into account personal (cognitive, metacognitive) and contextual factors (political will, equipment, existing beliefs and practices, influence of the socio-cultural environment, etc.) is essential in order to achieve the objectives of e-Learning for the benefit of teachers.

Ending this article on a positive note, we believe that in the Moroccan context, many favorable conditions to the use of IT and the development of e-Learning are met. It would, however, be necessary to double the efforts in the direction of general sensitization in order to obtain the support of all the actors and to overcome the resistance inherent to this change. The development of a virtual community of practice or project community, for example, would be an effective way of changing attitudes and reducing the skepticism and resistance to e-learning of both the target audienced and institutions. Finally, we recommend the following actions:

- Train the necessary qualified human resources for the development of distance learning;
- Support the acquisition of equipment for e-Learning needs;
- Develop digital content that meets expressed needs;
- Strengthen cooperation with national and international organizations to acquire expertise in the field of e-learning.

References

[1]. Ministère de l'emploi et de la solidarité, Délégation générale à l'emploi et à la formation professionnelle, The Circular of the General Delegation for Employment and Training DGEFP on e-learning, 2001; 22.[Online]https://cpformation.blogs.lingueo.fr/circulaire-dgefp-n2001-22-du-20-juillet-2001/

[2]. Santelmann P, La formation professionnelle continue, Association nationale pour la formation professionnelle des adultes (AFPA), Edition La Documentation française, T5241-Tome 5241, ISSN 1763_6191, 2006; 84(1):99–106.

[3]. Batime Ch and Weber E, La formation ouverte et/ou à distance, un levier pour des dispositifs de formation en mutation, Vie sociale, 2007; 29(4):127–150. [Online] https://doi.org/10.3917/vsoc.074.0127

[4]. Glikman V. Formations à distance : au nom de l'usager. Distances, Conseil Québécois de la formation à distance, 1999; 3(2):101–117.

[5]. Lazar J and Preece J. Designing and implementing Web-Based Surveys. Journal of Computer Information Systems, 1999;39(4):63–67.

[6]. Lisowski M, L'e-tutorat, Panorama of ODL, Periodical article, Mai/Juin 2009; 220:43–57. [Online] https://www.ressources-de-la-formation.fr/index.php?lvl=notice_display&id=52089&seule=1

[7].   Brigitte D, What roles and what training for tutors involved in distance learning schemes? In Distances and knowledge, 2003; 1(1):19–46. [Online] https://www.cairn.info/revue-distances-et-savoirs-2003-1-page-19.htm

[8].   Chaptal A, Geneviève Jacquinot-Delaunay and Elisabeth Fichez: L'université et les TIC, chronique d'une innovation annoncée. Revue francaise de pédagogie. 2010; 171:153–156. [Online] https://doi.org/10.4000/rfp.1967

[9].   Dasgupta S, Granger M and McGarry N. User Acceptance of E-Collaboration Technology: An Extension of the Technology Acceptance Model. Group Decision and Negotiation, 2002; 11:87–100. [Online]https://doi.org/10.1023/A:1015221710638

[10].   Xiao L and Dasgupta S, Measurement of user satisfaction with web-based information systems:an empirical study, AIS Special Interest Group on Human-Computer Interaction (SIGHCI), Human-Computer Interaction Studies in MIS, Eighth Americas Conference on Information Systems, 2002; p 1149-1151.

[11].   Brangier E, Technical assistance as a form of symbiosis between man and technology, Sketch of a model of the human-technology-organisation symbiosis, Journal of Human-Machine Interaction. 2002; 3(2):4.

[12].   Brangier E and Hammes S, How to measure the human-technology-organization relationship?, Interdisciplinary Perspectives on Work and Health, 9-2/2007. [Online] https://doi.org/10.4000/pistes.2959

[13].   Nejjari A and Bakkali I, The use of ICT in Moroccan schools: state of play and perspectives, Hermès, 2017; 02(78):55–61. [Online]https://doi.org/10.3917/herm.078.0055

[14].   Expert consulting, 1er Baromètre du e-Learning au Maroc, Mars 2012. [Online] https://fr.scribd.com/document/85949796/1er-Barometre-du-e-Learning-au-Maroc-Mars-2012

[15].   Peraya D, Nouvelles technologies ou technologies emergentes: vers une réappropriation pédagogique des nouvelles technologies? Johnson et Schurch Eds, la formazione a distanza, 1995:17–43.