# E-LEARNING, B-LEARNING, M-LEARNING AND THE TECHNICAL AND PEDAGOGICAL ASPECTS ON THE NEW PLATFORM TRENDS AS MASSIVE OPEN ONLINE COURSES

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The dynamics of Information Communication Technology (ICT) expanded the scope of Education Science and, consequently the Educational Technology has reached various emerging areas such as: E-LEARNING, B-LEARNING, M-LEARNING. This article is part of research being conducted in the PhD Program in Science Education - Specialization in Educational Technology at the University of Minho (Braga-Portugal). The method used was the bibliographical research supported by systematic review of the literature (SRL) methodology in databases, whose research protocol was based on the adaptation of SRL methods [33]. E-learning is defined as a type of interactive learning, where learning content is available online and automatic feedback of student learning activities is assured. Online real-time communication may or may not be included, but the focus of e-learning resides more on the content of learning than on the communication between students and tutors [18]. This paper covers e-learning in its varied aspects. The terminology of the word e-learning is firstly discussed, as well as its respective definitions and concepts. The main cornerstones in the development of e-learning as a teaching method are presented, then extended to the areas of b-learning and m-learning. This section also describes the historical aspects and the generations which arose from Distance Education. Furthermore, the technical and pedagogical approaches to e-learning are related. A table is subsequently presented, displaying the advantages and challenges of the e-learning practice. Finally, it analyses the e-learning system, together with new platform trends, namely the Massive Open Online Courses (MOOC). The traditional and contemporary paradigms are antagonistic. For this reason they are in frank tension, the first virtual learning environment (VLE) that serve to support classroom courses or closed courses and are fully virtualized. And on the other hand, MOOC appear with the goal of extending these courses through the network, and are therefore open to all users who want to take the course. This remarkable change of paradigms are the major challenges and excel in both aspects of pedagogy, after all this situation reveals that the Human Computer Interface (HCI) is fulfilling its main objective which is to make more accessible interaction and easy to be used by all users for more heterogeneous than they are.

**Keywords**: e-learning, b-learning, m-learning, technical and pedagogical approaches, Massive Open Online Courses (MOOC).

## 1 INTRODUCTION

The dynamics of ICT expanded the scope of Education Science consequently Distance Education (DE) and the Educational Technology have reached various emerging areas such as: e-learning, b-learning, m-learning. This article is part of research being conducted in the PhD Program in Science Education - Specialization in Educational Technology at the University of Minho (Braga-Portugal).

The method used was the bibliographical research supported by research tool SRL methodology in databases, whose research protocol was based on the adaptation of SRL methods [33].

It presents the technical and pedagogical aspects of e-learning, b-learning, m-learning and the new trend for new platforms as MOOC. The terminology of the word e-learning is firstly discussed, as well as its respective definitions and concepts. The main cornerstones in the development of e-learning as a teaching method are presented, which are then extended to the areas of b-learning and m-learning.

The paper describes the historical aspects and the generations which arose from DE. Furthermore, a table is presented, displaying the advantages and challenges of the e-learning practice. Finally, the e-learning system is analysed, together with new platform trends, namely the Massive Open Online Courses.

## 2 RELATIONSHIP BETWEEN E-LEARNING, B-LEARNING AND M-LEARNING

E-learning is defined as a type of interactive learning, where learning content is available online and automatic feedback of student learning activities is assured. Online real-time communication may or may not be included, but the focus of e-learning resides more on the content of learning than on the communication between students and tutors and our teachers [18].

According to [12] it is no simple task define e-learning, however we presents the definition, e-learning: covers a wide set of applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the provision of content through the Internet, Intranet/Extranet (LAN/WAN), audio- and videotapes, satellite broadcast, interactive TV and CD-ROM. "

The term "distance education" includes other forms of non face-to-face teaching that use, for example, television, radio or the post office. Any of these terms is

characterized by a physical separation between the teacher and the student and by a common goal: to provide a set of features and techniques to people who wish to study in a self-learning system. The implementation of these components, however, need not be dogmatic or absolute. It is widely acknowledged that there will be moments of learning, as well as failure (and even encouragement) which is also the case of some forms of more traditional education [26].

In accordance with [1] discuss the term e-learning and claim that it is not very accurate; it should draw attention to the fact that learning is only one of several elements of education. Thus, online education should cover the wide range of services contained in the term e-learning. It can also be stated that e-learning companies often focus on course content, while online education institutions cover the whole range of educational services. The need to offer more flexible ways of learning has promoted the adoption of approaches based on e-learning. It is thus very common to find higher education institutions that implement various projects in order to take advantage of e-learning capabilities, both in terms of initial training as well as in the context of post-graduate activities. In this context, the use of the blended learning mode (b-learning) has received special attention [25].

B-learning adopts a mixed system of education, which includes not only the mobilization of the two contexts (face-to-face and online), but also important issues such as: the centrality of the conjunction of different teaching approaches, the interaction of different technological tools and the adoption of virtual spaces in the teaching and learning process.

The concept of e-learning is related to the learning process through interaction with digital content, services and support. This type of education makes extensive use of Information and Communication Technologies (ICT) to serve, facilitate and revolutionize the learning process. In Figure 1 shows three massive learning models used.

Traditional learning students drive to school, college, or other physical spaces to learn. ICT can improve the learning process, but it is not necessarily included as an indispensable item in classroom teaching.

Distance learning or DE comprises a teacher or monitor, a time and location, or both, and the factor that students are separated. Courses are taught in remote locations via synchronous or asynchronous means of instruction. DE does not imply not using the classroom.

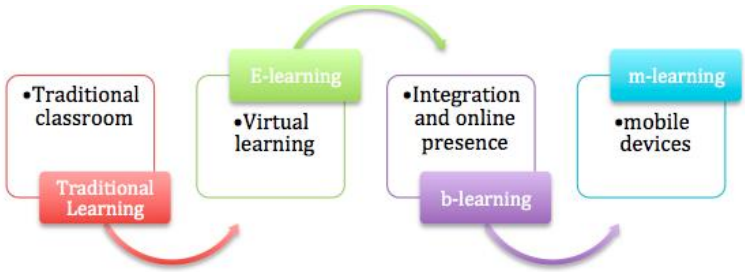


Figure 1: Learning Models.Source: http://elearnmag.acm.org/featured.cfm?aid=1621693

B-learning is a derivative of e-learning, and refers to a teaching model in which part of the content is transmitted from a distance, in this case though the use of the Internet yet it includes classroom sessions, hence the origin of the "blended" designation which means mixed, combined. Besides this, appeared the term Mobile-Learning (m-learning) or mobile learning appeared; this is one of the form of DE or e-learning that has emerged with the use of mobile devices in education, usually used outside the classroom.

The most commonly used term to refer to research studies that relate mobility, learning and mobile technologies is the mobile learning or m-learning. [37] points out that a definition of mobile learning will be very difficult.

The mobile learning is a relatively new field of research (about one decade), which is still in development phase, making it difficult the existence of a unanimous resolution [7]. For [4], the conceptualization given to mobile learning is still emerging and somewhat ambiguous. Therefore, we believe more research is needed so that one can talk of mobile learning as an "educational paradigm" [28].

According to [35] learning can occur in several ways: people can use mobile devices to access educational resources, connect to other people or create content, inside or outside the classroom. The mobile learning also includes efforts to support the broad educational goals (formal, informal and at various levels), as the effective management of school systems and better communication between schools and families.

One of the benefits of m-learning for students is that it is used as informal learning. That is, the m-learning can be adjusted daily and be used anywhere outside of the classroom. Educators also benefit from mobile learning affordances. Some of these advantages include the use of mobile devices for attendance reporting, reviewing the amount of hits and the activities of students, as well as to manage their time effectively. In higher education, mobile devices can provide educational materials for students, including due dates for assignments and information on schedules and room changes [29].

## 2.1 Perspective of Distance Education

According to [25], DE can be divided in five generations; the first generation was defined by correspondence-based studies, with the exclusive use of printed materials. Its origins can be traced back to the 1880s. DE evolved rapidly during the First World War. During this time, the first department of distance education was created at the University of Chicago. William R. Harper, known as "the father of modern education by correspondence", headed the department.

The second generation began in the 1920s, and was marked primarily by radio and television courses. Australia had the Radiophonic School, which transmitted classes to children living in remote and inaccessible locations. During World War II, there was the emergence of numerous educational programs in several countries, with the phone being used for interaction between teacher and student.

The third generation, characterized by a mixed use of various technological communications, appeared in the late 1960s, with the aim of providing high quality education at reduced costs. Using a systemic approach, the idea was to group various communication technologies such as printed study guides, guidance by correspondence, radio and television broadcasting, telephone conferences, kits for in-house expertise and other resources from a local library. The Open University (OU) stemmed from this generation and constituted the first British initiative to establish a committee to plan a revolutionary new educational institution in 1967, establishing the first national university of distance education.

The fourth generation emerged in the mid-1980s, characterized by the use of teleconferencing, was thus better prepared for education in groups. The use of satellites using interactive videoconferences made the first real-time interaction between students and teachers possible.

The fifth generation occurred with the rise of the Internet; it is characterized by the use of virtual classrooms based on computers and the Internet. It uses the constructivist methods of collaborative learning, highlighting the convergence between different media (text, audio and video) on a single communications platform. An important finding of the fifth generation is that all technologies have come to be used in an integrated manner, allowing for the expansion of interaction and collaborative learning at reduced costs. Today, this type of teaching and learning is an important means of

acquiring knowledge, whether for academic or professional purposes, with universities and companies seeking to exploit educational potential of the Internet.

## 3 PEDAGOGICAL ASPECTS OF E-LEARNING

Several pedagogical perspectives and learning theories can be considered in designing and interacting with e-learning. These theoretical perspectives are grouped into three main theoretical or philosophical schools: behaviorism, cognitivism and constructivism [1].

There are many different conceptual frameworks for describing the relationships learning theories, pedagogical strategies, instructional designs, as well as ICT [10]. E-learning, in general, does not change the fundamental process of learning [3]. However, research into how people learn online is in its infancy and further research is needed to provide insight into how to develop engaging and effective online learning environments in higher education [14].

Quality teaching requires the development of a nuanced understanding of the complex relationships between technology, content, and pedagogy, and using this understanding to develop appropriate, context-specific strategies and representations. Productive technology integration in teaching needs to consider all three issues not in isolation, but rather in the complex relationships within the system defined by the three key elements.[10] makes a similar point that no application of technology to learning and teaching is universally good. Instead, the best approach is to analyze the nature of the curriculum, students, and teachers in order to select the appropriate tools, applications, media and environments.

## 4 TECHNOLOGICAL ASPECT OF E-LEARNING

Distance Education (DE) binds strongly to information and communication technologies (ICT); this is particularly true of platforms and or virtual learning environments (VLE) which are used as a form of mediation to promote education. Among the technological aspects is the platform or the virtual learning environment. It is considered a VLE as a collective environment that favors the interaction of the participating subjects, so that this is a whole constituted by the platform and by all the

relationships established by the users who use the interaction tools, focusing mainly on learning.

VLE is a web space formed by the subjects and their interactions and forms of communication, which are established through a platform. This is understood to be a technological infrastructure composed of the features and graphical interface that make up the VLE [5] and provides a set of tools for the implementation of training actions at a distance, in particular:

- Manage entries, trainees and training workshops;
- Provide areas of downloadable content;
- Provide areas of interactive content;
- Report, including through e-mail, discussion forums, chats, audio and video conferencing;
- Register progress and assessment of trainees;
- Manage the study activities of the trainees;
- Create individual and group portfolios.

According to [32] the classification of VLE is based on functional characteristics, attached (or not) of the respective environment. In its evolution three generations of VLE can be discerned.

The first generation VLE includes Web interface (for student and instructor) and integration facilities - learning content editor, HTML pages, test system, discussion forum, the delivery system assignments, email, etc. The course is organized as self-learning with animation (image, hyperlinks, etc.), interaction (case examples, self-tests, e-mail, etc.), team collaboration (virtual classes, discussions), etc.

The 2nd generation VLE consists of a system management database-based content (DB) of learning materials on one side, and an e-learning platform / frame in which the learning process is structured and the activities and materials learning are connected via a URL.

The main features of the 3nd generation VLE are:

- Learning materials exchange capacity (for example, using standard XML document format);
- Intelligent document search (personalized learning);

- Dynamic path personalized learning (learning path based on learning objectives and not in a content structure);
- B-learning with the integration of a life session;
- Business simulation application integration, etc.

The e-learning advanced systems have:

- Browser-based interface for efficient document / info transfer;
- A database of learning document data;
- A powerful search engine;
- A flexible DB connection, allowing connections to the management information system (students, courses and id data instructors);
- Tools for easy adaptation to different learning applications;
- (XML) authoring tools for the development and adaptation of e-learning materials, etc.

### 4.1 E-Learning Systems

E-learning systems is the use of telecommunication technology to provide information related to education and training. Corresponding with the evolution of ICT, e-learning emerges as the paradigm of modern education. The contributions of e-learning include the facilitation of interaction among learners-teachers-tutors, and/or between learners-learners, regardless the limitations of time and space through the asynchronous and synchronous learning network model [16, 17, 34].

Currently, there are various educational systems to manage Distance Education (DE), better know as e-learning systems. These systems contain many features, which compose a new education strategy, such as: text, animations, graphics, videos, forums, chats, quizzes, among others. There are two methods can be uses e-learning systems; asynchronous and synchronous. According to [15], synchronous e-learning, is facilitated by the media, such as forums, e-mail and mailing list support the working relationship between students and teachers, even when participants cannot be online at the same time, so component key of the flexible e-learning.

Synchronous e-learning are supported by means such as video conferencing and chat, has the potential to support learners in developing learning communities and

exchange of experiences. Students and teachers use synchronous e-learning as a manner of bringing participants, creating social ties and avoids the frustration that the learner does not feel isolated.

In order to designate e-learning systems, a wide range of terminologies are used: Learning Management System (LMS), Virtual Learning Environment (VLE), Course Management System (CMS), Learning Content Management System (LCMS) or Management Learning Environment (MLE), Learning Support System (LSP), Learning Platform (LP), and online learning platforms (OLP). According to [20] , CMS and LMS are the most commonly terms, in United States. However, according to these authors LMS is more often associated with software for managing corporate training programs rather than courses in traditional education institutions. In the United Kingdom and many European countries, the terms VLE and MLE are used more frequently. However, these are crucial different between two terms. A VLE is a software application, typically supported by Web-based technologies; it is used to plan, execute and evaluate a specific learning process. VLE assist the teacher in creating and delivering content; they monitor student participation, and assess their performance. An MLE refers to the wider infrastructure of information systems in an organization that support and enable electronic learning. MLEs incorporate the VLE, together with other administrative processes and procedures, such as student records and management information systems, hence creating a more holistic environment [13]. However, for this thesis proposal, we intend to adopt the term VLE, because of its connection with issues relating to user interaction and system that directly impact the interface of the VLE.

Universities have adopted VLE quickly due to their low cost of deployment, offering free system licenses, despite the complexities and risks involved in creating a new education type. From the viewpoint of university planning, the initial selection of a VLE involves intertwined pedagogical, educational, administrative and technological issues intertwined, the interests of greatly diverse participants, and provides new dimensions to established institutional policies and procedures [8].

Although the characteristics of e-learning meet the requirements for learning in a changing modern society, today various educational institutes and universities have developed e-learning systems or adapted existing e-learning systems to their needs in an attempt to provide access to all users regardless of distance or time [2].

Despite the complexities and risks of deploying a VLE in an educational institution, almost all universities have joined this innovative manner of teaching and

learning. Access, cost and quality are three reasons commonly given for the contemporary importance of ICT in higher education and the changing patterns in the modes of delivery that are under way, according to [9].

One of the advantages of using a VLE is as a means of increasing the efficiency of teaching; for example, a VLE contains tools that allow the institution to have a means to accomplish resource-based learning on a large scale. It assists and facilitates the delivery of flexible courses, the identification and use of resources, communication and conferences, activities as well as assessments, and collaborative work management and student support.

Usually VLE are distinguished by their capabilities of supporting the teaching and learning process. Of the many e-learning platforms, some are commercial software's, whereas others are open-source software's. With the popularization of the Internet in 1990s, various tools have been developed and marketed, [22] were listed 23 VLEs, but since then this number has continued to grow. Currently, there are more than 150 different systems providing e-learning services [19].

VLE contains features which manage cater for the diversity of many students and teachers' digital courseware, including tools addressing needs such as assessment, communication, uploading of content, feedback of students' work, administration of student groups, questionnaires, tracking tools, academic of access reports, billboards, polls, tutorials, file repositories, technical support, log-on activities students and teachers', voicemail, tables containing student presentations and activities sent, wikis, blogs, chats and forums through the Internet.

Today there are close to a hundred vendors of training or e-learning management systems. VLE has attracted many organizations in the field of vocational training, and educational, both for-profit organizations such as Oracle, IBM, among others, as well as associations and other non-profit organizations. Therefore, we can divide the main VLE market into two distinct segments: commercial VLE; Open Source VLE. In Table 1 below, we quote the most used and known VLE, [11], [18]; [27],[19].

A widely used VLE is Moodle, is name means an acronym for Modular Object- Oriented Dynamic Learning Environment, this VLE was introduced in 1998, according to [19], and it is best solution and is becoming one of the most common used. Data obtained from official Moodle statics sites confirms the mentioned fact. Moodle has an ability of tracking the learner's progress, which can be monitored by both teachers and

learners. This fact implicitly includes both security and privacy threats and makes Moodle vulnerable system [20], [23].

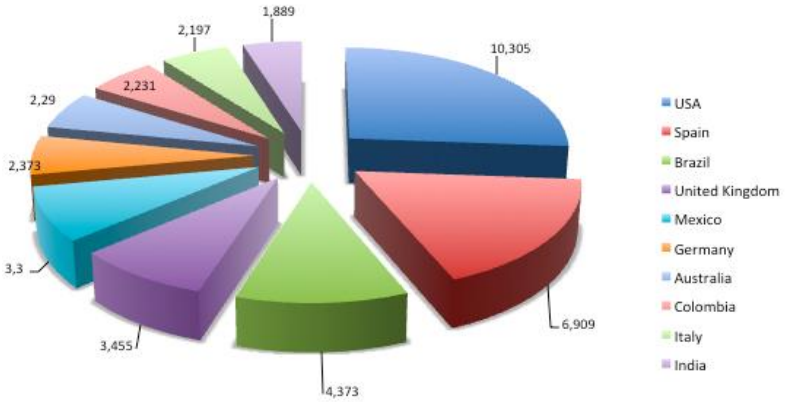


Figure 2: Top 10 countries by Moodle registrations. Source: http://moodle.net/stats/

According to Fig. 2, in the statistics from the Moodle site, worldwide, in 231 countries, there are 53.846 active websites using Moodle. The ten countries that most use Moodle are: United States, Spain, Brazil, United Kingdom of Great Britain and Northern Ireland, Mexico, Germany, Australia, Colombia Italy and India.

However, proponents of e-learning argue that learning-based technology compensates for the lack of direct human contact with the creation of virtual communities that interact through chats, forums, e-mails, etc., enriching the interaction process of people with the same interest, but with different views and located in different regions or countries.

Furthermore, Lifelong Learning (LL) and the mobility of students, and/or the globalization of education has become increasingly important. Recycling and adapting to change requires an increasingly flexible model, marking a new trend for universities to be more open and more relevant to the training needs of the Information Society. Currently, prestigious universities such as: Stanford, Harvard, Yale, Princeton or Berkeley, offer Massive Open Online Courses MOOC [36].

### 4.2 MOOC - Massive Open Online Courses

MOOC are a form of Web based distance learning. MOOC as originally conceived had no entry requirements, no course fees and no limitations on the number of

places available. They typically offer no academic course credits but some provide a course completion certificate for successful completion of associated assignments [6].

Despite the increasing numbers of users MOOC. Coursera, for example, one of the most widely known MOOC platforms, has more than 2.9 million registered users for more than 328 courses available [31] . In contrast to the traditional courses of DE, the MOOCs are open, that is, have free access to people who have Internet and "there is no criteria for the selection of students, except when it is indicated the need for specific prior knowledge and courses are mostly free. For this broad scope, the MOOC are entitled massive, reaching a large number of people "[30].

The semi-automated MOOC are courses with a typical instructional design (tablets, interactive videos, self-assessment and peer assessment, among others) that feed on the interactions of thousands of students, allowing for self-management of their own learning. In such environments, learning is characterized by interaction with microstructures (microcontent, microlectures microformats), leading to another current phenomenon, that of "Microlearning" [24].

Distinct from the traditional principle of VLE, which serve to support classroom courses or closed courses and are fully virtualized, MOOC appear with the goal of extending these courses via the network, and are therefore open to all users who intend to take the course. This concept of "open", according to [21] is already quite problematic because in many cases, a fee is charged if the student wishes to receive a certificate of participation. On the other hand, the knowledge remains open, even though, there is a tendency of some MOOC to start charging a fee is in a not too distant future [21].

In addition to traditional teaching materials such as videos, readings and problem sets, MOOC have helped to build a community for students and faculty forums. Academic Room, Coursera, EDX, Erasmus EU's Wired Academic, Udacity, are some examples of MOOC platform’s [33]. Although there are several definitions for the same concept, they have three points in common: Free: anyone can sign up for free; Scale: it supports a large number of participants (large scale courses);and, Simplicity: you only need a teacher to coordinate all the information found on the respective network.

Within the e-learning courses offered on platforms in MOOC format have become promising trend. Despite great challenges to overcome in both aspects Pedagogy, as in the area of Human Machine Interface (HCI) whose purpose is to make the interaction

more accessible and easy to use, to increasingly heterogeneous users, for example, older people and or disabled.

## 5 CONCLUSIONS

The information society and the dynamics of ICT, the Education Science with Distance Education and the Educational Technology have reached various emerging areas such as: e-learning, b-learning, m-learning. The traditional and contemporary paradigms are antagonistic. For this reason, they are in frank tension, the first (VLE) that serve to support classroom courses or closed courses and are fully virtualized. And on the other hand, MOOC appear with the goal of extending these courses through the network, and are therefore open to all users who want to take the course. This remarkable change of paradigms are the major challenges and excel in both aspects of pedagogy, after all this situation reveals that the Human Machine Interface (HCI) is fulfilling its main objective which is to make more accessible interaction and easy to be used by all users for more heterogeneous to be.

# ASPECTOS TÉCNICOS E PEDAGÓGICOS NAS NOVAS TENDÊNCIAS DA PLATAFORMA EM CURSOS ONLINE ABERTOS: E-LEARNING, B-LEARNING, M-LEARNING.

**RESUMO:** A dinâmica da Tecnologia da Informação e Comunicação (TIC) ampliou o escopo da Ciência da Educação e, consequentemente, a Tecnologia Educacional alcançou diversas áreas emergentes, como: E-APRENDIZAGEM, B-APRENDIZAGEM, M-APRENDIZAGEM. Este artigo é parte da pesquisa realizada no Programa de Doutorado em Ensino de Ciências - Especialização em Tecnologia Educacional da Universidade do Minho (Braga-Portugal). O método utilizado foi a pesquisa bibliográfica apoiada na revisão sistemática da metodologia da literatura (SRL) em bancos de dados, cujo protocolo de pesquisa foi baseado na adaptação dos métodos de SRL. A comunicação on-line em tempo real pode ou não ser incluída, mas o foco do e-learning reside mais no conteúdo da aprendizagem do que na comunicação entre alunos e tutores. Este artigo aborda o e-learning em seus diversos aspectos. A terminologia da palavra e-learning é discutida em primeiro lugar, bem como suas respectivas definições e conceitos. Os principais pilares do desenvolvimento do e-learning como método de ensino são apresentados e estendidos às áreas de b-learning e m-learning. Discorre ainda aspectos históricos e as gerações que surgiram da Educação a Distância, bem como, suas abordagens técnicas e pedagógicas correspondentes. As análises deste sistema de e-learning, juntamente com as novas tendências da plataforma, a saber, os Massive Open Online Courses (MOOC) nos sugere inferir que os paradigmas tradicionais e contemporâneos são antagônicos. Por esse motivo, eles estão em franca tensão, o primeiro

ambiente virtual de aprendizagem (AVA) que serve para dar suporte a cursos em sala de aula ou cursos fechados e são totalmente virtualizados. Por outro lado, o MOOC aparece com o objetivo de estender esses cursos pela rede e, portanto, é aberto a todos os usuários que desejam fazer o curso. Essa notável mudança de paradigma é o maior desafio e se destaca nos dois aspectos da pedagogia, depois de toda essa situação revelar que a Interface Homem Computador (IHC) está cumprindo seu principal objetivo: tornar a interação mais acessível e fácil de ser usada por todos os usuários. por mais heterogêneo do que são.

**Palavras-chave**: e-learning, b-learning, m-learning, Abordagens técnica e pedagógica, MOOC.

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