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E-LEARNING IN HIGHER EDUCATION

KEY CONCEPTS, EUROPEAN TRENDS AND GUIDELINES

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Contents

Overview

E-learning plays an increasingly important role in the changing landscape of Higher Education in the European area. In the three main provision areas (degree education, continuous professional development, and open education), Higher Education Institutions find in e-learning the possibility of supporting both the shift towards flexibility in learning paths and modalities, and the transition towards student-centered learning and active teaching methods.

It is now well established that e-learning in itself is not a panacea, nor, on the contrary, a catastrophe for educational systems, and it is generally accepted that it is not equally suitable for all educational settings, for all subjects and for all learners, but evidence from research can be found regarding its effectiveness under certain conditions. Furthermore, as was already known from decades of research into distance education and educational technologies, it is clear that pedagogical awareness and educational purposes must guide the choice and development of technical solutions, not the other way around. Such awareness allows education professionals to take full advantage of the affordances and possibilities of blended and online education for specific types of students, subjects and contexts.

The purpose of this study is to provide Higher Education Institutions and practitioners, policy makers, and education funders in non-EU CEI Member States with design principles and effective implementation models for online and blended courses and programmes, based on widely accepted learning theories, available evidence from research, and best practice.

The study is divided into three main sections.

Part 1 provides a conceptual framework for describing the variety of phenomena that go under the umbrella term of e-learning.

Part 2 focuses on current trends and future prospects for e-learning in the European Higher Education Area.

Part 3 gives insights into teaching and learning activities, people & roles, and technology in e-learning. Finally, relevant instructional and multimedia design principles are presented, as well as valuable guidelines for course development, implementation, and evaluation.

The writing of the book was completed in October 2020.

Common Abbreviations

CPD	Continuing Professional Development
EADTU	European Association for Distance Teaching Universities
ECTS	European Credit Transfer and Accumulation System
EHEA	European Higher Education Area
ENQA	European Association for Quality Assurance in Higher Education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
EUA	European University Association
HE	Higher Education
HEI	Higher Education Institution
ICT	Information Communication Technology
IQA	Internal Quality Assurance
IT	Information Technology
LLL	Lifelong Learning
LMS	Learning Management System
MOOC	Massive Open Online Course
OER	Open Education Resource
QA	Quality Assurance
VLE	Virtual Learning Environment

Part One

A Conceptual Framework

1.1. Building an understanding of common terms

Since e-learning is a fast-moving and dynamic field of education, its technical jargon is unstable so far[1]. Nevertheless, even when they use different specialized terms, the most widely adopted taxonomies are built on widely shared categories which refer to dimensions such as learner autonomy and delivery mode.

1.1.1. *E-learning: an umbrella term*

Since the use of ICT has long been a pervasive phenomenon in the educational field and affects, in various ways and to varying degrees, almost every form of education, the first choice to make is that of the expression to be used as an umbrella term, which is for us that of e-learning. In this and other cases we will follow an accredited use, referring to the glossary provided to the respondents on the occasion of the European University Association (EUA) 2014 survey on E-learning in European Higher Education institutions, which is therefore particularly focused on Higher Education in the European area (Table 1.1).

[1] It is precisely with the aim of achieving greater consistency in the use of terms that the UK Quality Assurance Agency for Higher Education has recently released a document dedicated to this issue (QAA, 2020). The page that Tony Bates, one of the most eminent scholars in this field, dedicates to the question of definitions is also constantly updated: https://www.tonybates.ca/2008/07/07/what-is-distance-education/

Table 1.1. E-learning glossary.

E-learning	The term e-learning is a generic expression for all learning involving the use of information and communication technologies (ICT) to support both learning and teaching. The term may refer to the use of various technologies and tools to support learning in different contexts, including face-to-face settings and distance learning, separately or in combination, in which case e-learning is usually called blended learning.
Blended learning	A pedagogical model combining face-to-face classroom teaching and the innovative use of ICT. Experts often associate blended learning with the redesign of the educational environment and learning experience, thus contributing to the creation of a "community of inquiry".
Online learning	A form of educational delivery in which learning takes place primarily via the Internet. Online learning can serve those who are geographically distant and without access to traditional classroom education, so it includes "distance learning". However, distance learners are not alone in benefiting from online learning, which is also commonly part of e-learning in mainly campus-based study programmes. In such cases, it may be referred to as blended learning.
MOOC	MOOC stands for "massive open online course": *massive*, since there is generally no participation limit, so thousands can enroll for the same course; *open*, as courses may be accessed free of charge by many different kinds of learners who normally register with their provider without having to satisfy any formal entry requirements; and *online* because the whole course, including its assessment and additional services, is delivered online (even though personal contact with tutors or other participants is possible).

SOURCE: Gaebel, M., Kupriyanova, V., Morais, R. & Colucci, W., 2014.

1.1.2. *Moving from enhancement to transformation*

The term e-learning, so defined, is so broad that it covers many forms and ways of integrating new technologies into teaching. Among the many works dedicated to this pedagogical issue, it is worth considering a theoretical reference framework, the SAMR model (an acronym for Substitution, Augmentation, Modification, Redefinition), developed in the early 2010s by Ruben Puentedura. The model identifies four levels of integration of technologies into the teaching/learning process, observing this integration according to its impact on teaching

methods and learning environments, compared to traditional ones, within a range that extends from augmentation to transformation.

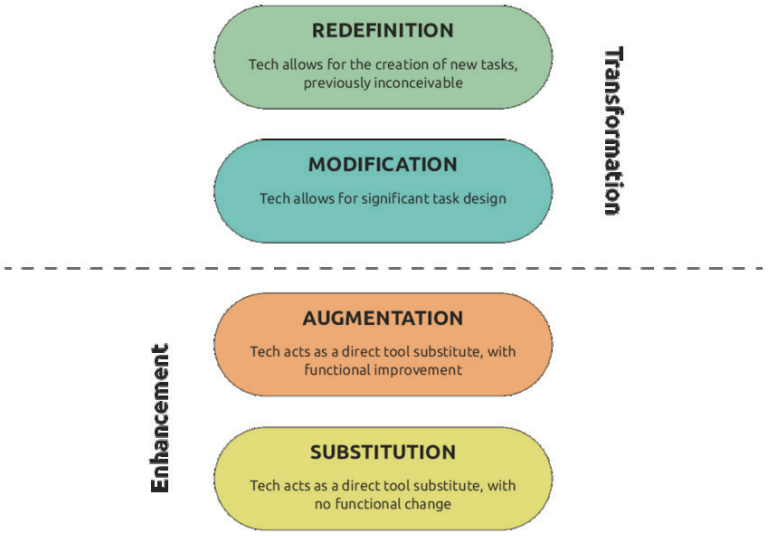

Figure 1.2. Puentedura's SAMR model.
SOURCE: Puentedura, 2013.

1.1.3. *Face to face (on-site, on-campus), blended (hybrid), or online?*

As the Authors of the EUA *E-learning in European Higher Education institutions* study pointed out, <it is not always easy to distinguish different means and types of provision: an online course may be part of an online degree or could just be non-degree-earning distance learning provision. But it could also be part of a blended learning degree, in which students would normally attend courses on campus, but would not have to attend classes for this particular course>. Therefore <the survey refers to blended learning (which may include online learning but which would also require learners to be regularly present on-campus) and online learning (which would only require on-campus presence for a short residency period, if at all)> (Gaebel, M., Kupriyanova, V., Morais, R. & Colucci, W., 2014).

1.1.4. *More definitions*

These definitions do not differ much from the terminology in use in the United States. The course classification used in the well-known annual surveys on Online in Higher Education in the United States conducted by the Babson Survey Research Group uses the proportion of content delivered online as its basis (Allen & Seaman, 2013):

> **Online** courses are those in which at least 80 percent of the course content is delivered online.
> **Face-to-face** instruction includes courses in which zero to 29 percent of the content is delivered online; this category includes both traditional and web facilitated courses.
> The remaining alternative, **blended** (sometimes called hybrid) instruction has between 30 and 80 percent of the course content delivered online.

Just to better clarify the BSRG's definition of ***Face-to-face*** *instruction*, it should be noted that in a "traditional" course no online technology is used, while in a "Web-facilitated" course <a course management system or course Web page may be used to post the syllabus and assignments, but the course is essentially taught face to face with some Web supports for information access> (Means *et al*., 2014).

As stated in the recent paper by the UK Quality Assurance Agency for Higher Education (QAA, 2020, p. 3), <some institutions use the term blended, particularly internally, as a generic term for provision that includes any element of digital learning>. The subdivision just mentioned above differs in some respects from the one proposed by Tony Bates (2019), which is also based on the modes of delivery. The margin of ambiguity is due to the fact that, how Bates claims, <there is a continuum of technology-based learning, from 'pure' face-to-face teaching to fully online programs>. According to Bates's definitions (2019, p. 524), the term "classroom teaching" corresponds to a residual phenomenon today in formal education, while the "blended" label includes at least two of the modalities (here enlisted as points 2a and 2b) that that the other sources cited in this study instead incorporates under the "face-to-face" category.

1. classroom teaching with no technology at all (which is very rare these days);
2. blended learning, which encompasses a wide variety of designs

2a. technology-enhanced learning, or technology used as classroom aids; a typical example would be the use of PowerPoint slides and/or clickers in a lecture;
2b. the use of a learning management system to support classroom teaching, for storing learning materials, providing a course schedule of topics, for online discussion, and for submitting student assignments, but teaching is still delivered mainly through classroom sessions;
2c. the use of lecture capture for flipped classrooms, where students watch the lecture via streamed video then come to class for discussion or other work;
2d. one semester face-to-face on campus and two semesters online;
2e. hybrid or flexible learning requiring the redesign of teaching so that students can do the majority of their learning online, coming to campus only for very specific face-to-face teaching, such as lab or hands-on practical work, that cannot be done satisfactorily online;

3. fully online learning with no classroom or on-campus teaching, which is one form of distance education, including:
3a. courses for credit, which will usually cover the same content, skills and assessment as a campus-based version, but are available only to students admitted to a program;
3b. non-credit courses offered only online, such as courses for continuing professional education;
3c. fully open courses, such as MOOCs.

The concept of **blended learning** itself is still debated and various definitions can be found in the literature. The term *blended learning* is defined as <the thoughtful integration of conventional and digital methods of teaching and learning> (Graham, 2013). According to the EADTU & ENQA (2017) consensus view:

> Blended learning combines conventional and digital methods to achieve an optimal exploitation of ICT and internet integrated with the conventional technologies of physical material, and co-presence in space and time. The value of blending the two is that digital methods offer much greater personalization, flexibility, inclusiveness and efficiency than conventional methods can, but they have to be used appropriately (Laurillard, 2015).

In any case, the definitions mainly imply that the digital is not a mere supplement aimed at replicating aspects of a conventional course, rather, it is a mixture of two methods, which enhance one another. The latter consideration could be traced back to a "transformative" level of the integration of new technologies in the teaching and learning process (with reference to the SAMR model, described above), rather

than to the delivery method and the proportion of the content delivered online.

1.1.5. *Online learning vs. Emergency Remote Teaching*

To better identify what the online learning concept is concerned with, it is important to make clear that effective and well-planned online education, as claimed by Hodges et al. (2020), is significantly different from the "Emergency Remote Teaching", <a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances> that an incalculable number of educational institutions around the world have suddenly had to make in response to the COVID-19 pandemic. Considering the absence of careful design and development process, it would be inappropriate to assimilate such varied emergency experiences – however honorable - to online education. Generally speaking, it has been observed that HEIs found themselves far more prepared to handle the emergency, as they had long integrated e-learning into their mainstream far more than educational institutions operating in other levels of education.

1.1.6. *Online learning as a subset of Distance Education*

The term “online learning” has relevance to that of "distance education", which represents an even wider concept, originally defined by Michael Grahame Moore (1972, cit. in Moore, 2013) as <the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors … so that communication between the learner and the teacher must be facilitated by print, electronic, mechanical, or other devices>. Online learning, in a sense, can be considered as the most recent branch of the centuries-old tree of distance education, which encompasses any educational practice that takes place, by any means, under the condition of separation of instructors from learners.

The ENQA Working Group on Quality Assurance and e-learning (Huertas *et al*., 2018) in a recent paper considered the definitions formulated by Tony Bates (seen above) valid for the context of their work, and, on this basis, it defined the following typology of Online learning which fits into the wider framework of Distance education.

Distance education courses.
Distance education courses are those where no classes are held on campus – all instruction is conducted at a distance. Distance education courses may use a variety of delivery methods, such as video/audio conferencing and those which are internet- or print-based.
Online courses.
A form of distance education where the primary delivery mechanism is the internet. These could be delivered synchronously or asynchronously. All instruction is conducted at a distance.
Synchronous online courses.
Courses where students and an instructor participate at the same time, but at separate locations other than an institutional campus. These courses may be delivered by video conferencing, web conferencing, audio conferencing, etc.
Asynchronous courses.
Courses where students are not required to participate in sessions at the same time as the instructor. These may be print-based courses or online courses using a learning management system, for instance.
Online programmes.
A fully creditable programme that can be completed entirely by taking online courses, without the need for any on-campus classes. These could be delivered synchronously or asynchronously.
Other forms of distance and online education include:
OER (open educational resources).
Materials that are offered freely for use by teachers and learners, i.e. without charge and with few or no restrictions on the way in which the material may be adapted and reused.
MOOCS[2] (massive open online courses).
Online courses that are designed for large numbers of participants, often offered for free and without any entry qualifications. They are distinguished from OERs in that they offer a full course experience and content that is not usually free to reuse.

Here we refer to one of the most comprehensive research summaries in this field - *Learning online: What research tells us about whether, when and how,* authored by Barbara Means, Marianne Bakia, and Robert Murphy (2014) - to introduce a general definition of the terms (here below) and some descriptive elements of its fundamental dimensions (see next paragraph: *A Conceptual Framework for Describing Online and Blended Learning*).

As we use the term, "online learning" refers to a learner's interaction with content and/or people via the Internet for the purpose of learning. The learn-

[2] On the same topic, see also the early EUA papers: Gaebel, 2013, and Gaebel, 2014.

> ing may be part of a formal course or program or simply something learners pursue for their own interests. (Means *et al.*, 2014, p. 6)

The authors, like other scholars before, underscore the change of era which is linked to the spread of the Internet and its impact on Education (Means *et al*., 2014, p. 8).

> As we have defined it, online learning was not possible prior to the inception of the World Wide Web. Certainly, there were technology-based learning options much earlier. [...] But computer- or server-based instructional offerings lacked the reach, affordability, and flexibility that are possible today with instruction taking place over the Internet.

However, as the authors point out, it is correct to include Online Education within the family of educational practices called Distance Education, and not to overlook the important results that decades of research have produced in that field (Means *et al*., 2014, p. 8).

> Distance learning is a broader concept, as it encompasses any instruction in which the learner and the instructor are physically separated. Because distance learning includes other technologies, going all the way back to print-based correspondence courses, we treat online learning as a subset of distance learning rather than a synonym of it. But some of the research we will examine comes from the distance learning literature, and it remains an important source of insights.

1.2. Insights from Distance Education theory

Scholarly theories of distance education have been developed and debated since the 1960s, and still represent an essential framework for educational theory and research in the increasingly cultivated area of e-learning studies. Michael Grahame Moore, in the early 70s, was responsible for the first theory that framed distance education from a pedagogical point of view.

> As long as this practice was defined solely by the technology, the few research questions that were generated were also stated as studies of the technology—usually how education through that technology might best resemble "real" teaching, i.e. teaching in classrooms. This began to change with the theory of transactional distance, which showed that teaching and learning in separate locations is better understood not as an aberration from the classroom, but as a significantly different pedagogical domain. (Moore, 2013)

1.2.1. *M.G. Moore, the Theory of Transactional Distance*

Moore's insight into the domain of distance education, namely the theory of transactional distance, has long been debated and enabled subsequent research, therefore deserve specific attention.

> The concept of transaction is derived from Dewey (Dewey and Bentley 1949). As explained by Boyd and Apps (1980: 5) it 'connotes the interplay among the environment, the individuals, and the patterns of behaviors in a situation'. The transaction that we call distance education occurs between teachers and learners in an environment having the special characteristic of separation of teachers from learners. This separation leads to special patterns of learner and teacher behaviours. It is the separation of learners and teachers that profoundly affects both teaching and learning. With separation there is a psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner. It is this psychological and communications space that is the transactional distance. *(ibid.)*

Moore claims that distance in an education program is a function of three sets of variables: the course *structure* (the rigidity or flexibility of different elements in the course's design, such as learning objectives and materials, teaching strategies, and evaluation methods), the *dialogue* between teacher and learner (its relevance to the course, the presence and size of a learning group, and the higher or lower interactivity allowed by the means of communication), and the degree of *learner autonomy* learners are required or allowed to exercise (according to their capability for making decisions concerning their own learning process).

> Successful distance teaching depends on the institution and the individual instructor providing the appropriate opportunities for dialogue between teacher and learner, as well as on appropriately structured learning materials. (*ibid.)*

1.2.2. *Instructional dialogue*

According to Moore's definition, instructional dialogue is the series of positive, learning-oriented interactions of the student that take place in an educational context.

The extent and quality of the dialogue are determined by the educational philosophy of the individual or organization that designed the

course, by the personalities of teachers and students, by the subjects of study, by various environmental factors.

One of the most important environmental factors - the one that usually receives the most attention - is the means of communication. Its nature has a direct impact on the extent and quality of the dialogue.

1.2.2.1. Media

In a course in which all communication is entrusted to one-way media such as TV, audio / video recordings, printed teaching materials, there will be no interaction between teachers and students because the medium is not suitable for returning answers. Ultimately, a form of dialogue will take place in a silent and internal form to the student.

A student involved in a correspondence course can instead establish a dialogue with the teacher, in a less spontaneous but perhaps more reflective form than a student who receives the same course face-to-face or via video conference over the network.

Highly interactive tools, such as online audio / video conferences, allow a more intense dialogue, more sensitive to personal style, more individual, more dynamic. Courses using these media are equipped to reduce transactional distance more effectively than those using registered tools.

It is evident that the interactive nature of the communication medium is a determining factor of the dialogue in the teaching-learning process. By manipulating this variable - the medium - it is possible to increase the dialogue between students and teachers and this reduces the transactional distance.

1.2.3. *Course structure*

In Moore's theory, a second set of variables that determine transactional distance are the elements of course design, or the ways in which the curriculum is structured to be delivered across various media. The structure of a program takes into account the needs of production, delivery and control of mediated messages.

Structure expresses the rigidity or flexibility of a course's learning objectives, teaching strategies and assessment methods. It describes the extent to which an educational program can adapt or respond to the individual needs of each student. Like dialogue, structure is a qual-

itative variable and is determined, among other factors, by the nature of the means of communication used.

A course recorded and broadcast on TV is highly structured, every detail is predetermined, does not provide for dialogue or the possibility of undergoing any alteration due to the response of students in general and of an individual in particular. On the contrary, a conference course involves dialogue, requires less structure, allows a great variety of responses from the teacher to the questions and written requests of the students.

The extent of the dialogue and the flexibility of the structure vary from course to course. These variables give one course greater or lesser transactional distance than another. The gap is large when a course is highly structured and does not involve dialogue between teacher and student. The distance is reduced when a course involves intense dialogue and has a less predetermined structure.

1.2.3.1. The partitioning of teaching responsibilities

In order to provide teaching programs that are highly effective in overcoming transactional distance, the clusters of variables - briefly described above - must be controlled, which is <an extremely complex matter, because what is appropriate varies according to content, level of instruction, and learner characteristics, especially the optimum autonomy the learner can exercise> (Moore, 2013). This may hardly ever be the task of the individual teacher; conversely, it is <a collaborative process joining together the expertise of a number of specialists in design teams and delivery networks. The typical model is that of the course team of content experts, instructional designers, and media specialists, providing structured materials which are then used as the basis for dialogue between learners and specialist teachers (often called tutors)> (*ibid.*). Moore lists some of the instructional processes that need to be structured in any distance education program.

- Presentation of information and teaching objectives.
- Support for student motivation.
- Stimulus to analysis and criticism.
- Offering counsel and advice.
- Practice, application, assessment and evaluation.
- Sharing the student's knowledge building process.

1.2.3.2. Media choice and integration

The means of communication must be chosen according to their appropriateness to each educational process. The appropriateness depends in part on other variables, such as the characteristics of the student and those of the contents. Furthermore, different media are differently effective in conveying a precise education process. The practical consequence is that designers divide the teacher's functions - and instructions assembled by a team of specialists - across multiple media.

1.2.4. *Learner autonomy*

In courses where the transactional distance is small, students receive instructions and advice through dialogue with the teacher, the program has a relatively open structure and has been designed to support such individual interactions.

In courses characterized by greater distance, where the expected dialogue is reduced or absent, the teaching materials are strongly structured in order to provide all the supports that the designers of the course can foresee, but without the possibility for the student to interact on this through dialogue individual.

In long distance transactional courses, students are responsible for judging and deciding study strategies. Although a course is structured in such a way as to provide maximum information and support, if it does not include dialogue, students will decide independently if, how, when and to what extent to use the instructions received.

The greater the transactional distance corresponds to the exercise of greater autonomy by the student. Since students are key players in the teaching-learning process, the nature of the learner - particularly their ability to undertake self-study - affects transactional distance in any type of course. There is a relationship between dialogue, structure and student autonomy: the more structured a course is and the less it involves dialogue, the more the student must exercise autonomy.

1.2.5. *Börje Holmberg: the guided didactic conversation*

Börje Holmberg identified the two building blocks of distance education in the mediated presentation of content and the mediated interaction between students and support organizations (Holmberg, 1985). His contribution to research and didactic experimentation in this field concerns precisely the didactic (non-technological) quality of mediation. He insisted on the importance of the relationships that are established between the student and the various figures of the educational institution for the purpose of achieving the learning objectives and attributed particular importance to the fact that mediated interactions are frequent and take a colloquial form, such as to allow the emotional involvement of the distance learner, which in turn is effective on learning. This empathic approach to didactic mediation, defined by the author <teaching-learning conversation> (Holmberg, 2003), does not only concern the exchanges that actually take place in both directions between students and the institution, but can also be applied in the dimension of individual study: through didactic materials prepared in an opportune way a simulated or silent conversation can take place. Now, a knowledgeable reader knows well that with the text he always establishes a form of "conversation", that to understand a text one must (to some extent and in both automatic and conscious forms) be able to cooperate with the text.

Exposed so briefly, Holmberg's proposal may appear to be common sense: well-constructed teaching materials are needed and when it comes to texts, it is necessary to take care of their legibility (from a linguistic point of view) and keep in mind that the knowledge presupposed by the text must not exceed those available in the reader. In reality Holmberg describes a precise style in the drafting of teaching materials, where the appeal to the reader is explicit and structured, goes beyond the immediate purposes of understanding the text and intends to orient the learning process. Furthermore, this reflection on teaching materials prepared according to a colloquial style must be placed within a distance teaching proposal that provides a high frequency of real interactions with tutors and teachers, exercises and evaluation activities that should conform to the same style.

1.2.6. *An industrialized form of teaching*

As Otto Peters pointed out in the late 60s (i.e. observing mainly correspondence education), DE is an industrialised form of teaching and learning characterized by division of labour (Peters, 2001). Peters proposed for the first time an analysis of distance education compared to industrial production systems. What distance emphasizes (and what the similarity with the industrial production system serves to underline) is the separation between teaching (observed as a production process) and learning (product). Distance education can take on industrial features of rationalization, division of labor, mechanization and mass production.

According to Miller and Rice's corporate organizational systems theory (1967), "operating activities" are those that directly contribute to the input/transformation/output processes which define the nature of the business and differentiate it from other businesses. This theory has been applied to distance education systems by Kaye and Rumble (1981), who have identified two operating subsystems characteristic of distance education:

- the course development subsystem;
- the subsystem of student support;

and the boundaries that separate these activities within the organization from other activities.

Desmond Keegan, in his *Foundations of distance education* (1990), developed this analysis and noted that the course development subsystem includes the planning, design, concretization, and registration of teaching (together with the proposed methodologies and structures for presenting the course at a future date) in mechanical or electronic form. The student support subsystem includes the activities designed by the institution considering the situation of the student at home (or at the institutional proximity study center) to provide an individual and personalized presentation of the course content, together with the simulation of the discussion with the teacher and with the peer group, who normally accompany the presentation of the courses in traditional group conditions and in presence.

In organizations that provide distance education, there are operational units dedicated to the course development process and others

that focus on support services for students who study remotely and this distinction of roles is clearer than it is in other educational institutions. These two characteristic "operational subsystems" would define the nature of a remote system and differentiate it from other forms of education.

1.2.7. *Distance learning is not an easy option*

A long-debated issue in the history of distance education is that of the excessive dropout rate that has characterized this sector in the past. Desmond Keegan (interview in Poce & Angelini, 2011), who accompanied a long period of the history of distance education with his studies, wrote:

> It has often been said that distance education is not an easy way to study because the student is often alone. Scholars have written about 'the loneliness of the long distance learner' and of the isolation of the student in distance systems. Drop-out has been a problem and some have claimed that excessive drop-outs was an inherent problem of distance systems.
>
> It was not until the 1970s and the foundation of the European Open Universities that sophisticated student support systems were put in place for student motivation and the stigma of excessive drop-out from distance systems was successfully addressed.

The main institutions and research centers active in the field of distance education, each placing the emphasis on the central aspects of their teaching model - have devoted a lot of attention to:

- the planning of courses and the construction of study materials capable of incorporating teaching mediation as far as possible, or of offering all the supports that it is possible for the designers of the course to foresee and the means of communication to convey;
- the adoption of procedures and technical means capable of automating, at least in part, the formative assessment processes, for example, the correction of tests and the return of comments (this is one of the aspects of the distance education systems that Otto Peters defined <industrial>);
- the development of student support systems aimed above all at limiting the dropout rate (study centers, tutors).

A particular case is constituted by the megaproviders of higher education, or by the large institutions that deal exclusively with distance education (secondary and above all post-secondary), have a very large catalog of educational offer and serve tens or hundreds of thousands of students , such as the Open University in the UK or the CNED in France. Some of these institutions, which arose as a result of a public initiative and as a result of a political decision to centralize the offer of distance education, as in the cases cited, have been operating in this sector for decades and have accumulated great technical and pedagogical resources, which combined with the "critical mass" of their user base allow at the same time to achieve economies of scale by "industrializing" the process and to reach the highest levels of quality in the sector, positioning themselves at the forefront of research and development.

The case of the United Kingdom Open University testifies to the great potential of the choice of distance education as a tool for disseminating educational opportunities to the adult population, but at the same time it has highlighted the limits that, in the course of a long history, has encountered a large institution created mainly to provide access to higher education to workers and more generally to those who, due to socio-cultural disadvantage conditions, find themselves without a secondary qualification.

From the process of integrating ICT into teaching and training, many expected important development opportunities from the point of view of extending the social base of education, with a view to continuing education; this has been considered, from the very beginning, also as one of the missions and promises of distance education.

In this regard Robin Mason, professor at the Institute of Educational Technology of the UK Open University (1999) observed the initial development phase of “virtual” education in Europe (noting, among other things, the frequent abuse of the term). While praise was being raised for the thaumaturgical property of "virtual" education, the author noted that it was not appreciably promoting the extension of the social base of education.

> It is clear that the new growth area in education is the lifelong learning market. And although the rhetoric about virtual education is that it will extend to the disadvantaged, the remote, the housebound, and the unemployed, those who are signing up for virtual education are the advantaged, the up-

> wardly mobile, the “over-employed” (i.e, those who are already incredibly busy), and the well educated. There is evidence from practitioners that virtual education is more appropriate and more successful for the advantaged learner: one who is motivated, has good learning skills, and has easy access to technology.

The problem is only partly due to the incidence of the digital divide phenomenon on a form of education that requires effective access to recently and unequally widespread technologies. The phenomenon was known and studied in the field of distance education well before the introduction of network technologies.

Helmut Fritsch (2003) of the Fernuniversität noted that since media belong to the structural configuration of distance learning and have been a subject of study for a long time, distance education institutions approached the new media with relative ease because they were already aware that such changes did not imply a structural need to change the theory. The "conventional" universities have had transition problems, they have had to equip themselves for the use of the new means of communication not only from the material point of view but by rethinking the fundamental principles of didactic use of the means of communication in university teaching. It has long been clear to distance education practitioners that <learning takes place in the central nervous system of the learner and not within the medium, neither book nor TV. And distance educators knew that help in optimizing, individualizing the path to learning needs personal communication> (Fritsch, 2003, p. 58).

According to Fritsch, there is no "inferiority complex" of distance education compared to traditional education, on the contrary: didactic planning, forms of structured interaction, systematic measurement of individual progress and continuous evaluation are part of the standard procedures of distance education and they are the foundation of the success of the institutions operating in this field, the main limit of which has occurred elsewhere, that is, in the dropout rate, which is on average higher than that found in traditional courses. Fritsch (*ivi*) states that <this phenomenon is based on the heterogeinity of the addressees>. At FernUniversitat the problem was studied as early as 1988 (Ströhlein, Fritsch, 1988) by relating the reasons for abandonment declared with the individual biographies of the students. Normally, in post-secondary distance education, students are also workers,

have social or family commitments and choose to continue their distance learning path because they could not do it otherwise.

The critical point, which we observe here from the point of view of distance education but is a crux of contemporary reflection in the educational field, is how to respond to the complex needs of the subjects who learn through the individualization of the education proposal. One of the limits with which even distance education has been confronted for a long time is in fact the tendency to propose an undifferentiated education offer, not very attentive to the characteristics of a user base that has a strong heterogeneity and a plurality of individual needs.

1.2.8. *Self-paced, adaptive instruction and mastery learning*

1.2.8.1. Individualization or personalization

As noted by Means, Bakia and Murphy (2014, p. 46), self-paced, adaptive instruction and competency-based learning is currently a major trend in online learning in higher education:

> the basic idea of having learners work through instructional content at their own pace has been around since the early days of computer-based instruction. Today, learning system providers are more likely to talk about "personalized" or "self-paced" rather than "mastery" learning, but operationally they usually mean the same thing.

In a study devoted to the question of "Personalization or individualization?", Massimo Baldacci (2005) noted how different training needs, which in the past presented themselves as alternatives, now ask education systems to be satisfied jointly. The first is that of the quality of education, which is realized as <a higher quality of school learning>, <a fundamental condition to allow the men and women of tomorrow to know how to orient themselves and to be able to move as architects of their own existence in the new social complexity> (*ivi*, p. 10), as workers and as citizens. The second is that of the equality of educational opportunities, understood in a non-formal way - that is, not as the simple offer of equal learning opportunities in terms of access to the education system, which would tend to confirm inequalities at the exit - but in the sense of equal mastery of basic skills. The third

is that of the enhancement of the different types of personal potential, described as <specific forms of intelligence> (*ivi*, P. 14) that is the student's talent (considering, with Gardner, these concepts as equivalent).

According to the author, the term "individualization" is ambiguous and has at least two relevant meanings. If used as a pedagogical category, the term indicates <a requirement that every formative action must satisfy: having been conceived taking into account the pupil in his existential concreteness> (*ivi*, p. 16); this meaning <is now part of educational "common sense">. Intended as a didactic category, <the term means the adaptation of teaching to the individual characteristics of the students through precise and concrete methods of didactic intervention, acquiring a recognizable and circumscribed operational content> (*ibidem*). Within the didactic meaning of the term "individualization", the author introduces a distinction between "individualization" in the strict sense and "personalization": the first <refers to didactic procedures aimed at ensuring all students have common (or basic) skills of the curriculum, through a diversification of learning paths>; the second,

> on the other hand, indicates the didactic procedures which aim to allow each student to develop their own peculiar intellectual potential, different for each one, always through different forms of learning itineraries. In other words, while in individualization the goals are the same for everyone, in personalization the goals are different for everyone. (Baldacci, 2005, p. 19)

1.2.8.2. Individualized instructional strategies

During the second half of the twentieth century, with mass schooling the issue of educational equality was placed at the center of the debate. The best-known didactic proposal related to the objective of making everyone achieve mastery of the basic skills of the curriculum is the individualized strategy of Mastery Learning (Bloom, 1976) which provides, alongside the central core of teaching aimed at the group of students, a compensation procedure to offer differentiated opportunities to students who experience difficulties in an intermediate test. The experiments conducted on the use of this strategy have produced the important result of verifying the hypothesis on which the very instance of educational equality is based: the frequency distribution of learning

outcomes does not necessarily take the form of the "bell curve". In fact, the adoption of didactic strategies suitable for each learner produces as an effect a "j-shaped" distribution, that is to say that under this condition the vast majority of students fully achieve the objectives.

The individualization model proposed by Benedetto Vertecchi, indicated by the acronym DIVA (Vertecchi, La Torre and Nardi, 1994; Nardi, 1997), which stands for Individualized Didactics with Analogical Evaluation, was developed and tested for the first time in 1993 at the Laboratory of Experimental Pedagogy of the University of Roma Tre. It assumes the positive results of mastery learning, considers some of its limits and pursues the same basic objectives with a different procedure. In mastery learning, the intervention can only follow the first segment of the learning path and the first manifestation of the student's difficulties. The formative evaluation (according to the distinction introduced by Scriven, 1967) is based on tests that must analytically detect the achievement of specific learning objectives and the compensatory proposal that is activated in the event that the outcome of the verification is negative, is equally specific and targeted. In this way, during the learning path, a sequence of specific interventions, not connected to each other, can be activated, which are added to its main development without replacing it (what, in the case of a student who has to recover very generalized failures, can also have a depressing side effect on motivation). While in the mastery learning model any learning difficulties manifested by the students during the process are compensated for through the wrong answer to the questions of the formative tests, in the DIVA model the procedure is to anticipate the learning difficulty, that is to prevent this from happening, offering paths suited to everyone's needs.

> A different solution [from mastery learning] consists in estimating, before the path starts, in correspondence of which objectives the difficulty is likely to occur. The estimate is carried out by analogy, that is, by proposing special analogical tests to the students, whose questions require performances similar to those corresponding to the learning objectives, but which do not require the possession of the knowledge relating to them (Vertecchi, 2012, p. 100).

While in mastery learning the formative assessment is placed within the process, in DIVA the analogical assessment precedes it, carrying out a prognostic function rather than a diagnostic one. In the di-

dactic field, as Sara Amatiste and Alberto Quagliata (2004, p. 221) noted, <the most effective models were characterized precisely by significant innovations in the evaluation procedures>.

> In the mastery learning model [...] the individualization of the training proposal is possible, in the context of a traditional group instruction, thanks to the progressive and specific feedback guaranteed by the analysis of the results of the training tests.
> In the DIVA model […] the analogical evaluation is the information base necessary to carry out the planning of individualized instruction interventions […]. Evaluation plays, in DIVA, a role that is both original and irreplaceable: original, because it aims to identify elements of knowledge relating to learning situations that will be realized (better: that are expected to be realized) in the future; irreplaceable, because the very design of the DIVA interventions would fail in the absence of the results of the analogue test (*ibidem*).

It is interesting to note that the research that accompanied the development of the DIVA model was conducted within distance courses. According to Vertecchi (1998, p. 109): <precisely if we consider distance education in the historical development line of experimental pedagogy, its peculiarity emerges, that of presenting particularly favorable conditions for research>.

1.2.8.3. Individualization at a distance

Despite the development of highly interactive network-based media and learner support systems, the same concerns that have driven the debate on individualization have also arisen in distance education. As Luciano Cecconi (2010) observed:

> the problem essentially concerns the ability of a training proposal (in this case at a distance) to adapt to the specific characteristics of its recipients. An adaptation that must take place in the contents (quantity and quality of information and knowledge), in the forms (quality of the communication processes and relationships that are established between learners and teachers), in the timing (of communication, learning, evaluation).

An important chapter of the reflection on individualization procedures in education, with particular reference to distance education with the use of IT tools and the way in which this can give an answer to the problem of the inhomogeneity of the characteristics of students,

was hosted in a monographic issue of the Italian journal "Istruzione a Distanza" (Distance Education), entitled *Individualization at a distance* (1998). At that time, Keegan (1998) considered that both from a theoretical and a practical point of view, contemporary distance education was better equipped than conventional education to achieve effective individualization of teaching processes through provision. of study materials appropriate to the previous knowledge and language skills of each student. On the same occasion, Vertecchi (1998) examined the possibilities and limits of the didactic strategies of individualization oriented to compensation based on formative assessment and laid the foundations for an individualization procedure centered <on the adaptation of the message to some characteristics of particular relevance on the cognitive level, such as those which refer to verbal skills>.

The first steps in this direction were taken in Italy in 1998, when a specific research project was launched at the European Education Center (CEDE) chaired by Vertecchi, and the first prototype of a system for "Development and provision of individualized distance courses", called IADIS, was developed and tested in the field of in-service teacher training.

Along this path, the subsequent "adaptive message learning" research project (Italian Fund for Investment in Basic Research - FIRB, 2009 - 2013) has made significant progress (Vertecchi, 2010). To allow the experimentation of the theoretical model mentioned above, a coherent online learning environment has been developed, called Orbis Dictus (Vertecchi, Poce, Angelini, Agrusti F., 2010). The system integrates two programs (Agrusti F., 2010): the first, called Lexmeter, is dedicated to the estimation of the differential existing between the lexicon available by the learner and the one supposed in the learning message (i.e. the contextualized assessment of the individual academic vocabulary), the other, called Adapter, provides for the consequent adaptation of the study texts. The initial and continuous assessment of the lexical competence of students is a core element in the am-learning model. It requires on the one hand the lexical analysis of the input to which students are exposed in a given context of formal learning, on the other hand the collection of measures on the reader in relation to the vocabulary of the texts and to the specific language of a subject area. In more detail, software-generated multiple-choice rational-deletion cloze-tests are used to measure the extent to which learners

can presently handle relevant vocabulary in discipline specific texts, in order to estimate how effectively they could cope with standard course materials and then use this information for adapting the wording of the study text to the individual student. The validation of the diagnostic assessment of am-learning required specific attention. In am-learning, quantitative analysis of words in a corpus of LSP texts is used for identifying the relevant vocabulary, that is to define by statistical criteria the vocabulary list to take into exam (which words may be deleted from a given text). The assessment of the individual vocabulary, then the automated construction and evaluation of the tests, are based on the frequency of occurrences of the content words in a specific language. In addition, it is possible to establish a system of automatic assessment on different aspects of vocabulary, provided that they can be described with reference to explicit and quantifiable data of the language. An exploratory study conducted within the project (Zini, 2011, 2012, 2013, 2014, 2015) examined the use of the rational-deletion cloze procedure combined with corpus analysis (Read, 2007) to select words in the specialized language of a discipline that have a peculiar frequency of use (Bolasco, 2008) in comparison to the use they have in common language. The main research question concerned the effectiveness of this test for measuring the extent to which learners can handle the relevant vocabulary while reading discipline specific texts. A positive relationship was found with concurrent measurements of thecnical vocabulary and prior knowledge on the topic.

1.2.8.4. Adaptive learning systems

The adaptivity of education systems, as mentioned in 1.2.8.1, is a major trend and an attractive feature often declared by providers of online learning. According to Means, Bakia and Murphy (2014, p. 47), the concept of adaptive instruction is more general and subsumes that of mastery learning: a system is adaptive if it uses information acquired during the use of it by a student (rather than information on background variables or prior knowledge) to better meet its needs by changing the way the system presents education:

> Systems can be adaptive in the way they represent a concept (e.g., through text or diagrams or formulae), the difficulty level of the text or problems they provide, the sequencing of material, or the nature of hints and feedback giv-

> en. While the mastery learning systems of the 1980s varied the pace with which students moved through a curriculum, they still had all students work through the same content in the same sequence. Newer adaptive learning systems with artificial intelligence capabilities are able to mimic the more complex variations in instructional styles that a human tutor would use with a student.

The implementation of mastery-based models, or adaptive instruction models, is therefore closely linked to two of the Design components in the conceptual framework referred to below: pacing and the role of online assessments.

> In systems using mastery learning principles (also referred to as competency-based learning), the assessments are used to determine if the learner is ready to move on to new content. In more sophisticated adaptive systems, assessments may be designed to provide data that the system can use to determine how much to scaffold the student in future, for example, with more or less explicit hints. (Means, Bakia and Murphy, 2014, p. 12)

1.3. A Conceptual Framework for Describing Online and Blended Learning

As already anticipated, we refer again to the work of Means, Bakia and Murphy (2014) to describe the vast and changing field of educational practices considered here by identifying some fundamental dimensions.

Considering that the field is rapidly evolving and the many attempts to define a typology are hindered by the continuous emergence of new phenomena, the Authors prefer to offer a set of dimensions that can be used to characterize them: context, design features, implementation, and outcomes (Figure 1.2).

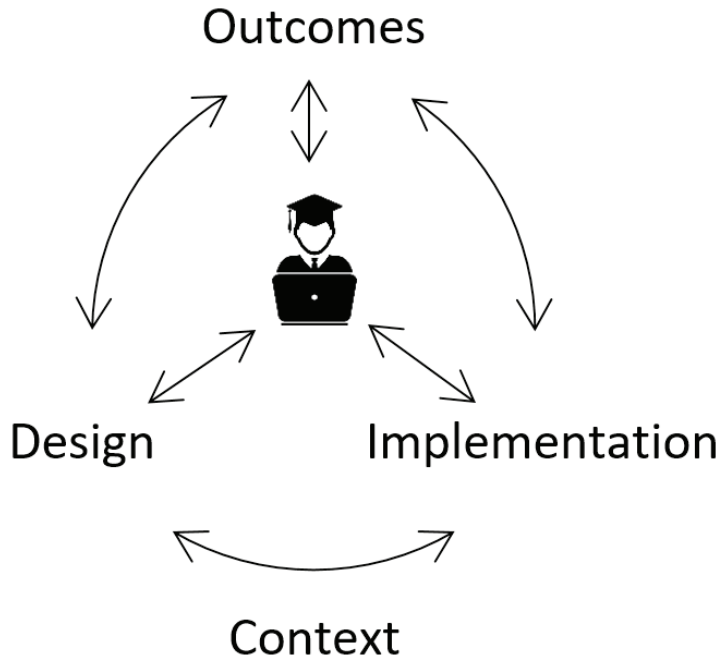

Figure 1.2. Four Dimensions of Online Learning.
SOURCE: Means, Bakia, and Murphy, 2014, Figure I.I, p. 9; student icon created by Wilson Joseph from the Noun Project.

The conceptual framework comprising these four dimensions, divided into several components and accompanied by examples (Table 1.2), is particularly effective for the description of the educational practices considered in this study, and beyond.

Table 1.2. A Conceptual Framework for Describing Online Learning.

Dimensions of online learning	Components	Example values
Context	Field of use	K-12 Higher education Post-secondary training Self-initiated Mixed
	Provider	District State For-profit vendor Consortium Nonprofit higher education institution Other nonprofit Government agency
	Breadth	Whole program Course Portion of course Brief episode
	Learner's level of preparation	Weak Adequate Strong
Design features	Modality	Fully online Blended with over 50% online but at least 25% Face-To-Face Blended with 25–50% online) Web-enabled FTF
	Pacing	Independent mastery-paced (self-paced: open entry and open exit) Class-paced Mixture (class-paced with some self-paced elements)
	Student–instructor ratio	≤ 35 to 1 36–99 to 1 100–999 to 1 ≥ 1,000 to 1
	Pedagogy	Expository Practice environment Exploratory Collaborative
	Online communication synchrony	Asynchronous and synchronous Asynchronous only Synchronous only None
	Intended instruc-	Active instruction online

Dimensions of online learning	**Components**	**Example values**
	tor role online	Small presence online None
	Intended student role online	Listen and read Complete problems and answer questions Explore simulation and resource Collaborate with peers in building knowledge
	Role of online assessments	Determine if student ready for new content Tell system how to support the student (basis for adaptive instruction) Provide student or teacher with information about learning state Input to grade Calculate student's risk of failure (identify students at risk of failure)
	Source of feedback	Automated Teacher Peers Mixed None
Implementation	Learning location	School Home Other Mixed
	Co-located facilitator	Primary instructor Monitor and facilitator Absent
	Student–instructor ratio	
	Level of online student–content interaction	High Medium Low
	Level of online student–instructor interaction	High Medium Low
	Level of online student–student interaction	High Medium Low
Intended outcomes	Cognitive	Declarative knowledge Procedural skills Problem solving and strategies
	Engagement	Primary goal Secondary goal

Dimensions of online learning	Components	Example values
		Not explicit goal
	Productivity	Course pass rate Graduation rate Time to completion Cost
	Learning to learn	Self-regulation New media skills

SOURCE: Means, Bakia, and Murphy, 2014, Table I.I, p. 10, integrated with Table 2.1 Online Learning Design Dimensions, p.27.

Part Two

The changing pedagogical landscape

E-learning in the European Higher Education Area

Some of the major trends in how universities are using e-learning have significant similarities in the European area, to which we will refer primarily, and in the United States. This is why it is worth taking a quick look at some of the US trends.

2.1. Trends in the US at a glance

Means (et al., 2014) refer to this latter area when they indicate the following four major trends in online learning as applied to higher education:

- self-paced, adaptive instruction and competency-based learning
- blended learning
- learning analytics[3]
- MOOCs.

In this regard, some surprising data can be found in the recent study *Grade Increase: Tracking Distance Education in the United States*, by the Babson Survey Research Group (Seaman, Allen, & Seaman, 2018).

[3] <Data collected by interactive online learning systems can be aggregated across large numbers of students and then analyzed to identify patterns and trends. Generally, educational data mining looks for new patterns in data and develops new algorithms and/or new models, while learning analytics applies known predictive models in instructional systems>. (Means, Bakia and Murphy, 2014, p. 51)

> Distance education enrollments increased for the fourteenth straight year, growing faster than they have for the past several years. From 2002 to 2012 both distance and overall enrollments grew annually, but **since 2012 distance growth has continued its steady increase in an environment that saw overall enrollments decline for four straight years** [...].
> The number of distance education students grew by 5.6% from Fall 2015 to Fall 2016 to reach 6,359,121 who are **taking at least one distance course**, representing **31.6% of all students**. Total distance enrollments are composed of 14.9% of students (3,003,080) taking exclusively distance courses, and 16.7% (3,356,041) who are taking a combination of distance and non-distance courses.
> Year-to-year changes in distance enrollments continue to be very uneven with different higher education sectors, with continued **steady growth for public institutions**, similar levels of growth (albeit on a much smaller base) for the **private non-profit sector**, and the continuation of the **decline** in total enrollments for the **private for-profit sector** for the fourth year in a row.
> Distance education enrollments are **highly concentrated in a relatively small number of institutions**. Almost half of distance education students are concentrated in just five percent of institutions, while the top 47 institutions (just 1.0% of the total) enroll 22.4% (1,421,703) of all distance students. [...]
> **Distance enrollments remain local**: 52.8% of all students who took at least one distance course also took an on-campus course, and of those who took only distance courses 56.1% reside in the same state as the institution at which they are enrolled. Virtually no distance enrollments are international: only 0.7% of all distance students are located outside of the United States.

2.2. The spread of e-learning across the EHEA during the first half of the 2010s

Taking into consideration the European area, it is noted that in the period corresponding to the eruption of the MOOCs, the topic of e-learning in HE took on great importance on the agendas of the EU, of the individual member states, and the HEIs, within a European landscape marked by intense research and reflection, poised between concerns raised by potentially disruptive changes and new opportunities.

Starting from the early 2010s, many issues related to digitalization in HE have been addressed in relevant European Commission communications aimed at setting an agenda for the modernization of Europe's higher education systems (European Commission, 2011, esp. point 4.3. *ICT in higher education*), and stimulating high-quality, innovative ways of learning and teaching through new technologies and

digital content (*Opening up Education: Innovative teaching and learning for all through new Technologies and Open Educational Resources*, European Connission, 2013). The growing attention of the European institutions for this topic is also evident from the work carried out in the same period by the High-Level Group on the Modernization of Higher Education, summarized in two reports to the EC: *Improving the Quality of Teaching and Learning in Europe's Higher Education Institutions* (2013b, p. 47), and, particularly, *New Modes of Teaching and Learning* (2014). Moreover, the same themes have been the subject of further studies, equally relevant, conducted over a short period of time, such as *The changing pedagogical landscape – New ways of teaching and learning and their implications for higher education policy* (Haywood, J., Connelly, L., Henderikx, P., Weller, M. &Williams, K., 2015), and the topic is also covered in the EUA Trends 2015 study (Sursock, 2015).

Although it may no longer represent the state of the art, the 2014 EUA study, *E-learning in European Higher Education institutions* (Gaebel, Kupriyanova, Morais, & Colucci, 2014) is a seminal work and still deserves to be examined in some detail.

The EUA 2014 E-learning study, based on the survey conducted by the EUA in the fall of 2013, has remarkably fulfilled the task of closing a data gap and stimulating <the discussion on the further development of national and European policies on the issue and to support its systematic institutional take-up>. The data collected concern a self-selected sample composed of 249 HEIs**,** in their majority universities, from 38 European systems in the EU and the wider Europe.

2.2.1. *Institutional take up of e-learning*

With regard to the institutional take up of e-learning, the survey shows that in 2013 almost all the responding institutions had, in some form, started e-learning experiences:

> Most of the surveyed institutions are using **blended learning (91%)**, integrating e-learning into conventional teaching, but surprisingly **82% of institutions also indicate that they offer online learning courses**. Less frequent, but seemingly also on the rise, are other forms of provision such as joint inter-institutional collaboration and online degree courses. Online examinations are likely to become more widely used for all students in all or most disciplines, also for conventionally taught courses. Besides pedagogical and eco-

nomic motives, the institutions refer to a **growing need for flexibility** of time and place, and better use of resources, **benefiting both residential students and a wider range of professional and other lifelong learners**.

2.2.2. *Potential for mainstreaming and diversification of provision*

Despite the general adoption of some form of e-learning, the extent of the incorporation of e-learning into the mainstream of HEIs' education provision was highly variable: only half of the institutions indicated that e-learning was implemented throughout the institution, and less than one-third of institutions involved all or most of their students in e-learning, thus, only 20% of HEIs indicated using it in all disciplines. In 2013, <the inconsistent and patchy implementation of e-learning throughout the institution could be seen as a cautious exploration> or a recent development, as a large number of HEIs stated that they were planning <to introduce new forms of provision>.

2.2.3. *Institutional strategies, governance, and management*

As regards the **institutional strategies, governance, and management**, national policies and strategies for e-learning in HE were not yet widespread, while half of the respondent institutions had already established such a strategy, and a further 26% were preparing one. E-learning activities were often driven by individual departments or even individual academics, while faculty e-learning strategies were not very frequent (13.8%), but nearly half of the surveyed HEIs had an institution-wide strategy in place, and one fourth was developing one at that time.

2.2.4. *E-infrastructure and support to students and staff*

The vast majority of institutions indicated that they had an ***E-infrastructure*** *for* digital courseware, online repositories for educational material, tools and management systems for content development and course management, student portals**,** and provided **specific student support for e-learning** and **staff training**; one-third providing incentives to staff, and 40% have a dedicated **eLearning center**: about this topic, <75% of survey respondents reported that e-learning is either managed by a central unit (35%), or as part of task-sharing

with faculty-based units (40%)>. As the study pointed out, <some of these developments cannot be seen exclusively in the context of e-learning but are part of the broader digitalization trend, particularly in the communication and administration of the institutions>.

Some of the topics covered in the EUA 2014 research are of particular relevance for the purposes of this study, therefore they will be examined in more detail. Below we will take up some of these issues and observe them through some up-to-date studies for the European area.

2.3. Current trends and Future prospects for e-learning in the EHEA

2.3.1. *Three emerging areas of provision*

The EADTU and ENQA (2017) study on *The development of blended and online programmes in European higher education*, identifies three areas of provision which emerge consistently in European universities: <degree education as the backbone of a university; continuing education and continuous professional development, which probably will exceed the number of degree students; and open education [MOOCs and OERs] which emerged mainly by the MOOC movement>.

In each of these areas, which are to some extent intertwined, European universities are redefining their profile, strategies, and policies, and can find new opportunities in e-learning. According to the predictions of the EADTU and ENQA (2017) study, in the next few years:

> *- **Blended degree education** will raise the quality and efficiency of degree education, facing large numbers of students and lower staff/students ratios.*
> *- Blended and online education will upscale the area of **continuing education** and **continuous professional development** (CPD) by offering flexible courses with a large outreach responding to the needs of learners at work, who face longer careers and career shifts.*
> *- **MOOCs** are offered online only, providing massive and open learning opportunities for all, promoting engagement in the knowledge society.*
> *In the area of continuing education, the deployment of **short learning programmes** (SLPs) is a most important solution. The online provision of SLP`s makes them even more scalable and flexible. They facilitate the accessibility of courses by learners and can be taken in combination with a job at all stages of life. SLPs should be awarded with appropriate qualifications (e.g. certificates, diplomas), corresponding with the European Qualification Framework.*

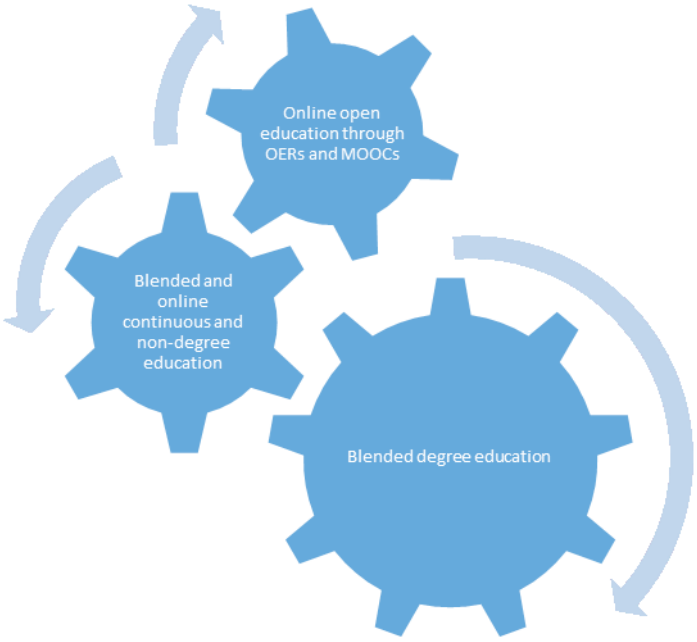

Figure 2.1. Three emerging areas of provision in higher education.
SOURCE: EADTU and ENQA, 2017, ANNEX 2.

Results from the EUA survey *Trends 2018. Learning and teaching in the European Higher Education Area* (Gaebel & Zhang, 2018) <confirmed that LLL seems indeed embedded into European higher education institutions' strategies and their education offer, with 67% of institutions providing lifelong learning opportunities as part of their institutional learning and teaching strategy or policy> (*ivi*, p. 51).

The trend towards blended learning, already noted in the EUA 2014 *E-learning* survey (Gaebel, Kupriyanova, Morais, & Colucci, 2014), has been also confirmed by the EUA *Trends 2015* report (Sursock, 2015), where the following important comment is made.

> While at present lifelong learning is often offered as a fee-paying service, the growing trend towards e-learning and blended learning may well blur the existing boundaries between lifelong learners and more traditional students. (Sursock, 2015, p. 96)

The *Bologna Process Implementation Report 2018* (European Commission/EACEA/Eurydice, 2018) also points out that <higher education is expanding and more people study in different phases of their adult life, but not everywhere yet in the EHEA>. The potential of e-learning for HEIs intervention in the field of LLL and, more generally, to broaden citizens' access to higher education is further highlighted.

> Digital technologies potentially may broaden access to higher education and lifelong learning. They give learners the opportunity to participate in education in a more flexible way – both in time and in space. Finally, digital technologies, for example through Massive Open Online Courses (MOOCs), open up the possibility of linking informal, non-formal and formal education. (*ivi*, pp. 74-75)

Taking into exam blended courses, online courses, and MOOCs, the same report confirms that blended learning is the most common type of course offered across the EHEA:

> Online components of degree programmes (blended programmes) are by far the most widespread provision in European countries (39 systems). In contrast, only 18 systems offer online degree programmes. Finally, higher education institutions in more than half of the countries (28) also provide courses as MOOCs. Only 11 systems' institutions offer all three types of course. (*ivi*, p. 79)

2.3.2. *Flexibility in learning paths and modalities*

According to the EUA survey *Trends 2018. Learning and teaching in the European Higher Education Area* (Gaebel & Zhang, 2018), <most of the institutions do not engage in short-cycle programmes, but <this should not lead to the assumption that they do not appreciate shorter and more flexible ways of providing learning>.

> *Sixty-two percent of institutions ("yes" and "to some extent") believe there is a growing demand for **short-term (non-degree) learning opportunities**. [...] Even more respondents (80%, "yes" and "to some extent") saw the need for more flexible provision for **degree programmes**, [...]. This is supported by the fact that practically all institutions state increasing participation as a priority, and more than half have observed increased participation in flexible learning offers over the past three years. Technology also contributes to this trend, given that almost three quarters refer to the **positive impact of e-learning** on their education provision (Gaebel & Zhang, 2018, pp. 45-46).*

2.3.3. *Towards Student-Centered Learning and active teaching approaches*

Another important issue addressed by the EUA survey *Trends 2018* is that of student-centered learning (SCL), which refers to a shift in educational paradigm, associated with constructivist theories of learning, and characterized by innovative teaching methods, which are identified by the emphasis on active learning approaches, rather than focusing on the transfer of knowledge. SCL was fully included into the Bologna Process since the Leuven/Louvain-la-Neuve ministerial conference, in 2009, and even more emphasized with the release of the 2015 Yerevan Communiqué, adopted at the EHEA Ministerial Conference in Yerevan, which states that <enhancing the quality and relevance of learning and teaching is the main mission of the EHEA>[4]. On that occasion, ministers stated that effective learning activities <should be supported by transparent descriptions of learning outcomes and workload, flexible learning paths and appropriate teaching and assessment methods>, and agreed to make the following commitment:

> We will encourage and support higher education institutions and staff in promoting pedagogical innovation in student-centered learning environments and in fully exploiting the potential benefits of digital technologies for learning and teaching.

As stated in a recent EUA Thematic Peer Group Report (Christersson, Staaf, Zhang, and Peterbauer, 2019, p. 6):

> – New technologies allow students and teachers to communicate and exchange assignments anytime. Due to this development, and also taking into account the increasing number of students who have part-time employment, universities now have the opportunity to wholly redesign the way learning space and time are used and adjust them to foster active learning, for example, by:
>
> •Providing learning environments which support active learning and embrace both formal and informal learning spaces. Active learning classrooms and flexible classrooms need to be advocated and further developed at higher education institutions.

[4] Yerevan Communiqué, adopted at the EHEA Ministerial Conference in Yerevan, 14-15 May 2015, p. 2.

- •Exploiting the possibilities provided by technology to use spaces other than the classroom for learning, and expanding the use of classrooms to diverse disciplines, departments and other stakeholders:

– Institutions will continue to face limitations regarding physical space, either due to financial or regulatory restrictions. The answer to limited physical space is, however, not (only) to acquire additional space, but to think of more targeted, creative and flexible ways to use and redesign available space. This process could involve the use of technology to broaden the definition of learning space. E-learning, learning management systems and other platforms can potentially turn any room (e.g. the student's home, the library, the cafeteria) into a learning space. This would reduce the pressure on current classrooms to serve as sole places of learning and allow these spaces to be used across departments and disciplines, and more intensely outside office hours.

2.4. National strategies on the use of new technologies in HE

The *Bologna Process Implementation Report 2018* (European Commission/EACEA/Eurydice, 2018) devotes considerable attention to the issue of national policies and their coordination.

> For new technologies to be used in an effective, efficient and trustful way in teaching and learning in Higher Education, certain framework conditions need to be met. New technologies need resources, infrastructure and human resources to use them. They equally need to be integrated into curricula, while learning outcomes acquired through using new tools need to be assessed and trusted at national level and abroad. Action required for the implementation of these changes needs long-term strategic planning, changes in the legal environment and financial resource allocation. (p. 75)

As seen above, e-learning in HE is a varied and thriving terrain, in which the effectiveness of the fundamental tools which have already been implemented across the entire EHEA during the last two decades in order to allow the fair recognition of foreign qualifications or study periods abroad, must be ensured (and cannot always be taken for granted). These tools include, among others: the ENIC and NARIC networks, the ECTS (European Credit Transfer and Accumulation System), the Diploma Supplement, the qualifications frameworks, and the ESG (Standards and Guidelines for Quality Assurance in the Eu-

ropean Higher Education Area), which will be discussed in the next paragraph.

The Report provides an overview of the situation regarding national strategies and policies on the use of new technologies in HE across the EHEA. Based on data updated to AY 2016-2017, <most systems (38 of 50) have such a strategy or policies in place>, among which only three countries have a specific strategy for higher education, while eighteen systems have broader national strategies which include new technologies in HE. Conversely, about a quarter of the countries (12) have neither strategies nor policies in this area (Figure 2.2).

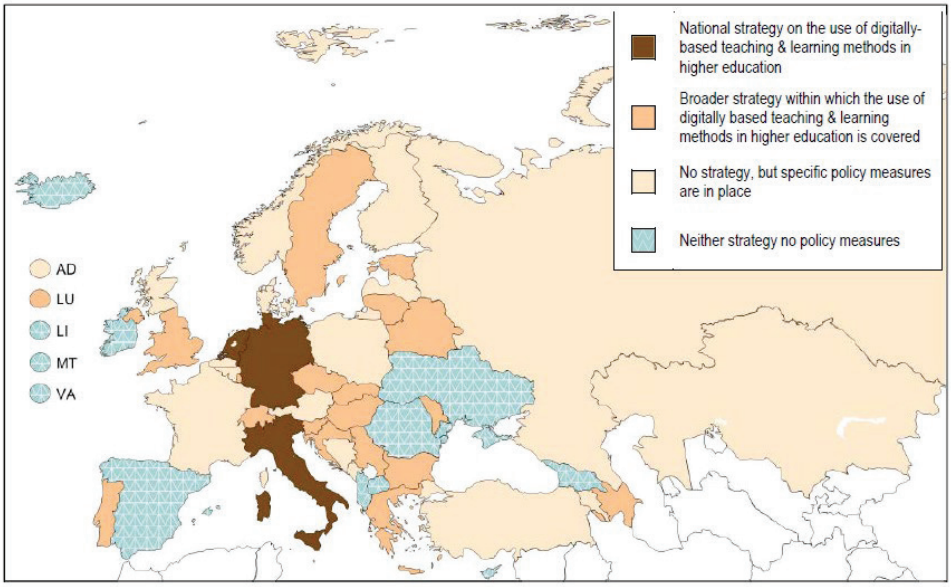

Figure 2.2. National strategies on the use of new technologies in teaching and learning in higher education, 2016/1.
SOURCE: Bologna Process Implementation Report 2018, p. 75; data source: BFUG data collection.

Some of the most important findings of the Report, indeed, concern the issues of adapting HE programmes to digital provision, developing appropriate Quality Assurance, and developing digital qualifications.

> While using ICT tools in teaching and learning and skills development are on the policy agenda in the majority of countries, significantly fewer countries prioritize **adapting programmes** to digital provision and related certification processes. Hardly any countries invest in additional resources for these purposes [...]. Twenty-three countries work on adapting higher education programmes to digital provision, only 17 and 18, respectively, mention **assessment and certification** or **quality assurance** of these courses as priority (*ivi*, p. 77)

As regards other support to the use of new technologies in HE, attention is drawn to the following data:

> Reflecting the strategic priority for the development of academic staff's skills in using digitally based teaching and learning methods, most systems (21) support higher education institutions in mainstreaming the use of new technologies by **providing methodological training** in initial teacher education (ITE) and in continuous professional development (CPD) of academic staff. [...] Less than half of the countries (16) have adapted their **legal framework** and external quality assurance procedures to facilitate and monitor digital provision. (*ivi*, p. 78)

2.5. Quality Assurance of e-learning provision

As stated in one of the European reference documents already mentioned, *The changing pedagogical landscape – New ways of teaching and learning and their implications for higher education policy* (Haywood, J., Connelly, L., Henderikx, P., Weller, M. &Williams, K., 2015): <Quality assurance has played, and continues to play, an important role in both giving confidence in the quality of European higher education qualifications and supporting the enhancement of educational quality>.

2.5.1. *Quality Standard Models*

The analysis on *Quality models in online and open education around the globe*, carried out by Ossiannilsson (et al., 2015), confirms that most quality standard models relate to three main domains, which are often divided into six areas, as shown in Figure 2.3 below.

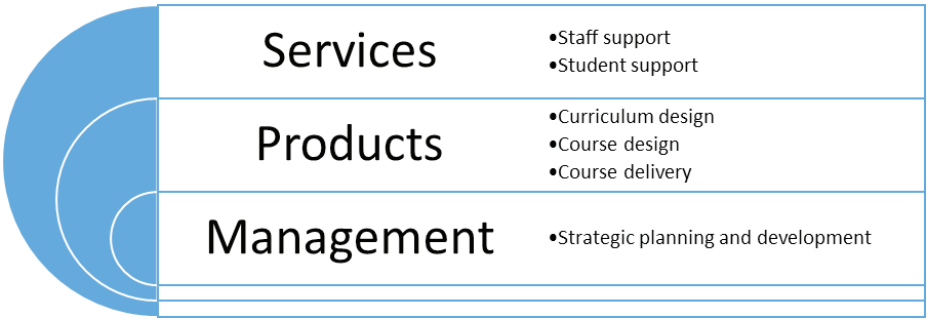

Figure 2.3. Three significant main areas related to quality in online learning, including e-learning.
SOURCE: Ossiannilsson, 2012, as cited in Ossiannilsson et al., 2015.

2.5.2. *ESG 2015-related Indicators for e-learning in EHEA*

In this field, the *Standards and Guidelines for Quality Assurance in the European Higher Education Area* (ESG 2015) are of strategic importance. The current version, revised and published in 2015, assumes that HEIs are diversifying as regards their <missions, mode of educational provision and cooperation, including growth of internationalization, digital learning and new forms of delivery>. This is why up-to-date ESG has become necessary which <apply to all higher education offered in the EHEA regardless of the mode of study or place of delivery>.

According to the ENQA working group on quality assurance and e-learning, <the ESG 2015 are equally applicable to all modes of teaching and learning, however, the necessity for an appropriate interpretation for using them persists> (Huertas et al., 2018). To this end, the ENQA, also taking into account the outcomes from EU-funded projects such as TeSLA[5] and SEQUENT[6], has developed specific indicators for HEIs, which are of the utmost importance for the purpose of this study, as shown below (Table 2.1).

[5] https://tesla-project-eu.azurewebsites.net/
[6] https://www.sequent-network.eu/

Table 2.1. ENQA (2018) ESG 2015-related Indicators for e-learning.

ESG 2015	INDICATORS
Part I. Internal quality assurance	
Standard 1.1 Policy for quality assurance	E-learning is part of the overall strategy for the institution's development as well as the policy for quality assurance.
	The institution uses a clearly articulated policy framework and governance structure when deciding on the adoption of new technologies to ensure the expected quality of e-learning provision.
	Institutional policies, structures, processes, and resources are in place to guarantee the successful teaching and learning process of students, including those with special educational needs.
	The institution has a policy and code of practice to ensure academic integrity and freedom and ethical behavior.
	Electronic security measures are considered by the institution's policy/code of practice.
	If external services or expertise are utilized, written agreements/contracts that define the roles and responsibilities exist.
	Stakeholders (especially students) are involved in the internal quality assurance system, even if they are not on campus.
Standard 1.2 Design and approval of programmes	The institution has a clear strategy for digital innovation, e-learning being a part of it. This strategy is known within the institution at all levels and is adopted by teachers in charge of designing the curriculum.
	E-learning programmes are aligned with the institutional mission.
	Curricula design reflects pedagogical practices and innovation, if applicable.
	People involved in designing/developing/evaluating e-learning programmes have expertise in academic and technical aspects.
	Teaching staff involved in designing/developing/evaluating programmes are familiar with the advantages/disadvantages of using e-learning in particular course contexts.
	Student needs are considered when developing the learning model and the curricula design.
Standard 1.3 Student-centered learning, teaching and assessment	Teaching methodologies and learning activities are chosen with the aim of achieving learning outcomes.
	Learning materials fit the pedagogical model and facilitate student learning.
	Authors of learning materials are relevant for the subject.

ESG 2015	INDICATORS
	Learning materials are reviewed and updated periodically.
	The technical infrastructure is aligned with the teaching methodology, learning activities, and e-assessment methods, and it eases the teaching and learning process.
	E-assessment methods are fit for purpose, allowing students to demonstrate the extent to which the intended learning outcomes have been achieved.
	Students are clearly informed about the e-assessment.
	Students are aware of plagiarism rules.
	Students are trained in how to appropriately paraphrase, cite, and reference, regarding both online and print sources.
	The institution gives advice on appropriate online behavior (netiquette rules).
Standard 1.4 Student admission, progression, recognition and certification	Students/prospective students are informed about requirements concerning equipment, e-learning and digital skills, preknowledge and prerequisite subjects, and attendance.
	Students are informed about the workload and pedagogical model of the e-learning programme.
	The institution has a policy and procedure in place for recognition of prior learning.
Standard 1.5 Teaching staff	The institution has defined the structure, profile, and role of the teaching staff that is aligned with the pedagogical model.
	The institution uses appropriate instruments to guarantee that the profile of the teaching staff corresponds to their duties.
	The teaching staff is trained and proficient in the use of learning technologies and e-assessment methods. There are particular training activities for new staff.
	The institution has developed procedures to identify the support requirements of the teaching staff.
	Technological and pedagogical support services for teachers are adequate, accessible, and timely.
	The teaching staff-student ratio avoids excessive workload for teachers and tutors.
	The institution has implemented appropriate procedures for recruiting and hiring teaching staff.
	The teaching staff is coordinated effectively.
Standard 1.6 Learning resources and student support	Learning resources:

ESG 2015	INDICATORS
	· The VLE[7] supports a variety of methods and tools.
	· The technical infrastructure ensures the accessibility of the e-learning programme by students with special educational needs.
	· The institution defines the electronic security measures that guarantee standards of quality and information integrity and validity.
	· The VLE is based on non-proprietary web standards and is constantly updated to reflect technological changes.
	· The institution provides students with an adequate e-library and virtual labs.
	Student support:
	· The institution has procedures in place that cover student support, including tutoring, pedagogical, technological, and administrative elements.
	· Student support is offered according to the student's profile and their specific needs.
	· The student support reflects characteristics of e-learning.
	· Support for the development of learning, as well as digital skills (students are guided towards reflection, developing time management skills, etc.), is provided.
	· Students receive guidelines/training in using e-learning resources (VLE, e-library, etc.).
	· Hours of support are transparent and suit the needs of students; for instance, periods of peak demand (evenings, weekends, holidays, etc.) are considered.
	Institutions provide opportunities for the virtual mobility of students and academics.
Standard 1.7. Information management	Collected data is used in order to evaluate e-learning programmes (e.g. comparative analysis of course design).
	There is a strategy on the use and purpose of learning analytics within the institution (i.e. the aim is improving student support).
	The information management system includes relevant, up-

[7] The term Virtual Learning Environment (VLE) is used to describe the collection of software systems that provide materials and facilities for online learning. These systems allow for the management of all processes from course authoring, to delivery of the course materials to students, and recording their performance (EADTU, 2016).

The term Learning Management System (LMS) is often used synonymously with VLE, but indicates a greater focus on administration than on course authoring and production (EADTU, 2016).

ESG 2015	INDICATORS
	dated, and reliable information concerning the institution and its programmes.
	The institution considers ethical norms and government policy with respect to data protection and the privacy of students.
Standard 1.8. Public information	The institution publishes reliable, complete, and up-to-date information on study programmes (i.e. recognition of qualifications, learning objectives, credits, requirements, assessment methods, timelines, and dates relevant for the programme).
	The institution publishes reliable, complete, and up-to-date information on institutional technical support.
	Technical requirements to enable the full and effective use of the system are clearly identified and published.
	The institution publishes information on completion rates, pass rates, and dropout rates.
1.9. Ongoing monitoring and periodic review of programmes	E-learning programmes are reviewed, updated, and improved.
	Pedagogical developments are aligned with the institutional strategy.
	ICT and pedagogy developments are analyzed and implemented when appropriate.
	The internal quality assurance system includes feedback to stakeholders (especially to students).
1.10. Cyclical external quality assurance	Elements to consider: Institutions providing e-learning are encouraged to make contact with their relevant quality assurance body to exchange information and help both parties better understand the specificities of e-learning and its assessment.
Part II. External quality assurance	
Standard 2.1. Consideration of internal quality assurance	The institution takes into account the European, national, and local policies, as well as ethical and legal considerations when designing its policy for quality assurance and its internal quality assurance system.
Standard 2.2. Designing methodologies fit for purpose	External quality assurance considers the characteristics of e-learning in regular procedures, such as innovation in teaching and learning processes (institutional or programme evaluation).
	All relevant stakeholders are involved in developing e-learning criteria (institutional or programme evaluation).
	Specific e-learning criteria for external quality assurance procedures (institutional or programme evaluation) are publicly available.
Standard 2.3. Implementing	The self-assessment report makes specific reference to e-learning by describing, for example:

ESG 2015	INDICATORS
processes	
	· the institutional strategy, pedagogical model, and VLE;
	· the innovation of instructional design;
	· the profiles and experience of teaching staff;
	· the online study programme (with detailed learning outcomes, course description, and competencies of teaching staff).
	Site visit:
	· The site visit takes place at a location where most of the institution's technical infrastructure is situated.
	· Interviews with stakeholders include representatives of all groups involved (i.e. teaching staff, tutors, students, technical staff, administration, alumni, employers, etc.).
	· The institution provides reviewers with access to the VLE, classrooms, e-library, etc.
Standard 2.4. Peer-review experts	The criteria for the composition of expert groups include e-learning competence/experience.
	The QA agency holds trainings for all experts before the site visit. Special attention is given to characteristics of e-learning.
Standard 2.5. Criteria for outcomes	No particularities.
Standard 2.6. Reporting	No particularities.
Standard 2.7. Complaints and appeals	No particularities.

SOURCE: Huertas *et al.*, 2018.

Part Three

Guidelines for e-learning in Higher Education

3.1. What is needed for an e-learning project?

The working range of HEIs, as mentioned above, also due to digitalization, is rapidly diversifying, and extending beyond traditional programmes and user base. For this reason, we will try to tackle issues that may concern e-learning projects of different sizes and types.

In the next paragraphs, we will focus on some fundamental aspects for the development of an e-learning project by an HEI: educational activities, people & roles, and technology. An overview of each aspect will be provided in this section. In the following sections, we will address some key points in a more practical way.

3.1.1. *Teaching and learning activities*

Careful design and planning, as mentioned above, is a key factor for any effective and quality e-learning programme. Unlike traditional education, where content delivery absorbs most of the instructor's energy, as for e-learning course design and development require the greatest investment. However, as Bates (2019: 482) suggests <it is important to look at time over the length of a course over several years, not just in the initial production or preparation of materials. Carefully produced media may take more time in production, but can save a great deal of time in delivery, especially if student activities and automated feedback can be built into the design>.

At least a part of the effort dedicated to the activities necessary for a given e-learning course, if well designed, can produce lasting results beyond the course itself, thus allowing work savings. In fact, an entire

self-paced course can be iterated several times, and single **components** of a course **can be reused**, even in instructor-led courses, and also in the context of other courses or curricula that share part of their content. For this to be possible, it is important that the components of the course (at the level of the single learning object) must be designed and developed in a granular and self-consistent way.

An **instructional design model** can be profitably adopted and adapted to the specific needs of the project. There are various models of instructional design, among which many are based on the classic ADDIE model (Morrison, 2010). It describes the process of instructional design in five phases, namely: Analysis, Design, Development, Implementation, and Evaluation, taking into consideration all the possible choices to be made in a complex education project, some of which may not be necessary or be in a simplified way, according to the nature of the project.

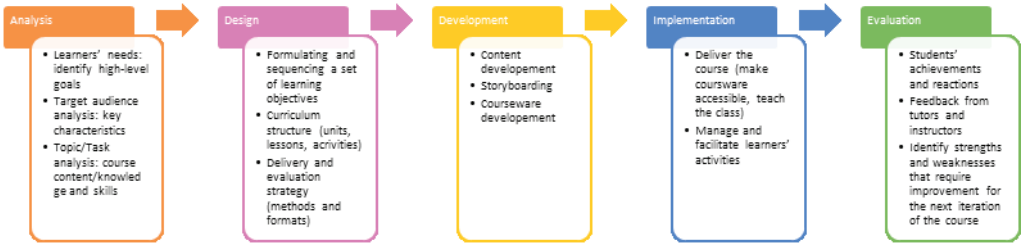

Figure 3.1. The ADDIE instructional design model for e-learning.

3.1.1.1 Digital Accessibility

Digital Accessibility is a primary concern, to which attention must be paid at all stages of the process. A significant portion of the population has special educational needs that arise from various conditions that make it difficult to overcome the barriers that society - deliberately or inadvertently - places. For this reason, the materials and activities must meet accessibility standards. The task is less demanding than it may seem, and results in an improved learning experience for all users. Many digital accessibility tips have, in fact, a general validity, such as, for example:

- provide the same content in multiple formats (e.g. both .doc and .pdf; add a table to a graph);
- provide content early;
- provide alternative text for images;
- provide transcripts and/or subtitles for videos (not everyone hear the same, or have the same linguistic proficiency in listening);
- provide audio for texts, or make sure they are accessible to text-to-speech apps (not everyone can see, or read the same);
- structure the pages and materials in such a way as to make navigation easy (clarity, segmentation, headings, layout, use contrast and colors, taking into account that not everyone sees them in the same way);
- apply controlled writing/speech criteria (brevity; simplicity of sentences; choice of the most common words, as far as possible; logical organization) to enable the recipients to understand.

3.1.2. *People & Roles*

3.1.2.1. Skills and jobs

Both the role of the teacher and that of the student in an e-learning course take on different characteristics compared to a traditional course. Although it is unrealistic to expect each faculty member to also become an e-learning expert, in addition to the usual teaching, research and service responsibilities, it is nevertheless likely that all teachers, through the necessary **training**, are interested in becoming competent in **teaching in a digital age** - which does not make it less appropriate to have one or more specialists who can support them for design (teaching methods with an online focus, the integration of design principles within a learning environment, choice of educational technologies, evaluation of the affordances of different media), the development phase (production) and management of online activities. Teamwork, as well as team teaching, is undoubtedly the key to decreasing, rather than increasing, the workload of teachers: collaboration with other experts in instructional design and media production allows them to focus on content and skills development. As Tony Bates (2019, pp. 690-691) states:

> a balance needs to be found between the provision of training in the use of learning technologies and the need for learning technology support units, which is why faculty development and learning technology units have tended to become integrated, and why institutions need a defined strategy for supporting teaching and learning. Thus, although it is possible for a particularly dedicated teacher to teach successfully without such support, learning technology support units are becoming an essential service for most teachers and instructors.

In addition to contributing, as **Subject Matter Expert**, the contents of the course, the teacher can define the instructional, delivery, and evaluation strategies (or cooperate with an **Instructional Designer** for this purpose), design e-learning activities, media elements, interactive components (which it can develop by itself, or in collaboration with **Media** Editors and **Web** Development specialists), support and motivate students in the learning path during implementation (or coordinate the **Tutors** in charge of carrying out these activities). The composition of the team depends on the organizational structure (namely, the presence of an operational unit dedicated to e-learning) and the guidelines of the institution, the size of the project, and the possibility of the individual to assume different roles, some of which require skills related to technology and media that are not as relevant for the teaching in traditional courses). For this reason, the specific training of teachers is of great importance for the effectiveness and efficiency of e-learning projects. Nevertheless, a **Technical Support** role is normally present, both to assist the teacher (or the team) and the course users.

3.1.2.2. Teacher and tutor training

The planning phase should be preceded by a specific training course dedicated to teachers and tutors. Assuming that the teaching staff has received from the institution all the necessary information regarding:

- key points of institutional strategy and policy on the provision of e-learning;
- resources, infrastructures and human resources;
- curriculum overview (for degree programmes);
- the initial training course should focus on:
- learning platform, authoring tools in use, and technological infrastructure in place;

- guidelines for course design, development, delivery, and assessment of learning outcomes;
- teaching methods and delivery formats;
- guidelines for multimedia design;
- guidelines for carrying out online interactive teaching and tutoring activities.

Especially teachers who newly come from traditional teaching should reconsider how they will better communicate content and engage learners in the absence of face-to-face interaction.

Tutors need to be trained on how to provide support and feedback to learners using online tools and facilitation techniques.

In addition, recurrent training should be planned for the following years.

Of course, it is worth considering the benefits of providing **online tutorials**, which allow for scalable, flexible, and cost-effective training.

3.1.2.3. Timing

The **timing** of the teacher's activities is also different from traditional teaching. The design and development activities, (which, as mentioned, are more demanding than the implementation of the course itself) must be started well in advance and concluded before the start date.

Conversely, the student's activity may extend beyond the final date, and it may take place in ways and times that do not conform to those of the face-to-face courses, but are suited to its family and job commitments, as well as to its learning style, or, possibly, to its special educational needs: e.g. a lesson (or part of it) can be listened to at any time and for as many times as desired; students can submit an assignment or post in a forum at any time (within the deadline); the timing and format of a test can be adapted to match different accessibility requirements.

3.1.3. *Technology*

A technological toolkit is necessary both for the production and for the provision of an e-learning course. The criteria for choosing tech-

nologies and media are many and varied. Tony Bates' SECTIONS model may help to make decisions at the macro level. It takes into account both pedagogical and non-pedagogical issues. The title is an acronym that stands for:

- Students;
- Ease of use;
- Costs;
- Teaching functions;
- Interaction;
- Organizational issues;
- Networking;
- Security and privacy.
-

Only a fragment of the complex model is considered here, but the reader could certainly draw much more useful information from the source.[8]

3.1.3.1. Access

Among the first group of criteria (Student), Bates first considers the **Access** issue, which undoubtedly represents a discriminating element: although an HEI can follow guidelines and policies that aim at broad access and can provide support to students, if access is clearly impeded by factors which it cannot control, it will hardly be effective.

> Of all the criteria in determining choice of technology, this is perhaps the most discriminating. No matter how powerful in educational terms a particular medium or technology may be, if students cannot access it in a convenient and affordable manner they cannot learn from it. Thus video streaming may be considered a great way to get lectures to students off-campus, but if they do not have Internet access at home, or if it takes four hours or a day's wages to download, then forget it. (Bates, 2019, p. 462)

However, once the technical constraints placed on the target population are known, such as the limited HW capacity or the low network bandwidth, it is always possible to adopt measures that **lower the ac-**

[8] The SECTIONS model has been developed over the years by the author up to the most recent formulation contained in the second edition of the well-known volume: Bates, A.W. (2019).

cess threshold, considering the connection speed required by different delivery formats (e.g. video, especially live webcasting, is among the most demanding, but in many cases, it can be effectively replaced by graphics and animations), and by appropriately balancing the rate of activities that allow or not to be carried out, at least for the most part, offline (e.g. acquiring knowledge through simple learning resources, or carrying out an assignment or project work).

3.1.3.2. Authoring tools

The **production** of the multimedia and interactive components, in addition to the necessary pedagogical awareness, requires the use of more complex authoring tools than those which are sufficient to produce simple learning resources, such as documents and presentations. There are specific software packages for this purpose, that incorporate multiple functions suitable for producing learning objects that combine text, graphics, videos, and assessment tools within a framework that makes them accessible to the user.

Authoring tools differ in one or more features:

- web and/or desktop-based
- ease of use, and skills required: simple, advanced, (semi) professional;
- publication: linkable or embeddable object hosted on video portal (provider's server) and/or local file (to be uploaded to a server);
- video quality;
- pricing plans (some SW are expensive, but free offers also exist).

Some authoring apps for e-learning - Articulate is among the best known - have developed various products and services, both desktop and hosted, which allow not only to create - within a single integrated toolset - entire e-courses to be uploaded and made accessible from the organization's Learning Management System, but also to distribute, manage, track courses and learner progress, i.e. they can play the role of an LMS. In the latter option, the relevant features to be evaluated are in fact similar to those of a hosted LMS service:

- pricing and scalability;
- number of learner accounts;
- login with Single-Sign-On using supported Identity Providers;
- learning reports and analytics;
- customization (course structure and parameters)
- bandwidth (amount of data available for streaming from the provider's server).

An important criterion, both for the choice of an authoring tool to create learning objects and for the choice of the learning management system (LMS) that will have to handle them, is the **compliance** with existing **standards**, such as SCORM[9] (Sharable Content Object Reference Model), which guarantee of compatibility with different systems, and reuse in other contexts.

3.1.3.3. Learning platforms. License, implementation, hosting

Educational institutions generally employ online learning platforms (most often: Learning Management System, LMS) for course **delivery** and **implementation**, that is to: manage the development, storage, and access to resources; manage learning programs and planning; administer the learning activities of online users, track their progress and achievements; enable interaction through such tools as forums and video conferences. Learning platforms have evolved in the direction of modularity, that is, they allow the administrator to add the desired components that extend their basic functionality.

License and Implementation

Some LMS is **proprietary** software, with license fees per user, others are **open source**, without license fees, i.e. they allow free sharing and modification under the terms of the GNU General Public License. At present, both offer reliable and interoperable systems. The main differences derive precisely from the different accessibility of the code. In the case of proprietary LMS, access is restricted, so both customization and possible development of new components can only be performed by the vendor's developers. On the other hand, the same vendor provides the client support and maintenance services, with a

[9] https://scorm.com/

cost included in the license, and the implementation and deployment do not present difficulties for the client. In contrast, open-source LMSs rely on the community of end-users and freelance developers to share support and development instructions. The possibilities to customize according to specific needs are ensured by experienced developers, based on the needs suggested by the community, and the release process is quick. On the other hand, the implementation of the LMS may require advanced technical skills, so outsourcing may be necessary for particular support or maintenance operations.

Hosting

The choice of a LMS also implies the choice of a deployment type. Most proprietary LMSs are cloud-hosted (such as Blackboard), while many open LMSs require hosting on-premise (such as Moodle, though cloud-hosted, scalable solutions are currently available).

A hosting solution, either **cloud-based** or **in-house**, must be identified that is consistent with the Institution's resources (e.g. license, IT support, HW and S W, and maintenance costs; deployment time; internal IT structure) and possible special requirements (e.g. data security issues). If the institution has the necessary resources, it can use an internal server to manage the platform, otherwise, the cloud-based model is preferable. The latter involves the use of the LMS platform via the web (customers access the application through a Web Browser) and is developed on a Cloud infrastructure. Customers generally pay for the system based on criteria, such as the number of registered users or projects.

Finally, leading providers of online courses (especially MOOCs) offer universities the possibility of a partnership (or special subscription), which allows the institution to integrate courses in its curricula chosen from a catalog of thousands of courses already available, including Credit-eligible online courses, guaranteeing the user a seamless and traced experience (Single Sign-On access, LMS integrations). These solutions also allow faculty to use authoring tools to create courses and curricula (possibly, with guidance from the provider), make them accessible to their students, and access learning analytics from their dashboard.

3.2. Course design

The analysis and design phases are crucial to ensure the effectiveness of a course and the engagement of learners.

3.2.1. *Target audience analysis*

The **analysis of the target audience** considers some factors that can influence the design of the course, such as:

- the type of study path to which the learners are enrolled;
- the previous study career, face to face and online;
- the knowledge and skills already acquired in the content area;
- the time available for study (full or partial);
- the area of residence and the distance from the university premises;
- the network bandwidth and the availability of HW and SW;
- the learners' skills in ICT.

3.2.2. *Topic analysis*

Starting from a heading, which in formal study paths often corresponds to the name of a discipline, it is necessary to identify the relevant **content** elements, the relationships between them, and the most important and challenging aspects from the students' point of view. This is the purpose of **topic analysis**: identifying and detailing the main categories of content; classifying the content elements according to these categories.

3.2.3. *Formulating and sequencing a set of learning objectives*

On this basis, it is possible to define detailed **learning objectives**, which specify the overall goal of the course. Learning objectives are statements that describe the expected outcomes for the course and for each learning unit. Learning objectives concern a learning content and may imply, according to Bloom's well-known taxonomy, six different levels of cognitive performance. The learning and assessment activities related to each learning objective must be consistent with its learning content and with the expected level of performance.

In order to structure a course, it is necessary that the learning objectives are ordered in a **sequence**, which can be based on the reciprocal implications (the achievement of an objective is a prerequisite for the next one), on the hierarchy of performance levels, on the inductive or deductive line of reasoning (from particular to general, from simple to complex, from example to definition, from concrete to abstract, or vice versa), or on the iterative revisiting and deepening the contents.

3.2.4. *Course structure*

Broadly speaking, e-learning offering can be divided into:

- single courses;
- learning tracks, that is, a sequence of courses that lead to a coherent set of learning outcomes.

Learning tracks can be seen as a way to:

- subdivide single courses that would turn out to be too extensive;
- connect logically consequent courses, or bring together courses that make up the curriculum of a formal study path (e.g. leading to a graduate or postgraduate degree).

Online courses have a quite homogeneous **macro-structure** which consists of modules and activities. A **module** (section) is a cohesive set of **activities** intended to achieve defined learning goals, and normally covers a single main topic.

According to the design model used by many providers, each module (or section) of the course requires a **week**'s commitment and includes varied kinds of activities. The module, therefore, constitutes a learning unit, or a part thereof, and it is desirable that it includes at least one assessment activity. Quite the opposite, grouping activities and resources into sections by type (e.g. one section for video lectures, one for self-assessment activities, and so forth), seems rather suitable for building a repository to support mainly face-to-face courses (web-enhanced). Instead, it is advisable to include **special modules** within very structured courses, or **special courses** within learning tracks, such as:

- introductory modules/courses, intended to introduce educators and allow learners to introduce themselves, provide learners with general orientation, verify the necessary background and suggest how to fill any gaps, group learners (if applicable);
- halfway modules/courses, which mark the achievement of intermediate objectives, where some activities can be gathered, such as collaborative exercises with peer assessment, self-assessment tests, assignments with tutor assessment, classroom lessons or lab work sessions (if any);
- finish line modules/courses, where closing activities should be preferably included, such as final tests, assignment submissions, quality survey.

A course may drive learners along a predefined, **linear** learning path, consisting of a sequence of steps (modules), in turn, broken down into individual resources (learning objects, activities, live sessions), or allow them to define their own **personal** path, selecting and combining specific elements of the course. In **instructor-led courses,** a **start and end date** are normally specified. Multiple releases of each course can be scheduled during the year. It is also possible to provide **self-paced** walk-in courses, where, as a rule, interaction and feedback are mainly automated, although some opportunities to interact with peers or tutors are possibly offered (e.g. discussion boards).

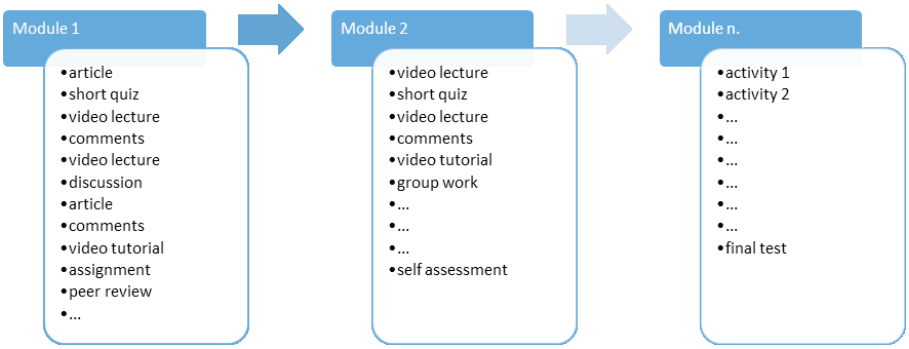

Figure 3.2. Example course structure.

3.2.5. *Course plan*

At this stage, it is advisable to draw up an **outline of the course plan** and make decisions on teaching methods, delivery formats for activities and resources, and evaluation strategies consistent with each learning objective and with the overall goals of the course. The course plan can be used both as a guide to the course development and as a basis for drawing the course program to be made available to learners in the course heading.

The course plan should include (if applicable):

- title (should be descriptive and captivating at once);
- teaching language(s);
- educators team: instructor(s) and tutor(s); partition of responsibilities among them; availability during the course;
- target specification: course level (introductory, intermediate, advanced), recommended background (prerequisites);
- HW and SW special requirements, if any;
- accreditation level(s) (statement of participation/certificate of achievements/academic credits) and conditions; amount of university credits awarded;
- course period and schedule (with particular reference to live sessions, if any);
- study time (commitment) required of the student in order to successfully follow all the learning activities (estimated total amount, and per week/module);
- expected learning outcomes;
- course topics (content summary);
- teaching methods used and learning activities required of the student (elective/mandatory; deadlines);
- course structure: modules and activities (each module should be related to pertaining learning objectives in order to ensure course consistency);
- assessment methods and criteria;
- assigned and/or suggested readings (or any in-depth materials).

It is recommended that the institution provide teachers with a **planning form**, and support, by providing them with a **quality compliance checklist**.

A micro-design phase follows, when an outline for content development is drafted for each of the activities (see the Course development section - Storyboarding paragraph for more detailed information on this topic).

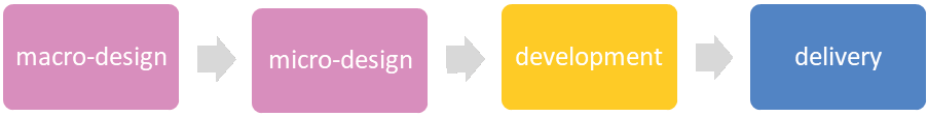

Figure 3.3. Example workflow.

3.2.6. *Delivery and evaluation strategy (methods and formats)*

As in any educational and training context, apart from self-learning, and even in e-learning, the role of the teacher is that of an active mediator, who well knows and applies the most suitable methods to facilitate the learning process, with the particularity that in e-learning the interaction between the actors involved in the teaching-learning process (Student-Teacher, Student-Student) takes place indirectly, i.e. it is largely mediated by technologies, which require specific formats.

I**nstructional methods** can be broadly divided into:

- **expository** teaching, focused on the presentation of new information by the teacher and on the acquisition of it by the learners;
- **active** methods, centred on the construction of knowledge by learners and on performing tasks, both in an *individual* dimension and in a *social* dimension of knowledge sharing and collaboration.

In e-learning, expository teaching is mainly realized in those teaching actions that are, in a broad sense, comparable to expository classroom teaching, focused on the presentation of contents by the teacher, such as **videos** (ordinarily, a set of short, well-partitioned studio-recorded video lectures, or live-streaming lectures, or web-seminars),

audios, and **articles**, and also any course materials. Some types are given by way of example:

- monographs or essays;
- reference works;
- multimedia resources (e.g. expert interviews);
- worked examples, tutorials, task instructions;
- collections of specialist websites;
- lecture notes;
- concept maps;
- timeline.

Active methods can be realized in all activities where interaction is involved:

- interventions addressed by the teacher/tutor to the whole class (or a subgroup), typically in the form of demonstrations or additional explanations through FAQs, mailing lists, or web forums;
- short interventions made by students (for example in discussion or collaboration environments: web forums, blogs, wikis);
- structured e-tivities (whether individual or collaborative), typically in the form of reports, exercises, case studies, problem-based tasks, WebQuests, project works, reviewed by peers or the teacher/tutor;
- interactive web-conference sessions for in-depth analyses, case discussions, catch-up lessons;
- any forms of ongoing tests or formative assessment, such as multiple-choice or open-ended questions.

Both the expository methods (such as presentations of information on a specific topic, demonstrations of procedures for carrying out a task, case studies, or commented examples related to the topic), and active ones (from simple practice to case-based exercises, from instructor-led research to individual or collaborative project work for the development of a product or a project), can assume different **delivery formats**, both synchronous and asynchronous. For example, the presentation of information can be carried out through a simple document, or through a recorded video lecture, or a video conference in

which learners can interact (virtual classroom), or an interactive lesson where text, images, audio/video, questions, and feedback are combined. Delivery formats such as discussion forums, wikis, and shared documents can be used for both individual project work, or collaborative group work, or peer review.

Interactive activities are provided by means of LMS tools (such as discussion board forum, assignment, wiki, workshop, etc.), for which some kind of feedback is given (from an academic, or peers, or automated) and may be graded as well, such as:

- discussion board forums (whether cumulative or related to specific course topics/steps);
- interactive videoconference sessions;
- assessment activities (MCQs tests, quizzes, question & answer boards, online submissions, graded assignments, reports, etc.);
- collaborative activities, possibly in groups (group work, workshops, peer review);
- practice exercises;
- project work.

Essentially, an online or highly blended course is delivered in the form of:

- **interactive learning materials** (single or multiple screens/pages that can contain any blend of text, graphics, audio, video, including self-assessment tests and other interactive activities);
- **synchronous sessions**;
- **asynchronous collaborative activities** (e.g. discussion forums, shared documents, blogs, etc.);
- **asynchronous individual activities** (e.g. assignments).

The choice of delivery formats is also influenced by factors related to students, such as the time available and technical expertise, to technologies, such as connectivity and devices in use, and to organizational factors, such as the development time of multimedia and interactive content or the budget for tutors and instructors. At this stage, attention must be paid to **digital accessibility** and **access** issues, which we discussed above, and to foreseeable solutions.

3.3. Course development

A properly trained teacher could independently develop both the e-learning content and courseware following guidelines defined by the institution and using user-friendly authoring tools. For more complex projects it is quite usual to work in a team with other professionals, such as instructional designers (which would already play an important role in the previous design phase), media editors, or web developers. In any case, as a subject matter expert, the primary contribution of the teacher in the development phase is to **assemble or author the contents** necessary to prepare e-learning resources and activities. The analysis and design phases are crucial to ensure the effectiveness of a course and the engagement of learners.

3.3.1. *Content development*

It is likely that quality materials for a given knowledge domain (textbooks, handbooks, articles, lecture notes, slides, and other types of resources, such as audio and video documents) are already present, either authored by the teacher itself or other scholars, which were not designed for an e-learning environment. The teacher, as in a traditional course, can choose whether to indicate to students this kind of learning resources (i.e. not interactive) as assigned and/or additional readings, providing them with bibliographic references, links, or to make them available on the portal for consultation or download, according to the rules in use on copyright. In these cases, it is not a question of e-learning content; indeed, the mere fact of making resources available online, without adaptation, does not make them suitable content for e-learning. Not-interactive and **simple learning resources**, such as documents or slide presentations, even if produced *ad hoc*, should support a minor part of content delivery.

Writing content for e-learning is not like writing teaching materials for a face-to-face course (nor for scientific publishing, of course). E-learning contents must be specifically conceived and designed in order to embed the instructor's support and allow the learner to use it independently, in self-paced courses, or with tutoring, in instructor-led courses.

The most common approach in self-paced courses is rather that of building **interactive e-lessons**, i.e. sequences of screens that use dif-

ferent media (text, audio, video, graphics) and interaction (e.g. questions and answers) as well as providing any links to external or additional resources. In instructor-led courses, where tutoring is provided, the course content is typically integrated by lessons held by the instructor in a virtual classroom, and by either synchronous or asynchronous, individual (assignments) or collaborative (group discussions, project work) practice activities guided by a tutor, using communication tools such as email, discussion board forum, chat, document sharing, application sharing.

One of the most challenging aspects of e-learning teaching, and one of the key factors in the success of a learning programme, is to **make the most** of the interaction features currently supported by the Internet, on the one hand, and multimedia authoring, on the other, which can actually result in an **active** and **media-rich** learning environment. Both competency-based approaches, based on guided individual work, and **collaborative approaches** are possible, in which students build and share knowledge, explore the way of thinking (as well as notions) that is specific to a discipline and use it to solve problems, carry out tasks, answer research questions, in activities designed or guided by the teacher, who plays the role as a link with scientific knowledge (the state of the art).

Content development is based on the course plan, where topics are analysed and learning objectives are detailed and sequenced. Whether they come from source materials, or are developed *ad hoc* by the teacher, contents have to result in media elements (text, graphics, animations, audio, video), which make up presentations, demonstrations, examples, interposed and linked with practice activities, exercises, and assessment tests.

3.3.2. *Storyboarding*

It is advisable to draw a **storyboard** for each of the resources and activities that make up a course section (or learning unit), which should give an idea of how the different elements that make up the section are to be developed, sequenced, and shown, covering all the contents and activities necessary to achieve specific learning objectives.

Storyboard design, in the development phase of an e-learning course, is a fundamental factor for its success. The term "Storyboard" is borrowed from the jargon of movie production, where it means a se-

ries of drawings or images showing the planned order of images, with more or less detailed information, for every single shot, on action, dialogue, effects, time, and sound.

In e-learning, the storyboard allows everyone involved to check how the course will look, suggesting changes, and identifying any weak points. In particular, the storyboard allows the developer to have an overall picture, as well as clear ideas on how to achieve in practice what is designed, and the commitment required for each action (however, nothing prevents from directly developing some simple steps with the authoring tool).

3.3.2.1. Principles of multimedia design and guidelines for e-learning

With regard to **interactive learning materials**, the storyboard should describe the following elements in detail, "frame by frame":

- text;
- audio;
- visuals;
- interactions;
- navigation (e.g. a sequence of steps, or any links to other nodes, when non-linear navigation is allowed).

Valuable insights and guidance on how to better use visuals, text, and audio, can be found in the **twelve principles of multimedia design** (briefly listed in Box 1) developed by Richard Mayer over decades of research on how learners actually process multimedia (Mayer, 2001[1], 2009[2], 2020[3]).

Clark and Mayer (2016) provide evidence-based knowledge and congruent recommendations on several e-learning key issues, such as:

- how to best use visuals, text, audio (that is the principles for multimedia design specifically applied to e-learning);
- opportunities for engagement: methods that induce appropriate psychological engagement (either without or with behavioral activity);
- principles to optimize benefits of worked examples (i.e. step - by - step demonstrations of how to complete a task);

Box 3.3. Twelve principles of multimedia design.

Principles for reducing extraneous processing
1. Coherence Principle – People learn better when extraneous words, pictures and sounds are excluded rather than included.
2. Signaling Principle – People learn better when cues that highlight the organization of the essential material are added.
3. Redundancy Principle – People learn better from graphics and narration than from graphics, narration and on-screen text. And when words are presented as narration rather narration and on-screen text.
4. Spatial Contiguity Principle – People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
5. Temporal Contiguity Principle – People learn better when corresponding words and pictures are presented simultaneously rather than successively.
Principles for managing essential processing
6. Segmenting Principle – People learn better from a multimedia lesson is presented in learner controlled segments rather than as continuous unit.
7. Pre-training Principle – People learn better from a multimedia lesson when students know names and behaviors of system components.
8. Modality Principle – People learn better when words are presented as narration rather than as on-screen text.
Principles for fostering generative processing
9. Multimedia Principle – People learn better from words and pictures than from words alone.
10. Personalization Principle – People learn better from multimedia lessons when words are in conversational style rather than formal style.
11. Voice Principle – People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.
12. Image Principle – People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

SOURCE: Mayer, 2009.

- benefits of practice interactions that include effective, explanatory feedback;
- guidelines regarding optimal use of computer-mediated collaborative learning;
- guidelines for building thinking skills;
- guidelines for games.

Box 3.2 shows the e-learning guidelines included by the authors in their summary.

Box 3.2. A summary of e-learning guidelines.

Multimedia Guidelines for All Types of e-Learning
When Using Text and Graphics (Not Audio)
1. Use relevant graphics to accompany text for novices—Multimedia Principle.
2. Use animations to demonstrate procedures or to illustrate abstract ideas; Use a series of stills to illustrate processes—Multimedia Principle.
3. Use cueing devices such as color or arrows to direct attention in complex graphics or animations—Signaling Principle.
4. Use visuals that are as simple as possible to promote understanding of novices—Coherence Principle.
5. Use explanatory visuals that show relationships among content topics to build deeper understanding—Multimedia Principle.
6. Use transformational graphics (animations and stills) to show changes over time—Multimedia Principle.
7. Use interpretive graphics to explain how a system works or to illustrate abstract ideas—Multimedia Principle.
8. Place text near the corresponding graphic on the screen—Contiguity Principle.
9. Avoid covering or separating information such as feedback on a learner's question response that must be integrated for learning—Contiguity Principle.
10. Place labels on the screen rather than in legends—Contiguity Principle.
11. Avoid irrelevant graphics, stories, and excessively lengthy text—Coherence Principle.
12. To improve motivation, design relevant graphics using warm colors and human features such as eyes and facial expressions—Emotional Design Principle.
13. Write in a conversational style using first and second person—Personalization Principle.
14. Use virtual coaches (agents) that serve a relevant instructional purpose such as providing feedback, examples, and hints—Personalization Principle.
15. When using a virtual coach, design it with life-like features such as eye gazes and gestures—Embodiment Principle.
16. Break content down into small topic chunks that can be accessed at the learner's preferred rate—Segmenting Principle.
17. Teach important concepts and facts prior to procedures or processes— Pretraining Principle.
18. When teaching concepts and facts prior to procedures or processes, maintain the context of the procedure or process—Pretraining Principle.
When Using Audio and Graphics
19. Use relevant graphics explained by brief audio narration to communicate content to novice learners—Multimedia and Modality Principles.
20. Maintain information the learner needs time to process as on-screen text, such as directions to tasks, new terminology—Exception to Modality Principle.
21. Do not allow temporal separation of visuals and audio that describes the visuals—Contiguity Principle.
22. Do not present words as both on-screen text and narration when there are graphics on the screen—Redundancy Principle.

23. Avoid irrelevant videos, animations, music, sounds, stories, and lengthy narrations—Coherence Principle.
24. Script audio in a conversational style using first and second person—Personalization Principle.
25. Script virtual coaches to present instructional content such as examples and hints via audio—Modality and Personalization Principles.
26. Break content down into small topic chunks that can be accessed at the learner's preferred rate using a continue or next button—Segmenting Principle.
27. Use a continue and replay button on animations that pause the animation after short logical segments—Segmenting Principle.
28. Teach important concepts and facts prior to procedures or processes— Pretraining Principle.
Guidelines for e-Learning Designed to Teach Job Tasks [In Addition to the Above Guidelines]
29. Focus on generative instructional methods that promote relevant psychological engagement—Generative Learning Principle.
30. Avoid generative instructional methods that overload cognitive processes (for example, replace drawing-from-scratch assignments with supported drawing)—Generative Learning Principle.
31. Include peer teach-back assignments—Generative Learning Principle.
32. Include collaborative problem-solving assignments along with an animated display of a tutor guiding a student through the problems—Generative Learning Principle.
33. Increase engagement in receptive learning environments by using clickers in face-to-face classrooms and polling or other response facilities in synchronous classrooms—Generative Learning Principle.
34. Provide worked examples (demonstrations) of lesson tasks for novice learners—Worked Example Principle.
35. Transition from full worked examples to full practice assignments using fading—Worked Example Principle.
36. Insert questions next to worked steps to promote self-explanations—Self-Explanation Principle.
37. Add explanations to worked out steps in some situations—Guidance Principle.
38. Provide several diverse worked examples for far transfer skills—Transfer Principle.
39. Assign active comparisons of varied context worked examples—Transfer Principle.
40. Assign job-relevant practice questions interspersed throughout and among the lessons—Spaced Practice Principle.
41. For more critical skills and knowledge, include more practice activities—Power Law of Practice Principle.
42. Mix practice types throughout lessons rather than grouping similar types together when discrimination of problem types is a goal—Distributed Practice Principle.

43. Provide explanatory feedback in text for correct and incorrect answers—Feedback Principle.
44. Write feedback that gives explanations relevant to the task, the task process, or task self-monitoring—Feedback Principle.
45. Design space for feedback to be visible close to practice answers—Contiguity Principle.
46. Avoid praise or negative comments in feedback that direct attention to the self rather than to the task—Feedback Attention Focus Principle.
Guidelines for Collaborative Learning
47. Assign collaborative projects that are sufficiently challenging to warrant collaboration.
48. Form small teams of two to four members of diverse prior knowledge and background for transfer problems and similar backgrounds for familiar problems.
49. Provide structured team processes that support individual participation and individual accountability for outcomes.
50. Use a combination of synchronous collaboration for synergy and asynchronous collaboration for reflection and equal participation.
51. Provide structured assignments such as structured controversy to minimize extraneous cognitive load.
52. Provide technology features that support collaboration, such as search facilities, repositories for resources, visualization of arguments, member profiles, and so forth.
53. Use facilitation techniques that optimize social presence in online collaborative environments.
Guidelines for Navigational Options—Learner Control Principles
54. Give learners choices over topics and instructional methods such as practice when:
• They have related prior knowledge and skills and/or good self-regulatory learning skills.
• Courses are designed primarily to be informational rather than skillbuilding.
• Courses are advanced rather than introductory.
• The content topics are not logically interdependent so sequence is not critical.
• The default option leads to important instructional methods such as practice.
55. Limit learner choices over topics and instructional options when:
• Learners are novice to the content, skill outcomes are important, and learners lack good self-regulatory skills.
56. Consider testing emerging control options such as shared control, advisement, or recommender systems.
57. Always give learners options to progress at their own pace, replay audio or animation, review prior topics/lessons, and quit the program.
Guidelines for Learning to Build Thinking Skills
58. Focus lessons on specific essential thinking skills linked to optimal workplace performance.
59. Ensure that the training focuses on explicit thinking skills that are explained, demonstrated, and practiced in a job-realistic context.

60. Use realistic job scenarios to teach job-specific thinking skills.
61. Provide worked examples of experts' problem-solving actions and thoughts.
62. Provide sufficient guidance to ensure productive casework in scenario-based lesson designs.
63. Incorporate collaboration—synchronous or asynchronous—in the form of oral or written discussions of scenarios.
64. Base lessons on an analysis of actions and thoughts of expert practitioners derived through cognitive task analysis.
Guidelines for Games
65. Align the goals, rules, activities, feedback, and consequences of the game to desired learning outcomes.
66. Incorporate evidence-based methods that promote deeper processing of the core content, such as self-explanations, feedback, and coaching.
67. Embed games into the context of existing training programs, rather than making wholesale conversions of training programs into games.

SOURCE: Clark & Mayer, 2016, pp. 397-401, *Exhibit 18.1. A Summary of e-Learning Guidelines*.

3.3.2.2. Note on videos

As videos play a substantial role in several online courses, sometimes as the preferred form of expository teaching, it is worth considering video lessons in more detail.

In order to reduce the effort required for the learner to focus and sustain attention, video lectures must be thought of as self-consistent units, intended for the acquisition of a single concept or the achievement of a single learning micro-objective of the course; moreover, the average length of time fixed for recording videos is usually 15-20 minutes (while the typical lesson in conventional learning lasts 1 hour).

There is no 'one-style-fits-all' approach to framing, which can essentially be of three types: screen only (e.g. presentation slides without a visible speaker), screen plus camera, or camera only. The so-called 'talking head' is one of the most common educational video styles today (although framing the speaker's image is not necessarily beneficial for learning: see Mayer's Image Principle above), followed by or in combination with presentation slides; shots on location, classroom takes and animations are also of average use (Reutemann, 2016).

3.3.3. *Courseware development*

Once the storyboard is completed, a trial version of the courseware is developed to be **tried out and reviewed** before delivery.

Adequate training, the use of user-friendly authoring tools (template-based, preferably) and LMS, as mentioned above, can enable teachers to create simple graphics and animations, edit audio and video, develop interactions, assemble the course components, and set up menus and navigation controls. However, according to the mix of media, the desired level of interactivity, the need to develop tailored templates, courseware development may require the teamwork of several professionals (such as graphics or multimedia editors, coders, and programmers).

Depending on the authoring tools in use and the specific LMS intended to make it accessible, the options available for courseware development can vary widely.

3.3.3.1. Make the course structure and agenda clear

As seen above, sequencing is appropriate at both a macro and a micro-level. For example, the program of a 6 ECTS awarding university subject course can take the form of a **learning track**, divided into several cohesive courses, each of which has internal coherence.

Online **courses**, both those pertaining to a degree program and the MOOCs, are divided into **modules** (sections) which are in turn composed of a series of **activities**.

Modules, according to the nature of the course, can coincide with topics and, as usually happens in instructor-led courses, weeks. In courses leading to the acquisition of university credits, it is necessary to **estimate the required commitment** (in hours); however, it is also advisable in open courses, if a certification is to be issued, and is generally recommended, since it allows learners to plan their own timing.

Clear expectations should be set about the **engagement agenda** for each module and the overall course, and **step by step task instructions** should be specified. As mentioned above, the **calendar** of any live activities (online and in person, if any), of the final **assessment** tests, and the deadlines for the submission of assignments, should be prepared and published before the start of the course, as well as the conditions required for issuing different levels of **accreditation**. A

clear **schedule** should be provided for all activities that learners should aim to complete within a given time. It is also possible to foresee the possibility of late starts, or the way to **make up** missed steps for those who run out of time.
The student dashboard should be developed in a way that makes this information accessible in a simple and clear way (for example, by showing the to-do list and the timeline).

3.3.3.2. Make navigation clear and consistent

It is important that the learner can **navigate within and through the modules** in a clear and consistent way. For this, it is useful to make the module menu accessible from any page and provide direct links to the steps that precede and follow the current one.

Some steps forward can be set to **conditional access** (i.e. require the completion of previous steps), while backward scrolling must always be possible.

3.4. Course delivery and evaluation

In this section, the teaching, learning, tutoring, and assessment activities that make up the life cycle of a course are addressed in a practical way, with particular reference to instructor-led or facilitated courses, and to tasks that instructors and tutors perform in the implementation phase in order to:

- actually deliver the course;
- manage and facilitate learners' activities, enhancing their engagement and motivation;
- run online assessments and exams.

3.4.1. *Making the cycle of learning events happen*

Once the enrolment procedures have been completed (through the learning platform and any other administrative services of the supplying institution), the actual course becomes accessible to learners. Typically, the course is not published in its entirety right away, but **one module at a time**, week after week.

In a broad sense, some **components** seem to be typical of an online course (Figure 3.4).

Figure 3.4. Cycle of learning events.

1. An **initial event** (synchronous or asynchronous) in which the instructor introduces himself, the educational staff, the objectives, contents, methods, and agenda of the course, and the expected learning outcomes. This event should motivate attendees and make clear what engagement is expected of them. Sometimes learners are offered the opportunity to introduce themselves and exchange welcome messages with each other; this element - together with the instructor's approachable, reliable, non-patronizing style - can lend a more personal feel to the experience.
2. An **initial or preparatory learning activity** is often included in the first module. It is of particular importance for learners, who will get their first impression of the course and the learning platform. It will be equally useful to the instructor, who can use it to teach the basics, to check if learners can master prerequisites for the course, to bridge any gap, or to notice any technical issues.
3. The heart of the course consists of a **cycle of learning events**, which includes both individual study and individual or collaborative activities. Participants learn by reading **texts** and **multimedia** presentations and by attending to **video** lectures, mainly in the form of interactive learning materials and synchronous sessions (if any). As a rule, for each step learners are offered some opportunity to **take action** by:

   – commenting, sharing reflections, participating in discussions (initiated by facilitators or spontaneous),
   – answering or asking questions,
   – taking quizzes and tests (graded or ungraded),
   – carrying out individual assignments or group work,

  - and getting replies and feedback from peers, tutors, or the system.

4. Different forms of formative assessment (both self-, peer-, or tutor-assessment) are scattered along the learning path. Courses that issue formal accreditation often include a graded **final test**, or exam, which can be done online or at the institution's headquarters (or authorized centres) according to the Institution's policies and the relevant legal framework.
5. At the end of a course, attendees are often required to fill out a survey, or are anyhow encouraged to give **feedback** about the course. This step provides the teacher, or team, who developed the course with valuable information on how to improve in view of future iterations (of the entire course or its components).

3.4.2. *Enhance learners' engagement and motivation*

Learners' participation is the key to achieving course goals. Here are just some easy ways to enable learner activity.

Interact with content

- Annotable files: mark, save, and possibly share notes on course materials, e.g. in textual, or graphic form.
- Student Response Systems tools can facilitate the interaction between instructor and learners, support feedback processes, and data collection from learners, such as:
  - interactive content, e.g. drag & drop items, included in recorded video lectures;
  - or polling and e-voting tools during a live lesson.

Have your say

- Give feedback about course plan, or activities, by filling out easy surveys (possible question formats: MCQs, Short Open-Ended Qs, yes/no Qs, scales, etc.).

– Choose between several alternatives offered, e.g. proposals for exercises, or in-depth studies (e.g. choice of theme for a project work).

Communicate

– Chats are the simplest and most accessible synchronous communication tool, e.g. during a live session, to ask questions to the speakers, or at scheduled reception hours, to consult the instructor or tutor.
– Forums are the main asynchronous communication tool, which can be applied for different purposes and in different ways, such as:
    – a “general announcements” board (one-to-many), where the teacher or tutor can post reminders when important events or deadlines are approaching;
    – a "direct line" forum where learners can ask questions to the instructor or tutor, and receive a reply;
    – a discussion board (many-to-many) attached to a single course step, and/or relating to the entire course, or a forum dedicated to a given group activity.

Practice and Create

It is essential that learners are encouraged to reach the highest levels of the taxonomy of cognitive objectives, i.e. that they can apply, analyse, evaluate and create, carrying out tasks either designed as individual or group work, such as:

– drafting a presentation, an essay, or a report;
– developing an artefact;
– carrying out case/problem/scenario-based tasks;
– conducting peer-review workshops.

It is also possible to carry out some forms of lab work online, for example, by interpreting an assigned data set.

Collaborate

Group work is widely recognized as one of the most effective methods for achieving meaningful learning. It encourages engagement

with course content and skill development, including soft skills, which have relevance beyond the curriculum and are highly regarded by graduate employers.

Some collaborative activities are straightforward, e.g. building the Course Glossary (insert new entries, comment on peer contributions) or a Database (insert records, with your own comment, and comment on those entered by others).

Evaluate

Self-assessment (e.g. taking a test) and peer-assessment activities (e.g. reviewing submissions by colleagues in workshop-like activities) encourage reflection and deep-learning, help learners place their own work, and learn from each other.

3.4.3. *Manage learners' activities*

Some activities are as valuable for learners as they are challenging for the instructor and tutor, who are tasked with moderating group work, providing step-by-step instructions, assessing online submissions, and giving prompt and substantial feedback. For this reason, such activities must be carefully designed before delivery, also taking into consideration the time and personnel constraints in the implementation phase.

All learning platforms offer specific management tools and control functions (dashboards) that support the instructor and tutor in supervising learners' activities and performing some key tasks in the implementation phase of the course, such as assessment. Below is an overview of features found in most LMSs.

Reports

Allow the instructors to get an idea of students' overall progress and patterns of learning behavior in the course, both at the single activity level and at the user level.

- *Course report*: provides an overview of learners' progress and completion rate.
- *Activity report*: shows the number of views for each activity and resource.

- *Participation report*: generate a list of students who participated in a given activity; allows messaging either single students or a selected group.
- *Test statistics*: provide a statistical analysis of both the whole test and the items within it.

Group management

Allow group-building, both at the course level (as the default mode for all activities) and for specific activities. The composition of the groups can be either randomized, or at the free choice of students, or decided by the teacher (possibly based on survey or test results). This step can be automated, based on settings defined by the course administrator, such as group size and other criteria.

Assessment workflow and settings

When an activity involves grading and this cannot be automated, as in the case of assignments, teachers and tutors must provide for a reasonable amount of time to carry out the task. The grading interface usually allows the instructor to customize many aspects of the assignment itself and the related workflow, including scores, scales, and rubrics. The assignment activity can be set as a file submission, or writing an online text (using subject-specific notation filters, if needed). The teacher/tutor could simply mark learners' online submissions, or also produce a review with specific notes, and notify the student with any comments as soon as the grade is assigned. The instructor's review may serve the learner for redrafting its product in view of the final submission. The latter kind of workflow is highly educational, though decidedly time-consuming from the teaching team's point of view.

3.4.4. *Online exams*

Taking an exam at the university premises (or at authorized centers) has long been the only or prevailing way, even in distance education, to certify the completion of accredited courses. However, it is currently practicable to carry out any type of exam online (oral, digital, paper and pen) by adopting different proctoring methods. Under the special conditions due to the COVID-19 pandemic, new guidelines and regu-

lations on remote exams were issued by many HEIs. Three different options can be applied in invigilated online exams.

L-proctoring - Live environmental control

L-proctoring consists in visual inspection of the exam candidate(s) using a video conferencing environment (webcam and microphone turned on). The candidate is identified by seeing the university card or other document. L-proctoring is appropriate for oral exams, or written exams undertaken by small groups of students (whose behavior during the test is controllable by invigilators). As for written exams, it is advisable to divide a complex test into several short tests to be carried out in subsequent sessions and, in any case, to assign a short duration to each test (30 minutes at most), possibly following a short oral test. A short test reduces the chances of incorrectness.

For digital exams, when the candidate takes the test using a computer and generates a digital document, an additional level of security may be added by installing a Safe Exam Browser (SEB) on the computer of the candidates, which prevents access to external resources.

E-proctoring - Automatic environmental control

For written exams that require traceability of the student's behavior throughout the test, it is advisable to adopt an e-proctoring system, that is a plugin connected to a service which provides for the registration of the candidate’s image and desktop snapshots and, at the end of the test, reports behaviors that do not comply with the defined rules. For each student, at the end of the test, the teacher still has the recordings and snapshots available. E-proctoring systems are paid with an annual cost per student or per single exam.

T-proctoring - Trusted

Some kinds of exams, where candidates are requested to apply, analyse, contrast, or evaluate information, may not involve significant risks of unfair practice. Candidates must take the test in times and ways defined by the teacher, who trusts the authenticity of the task even without the help of proctors. However, it is advisable to validate the results through a short oral exam.

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