Chapter 81
Remote Teaching and Learning:
Design Models and Organizational Solutions

Giovanni Ganino
University of Ferrara, Italy

Laura S. Agrati
Pegaso University, Italy

ABSTRACT

Distance learning in the knowledge society, characterized by the massive use of information and communication technologies, is increasingly used and leads to teaching and learning methods that are different from conventional ones: use of networking, high degree of independence of the teaching path from spatial and temporal constraints, continuous monitoring of the learning level both through tracking and through frequent assessment and self-assessment, enhancement of multimedia and digital cognitive artifacts, enhancement of the interactive potential offered by computer-mediated communication and use of learning environments (SML) with socio-constructivist characteristics. This methodology includes teaching methods and strategies aimed at creating a new learning environment. The network becomes a school, a university, a place of formal and non-formal training, and is therefore an important area for experimentation and pedagogical research.

1. INTRODUCTION

Distance learning in the knowledge society, characterized by the massive use of Information and communication technologies (ICT), is increasingly used and leads to teaching and learning methods that are different from conventional ones: use of networking, high degree of independence of the teaching path from spatial and temporal constraints, continuous monitoring of the learning level both through tracking and through frequent assessment and self-assessment, enhancement of multimedia and digital cognitive artifacts, enhancement of the interactive potential offered by computer-mediated communication and use of learning environments (Learning management system) with socio-constructivist characteristics. This methodology includes teaching methods and strategies aimed at creating a new learning environment, the network becomes a school, a university, a place of formal and non-formal training, and is therefore an important area for experimentation and pedagogical research.

DOI: 10.4018/978-1-6684-7366-5.ch081

In its latest evolution, distance education is directly linked to the concept of computer-mediated communication (CMC), i.e., to the communication process that has taken place since the 1980s, thanks to the connection of computers to the electronic network, in the absence of spatial and temporal constraints (only spatial in case of synchronous communication). Theoretically, computer mediation in the communication process leads to major transformations (Mantovani, 1995): the shift from the Shannon and Weaver transmission paradigm, known as the parcel-post model, based on the linear transmission of a message from the broadcaster to the receiver, to the paradigm of two-way network communication based on the co-construction of messages, and on the sharing of speakers of a common ground of languages, beliefs and expectations (communication as social construction of meanings) (Rivoltella, 1998). It should also be noted that computer-mediated communication can lead to some critical issues such as an increase in message ambiguity and the possibility of misunderstandings due to the absence of the communication codes used in physical situations in person. These risks, known as aberrant decoding, communication difficulties and sociality factors, can have an important negative impact on distance education: aberrant decoding refers to misunderstandings of communicative meanings (caused by the decontextualization of CMC, contraction of usable non-verbal codes, lack of feedback in asynchronous communication); for communication difficulties reference is made to the possibility of polarization of CMC which may result in aggression and offensive messages (flaming) or flame war; main critical sociality factors include lurking, that is, the behavior of those who connect to online environments without taking part in them, but only reading the content contributed by others, lower attention levels caused by lack of context (especially if the webcam is turned off), increased cognitive burden, the perception of loneliness especially in the cases of asynchronous communication and self-learning courses (Ferrari, 2006; Rivoltella, 2021a). This premise places our definition of remote learning within a problematic framework, far from technocentric determinism, and close to theories that consider technologies, used in a skillful way from a pedagogical point of view, useful for teaching.

2. BACKGROUND

We now talk about distance learning or remote learning to indicate learning processes that take place remotely (anywhere, anytime) and focusing on the learning process as a change in human disposition or capacity that persists beyond a period of time and is not simply attributable to the growth process (Gagné, 1985). The same emphasis of the learning process is also found in didactic experiences in e-learning or blended-learning, which can take place either in conventional didactic situations, in person, in the same physical place (when using the classroom network), or remotely (online). The emphasis on the concept of networked learning (e) shows that the quality of educational actions depends on the conditions that it can provide for students, for those learning (Rivoltella, 2021b, p. 13). The educational actions must take place in learning environments within which the key educational and relational dynamics used in conventional teaching can be recreated. This is why an appropriate definition of virtual classroom seems to be as follows: “A communication space that allows students and teachers who do not share the same place to co-build knowledge through a system of relationships involving the definition and management of an emotional atmosphere” (Rivoltella, 2021c, p. 276).

The history of distance didactics, classified in, first, second and third generations, is marked by a path that links technological evolution, from the press to the Internet, passing through mass media (Garrison,

1985; Nipper, 1989), and a different underlying pedagogical, cognitive-behaviorist, socio-constructivist, connectivist model (Anderson & Dron, 2011).

The first generation of distance learning, known as "by correspondence," used the development of transport networks and postal services from the mid-1800s to disseminate paper materials to students who had difficulty reaching school sites. At the University of London the first distance courses based on cognitive behavioral pedagogy started around 1858: didactic material (written texts) with indications on how to study was sent by post, study was individual, the assessment phase involved the compilation of papers and interaction was absent. The presence of the teacher was replaced by the teaching material in the form of written text. Even today, it is easy to see how in many cases distance learning remains the same as in the first generation, self-learning and little or no interaction.

The second generation was marked by the advent of mass media, radio, cinema and television, and by the use of video starting from the 1970s. Radio contributed to the first evolution of teaching by correspondence (in the United States starting from 1921, in Europe from 1927 with courses offered by the BBC): it changed from a delayed to a broadcast mode of educational communication, from a broadcaster to a multitude of student-receivers, live. The real revolution came after the second world war with the use of television (in the United States since 1949), the advantages of which are evident: a convincing representation of reality, complete communication, facilitating the process of understanding for an illiterate audience, and the ability to broadcast. US-derived research produced studies in the 1950s in which three main communication paradigms were identified regarding the use of television in education: televised-education approach, broadcast-production approach, video-instrument teaching approach (Dunham, Lowdermilk & Brodenick, 1957; Farnè, 2003; Ganino, 2022). Second generation distance learning, characterized by the integrated use of educational texts (paper material, radio broadcasts, audio recordings, telephone, television broadcasts, home video media), still focused on cognitive-behavioral logic (lack of interaction and participation in the building of user knowledge): self-learning was accompanied by processes of greater personalization in an attempt to respond to the different needs expressed by users, particularly adult users.

The current third-generation phase, introduced by the spread of the Internet (not by chance, we talk about e-learning), provided the first significant experiences in computer-managed instruction and software-based training, the introduction of courseware platforms and their synchronous and asynchronous interaction tools. Digital technologies are a shift from the educational paradigms previously used to employ social-constructivist pedagogies, in terms of the active and collaborative role of the student, the lecturer as facilitator, with a scaffolding function and companion in the learning process, social construction of knowledge alongside the transmission of knowledge (Jonassen, Peck & Wilson, 1998), and connectionist in terms of community centrality (increase of learners online) with features based on the self-organization of learning (Siemens, 2005; Downes, 2007; 2008).

In particular, according to the constructivist epistemological matrix, the digital environment ceases to be a place exclusively full information already formed externally, according to an objective view of knowledge, becoming instead a "place of experience", which offers different possibilities and opportunities to co-build information and knowledge, which are no longer seen as something that can be received passively by the individual, but result from the relationship between an active individual and reality. Learning is therefore seen as a personal interpretation of the world. For this reason, the digital environments used in distance learning activities and their methodologies must be focused on students, on their interaction and participation and on settings. In this way, both the development of metacognitive skills and self-training processes can be encouraged.

Of course, the described evolutionary process must not be interpreted rigidly, with pedagogy replacing the previous one; the teaching models that have characterized the three generations of distance learning now coexist within the new learning environments: it isn't uncommon to continue to come across content-driven distance learning offerings and self-learning logic.

3. DESIGN OF DISTANCE LEARNING

E-learning requires an overall redesign of the training path, which must take into account didactic modalities capable of exploiting the evidence-based theoretical paradigms underlying online pedagogy: the overall design in its various forms, from the learning management system platform (LMS) to the educational resources employed; synchronous and asynchronous activities, interactive and relational aspects, such as adjustment, moderation, feedback, which are useful for managing the animation of the learning group, the professionals involved, in addition to the teacher and, finally, assessment, in its dual sense of assessment of learning and processes (the latter topic is not covered in this article).

In the indications of Rivoltella (2021d) the design of a distance learning course must include two complementary activities, the macrodesign involving the construction of the course syllabus (a detailed program which lays down the field of rules to which the teacher and student will refer for guidance in their educational relationship), which is essential for the customization of the educational space within the LMS, and the microdesign that is supported when drawing up the lesson plan in which the individual lessons or work sessions are planned in detail (as educational resources to be used asynchronously, such as the communicative-didactic role of the individual resources, whether or not to provide initial, ongoing or final self-assessment tests, to provide for didactic or e-tivities, to provide for case studies on which to exercise observation and criticism, or to develop skills to solve real problems, possible synchronous web conference sessions, etc.). Great attention must be paid at this stage, on the one hand, to problems connected with the students' attention (and their cognitive load), which is certainly lower than that achieved in conventional teaching situations, and, on the other, to avoid simply "moving" from the physical classroom to the virtual classroom. Each environment and tool must be used in accordance with precise theoretical paradigms that restrict their use, while conscious, good quality design entrusts separate educational functions to the various media that are often wasted transmitting contents of pure illustrative description which could be better transmitted with printed or digital text. As a rule, at this stage, inexperienced teachers should be accompanied by an instructional designer and a document production center.

3.1 Learning Management System

E-learning takes place in learning environments defined as learning management systems (LMS) used to design, distribute, choose, manage, and extend learning. These environments, based on the use of the network connection and the use of personal computers or smartphones (possibly supplemented by other interfaces) as the main tools for the learning path, consist of several sections dedicated to a series of educational activities which may take place synchronously or asynchronously (Garavaglia, 2019, with our integrations):

1. *Delivery or transmission of knowledge*. Tools dedicated to mainly transmissive, more or less interactive strategies where learner feedback is essentially linked to automated processes: asynchronous delivery of videos, video lectures, learning objects, multimedia presentations, paper materials, etc.)
2. *Settings dedicated to synchronous work*. Webconference systems that enable the sharing of the teacher's image, the computer screen, applications and shared work tools, tools useful for managing the relationship with the class, "student response" tools for conducting surveys and quizzes.
3. *E-moderating*. Activism-oriented tools based on the enhancement of communication and the action of the teacher or e-tutor that follows and moderates learners' actions (forums, wikis, workshops). Moderation can occur in synchronous and asynchronous modes.
4. *Situated*. Tools that help build worlds to explore at different levels of fidelity than the authentic ones to which they relate in order to facilitate learning: Slater and Wilbur (1997, in Garavaglia, 2019) proposed two different categories in relation to subject and environment, presence to indicate the level of awareness the subject has of being in a virtual environment, immersion to indicate total involvement (inclusive, extensive, surrounding and vivid). Environments in this category - today we talk about virtual and augmented reality - fueling simulative and educational processes based on situated, authentic activities that are functional to the development of skills and abilities.
5. *Assessment*. Tools aimed at measuring the achievement of training and educational objectives.

In addition, each LMS normally includes other functional sections, such as the administrative part (tools for the organization and preparation of training paths), user management (tools used to define access and roles), the monitoring and tracking aspects of the activities carried out and navigation.

Knowledge of the potential of LMSs is useful to avoid considering them as a simple repository of teaching materials rather than the actual learning environments that they are. In this regard, it is important to stress that the concept of an environment in didactic situations must be understood differently from that of a physical space (Garavaglia, 2019): within a defined space bodies can simply move around, whereas in an environment students can live and develop social and cultural activities. Therefore, this concept is better suited to defining the right context (online setting) in which educational actions can take place and an effective system of functional relationships can create an emotional atmosphere.

From a technical point of view, learning lanagement systems are built on responsive web standards and can be considered cloud-based applications that can interface with, for example, Google Drive or Microsoft Team. They provide for the use of an interoperability standard that makes contents accessible on different platforms thus optimizing production and distribution costs (Garavaglia, 2021).

3.2 Design of Digital Educational Resources

In remote learning processes, educational resources such as video lessons, educational videos, multimedia presentations, hypertexts, web conferences etc. are particularly useful. These texts can have a significant impact on the representation, transmission and construction of knowledge, provided that they are carried out in accordance with precise theoretical paradigms (Ganino, 2022) and are accompanied by the overall design of the training activity (Laurillard, 2012). On a more concrete level, it can be seen that educational resources, in particular video, can be highly effective in training processes if the principles of instructional design are respected: proper management of the cognitive load; enhancement of cognitive theories of multimedia learning; promotion of student involvement and attention; exploitation of active learning.

The theories and corresponding principles developed that refer to the first two points support and show how multimedia learning depends on optimizing the information presented in relation to the functioning mechanisms of students' mental and cognitive processes (Sweller, 1988; Sweller et al., 1998, 2019; Mayer, 2009, 2014; Clark & Mayer, 2016; Clark & Lyons, 2010). This means that mental effort must focus on an active reasoning process based on the operations of selecting relevant incoming information, organizing it in coherent mental representations, and then integrating it with the mental representations already possessed. In relation to this field of research there are various international empirical studies according to which the enhancement of the educational content through video or multimedia presentations improves learning results, as long as they are made with the intention of reducing the extraneous cognitive load, increasing the relevant one, and managing the intrinsic one.

With regard to the promotion of involvement and attention, many researchers agree that audiovisual texts in open and remote teaching situations are the preferred educational resource of university students (Carmichael, Reid &Karpicke, 2018; Ramlogan, Raman & Sweet, 2014; Mitra, Lewin-Jones, Barrett & Williamson, 2010) who show a growing desire for greater independence in controlling their own learning (Rasi & Poikela, 2016), and above all greater participation in problem-based learning processes (ibid.) due to the opportunities to learn better from experts in the field, to see procedures and operations in detail and repeatedly (Ramlogan et al., 2014; Cooper & Higgins, 2015), in a concrete and non-abstract way, in an approach supported by audiovisual communication, which can reduce the cognitive load of trying to mentally recall real situations or perform a "mental animation" process to give concrete meaning to processes, especially in STEM subjects (Castro-Alonso, Ayres, Wong & PAA, 2018). A number of studies also show that attention facilitates the selection of incoming perceptual information and limits the amount of external stimuli, thus avoiding the effects of cognitive overload. A learning process without sustained attention makes it more difficult to achieve effective learning, which is why the relationship between using video and engaging students is a very interesting subject, though not easy to analyze. In recent years, it has become commonplace among researchers, along with subjective assessments related to student educational performance, to use brain wave sensors to monitor attention/concentration levels, stress detectors (emWave type) capable of measuring heart rate to monitor emotions, eye tracking systems on eye movement, subjective and objective scales of cognitive load, total and broken down into its three specific dimensions (foreign, intrinsic, relevant). In general, we believe that involvement and attention are independent of a specific approach and are based on a wider context geared toward improving the overall learning experience.

With regard to the enhancement of active learning, in addition to what has been said in the previous point, it is clear that the use of audiovisual resources, particularly on-line, which are not supported by the principles of didactic design may have disadvantages due to the difficulties of conceptualization and abstraction on the part of students, the unidirectionality of the video message and the lack of involvement caused by the mediation of the screen interface. In response to these inherent characteristics of the audiovisual text, there are solutions and methodologies that can promote the active role of the student and bring audiovisual and alphabetical-text modes of use closer together. In particular, the two learning patterns, one based on immersion, the other on abstraction, can be brought closer through the use of digital and multimedia languages, provided, for example, by interactive video annotation applications (Miller & Carney, 2007; Tripp & Rich, 2012; Rich & Hannafin, 2008). Video annotation is a widely used technology in North America that allows you to easily, almost intuitively, integrate your normally

passive video consumption with an active, participative, reflective mode by adding a series of hypertext functions that are time synchronized: input of feedback, quizzes, self-assessment tests, surveys, subtitling for accessibility, highlighted areas for inclusion of supplemental text, hyperlinks, content discussion activities, assignments. All in the direction of overcoming passive vision (looking) and toward more active and reflective activities (thinking), exploration and discussion (understanding).

There has been extensive research on all of these points, especially the first two, and there is clear evidence of their functionality but they are not yet actually activated in educational practices (Sweller, van Merriënboer & Paas, 2019).

3.3 Adjustment, Moderation, Feedback: Between Synchronous and Asynchronous Teaching

In order to direct an LMS, as mentioned above, toward a functional space for the co-construction of knowledge through a system of relationships and the creation of an emotional atmosphere, the management of feedback through adjustment and moderation is crucial.

In the classroom, not only what the teacher says, but any gesture he/she makes, his/her facial expression, the tone and rhythm of his/her voice, or silence, is regarded by the students as a sign to which to attribute meaning (See Watzalawick's concept of "punctuation".) Studies on the pragmatics of human communication carried out by the Palo Alto school suggest that one cannot not communicate (first axiom) and cover how communication is punctuated (third axiom) (Watzlawick, Beavin & Jackson, 1967). Didactic adjustment consists of reading the classroom, i.e. understanding the students' state of interest and motivation, and possible subsequent realignment, in the event of a change in the standard situation, through didactic interventions to manage the proper relationship with the students.

In synchronous modes, adjustment feedback is complex given the need for a look at a communicative situation that links students and teachers within which the teacher must re-align the classroom with the objectives of the lesson in an interactionist perspective (Fishman & Dede, 2016). As reported by Simona Ferrari synchrony and interactionism oblige the teacher to enlarge their perspective (Carenzio & Ferrari, 2021). They must continually move it from an egocentric position (the teacher and his/her explicit design of the communicative event) to an allocentric position (the students' point of view and their feedback) and then return to a "repositioned egocentrism" both with respect to design and with respect to their communicative posture (Berthoz, 2011).

This system of teacher-student interactions, which is useful in creating the best conditions for learning to take place at a distance, is more complex due to the lack of a set of communication codes, in particular due to the absence of bodies and all that follows. This must make us reflect on different forms of relationship in which interaction through the body is rarefied or absent, where proxemics are lacking, central to the relationship between people (Hall, 1963), and where the "theatrical" vocation of didactics is almost lost. Or rather the body is there but it does not affect the performance: it is forced to be seated in front of a screen contributing to describing the traits of what in literature has begun to be called Zoom fatigue (Rivoltella, 2021e). This forces the identification of functional strategies to activate feedback, both in the situation of synchronous and asynchronous teaching, naturally in a different way, the use of which, recalls Alessandra Carenzio (Carenzio & Ferrari, 2021) quoting Hattie (1999), is the most important moderator for increasing learning outcomes.

3.3.1 Synchronous Learning Activity and Feedback

In the case of online teaching, the use of adjustment is of fundamental importance, since the body turns out to be stationary and reduced to a snapshot in ID-photo format (Bailenson, 2021). For this reason the teacher is required to intervene "just in time". This technique may involve the use of pre-class training activities, early work in an asynchronous manner, which will provide the teacher with a set of information for planning the lesson better (Hake, 1998; Novak, Patterson, Garvin et al. 1999), or in synchronous mode to encourage attention, motivation, and activation of students (e.g. warmups or puzzles).

Of course, in synchronous mode, for example through a webconference lesson session, there is also the possibility of immediate feedback through stimuli of different kinds (quizzes, surveys, lesson topics), Student Response System applications, such as mentimeters, socratives and top hats. These applications allow real-time processing of the answers that come from the classroom and graphical representation of the answers so that they can be used immediately as part of the lesson for comments, analysis and correction of any errors. It is also suggested to include hinge questions that allow the teacher to understand to what extent the students are following the lesson and how much they have understood the content, especially when considering adding new propositions or constructions related to previous ones (Carenzio in Carenzio & Ferrari, 2021). In webconference sessions, many other applications such as electronic message boards (Padlet or Wakelet) can be used to gather a real-time response from students or to probe classroom knowledge according to animation principles (Kahoot!).

All platforms can also have a set of standard tools:

- Chats where you can ask students to summarize their questions (either freely or according to the logic of question time) or post their comments, share information (such as links to resources on the web), carry out quick checks on the state of understanding of the contents;
- Status indicators such as the functional raising of hands to ask to speak within a session.

3.3.2 Asynchronous Learning Activity and Moderation

Moderation may concern in general the overall economics of an online course: the management of notices, animation through the use of the board, communication related to the steps involved in the performance of the activities, checking deadlines for doing assignments, chairing discussion forums (Rivoltella, 2021a). In asynchronous online teaching modes, moderation takes on a very important aspect; it can help with the study of a video lesson, participation in a forum, the drafting of a wiki, and the development of e-tivities. In these cases, in the indications of Ferrari (Carenzio & Ferrari, 2021), it can promote a deep and more reflective reading of the didactic activities thanks to the "extended time" allowed for encoding and decoding processes, from the possibility to return to the communication passages operated by the individual author or from group exchanges, from the prevalence of a written interactive register (Ferrara, Brunner & Whittemore, 1991). This moderation activity requires special attention and techniques (Ferrari, 2006) to the point of often assigning this function to tutoring figures (Rivoltella, 2006) who accompany the teacher within a teaching team. Moderation of the e-tutor or e-teacher, for example, is essential for the forums to be able to determine collaboration and co-production: time management needs to be good, the group needs to be driven toward the objectives to be achieved through clear operational procedures, the connection between the forum and the lessons of the course (or digital contents) needs

to be evident and adjusted in a complementary way (the idea of the forum should not be perceived as a secondary activity).

The latter aspect is particularly interesting for the proper functioning of a forum (but also of a wiki or a blog). Often in forums, which form the dynamic part of education and are the result of the interaction of students with each other, and students with the teacher, content is developed through discussion that is complementary to that provided through the teaching materials. Perhaps unstructured content that needs formalization or labeling through semantic marking work, using specific symbols (e.g. green light for relevant posts, thumb down for less interesting ones). This work could be done by an e-tutor, but also by the students themselves, in a bottom-up and folksonomic way, as is the case in social learning platforms.

3.4 Roles and Responsibilities in the e-Learning Environment

The e-learning environment requires numerous skills to be designed, implemented, managed and monitored. Such skills relate to several roles, especially within complex organizations. Ranieri (2005) proposed an agile descriptive model, inspired by the systemic-recursive paradigm, useful for distinguishing between the numerous roles of e-learning. It identifies three levels of intervention corresponding to the elaboration phases of an e-learning project: macro-didactic, micro-didactic and production-development.

The roles involved at the *macro-didactic level* have the task of analyzing the 'system constraints' - i.e., the users (physical distance, number, technological literacy, knowledge of the subject, homogeneity of interest, willingness to share), the contents (open or closed, static or dynamic, textual or multimedia-modal), the training objectives (defined on the basis of taxonomies) and the infrastructure (in terms of technology and availability of human resources) - essential for choosing the type of e-learning, the degree of integration between presence and distance, and the degree of 'self-generation' of the training activity. Such tasks are shared between purely technical figures – such as technical support, data analyst, technology specialist etc. - and the project manager (e.g. the head of a degree course).

The roles intervening at *micro-didactic level*, on the other hand, fulfill the strictly instructive dimension, that is the choice of methodological-didactic solutions according to the variables of the macro-didactic level. In fact, the methodological-didactic choices concern the most effective models with respect to the educational conditions, didactic strategies and evaluation methods as well as the communication of the contents in order to promote learning. These tasks are shared between the *subject matter expert*, the teaching method expert and the interface expert who work on the articulation of the course structure (e.g. content story board and page layout, i.e. the graphical interface with which the student interacts). Both roles could be covered by the e-teacher or not (see below).

The roles related to the specific production-development level are usually divided into tasks of 'content implementation/delivery' - namely, *e-teacher* - and 'interaction management' - e-*tutor*, see below.

Some authors prefer to distinguish between the *instructional* and *learning designer* roles (Bates, 2019; Carr-Chellman, 2016; Goodyear, 2015):

- The first, as an engineer, leads 'the process of translating principles of learning and instruction into plans for educational materials, activities, information resources, and evaluation' (Smith & Tillman, 1999), intervening both in terms of the general structure of the project (macro-didactics, alongside the project manager) and with the methodological-didactic definition (micro-didactics, alongside the subject matter expert and the interface expert).

- The second provides 'descriptions of learning tasks, resources and supports (…) so that other teachers can understand and use them in their own context' (Donald, Blake, Girault, Datt, & Ramsay, 2009); therefore, it focuses more on the micro-didactic level.

The roles described can multiply or merge in relation to the types of courses and the complexity of the projects.

During the Covid pandemic, just when it was necessary to proceed with the forced adaptation of training courses from face-to-face mode to remote mode, the need for a clearer distinction between the tasks and roles of e-learning was perceived more strongly. In fact, the limit of the emergency adaptation of courses to online mode was not perceived so much in terms of interaction management (e-teacher and e-tutor), as at the micro-didactic level, of integration of learning contents and learning system, due to the lack of specific *instructional* and *learning* designer tasks.

3.4.1 e-Teacher

Studies on the e-teacher's role within the online environment underlined the ability to select, modify and produce digital content in a way that is useful for the learning of e-students, which was also noted in national and international documents in Europe (ANVUR, 2017). The American Educational Testing Service (ETS) has developed the iCritical Thinking certification program (Educational Teaching Service, 2009; Guri-Rosenblit 2018, p. 95), a list of seven activities, useful for representing the areas of intervention of the e-teacher, i.e.:

- Define ("understand and articulate the scope of an information problem in order to facilitate the electronic search for information");
- Access ("collect or retrieve information in digital environments");
- Evaluate ("judge whether information satisfies an information problem by determining authority, bias, timeliness, relevance, and other aspects of materials");
- Manage ("organize information to help others find it later");
- Integrate ("interpret and represent information using digital tools to synthesize, summarize, compare and contrast information from multiple sources");
- Create ("adapt, apply, design and construct information in digital environments");
- Communicate ("disseminate information tailored to a particular audience in an actual digital format').

As Guri-Rosenblit points out (2018; Alexander et al. 2017), the e-teacher is asked for a sort of mediation surplus between learning contents and students' needs, that is the ability to reshape their own specialized contents through the opportunities of the learning environment and to adapt them to the characteristics and learning needs of the students – in other words "the ability to teach content from the students' point of view" (Ben-Peretz 2011, p. 4). However, this ability requires that the e-teacher develop a more flexible relationship with his/her own discipline, an authentic interest in the learning characteristics of the students, that he/she is available to experiment with new learning tools advanced by technology (Alexander et al. 2017; Wineburg et al. 2016). It also requires an organization, either school or university, that supports this transformation through learning contexts that are equally open to change (Fabbri & Romano, 2019).

3.4.2 e-Tutor

The e-tutor «interacts directly with students to support their learning process when they are separated from the tutor in time and place for some or all of these direct interactions» (Denis, 2003, p. 152; see also Ferrari et al., 2021).Literature on e-learning tends to conceptually distinguish between different types of e-tutors, with mainly *didactic-disciplinary* or *organizational-management* functions, based on the type of course (Calvani & Rotta, 2000; Ranieri, 2005) or context:

- The *instructor* provides more depth to the learning contents within 'content & support' type courses and, therefore, has scientific-disciplinary skills related to the contents of the course;
- The *facilitator* supports students' learning processes by providing different types of structures within personalized 'wrap around' courses and has *student-oriented* pedagogical-didactic skills;
- The *moderator* manages group dynamics and activities in *integrated* courses and has proactive animation skills.

From a more operational point of view, two types of e-tutors are also distinguished (Rivoltella, 2006; Rossi, 2007):

- The *on-line tutor* who has "the task of supporting the student's motivation throughout the teaching process, adapting the study path adequately to the characteristics of each student and promoting their active role, with a focus on the understanding of the context in which the training course is developed" (Ferrari et al., 2021, p. 116);
- The *disciplinary tutor*, that is "an expert, qualified in the subject area, who supports the teacher in charge of teaching, contributing to the continuous improvement of the quality of the course, the service offered and student learning" (Ferrari et al., 2021, p. 116).

However, beyond conceptual distinctions, it is agreed that the e-tutor must develop at least three 'necessary' skill areas (Kemshal-Bell, 2001), namely:

- *Techniques* - ability to use technologies and the network and the tools they make available;
- *Facilitation skills* - methodological, communicative and psychological;
- *Managerial skills* - related to the management of activities to define times and methods, providing feedback and monitoring the progress of students.

3.4.3 The e-Moderator

Salmon (2012), instead, follows a *transversal* approach to the conceptual distinction between the roles of e-teacher and e-tutor. According to the author, both the teacher and the tutor could act as *e-moderators* with varied skills based on the different phases that describe the training process undertaken by the student, namely:

- *Access* and *motivation* - support phase for student familiarization with respect to the software and the various proposed activities;

- *Online socialization* - phase of building the learning community through relationships of trust between students through online activities (*e-tivities*);
- *Information exchange* – phase in which e-students exchange information, materials, ideas and opinions through e-tivities and thus develop a proactive attitude;
- *Knowledge construction* – phase in which e-students learn autonomously by completing the assigned projects and developing their own critical skills;
- *Development* - phase in which learners acquire awareness of their own learning path and are able to assist other classmates or colleagues.

CONCLUSION

International educational policy bodies have been promoting the achievement of a number of objectives in education and training for several years: the structured use of information and communication technologies, the dissemination of digital culture, the integration between formal and non-formal, the complementary use of real and virtual environments, the development of quality contents through the use of technologies and multimedia. Universities, schools, professional and business training providers are therefore called upon to use e-learning methodologies and digital technologies to improve inclusive teaching processes and support ongoing education and the cultural, social, and economic development of citizens living in increasingly complex societies. From this perspective, important factors relating to the quality of teaching and learning activities are considered to be useful in building-discovering knowledge (research) and transmitting-acquiring knowledge-skills (didactic) (Galliani, 2002). It is also important to point out that there is no correlation between investment in technology and automatic improvements in teaching processes. Those who know the history of technology are aware that it is a constant repetition of the same illusions (Laurillard, 2008). For this reason, all efforts, as indicated in this article, must be directed toward problems relating to method: distant from technocentric views of technological determinism and close to those theories, supported by scientific evidence, which consider technologies and digital languages useful for teaching.

SOLUTIONS AND RECOMMENDATIONS

Information and communication technologies are now an integral part of the knowledge society, it follows that, although they do not automatically determine advantages for education, it is no longer possible to think of teaching and learning processes without technologies. Scientific evidence shows that the new online learning environment requires innovative teaching methodologies, far from simply "moving" the lesson from the real classroom to the virtual classroom. The best recommendations indicate how to redesign online learning through solutions that enhance the socio-constructivist characteristics of digital platforms alongside the transmission of information, the interactive, participatory and relational potential offered by computer-aided educational communication functional to the animation of the learning group, the communicative and inclusive potential of multimedia educational resources, the involvement of professional figures to support the teacher such as instructional design and the e-tutor, and the evaluation of processes and learning results. In practice, we need to think about digital environments and related methodologies as being centred on students and settings. This makes it possible to promote both the

development of metacognitive skills and self-training processes. This new learning environment thus constitutes an important area of pedagogical experimentation that should enable students and teachers who do not share the same place to co-build knowledge through a system of relationships involving the definition and management of an emotional atmosphere.

FUTURE RESEARCH DIRECTIONS

The added value of e-learning can only come from the teaching methodologies that are useful for the proper use of online environments and away from the pure transmission of information in a model based on simply "moving" from the physical classroom to the virtual classroom. Educational methodologies that must have a clear reference to scientific evidence, with specific reference to the following key issues of distance learning:

1. The epistemological framework, the theoretical paradigms of online pedagogy with a particular focus on constructivist and connectivist learning;
2. The design and architecture of technological platforms in the direction of creating environments capable of integrating the main learning paradigms;
3. Design of the educational resources employed relating to the representation of knowledge in compliance with: a) the characteristics of the different media and materials (often wasted with purely illustrative description of content transmitted effectively with text, print or digital); b) cognitive theories on multimedia learning and the related optimization of the information presented in relation to the workings of the mental and cognitive processes of students;
4. The methodologies of networked, synchronous and asynchronous communication in terms of adjustment, moderation and feedback;
5. Self-assessment and online monitoring of learning with training feedback, portfolio records and evaluation of learning and processes;
6. Preparing students for the use of ICT in terms of acquiring the right digital skills ;
7. The training of teachers, tutors and trainers;
8. The involvement and role of new professionals such as the e-tutor alongside the teacher;
9. Policies put in place by educational, training and university institutions to overcome teachers' resistance to change, especially in universities.

Exploring these issues in more depth through meaningful research can finally bring about real change capable of strategically integrating ICT into the institutional educational organization. The question is no longer whether teaching should change, but how such change should take place and what place e-learning should have in the training of the future.

ACKNOWLEDGMENT

The approach of the article was shared by the authors. However, for reasons of scientific responsibility, Giovanni Ganino wrote paragraphs 1, 2, 3, 3.1, 3.2, 3.3 and future research direction; Laura Sara Agrati wrote the paragraphs 3.4, solution and recommendations, conclusion.

REFERENCES

Alexander, B., Becker, S. A., Cummins, M., & Giesinger, C. H. (2017). *Digital literacy in higher education. Part II: An NMC Horizon project strategic brief.* The New Media Consortium.

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *International Review of Research in Open and Distance Learning*, *12*(3), 80–97. doi:10.19173/irrodl.v12i3.890

ANVUR – Agenzia nazionale per la valutazione del sistema universitario e della ricerca: linee guida AVA per l'accreditamento periodico delle sedi e dei corsi di studio universitari [National agency for the evaluation of the university system and research: guidelines for the periodic accreditation of university study courses]. (2017). http://www.anvur.it/attivita/ava/accreditamento-periodico/linee-guida-per-laccreditamento-periodico/

Bailenson, J. (2021). Nonverbal Overload: A theoretical argument for the causes of Zoom Fatigue.[-. *Technology, Mind, and Behavior*, *2*(1), 1. doi:10.1037/tmb0000030

Bates, A. W. (2019). *Teaching in a digital age* (2nd ed.). Tony Bates Associates.

Ben-Peretz, M. (2011). Teacher knowledge: What is it? How do we uncover it? What are its implications for schooling? *Teaching and Teacher Education*, *27*(1), 3–9. doi:10.1016/j.tate.2010.07.015

Berthoz, A. (2011). *La semplessità* [The simplexity]. Codice.

Calvani, A., & Rotta, M. (2000). *Fare formazione in internet* [Do training online]. Erickson.

Carenzio, A., & Ferrari, S. (2021). Suggerire e gestire il feedback: regolare la didattica in just in time [Suggest and manage feedback: regulate teaching in just in time]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Carmichael, M., Reid, A. K., & Karpicke, J. D. (2018). *Assessing the Impact of Educational Video on Student Engagement, Critical Thinking and Learning: The Current State of Play* (White Paper). Thousand Oaks, CA: SAGE Publishing, Inc.

Carr-Chellman, A. (2016). *Instructional design for teachers: improving classroom practice* (2nd ed.). Routledge.

Castro-Alonso, J. C., Ayres, P., Wong, M., & Paas, F. (2018). Learning symbols from permanent and transient visual presentations: Don't overplay the hand. *Computers & Education*, *116*, 1–13. doi:10.1016/j.compedu.2017.08.011

Clark, R., & Lyons, C. (2010). *Graphics for learning: proven guidelines for planning, designing, and evaluating visuals in training materials*. Pfeiffer.

Clark, R., & Mayer, R. E. (2016). e-Learning and the science of instruction: proven guidelines for consumers and designers of multimedia learning. Hoboken, NJ: John Wiley & Sons.

Cooper, D., & Higgins, S. (2014). The effectiveness of online instructional videos in the acquisition and demonstration of cognitive, affective and psychomotor rehabilitation skills. *British Journal of Educational Technology*, *46*(4), 768–779.

Denis, B. (2003). Quels rôles et quelle formation pour les tuteurs intervenant dans des dispositifs de formation à distance? [What roles and what training for tutors involved in distance learning systems?]. Distance et savoirs, 1(1).

Donald, C., Blake, A., Girault, I., Datt, A., & Ramsay, E. (2009). Approaches to learning design: Past the head and the hands to the HEART of the matter. *Distance Education*, *30*(2), 179–199. doi:10.1080/01587910903023181

Downes, S. (2007). An introduction to connective knowledge. *International conference on media, knowledge, education. Exploring new spaces, relations and dynamics in digital media ecologies*. http://www.downes.ca/post/33034

Downes, S. (2008). Places to go: Connectivism, connective knowledge. *Innovate (North Miami Beach, Fla.)*, *5*, 1. http://innovateonline.info/pdf/vol5_issue1/Places_to_Go_Connectivism_&Connective_Knowledge.pdf

Dunham, F., Lowdermilk, R., & Broderick, G. (1957). Television in education. *Bulletin n. 21*, US Department of Health, Education and Walfare.

Educational Testing Service – ETS: ICritical Thinking. (2009). Princeton University Press.

Fabbri, L., & Romano, A. (2019). Costruire infiniti mondi professionali. Prospettive trasformative [Building infinite professional worlds. Transformative perspectives]. *Education Sciences & Society*, *10*(2).

Farnè, R. (2003). *Buona maestra Tv. La Rai e l'educazione. Da "Non è mai troppo tardi" a "Quark"* [Good television teacher. Rai and education. From "It's Never Too Late" to "Quark"]. Carocci.

Ferrara, K., Brunner, H., & Whittemore, G. (1991). Interactive written discourse as an emergent register. *Written Communication*, *8*(1), 1, 8–34. doi:10.1177/0741088391008001002

Ferrari, S. (2006). *Giochi di rete. Metodi e strumenti per l'analisi psicopedagogica del forum* [Web games. Methods and tools for the psycho-pedagogical analysis of the forum]. Guerini Studio.

Ferrari, S., Mauro, I., Rivoltella, P. C., Raviolo, P., & Messina, S. (2021). E-tutoring nella didattica telematica, pratiche di modellamento [E-tutoring and digital teaching. Modeling practices]. *Excellence and innovation in learning and teaching,* 113-125.

Fishman, B., & Dede, C. (2016). Teaching and technology: New tools for new times. In *Fishman, B., Dede, C., Means, B. (a cura di). Handbook of research on teaching* (pp. 1269–1334). Routledge. doi:10.3102/978-0-935302-48-6_21

Gagné, R. M. (1985). *The conditions of learning and theory of Instruction* (4th ed.). Holt, Rhinehart & Winston.

Galliani, L. (2002). Introduzione. "Ballare col diavolo" ovvero introdurre le tecnologie nell'università [Introduction. "Dancing with the devil" in other words introducing technologies into the university]. In L. Galliani (Ed.), *L'Università aperta e virtuale* [The open and virtual University]. Pensa MultiMedia.

Ganino, G. (2022). *Insegnare e apprendere con le tecnologie. Video-based learning e processi cognitivi: percorso storico, stato dell'arte e prospettive di ricerca* [Teaching and learning with technologies. Video-based learning and cognitive processes: historical path, state of the art and research perspectives]. Pensa MultiMedia.

Garavaglia, A. (2019). Ambienti di apprendimento [Learning environments]. In P. C. Rivoltella & P. G. Rossi (Eds.), *Tecnologie per l'educazione* [Educational technologies]. Pearson.

Garavaglia, A. (2021). I LMS: dal coursware al social learning [LMS: from coursesware to social learning]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Garrison, D. R. (1985). Three generations of technological innovations in distance education. *Distance Education*, *6*(2), 235–241. doi:10.1080/0158791850060208

Goodyear, P. (2015). Teaching as design. *Herdsa Review of Higher Education*, *2*(2), 27–50.

Guri-Rosenblit, S. (2018). *E-teaching in higher education: An essential prerequisite for e-learning*. University of Alicante.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanism test data for introductory physics courses. *American Journal of Physics*, *66*(1), 64–74. doi:10.1119/1.18809

Hall, E. T. (1963). *The Hidden Dimension*. Bompiani.

Hattie, J. (1999). *Influences on student learning. Inaugural lecture*. University of Auckland. http://cdn.auckland.ac.nz/assets/education/about/research/documents/influences-on-student-learning.pdf

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1998). *Learning with Technology: A Constructivist Perspective*. Merrill.

Laurillard, D. (2008). *Digital Technologies and Their Role in Achieving Our Ambitions for Education*. Institute of Education.

Laurillard, D. (2012). Teaching as a design science: building pedagogical patterns for learning and technology. Milan: Franco Angeli.

Mantovani, M. (1995). *Comunicazione e identità. Dalle situazioni quotidiane agli ambienti virtuali* [Communication and identity. From everyday situations to virtual environments]. Il Mulino.

Mayer, R. E. (2009). Multimedia Learning. Cambridge University Press. doi:10.1017/CBO9780511811678

Mayer, R. E. (2014). Multimedia instruction. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of Research on Educational Communications and Technology* (pp. 385–399). Springer. doi:10.1007/978-1-4614-3185-5_31

Miller, M., & Carney, J. (2007). An analysis of video annotations that capture teacher's in the moment cognition, assessment and learning. *Society for Information Technology & Teacher Education International Conference*, *1*, 141-145.

Mitra, B., Lewin-Jones, J., Barrett, H., & Williamson, S. (2010). The use of video to enable deep learning. *Research in Post-Compulsory Education*, *15*(4), 405–414. doi:10.1080/13596748.2010.526802

Nipper, S. (1989). Third generation distance learning and computer conferencing. In *Mindweave: Communication, computer and distance education* (pp. 63–73). Pergamon.

Novak, G., Patterson, E. T., Gavrin, A. D., & Christian, W. (1999). *Just in timeteaching: Blending Active learning with Web Technology*. Prentice Hall.

Ramlogan, S., Raman, V., & Sweet, J. (2014). A comparison of two forms of teaching instruction: Video vs live lecture for education in clinical periodontology. *European Journal of Dental Education*, *18*(1), 31–38. doi:10.1111/eje.12053 PMID:24423173

Ranieri, M. (2005). *E-learning: modelli e strategie didattiche* [E-learning: teaching models and strategies]. Erickson.

Rasi, P., & Poikela, S. (2016). A review of video triggers and video production in higher education and continuing education pbl settings. *The Interdisciplinary Journal of Problem-Based Learning*, *10*(1). Advance online publication. doi:10.7771/1541-5015.1609

Rich, P. J., & Hannafin, M. (2008). Video Annotation Tools: Technologies to Scaffold, Structure, and Transform Teacher Reflection. *Journal of Teacher Education*, *60*(1), 52–67. doi:10.1177/0022487108328486

Rivoltella, P. C. (1998). *Teoria della comunicazione* [Communication theory]. La Scuola.

Rivoltella, P. C. (2006). *E-tutor. Profilo, metodi, strumenti* [E-tutor. Profile, methods, tools]. Carocci.

Rivoltella, P. C. (2021a). Fare moderazione online [Do moderation online]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Rivoltella, P. C. (2021b). Introduzione [Introduction]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Rivoltella, P. C. (2021c). La moderazione asincrona [Asynchronous moderation]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Rivoltella, P. C. (2021d). Il design: architettura, carico cognitivo, layout [The design: architecture, cognitive load, layout]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Rivoltella, P. C. (2021e). Regolare nel distance learning [Regulate in distance learning]. In Apprendere a distanza. Teorie e metodi [Distance learning. Theories and methods]. Milan: Raffaello Cortina.

Rossi, P. G. (Ed.). (2007). *Progettare eLearning* [eLearning design]. EUM.

Rotta, M., & Ranieri, M. (2005). *E-tutor: identità e competenze* [E-tutor: identity and skills]. Erickson.

Salmon, G. (2012). *E-moderating: The key to teaching and learning online* (3rd ed.). Routledge. doi:10.4324/9780203816684

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, *2*(1), 3-10. http://www. idtl. org/Journal/Jam _05/article01. html

Smith, P. L., & Tillman, J. R. (1999). *Instructional design*. Wiley.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, *12*(2), 257–285. doi:10.1207/s15516709cog1202_4

Sweller, J., van Merriënboer, J. J. C., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*(3), 251–296. doi:10.1023/A:1022193728205

Sweller, J., van Merriënboer, J. J. C., & Paas, F. G. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, *31*(2), 261–292. doi:10.1007/s10648-019-09465-5

Tripp, T. R., & Rich, P. J. (2012). The influence of video analysis on the process of teacher change. *Teaching and Teacher Education*, *28*(5), 728–739. doi:10.1016/j.tate.2012.01.011

Watzlawick, P., Beavin, J. H., & Jackson, D. D. (1967). *Pragmatics of Human Communication.* Astrolabio.

Wineburg, S., McGrew, S., Breakstone, J., & Ortega, T. (2016). *Evaluating information: the cornerstone of civic online reasoning.* Stanford University. https://purl.stanford.edu/fv751yt5934

ADDITIONAL READING

Clark, R., & Lyons, C. (2010). *Graphics for learning: proven guidelines for planning, designing, and evaluating visuals in training materials*. Pfeiffer.

Clark, R., & Mayer, R. E. (2016). e-Learning and the science of instruction: proven guidelines for consumers and designers of multimedia learning, Hoboken, NJ, John Wiley & Sons.

Jonassen, D. H., Peck, K. L., & Wilson, B. G. (1998). *Learning with technology: a constructivist perspective*. Merril.

Laurillard, D. (2012). *Teaching as a design science: building pedagogical patterns for learning and technology*. Routledge.

Rivoltella, P. C. (2021). *Apprendere a distanza. Teorie e metodi*. Raffaello Cortina.

Salmon, G. (2012). *E-moderating: The key to teaching and learning online* (3rd ed.). Routledge. doi:10.4324/9780203816684

Sweller, J., van Merriënboer, J. J. C., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*(3), 251–296. doi:10.1023/A:1022193728205

Sweller, J., van Merriënboer, J. J. C., & Paas, F. G. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, *31*(2), 261–292. doi:10.1007/s10648-019-09465-5

KEY TERMS AND DEFINITIONS

Adjustment: functional technique to tune to the same wavelength as the classroom whenever proper contact with the students is lost. It recalls the technological process of tuning, which is performed using a knob in old radios for repositioning them on the right signal.

Blended Learning: A teaching model that converges the traditional face-to-face learning environment with the computer-mediated learning environment.

E-Tivitiy: The term, coined by Gilly Salmon, means "online activity", and refers to a theoretical framework for significantly managing interactive activities on the web.

Hinge Questions: Is a diagnostic tool. The students' answers tell the teacher whether a topic has been understood and whether it is possible to move on to another topic or to cover misunderstood concepts again.

Puzzles: Tests that are usually used to close a work session and have the task of helping to summarize contents or explore them in more depth.

Syllabus: Teaching program including learning objectives, knowledge and skills intended to be acquired, content and topics to be covered, training materials, evaluation methods and assessment criteria.

Warmup: Small tests given prior to the lesson that are intended to prepare students for a particular subject or to help the teacher know in advance which critical points to focus during the work session.

Wrap Around: Type of training course in an e-learning environment based on the combination of online resources, activities, discussions, books, CD-ROMs, and tutorials, which promotes student freedom and offers less structured learning contents.