Erasmus+

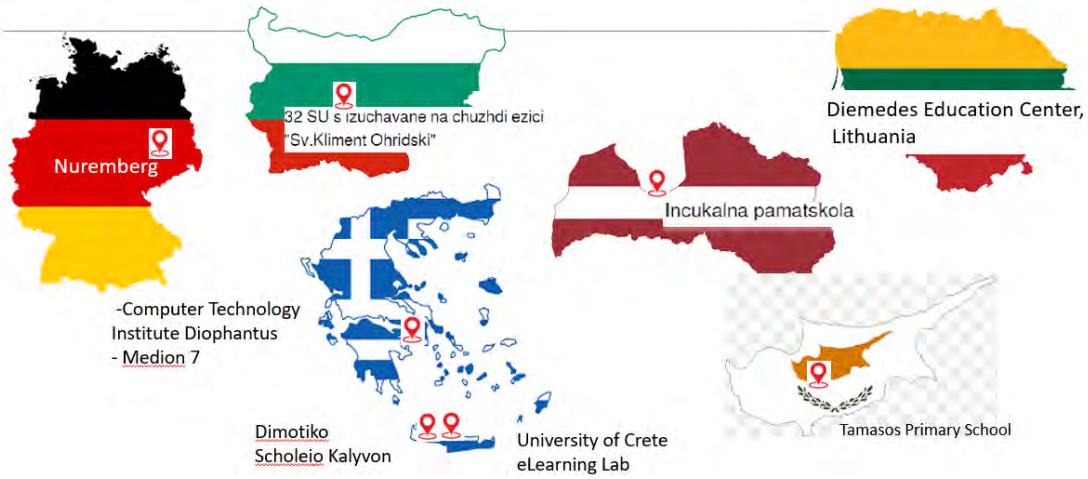
Co-funded by the European Union

Intelligent iLearning-eCreativity-eDiversity

iLCD

RESULT 1

Advanced Pedagogy Framework for iLearning-eCreativity-eDiversity in K12 education (APF)



Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Erasmus+ Project 2021-1-EL01-KA220-SCH-000027791

Project Acronym:	**iLearning-eCreativity-eDiversity**
Project full title:	**Intelligent iLearning Environment for Creativity and Diversity**
Project No.:	**2021-1-EL01-KA220-SCH-000027791**
Funding Scheme:	**Erasmus+**
Coordinator:	**PANEPISTIMIO KRITIS eLearning Lab**
Result Leader:	**PANEPISTIMIO KRITIS eLearning Lab**
Author:	**PANEPISTIMIO KRITIS eLearning Lab**
Reviewers	**32 SU s izuchavane na chuzhdi ezici "Sv.Kliment Ohridski" (E10064095 - Bulgaria) , Tamasos Primary School (E10174794 - Cyprus) , Incukalna pamatskola (E10193013 - Latvia) , DIMOTIKO SCHOLEIO KALYVON, (E10273990 - Greece) Diemedis Education Centre, Lithuania Associated Partner**
Result Type:	**Methodologies / guidelines – Pedagogical strategy**
First Version:	**October 2022**
Last version:	**September 2024**
Status:	**Finalised**
Dissemination Level:	**Public**

Table of Contents

1. Defining e-Learning

1.1 What is e-learning?

The term "e-learning" was first used in the mid-1990s in the Oxford English Dictionary as a shortened form of "Electronic learning". Since that time, the term has been defined from several different perspectives as educational technology evolves and researchers designate the intersection of teaching and learning with Information and Communication Technologies (Friesen, 2009). In its publication including the major key terms of open and distance learning used in relative literature, the "Commonwealth of Learning" defines the term "e-Learning" as "an umbrella that refers to the use of any digital device or media (multi-media) for teaching and learning, especially for delivery or accessing of content (COL, 2020:3).

Beyond the evident proliferation of several innovative digital technologies and principally the increase of Internet services and applications, many researchers focused on establishing a conceptual framework for the definition of e-learning in all educational fields. However, there has been extensive dialogue about a common definition of the e-learning concept that it would cover a range of technological applications, processes, and industrial and academic areas. Many researchers have attempted to survey different meanings or definitions of e-learning in different academic areas and provide a basis for future debate to ensure greater consistency in the e-learning definition (Arkorful & Abaidoo, 2015, Merchant et al., 2014, Li, Lau & Dharmendran, 2009, Mason & Rennie, 2006).

Sangra, Vlachopoulos & Cambera (2012), review the literature that defines e-learning and identified four general categories: "*Technology-driven, delivery-system-oriented, communication-oriented, and educational-paradigm-oriented*" (p.148). In particular, the definitions in the technology-driven category, portray e-learning as the use of technology to deliver learning and training programs at distance. According to Guri-Rosenblit (2005) e-learning "*is a relatively new phenomenon and relates to the use of electronic media for a variety of learning purposes that range from add-on functions in conventional classrooms to full substitution for the face-to-face meetings by online encounters*" (p.469). The definitions included in the delivery-system-oriented category present e-learning as an electronic means of accessing knowledge (through learning, teaching, and training). For instance, Koohang and Harman (2005) stated that "*e-learning is the delivery of education (all activities relevant to instructing, teaching, and learning) through various electronic media*."

The communication-oriented category considers e-learning as a digital tool for supporting communication, interaction, and collaboration. For instance, Bermejo (2005), claims that "*E-learning is education that uses computerized communication systems as an environment for communication, the exchange of information and interaction between students, and instructors*". Educational-paradigm-oriented category asserts that e-learning is a new way of learning or a mean of improving teaching and learning. The definition provided by Alonso et al. (2005), defines learning as "*the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as remote exchange and collaboration*".

In light of the evolution of learning technology in all educational settings, theorists and practitioners who have either academic, research-based backgrounds, or practical on-the-job experience (or both) attempt to provide more inclusive definitions for e-learning. In a review of the existing educational literature on the use of e-learning definitions, Rodriguez, et al. (2019) provided an umbrella definition of e-learning: *"E-learning is an innovative web-based system based on digital technologies and other forms of educational materials whose primary goal is to provide students with a personalized, learner-centered, open, enjoyable and interactive learning environments supporting and enhancing the learning process" (p.95).*

As learning technology continues to evolve and teachers and learners utilize these emerging technologies, current research places special focus on understanding the nature of e-learning as an educational innovation that contributes toward the development of effective and engaging learning environments (Martin, Sun & Westine, 2020).

1.2 E-learning and Related Terms

The e-learning literature is vast and continues to grow steadily focusing on providing a coherent understanding of how technological developments are transforming teaching and learning (Garisson, 2011). More than two decades ago Picciano, (2002) in their book entitled "*Distance Learning: Making Connections Across Virtual Space and Time"* attempted to blend historical and theoretical backgrounds with the technological applications being used in distance education, to paint a coherent and complete picture of distance learning in the educational environment.

He pointed out that there is a whole list of terms that describe the educational process in which a teacher and students are physically separated one from another, that is, "*distance education*", "*distance teaching*", "*distance learning*", "*open learning*", "*distributed learning*", "*asynchronous learning*", "*telelearning*", and "*flexible learning*" e.tc. Since then, many policymakers, scholars, and practitioners are still using these terms more or less interchangeably as synonyms, emphasizing the continuous blurring of boundaries between conventional and distance education (Guri-Rosenblit, 2005). However, the offered definitions of terms are very often too vague and raise ambiguity in the applied terminology (Anohina, 2005, Tsai & Machado, 2002).

According to Anderson & Rivera-Vargas (2020), one of the most common distinctions raised in the literature divides what distance education and e-learning. On the one hand "*Distance education*", in its most traditional (and static) definition, is considered a formal education (accredited by an educational institution), in which the students and the teacher are separated in time and/or distance by at least in certain stages of the learning process. On the other hand, "*E-learning*" constitute the digital and online version of distance education which "*does not necessarily represent a break or an entirely new model, but rather an evolution of the model, which is afforded by the development of the internet and the widespread use of digital technologies*" (p.210). Theorists have described the "e-learning" as a direct consequence of the massification of digital technologies, and not necessarily as an evolution of distance education (Guri-Rosenblit, 2005). Others suggest that e-learning represents "*a new era of distance education*" (Garisson, 1997) which is afforded by the development of the internet and "*expanded capacity to send, receive, and use the information and the capacity to bridge time and space for educational purposes*" (Garisson, 2011, p.13).

There is a considerable amount of literature that tends to associate the concept of "*e-learning*" with the concept of "*online learning*" which is described as a more recent version of distance learning that improves access to learning experiences via the use of the Internet (Carliner, 2004). In this respect, Mohamed Ally (2008) defines "online learning" as "*the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, to acquire knowledge, to construct personal meaning, and to grow from the learning experience*" (p. 7). Saba (2011) claim that the term "*e-learning*" is generally referred to learning activities involving computer networks. However, as Saba (2011) explains, "*the 'e' in e-learning refers to "electronic," and it should include other electronic media such as radio and television, to name just two, if the term is inclusive of all of its connotations*" (p. 11).

The affordances of ubiquitous and powerful digital technologies along with the contributions of computer scientists to the field of education have also led scientists to define various forms of learning through ICT with at least a dozen different terms. In a bibliometric study on e-learning-related concepts literature during 1960-2014, Aparicio, Bacao & Oliveira, (2016, p.293-295) identified 23 different terms related to e-learning that belong to the field of education technology. The most prevalent terms include Computer-assisted instruction (CAI), computer-assisted learning (CAL), computer-based education (CBE), learning management systems (LMS), self-directed learning (SDL), and massive open online courses (MOOC). All these concepts have two aspects in common: Learning and computers, emphasizing the use of technology in learning activities, used especially for learning purposes:

- Computer-Assisted Instruction (CAI): Computer usage focused on programming teaching used in various fields: mathematics, engineering, psychology, physics, business administration, statistics
- Computer-Assisted Learning (CAL): Focused on individuals rather than tasks. The use of computers to assist problem-solving.
- Computer-Based Education (CBE): A concept that focuses on the variety of computer uses in education.
- Learning Management Systems (LMS): Supports registering services, tracks, and delivering content to learners. It also reports learner progress and assesses results. LMS focuses on content and teacher/student interaction.
- Self-directed learning (SDL): Focus on the teaching-learning method. SDL refers to the use of individual ways of learning, using self-strategies of learning. These strategies may occur using a computer, although SDL may occur without a computer.
- Massive open online courses (MOOC): Free diffusion of content courses to a global audience through the Web. Integrates the connectivity of social networking, the facilitation of an acknowledged expert in the field of study, and a collection of freely accessible online resources.

The broad terminology describing possible learning ways and approaches that use various technologies in the learning process has appeared following the rapid growth of e-learning applications in distance and distributed educational contexts (Wilson, 2012). This multiplicity of perspectives surrounding e-learning confuses and, sometimes, even contradictions, as the term e-learning is used in conceptualizing computerized systems to enable or facilitate the learning process (Kumar Basak, Wotto, & Bélanger, 2018). Moore, Dickson-Deane & Galyen (2011) agree that "*what is abundantly obvious is that there is some uncertainty as to what exactly are characteristics of each term, but what is clear is that all forms of e-Learning,*

whether they be as applications, programs, objects, websites, etc., can eventually provide a learning opportunity for individuals".

In the relative literature, the similarities and differences between the terms "e-learning" and "blended learning" are also clarified to solve educational and learning issues. Both terms are stimulated in digital uses for learning and can be considered a part of the distance education universe (Singh, 2021). However, each term has its fundamental perspectives on the environments in which learning takes place and the components of the learning experience. Considering the possibilities of educational technologies developed for application in distance and distributed educational contexts, Anderson & Rivera-Vargas (2020) distinguish between teaching in e-learning environments and teaching in dual or bimodal environments as follows:

- Teaching in e-learning environments uses the tools provided by various technologies as a means of transmission of knowledge, communications amongst and between students and teachers, and the management of the education process. Through the use of digital technologies, it might be possible to build a collaborative, virtual pedagogical space that does not reproduce distance between the different actors of the educational process and between these and the content.
- Teaching in dual or bimodal environments is the result of the symmetric coexistence of the two classic models; face-to-face and remote, in the same setting. The teaching experience includes mixed or combined teaching activities, and it is also described with the terms blended learning, distributed learning, etc.

The explosion of applications of digital technologies gives rise to concerns for the understanding of both the technological and pedagogical implications of e-learning and, more importantly, the new perspectives that enhance considerably e-learning as a theoretical concept for teaching and learning in the context of distance and conventional education.

1.3 The Concept of E-learning

As a concept of learning practice and research, e-learning is an evolving field that unites technology and learning as its principal components. As far as technology, e-learning aggregates digital, computer, web-based, and portable technology that is applied and used to support and enhance the learning process. There is a vast literature describing Internet technologies and other digital tools (networked or not) taking advantage of its expanded capacity to send, receive, and restore information to bridge time and space for educational purposes (Garrison, 2011). Examples of e-learning technologies that have been widely adopted in education include communication media, content development tools, authoring systems, augmented reality tools, cloud computing, virtual reality applications, gamification, Internet of Things, wearable technologies, robotic devices, 3-D printings, data analytics, artificial intelligence, e.t.c. (Padugar, Gloria, & Diongco, 2022). Aside from the above tools and innovative applications, e-learning systems aggregates platforms to deliver content and facilitate learning activities such as Blackboard, Moodle, e.t.c. (Giannakos, Mikalef & Pappas, 2022).

As far as learning is concerned the extensive literature from the field reveals that the "e-learning" concept "apart from technology, describes learning strategies, and learning

methods, and lately is very much directed to the vast possibilities of content diffusion and connection" (Aparicio, Bacao & Oliveira, 2016, p.295). To provide a more comprehensive picture of e-learning systems, many researchers constructed frameworks and theoretical models that underline the transformative relationship between instructional technologies, pedagogical models, and the different perspectives or views on cognition and knowledge. Friesen (2009) suggests that "e-learning, like any other field of endeavor, does not arise completely sui generis or without precedent, but that it inherits many of the strengths and also the limitations of the disciplines and disciplinary configurations from which it emerged" (p. 5).

In this respect, "e-learning" is preceded by at least two other fields of educational theory and practice, educational technology, and distance education. The field of educational technology (which was first appeared in the '50s as a means of using computers in learning activities), is an inclusive term that no longer restricted to the use of high technology as an artifact in the learning process. Educational technology deploys theoretical foundations from various disciplines such as epistemology, psychology, sociology, and computer science for supporting teaching and learning (Huang, Spector & Yang, 2019). The field of distance education "has its roots in independent study, self-directed learning, and non-traditional and open education" (Saba, 2011, p.11). Key principles of distance education principles such as the learner's centeredness and a focus on learning rather than teaching have contributed towards the development of powerful new modes of educational content delivery, new principles of learning activities, and new educational roles and entities in e-learning settings.

The significance of educational technology and distance education concepts for e-learning is also indicated by the explosion of studies that focus on both the integration of existing and emerging technologies to improve or manage the teaching and learning process and to apply associated pedagogical frameworks to requisite pedagogical shifts to facilitate knowledge building and meaningful learning. At the same time, as the demand for e-learning has been rising steadily, primarily due to the fact of technological advancements, it has triggered a revolutionary wave in the fields of educational technology, instructional design, media, and information systems design research and practice.

It is well established in the relative literature, that educational technology when combined with effective pedagogy and reflective instructional strategies has transformed all forms of teaching and learning in multiple ways. In essence, the concept of "e-learning" extends well beyond educational technology and distance education. Bates (2005) claims that the "e-learning" concept represents a new learning paradigm that involves internal cognitive processes and external stimuli from pedagogical factors, and digital technologies and offers legitimacy and visibility to formal and non-formal educational environments. Garrison (2011) states that "e-learning will fail if we merely add on or repackage our current educational designs. We must be prepared to rethink current dominant approaches and be clear as to what type of learning we wish to design. This will require a theoretical framework and models to guide our study…" (p. 1).

2. Theoretical Background for e-Learning Design

2.1 Theories of Learning and e-Learning Design

Early back in 1994, the debate between Clark and Kozma triggered many discussions on the effects of technology use in learning. In particular, Clark (1994), claimed that "technology not only does not influence learning, but it will never influence learning, and that media is neither sufficient for nor necessary to learning" (p.23). Kozma (1994), fueled the debate, but because technology changes over time, he contended that "if we can find a relationship between media and learning then we will be able to see how technology influences learning" (p. 8). Despite technology having come of age, this debate has recurred on how networked technologies have redefined the boundaries and pedagogies of technology-based learning environments. Reflecting a general trend in educational technology toward a learner-centered paradigm (Jonassen, 2001). Ertmer and Ottenbreit-Leftwich (2013) suggests that "technology integration is no longer be achieved separately from pedagogic goals, but simply how students engage in relevant and meaningful interdisciplinary work" (p. 176).

Based on this approach, the e-learning field establishes technologies not as means for content transmission but as tools to mediate interactive learning activities, support the learner and facilitate the teachings and learning process (West & Alman, 2022). A range of theories underpins research on technology-enhanced learning environments, and are used more intentionally in informing e-learning interventions, and explaining how these could improve teaching and learning. Rooted in epistemological frameworks for teaching and learning, the most common approaches used in e-learning environments employing theoretical perspectives ranged from cognition theory and constructivist approaches (Nardi, 1996, Papert, 1980), to Social Development Theory (Vygotsky, 1978), and connectivism (Siemens, 2008, 2004). E-learning approaches also adopt behaviorist approaches (Ajzen, 1985, Barker, 1968), distributed cognition approaches (Rogers, 1997), or Collaborativism (Harasim, 2017). A summary of the major theories and concepts of learning used in e-learning environments is provided in Table 1 and Table 2 accordingly.

Table 1. *The Major Theories of Learning Used in e-Learning Environments*

Theory	Theoreticians	Learning Design Attributes
Behaviorism	Skinner (1963) Watson (1976)	• Lecture, drill and practice, rote learning, multiple choice • Statement of the purpose of teaching as the behavior of the learner • Using cue prefixes to guide students toward behavior • Choose consequences that will reinforce behavioral achievement
Cognitivism	Piaget (1976) Bandura (1977)	• Statement of the purpose of teaching as the behavior of the learner • Carefully relate new information to existing knowledge • Use of technical variations to guide and support student learning, including a focus on questions, high-level analogies, mnemonics, and similes
Constructivism	Glasersfeld (1995)	• Provide opportunities for students to solve real problems and meaningful problems

		• Provide study group activities • Models and process guides build knowledge in a mutually beneficial problem-solving context

Table 2. *The Major Theoretical Concepts of Learning Used in e-Learning Environments*

Theory/Concept	Theoreticians	Learning Design Attributes
Sociocultural Theory of Cognitive Development	Vygotsky, (1978)	• Independent creative and reproductive cognitive and metacognitive (reflective) activities with electronic materials using a personal computer, PDA, mobile phone, DVD player, TV, and other electronic materials • Creation of a distributed community of users (social networks), leading a common virtual learning activity and implementing creative and reproductive cognitive and metacognitive (reflective) activities • Develop educational web resources and, implement creative and reproductive cognitive and metacognitive (reflective) activities.
Constructionism	Papert (1980)	• Make the eLearning process engaging and exciting. Create scenarios that otherwise are impossible to create. Focus on a practical approach rather than just theory. Encourage online learners to learn from their mistakes. Allow for self-guided exploration.
Discovery learning	Bruner, (1961)	• Encourages active engagement, promotes motivation, promotes autonomy, responsibility, and independence, develops creativity, and problem-solving skills, and tailors learning experiences.
Experiential learning	(Rogers, 1969)	• Roleplay, gamification, case studies, simulations, and problem-solving.
Multiple Intelligence	Gardner (1983)	• Linguistic, logical/mathematical, spatial, bodily-Kinesthetic, musical, interpersonal, Intrapersonal, and naturalist.
Situated learning	Lave (1991)	• Real word context, social interactions, authentic learning, use of tools.
Activity theory	Leontjev (1983), Nardi (1992)	• Clarify the purpose of the activity system. • Provide a big picture of the overall initiative. • Specify the activities to be analyzed. • Examine the role of the tools. • Address the internal and external context. • Monitor what is happening and document progress and the process.
Self-regulatory learning	Zimmerman (1990)	• Think-Pair-Share, Reading Reflections, Mastery Exercises, Peer Instruction, Knowledge Surveys.
Collaborative learning	Swan, Shen & Hiltz (2006)	• Products are co-constructed, Focus on individual goals within group goals. • The individual constructs learning. • Learning is co-instructed, challenged, modified, agreed upon, and shared understanding. • Roles/ responsibilities are pre-defined/ imposed.
Community of practice	Wenger (1998)	• Information and knowledge sharing, instant feedback, and collaboration.

Although the link to the theoretical approach used was not always clear when different technologies are involved, e-learning environments are usual frequently reported with a mixture of the main behaviorist, cognitivist, and constructivist theories and the major theoretical concepts of learning employed (Janelli, 2018, Ghislandi, 2012).

2.2 Pedagogical Principles for E-learning Design

It is widely recognized in the literature that although digital technologies are considered an important variable for designing more effective and purposeful e-learning systems, it is the **pedagogical concepts and principles** that enable learning to take place, and contribute to the achievement of learning outcomes (Debattista, 2018). Literature has allowed identifying three key ideas that guide e-learning designers in making effective choices, namely: (1) enhancing interaction, (2) promoting learning through community, and (3) facilitating active learning activities (Allman & West, 2021).

(1) Enhancing Interaction

Interaction has long been a defining and critical component of the educational process and context (Anderson, 2003a). Anderson and Garrison (1998) described the three more common types of interaction discussed in the literature involving students (student-student, student-teacher, student-content), and extended the discussion to the other three types of interaction (teacher-teacher, teacher-content, content-content) as shown in Figure 1.

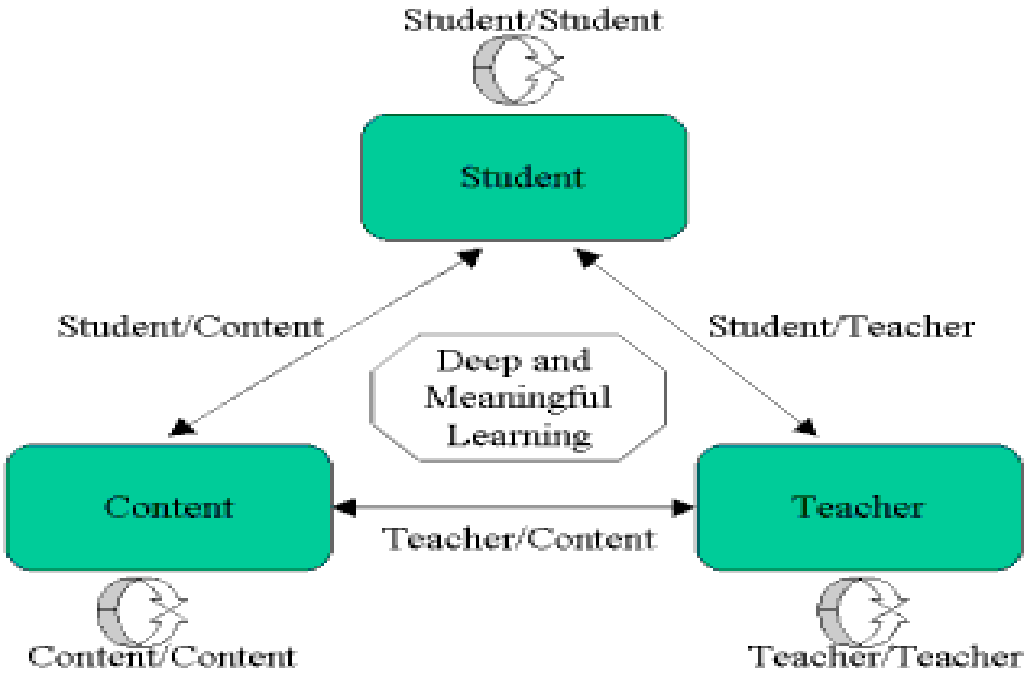


Figure 1. *Modes of Interaction in Distance Education (Source: Anderson & Garrison, 1998)*

This theorem of interaction implies attempts to provide a theoretical rationale and guide for instructional designers and teachers interested in developing distance education systems that are both effective and efficient in meeting diverse student learning needs (Anderson 2003b). Thus, for planning or developing e-learning courses, designers are encouraged to build into their programs strategic amounts of each type of interaction and to develop activities that will encourage this amount of interaction. Anderson's mode of interaction (Anderson & Garrison, 1998) is explained briefly in Table 3.

Table 3. *Anderson's Modes of Interaction*

Modes of interaction	Implications e-learning design
Student-Student Interaction	• group projects. • group case studies. • peer instruction. • Role-playing. • synchronous or asynchronous discussions or debates. • collaborative brainstorming. • peer review of selected work.
Student - Content Interaction	• provide an online help facility, or intelligent help, if the user is modeled and their path is traced through the information space. • use an adaptive interface, based on several stereotypical user classes, that modifies the environment to suit the individual user. • provide adaptive advice and model users' acquisition of knowledge through their use of the environment (including navigational use, answers to questions, and help requested), to intelligently suggest a preferred individualized path through the knowledge base.
Student-Teacher Interaction	• Support a large number of varieties and formats that include asynchronous and synchronous communication in text, audio, and video communications, discussion forums, or chats. • Provide feedback on assignments, learning journals, or other reflective activities. • Send frequent announcements to summarize the previous week or describe the next week. • mentoring individual learners. • working with small groups of students assigned to help teach portions of the course (peer teaching).
Teacher - Content Interaction	• teacher's creation of content: learning objects as well as units of study, complete courses, and associated learning activities. • teacher-content interaction allows teachers to continuously monitor, construct, and update course content resources and activities.
Teacher - Teacher Interaction	• Creates the opportunity to sustain teachers with professional development and support through supportive communities. • These interactions encourage teachers to take advantage of knowledge growth and discovery, in their subject area and within the scholarly community of teachers.
Content - Content Interaction	• Content is programmed to interact with other automated information sources to constantly refresh itself and acquire new capabilities, through updates and interaction with other content sources.

(2) Promoting Learning Through Community

A learning community consists of formally implemented small peer groups with a focus on active and collaborative peer learning (Brouwer, et al. 2022). The notion of a learning community as it is rooted in the principle of social constructivism is that through ongoing peer interaction in a relatively stable small group, students develop learning support relationships (Vygotsky, 1978). Previous experiences, based on social network models, revealed that the learning that evolves from learning communities is collaborative, in which the collaborative knowledge of the community is greater than any individual knowledge (Coleman, 1990).

By viewing learning as being socially constructed, Wenger (1998) provides a theoretical basis for communities of practice. According to Wagner (1998, p.1) "*communities of practice are groups of people who share a concern or a passion for something they do and learn how to do*

it better as they interact regularly". The essence of a community of practice is that, through joint engagement in some activity, an aggregation of people come to develop and share practices (Mayes & de Freitas, 2004). Learning in such a community of practice is known as ''*situated learning*'' (Wenger, 1998). The three of characteristics for communities of practice are presented in Table 4.

Table 4. *The Three Elements that Constitute a Community of Practice*

Element	Description
The domain	• A community of practice is not merely a club of friends or a network of connections between people. It has an identity defined by a shared domain of interest. Membership, therefore, implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people.
The Community	• In pursuing their interest in their domain, members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other
The practice	• A community of practice is not merely a community of interest--people who like certain kinds of movies, for instance. Members of a community of practice are practitioners. They develop a shared repertoire of resources: experiences, stories, tools, and ways of addressing recurring problems—in short, a shared practice.

Goodyear (2002) described a cycle of learning, moving through phases of externalization (of tacit knowledge), sharing, discussion, refinement, and then internalization. He admitted how little is yet understood about how to design online learning spaces and places and how primitive our understanding yet of how the affordances of all the web-based learning resources should shape the design characteristics of Virtual Learning Environments. For Jones (2001), virtual communities use networked technology, especially the Internet, to establish collaboration across geographical barriers and time zones (p.51).

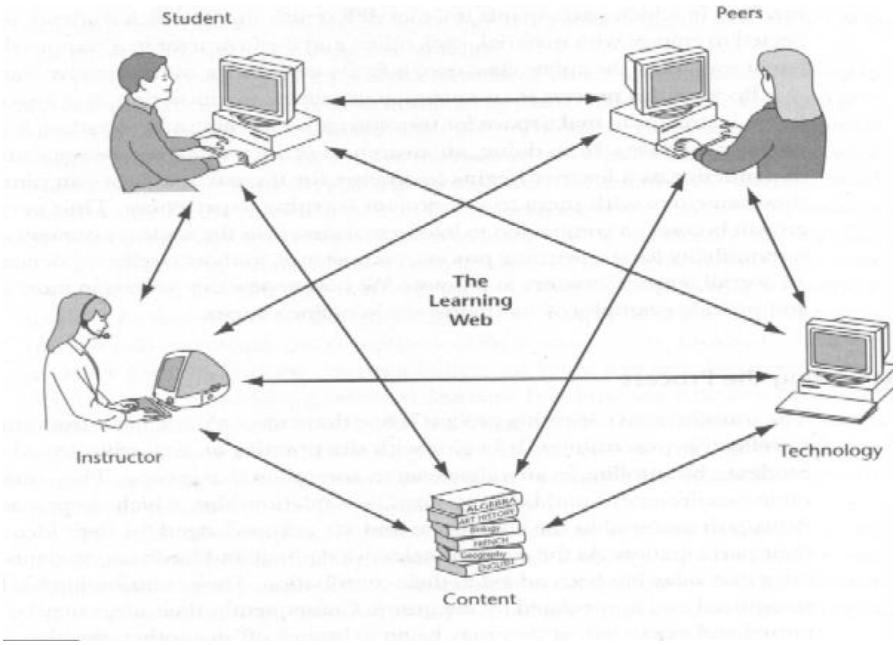


Figure 2. *Elements of Communities of Practice (Source: Palloff & Pratt, 1999)*

According to Pallof & Pratt (1999), virtual communities in cyberspace differ from traditional communities in several respects. The key concept of virtual communities is that they exist according to the identification of an idea or task, rather than the place. Networked communities bridge time zones and geographical locations allowing these virtual communities to exist. In particular, the Internet, or the WWW, becomes the "place" for the community, thus networked communication has increased the parameters of what is known as a community (Palloff & Pratt, 1999).

Palloff and Pratt (1999) revealed that both virtual communities and communities of practice have life cycles. They outlined the following five stages concerning the life cycle of community development, whether the community is traditional or virtual: (1) Forming, (2) norming, (3) storming, (4) performing, and (5) adjourning. Communities of practice comprise social arrangements in which individuals learn by participating in activities. Constructivist techniques (e.g., collaboration, facilitation, and ill-structured problems) enable learning to take place in communities of practice. It is long been recognized that virtual communities are organized around an activity, and they are formed as a need arises (Squire & Johnson, 2000).

(3) Facilitating Active Learning Activities

There is a consensus in the literature that learning activities refer to the actions and operations that individuals perform to achieve the desired learning outcome mediated by educational tools (Lapre, Mukherjee, & VanWassenhove, 2000). In the context of online learning, such activities are mediated by online learning tools (Lam, Schaubroeck, & Brown, 2004). Levy (2006) defined online learning activity as ''an educational procedure designed to stimulate learning by online experience utilizing online learning systems and tools" (p. 30). According to Levy, online learning activities combine the subjects (i.e., learners and professor[s]) with the online learning systems and tools, and with learning actions and operations to produce a learning outcome (see Fig. 3).

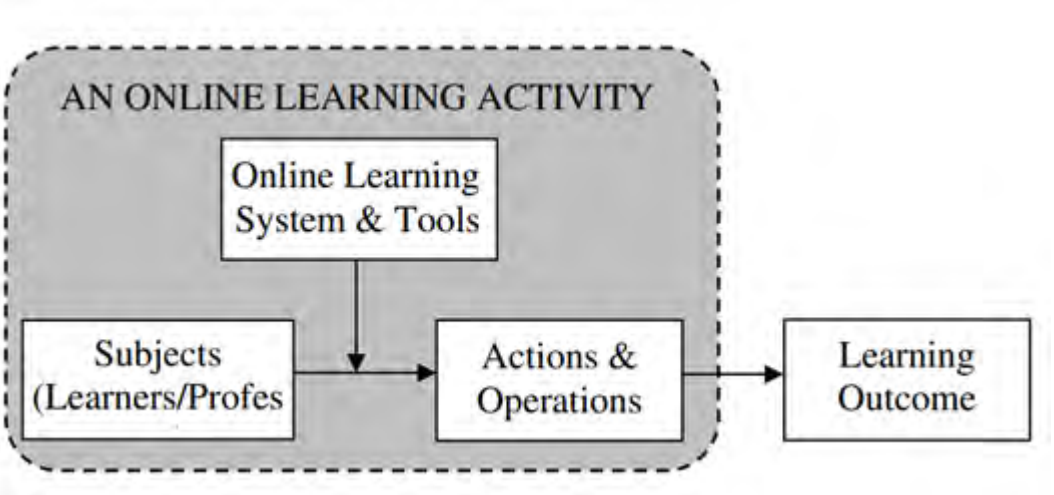


Figure 3. *Human Activity in the Context of Online Learning (Source: Levy, 2006)*

Jonassen and Rohrer-Murphy (1999), proposed a framework for designing constructivist learning environments based on activity theory. The activity theory is "the idea that the development of thoughts and cognitive activity requires social interaction and exchange with

a physical environment (Morten et al. 2002, p. 155). Kaptelinin and Nardi (2006) explain that in technology-based learning environments "acting with technology is a phrase to position our relationship to technology as one in which people act intentionally in specific ways with technology – ways that we can study and for which we can produce effective designs" (p. 1). In the context of online learning, such actions are mediated by online learning tools. Levy (2008), listed online learning activities into five critical factors. The five factors with relative activities are presented in Table 5.

Table 5. *The Five Factors Relative to Online Activities (Source: Levy, 2008)*

Factor	Activities in Online Courses
Collaborative, social, and passive learning activities	• Participating in chat sessions (unofficial with other students) • Sharing my assignments with the other students (via the forum, email, etc) • Participating in chat sessions (official sessions with the professor) • Participating in live voice-chat sessions (i.e., PlaceWare, etc) • Reviewing chapters slides online • Reading other students' assignments (i.e. via discussion forum) • Using audio/visual resources
Formal communication activities	• Reading feedback from the professor (via e-mail etc) • Reviewing professor's feedback on assignments • Sending messages to the professor • Reading the professor's discussion forum messages • Reading information from the school's site • Checking grades online • Register for courses online • Reading assignments' guidelines online • Checking ''myWebCT" for course(s)' updates
Formal learning activities	• Replying to students' discussion forum messages • Posting new discussion forum messages • Reading other students' discussion forum messages • Submitting course(s)' assignments online • Reviewing other students' Websites • Developing personal Website, profile, or blog • Replying to professor's discussion forum messages
Logistic activities	• Download the course syllabus • Download assignments' guidelines • Download chapters slides • Purchasing software for the course(s) online • Upload assignments and course-related files to an online storage site. • Purchasing books, textbooks, and other course-related literature online
Printing activities	• Printing assignments' guidelines • Printing other course documents (besides assignments) • Printing course syllabus

2.3 Frameworks for E-learning Design

In e-Learning design practice, theoretical approaches are applied in two ways. Firstly, theories for learning are used to inform the design or evaluation of e-learning interventions to facilitate meaningful learning interventions and knowledge building. For instance, Dabbagh (2005) presents a theory-based design framework for e-Learning that emphasizes "*the systematic and transformative interaction between pedagogical models, instructional strategies, and learning technologies consequently allowing the E-Learning developer or instructor to adopt a grounded design approach*" (p. 41). The three key components of this framework working

collectively to foster meaningful learning and interaction are (1) pedagogical models or constructs, (2) instructional and learning strategies, and (3) pedagogical tools or online learning technologies i.e., Internet and Web-based technologies (Figure 4).

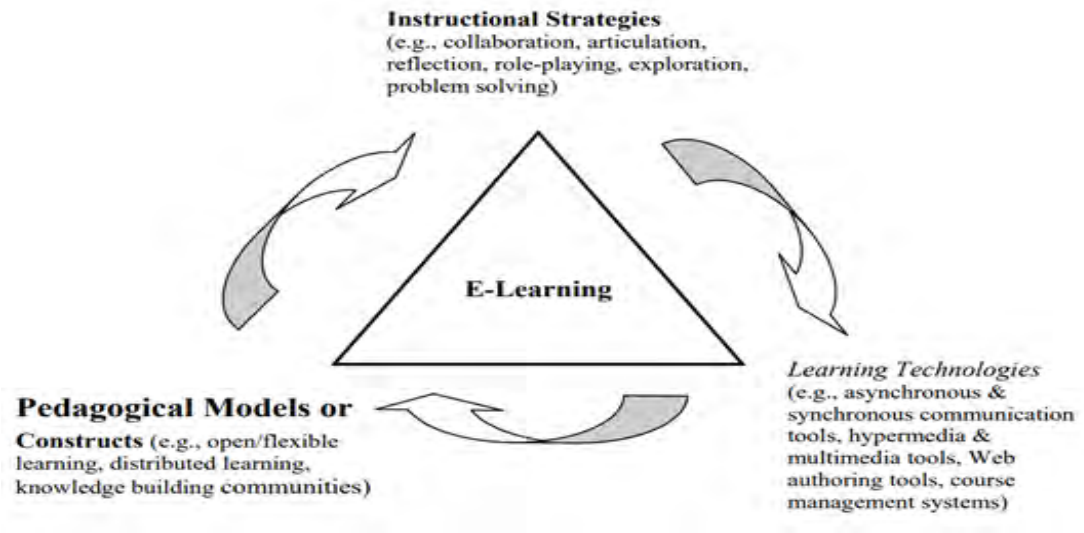


Figure 4. *A Theory-Based Design Framework for E-Learning (Source: Dabbagh, 2005, p.32)*

Furthermore, theoretical concepts and approaches are used to construct a conceptual framework as a holistic theoretical background with the view to improving e-learning research strategies. For instance, Aparicio, Bacao & Oliveira (2016) constructed a theoretical e-learning conceptual framework based on the three main pillars of an information system: people, technology, and services provided by technology itself (Figure 5). As they explain "*Guided by these main pillars we revise and identify the stakeholders' groups and their interaction with e-learning systems. We then present the classification of the technical considerations to these kinds of systems, focusing more on the content type and ways of communication, than on providing a list of the platforms existing in the market. This is an important feature of the framework because apart from the commercial platforms we identify technological specifications that can be applied to any technological artifact. The third pillar corresponds to services provided by an e-learning system. Services are considered here as the main output, as they operationalize instructional strategies and several pedagogical models. The framework provides the theoretical structure for multiple studies in e-learning systems*" (p. 303).

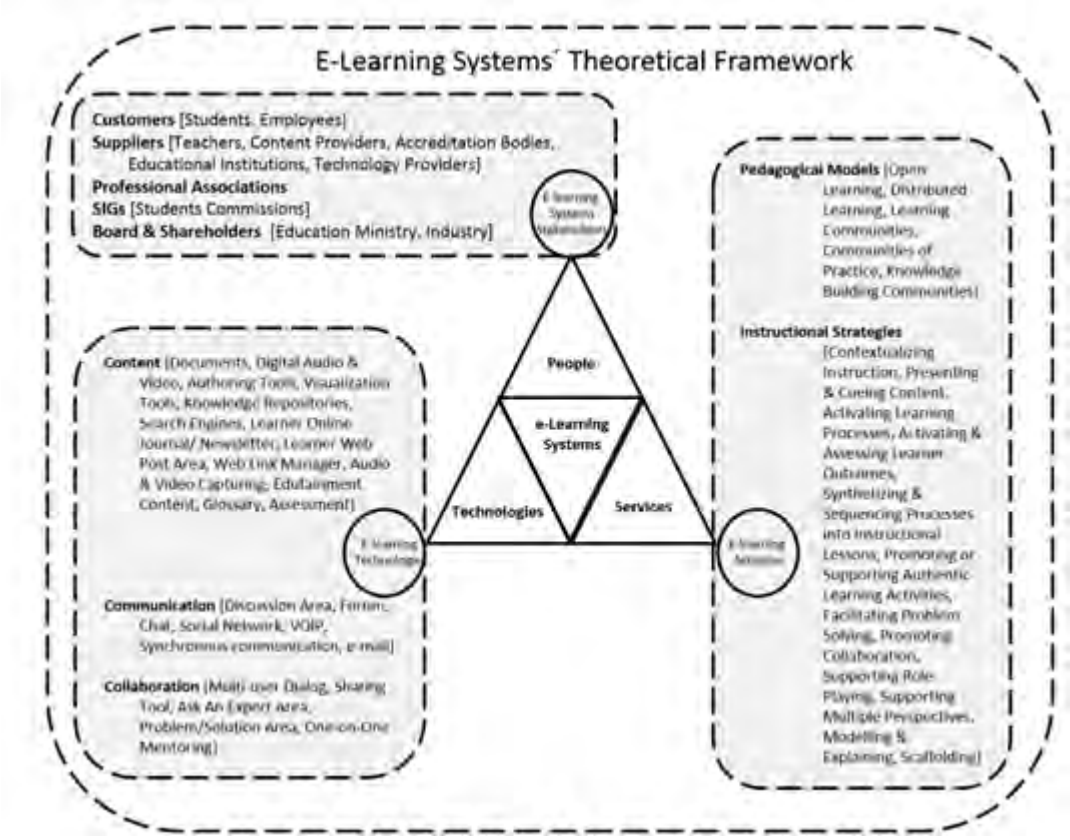


Figure 5. *Holistic e-learning systems theoretical framework (Source: Aparicio, Bacao & Oliveira, 2016).*

Today, the discussion of e-learning design uses these frameworks to combine, modify, and/or directly applied existing or new theories of learning to guide e-learning design and to propose a model for assessing the success of e-learning systems. In the realities of advanced technologies artifacts and other technology-based options that were made available to integrate them into all levels of education, e-learning scholars and practitioners seek to actively converge to stimulate authentic human activity, enhance collaboration, and enrich the learning process.

2.4 Towards a theory for e-Learning Design

Because "*a choice of pedagogy inevitably communicates a conception of the learning process and the learner*" (Bruner 1996, p.63), many theorists have examined whether a common theory for e-learning can be developed (Rodrigues, et al., 2019, Arkorful, & Abaidoo, 2015). Anderson (2011) in a provocative chapter "*Towards a Theory of Online Learning*" on the constant evolution of diverse forms of teaching and learning that can be supported by e-learning, provides evidence that it is a difficult, and perhaps fruitless task to define a particular theory of e-learning. However, he advocates that "*the creation of a model is often the first step towards theory creation*"(p. 68).

Taking into account Graham, Henrie & Gibbon's (2013) assumption that the terms "*theory*" and "*model*" are used interchangeably and generally refer to the same concept, Picciano

(2017) agrees that "*the purpose of a theory or model is to propose the answers to basic questions associated with the phenomenon*". In this perspective, scholars and practitioners have used models to guide the design of e-learning systems even if is a single learning module, a course, or a full program.

Based on theoretical frameworks relevant to the pedagogical aspects of e-learning these design models provide guidelines to consider the content, purposes, and learning strategies as well as how the teaching is represented and controlled through available technology tools. A particular focus is on describing different combinations of pedagogy, processes, and digital tools, in a way that "*design is more than a process; that process, and resulting product, represent a framework of thinking*" (Driscoll & Carliner, 2005, p.9).

3. Instructional Design Models

Perhaps the most prominent learning design model is the "Instructional Design", also known as Instructional System Design. By definition, Instructional Design "*is intended to be an iterative process of planning outcomes, selecting effective strategies for teaching and learning, choosing relevant technologies, identifying educational media, and measuring performance*" (Branch & Kopcha,2014, p. 77). According to David Merrill (2002), "Instructional Design" is the process of creating learning experiences that makes the acquisition of skill more appealing, effective, and efficient. The foundation concept of the Instruction Design model refers to "*the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation*" (Smith & Ragan, 2005, p. 4).

The instructional design process consists of determining the needs of learners, defining the end goals and objectives of instruction, designing and planning assessment tasks, and designing teaching and learning activities to facilitate learning most effectively (Rodrigo, Iniesto & García-Serrano, 2020). As a well-defined approach to the design of e-learning processes, instructional design follows specific systematic approaches and learning theories to understand, explore, create, and evaluate situations requiring educational interventions and using educational technology as a method to support them (McDonald & West 2020).

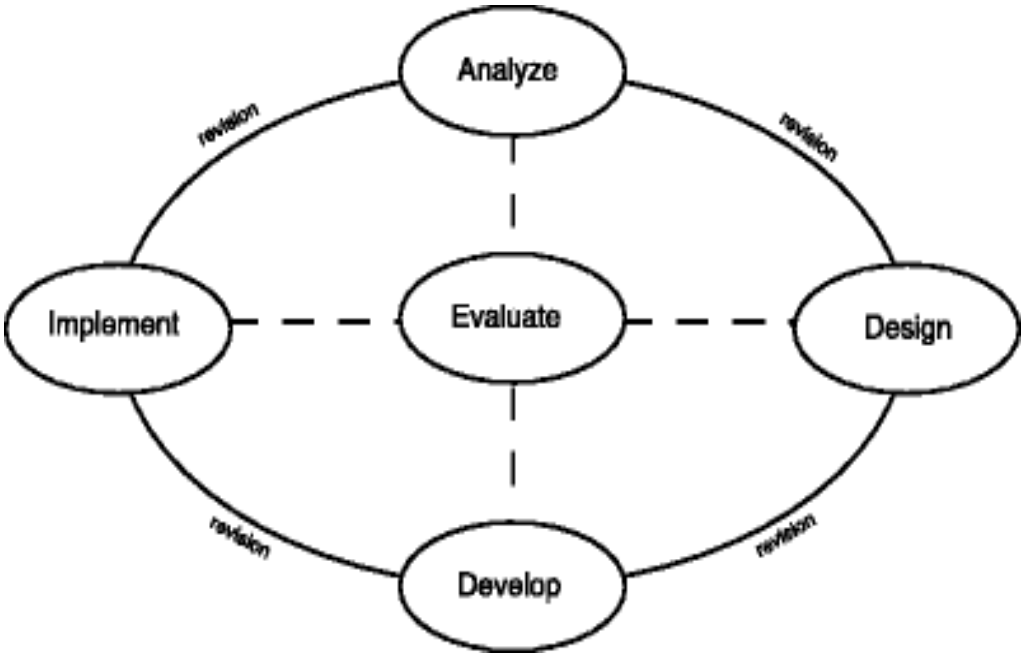


Figure 6. Conceptual core elements of instructional design (Source: Branch & Kopcha, 2014).

There are numerous instructional design models used in different contexts each of which combines both theoretical aspects and practical information from field experience to help instructional designers create the most compelling and effective courses (Arshavskiy, 2017). Among several models that learning designers acknowledge and use to visualize, direct, and

manage the learning process, the most widely used the in e-learning context are the ADDIE Model, Merrill's Principles of Instruction, Bloom's Taxonomy, and Gagne's Nine Events of Instructions. These models are briefly presented as follows.

3.1 ADDIE Model

ADDIE refers to the instructional development process comprising five phases: Analysis, Design, Development, Implementation, and Evaluation in that particular order (Yeh & Tseng, 2019). The original goal of the ADDIE model is to increase the effectiveness and efficiency of results in choosing solutions to instructional problems (Allen, 2006). According to Molenda et al. (1996), the original version of the ADDIE model worked well for the business, military, and continuing education settings as well.

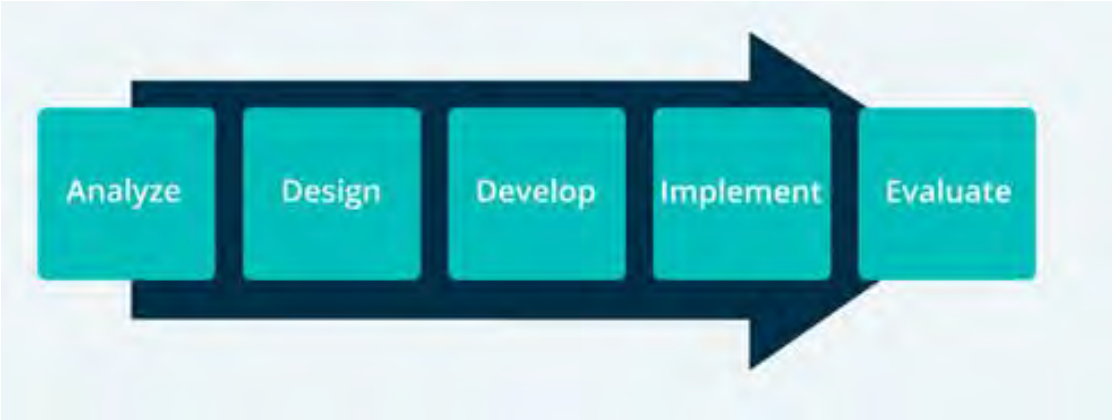


Figure 7. *The Original ADDIE Model in Linear Structure, Starting with Analysis and ending in Evaluation* (Source: Research.com, 2022)

Considerable research discusses the relationship between e-learning and ADDIE and how their combination will deliver e-learning content successfully in academic, training, and business education contexts (Kim, et al., 2020, Nichols Hess & Greer, 2016, Branch & Kopcha, 2014, Alajmi, 2009).

Table 6. *ADDIE Model's Phases and Examples of Implementation in e-Learning Courses*

ADDIE Model's Phases	Description	Examples used in e-Learning
1. Analysis	The analysis phase is the "Goal-Setting Stage". The designer validates the performance gap and determines instructional goals.	• The analysis phase clarifies instructional problems and objectives and identifies the learning environments, and the learners' existing knowledge and skills.
2. Design	The focus is on learning objectives, content, subject matter analysis, exercise, lesson planning, assessment instruments used, and media selection.	• The design phase deals with learning objectives, assessment instruments, exercises, content, subject matter analysis, lesson planning, and media selection.

3. Development	This stage starts the production and testing of the methodology being used in the project. Development also involves creating and validating learning resources and learning outcomes.	• In the development phase, instructional designers and developers create and assemble content assets blueprinted in the design phase
4. Implementation	The implementation stage reflects the continuous modification of the program to make sure maximum efficiency and positive results are obtained.	• The implementation phase develops procedures for facilitators and learners.
5. Evaluation	The main goal of the Evaluation stage is to assess the quality of the instructional products and processes, both before and after implementation	• The evaluation phase consists of two aspects: Formative and summative evaluation.

3.1.1. Merrill's First Principles of Instruction

Merrill's First Principles of Instruction is an instructional design theory described as a set of interrelated principles that can be used in a task or problem-centered cycle of learning. Founded by educational researcher David Merrill (2002), this model supports that the principles of activation, demonstration, application, and integration are necessary for the success of a learner (Collis & Margaryan, 2005).

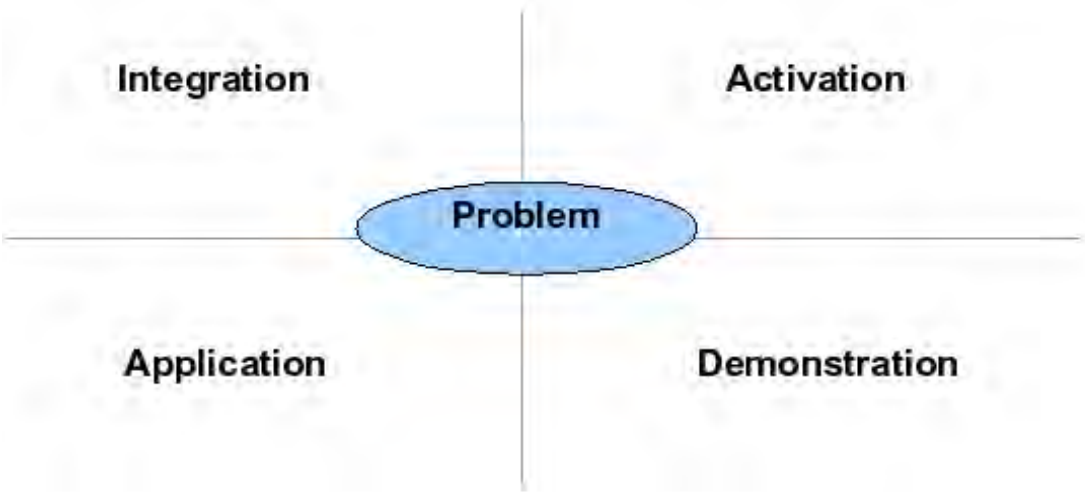


Figure 8. *Merrill's First Principles of Instruction (Source: Merrill, 2002, p. 45)*

From Merrill's research, the first principle relates to problem-centered instruction: "Learning is promoted when learners are engaged in solving the real-world problem" (p.44). Problem-centered learning supports constructivist theories where learners construct t own understanding by building on their previous knowledge and experiences (Merrill, 2018). The

second principle follows the concept that "learning is promoted when existing knowledge is activated as a foundation for new knowledge"(p.46). Learners must be able to recall, relate, describe, or apply knowledge from relevant past experiences that can be used as a foundation for the new knowledge.

According to Merrill's (2002) third principle "Learning is promoted when new knowledge is demonstrated to the learner"(p.47). Learners absorb more concepts and practices when the instruction demonstrates what is to be learned rather than merely telling information about what is to be learned. Merrill's application phase follows the concept that "learning is promoted when learners are required to use their new knowledge or skill to solve problems" (p.49). Learners can grasp information if the new lessons offer multiple opportunities to apply learning to a range of situations to consolidate learning. The integration principle concludes that "Learning is promoted when learners are encouraged to integrate (transfer) the new knowledge or skill into their everyday life" (Merrill, 2002, p.50). Effective learning can occur when learners demonstrate or share their knowledge and skills with others, reflecting on their learning and transferring new meaning and understanding to their own lives (Merrill, Tennyson & Posey, 1992).

In this modern era, with the advent of E-leaning Merrills' five principles of instruction remain relevant and help to improve the learning experience and shape effective e-learning design outcomes in business training, a professional or academic perspective though (Karthik, et al., 2019, Andreoli, et al., 2017, Pappas, 2017).

Table 7. *Merrill's First Principles of Instruction and Examples of Implementation in e-Learning Courses (Source: IDA, 2022)*

Principles of Instruction	Phases	Examples can be used in e-Learning
1. Problem centered	Show task	Provide a worked example of the task that learners will complete.
	Task level	Ensure learners are engaged at the problem and task levels, as well as the operation or action level.
	Problem progression	Begin with a basic problem, then build the complexity to scaffold learning.
2. Activation	Previous experience	Tap into learners' existing knowledge and experiences
	New experience	Ensure tasks are engaging, interesting, and authentic.
	Structure	Begin with a basic problem, then build the complexity to scaffold learning.
3. Demonstration	Demonstration consistency	Provide content with demonstrations and examples that reflect the learning outcomes.
	Learner Guidance	Provide multi representations of ideas, concepts, and perspectives
	Relevant media	Ensure media and technological tools support effective learning
4. Application	Practice consistency	Align teaching practice activities with learning outcomes.
	Diminishing coaching	Gradually withdraw coaching to build learner independence.
	Varied problems	Provide opportunities for learners to apply learning to different contexts.
5. Integration	Watch me	Provide opportunities for learners to demonstrate, and share their learning.

	Reflection	Include reflection activities to recognize learners' progress.
	Creation	Encourage learners to transfer their learning to their own lives.

3.2 Gagne's Nine Events of Instruction

Robert Gagné outlined nine instructional events and corresponding cognitive processes in the field of instructional design. These events facilitate learner engagement as well as retention of the content being presented (Curry, Johnson, & Peacock, 2020).

Figure 9. *Gagné's Nine Events of Instruction (Source: Curry, Johnson & Peacock, 2020)*

These events guide the structure of e-learning systems. Many e-learning designers hypothesized that the use of these nine events facilitates learners' engagement and thereby enhances their learning (Gowda & Suma, 2017, Roca & Gagné, 2008, Ravenscroft, 2003).

Table 9. *Gagne's Nine Events of Instruction and Examples of Implementation in e-Learning Courses*

Gagné Events of Instruction	Activity to Produce Event	Examples can be used in e-Learning
1. Gain attention	Present introductory activity that engages learners.	• Use media to create an attention-grabbing introduction
2. Describe the goal	Give learner objectives for the course.	• Provide clear objectives for the overall e-learning course goals
3. Stimulate prior knowledge	Present an experience that stimulates the memory of prior learning	• Review previously presented material and concepts and connect them to the material to be addressed in the current module.

4.	**Present the material to be learned**	Deliver content.	• Readings, presentations, demonstrations, multimedia, graphics, audio files, animations, etc. to create a goal-centered eLearning content
5.	**Guidefor learning**	Providing learner guidance entails giving learners the scaffolding and tools needed to be successful in the learning context.	• Design e-learning material to include basic guidelines that help learners understand and retain the information.
6.	**Elicit performance**	Learners need to be given enough opportunities to practice newly acquired knowledge.	• Give practice activities such as group research projects discussions, activities, etc.
7.	**Provide feedback**	Immediate, specific, and constructive feedback is provided to students.	• Badges, leaderboards, and the unlocking of various rewards are all great for offering positive reinforcement and motivating the learner
8.	**Assess performance**	Present learners with post-assessment items.	• Assessment activities such as quizzes, research projects, essays, or presentations.
9.	**Enhance retention and transfer**	Give resources that enhance retention and facilitate the transfer of knowledge.	• Short quizzes, checklists, videos, or even invitations to brief e-learning courses.

3.3 Bloom's Taxonomy

At the core of Benjamin Bloom's taxonomy (Bloom, 1956) is the learning objective. Based on cognitive (mental), affective (emotional), and psychomotor (physical) domains of learning, Bloom's taxonomy explains a way of classifying educational objectives as a method of organizing learning in the most appropriate conditions. This significant contribution came through Bloom's 1956 book "*Taxonomy of Educational Objectives*". Krathwohl revised this taxonomy in 2002 and it is one of the main structures used for curriculum development.

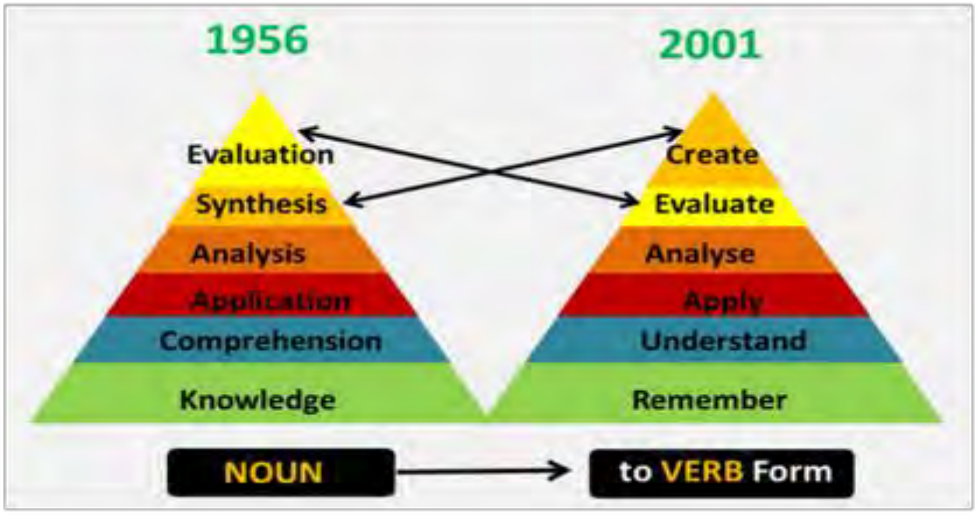


Figure 10. *Bloom's Original and Revised Taxonomy (Source: www.playxlpro.com)*

Although Bloom's concept has been in existence since 1956 purposely for traditional classroom teaching or training, e-learning developers begin the design process with measurable and written objectives that will be mapped or aligned to all assessments, instructional materials, activities, and technologies utilized in the program, the course or the e-learning module. The discipline follows each of the levels and is associated with specific 'performance verbs' that can be used to influence and inspire the process of designing e-learning materials and achieving successful learning outcomes.

Table 9. *Learning Outcome Verbs and Examples of Implementation in e-Learning Courses (Source: Adapted from https://courses.lumenlearning.com/)*

Bloom's Understanding	Action/Verb	Learning Method	Examples can be used in e-Learning
1. Creating	Assemble, create, design, develop, write, organize, synthesize	Case studies, debates, discussions, and creative projects.	Discussion, presentations, debates, and lead tutorials.
2. Evaluating	Appraise, argue, defend, select, critique, rank	Plan development, interviews, and research.	Design and build models, portfolios, and presentations.
3. Analyzing	Compare, contrast, criticize, examine, test	Case studies, simulations, discussions, and labs	Essays, e-portfolio entries, compare and contrast questions.
4. Applying	Choose, demonstrate, employ, illustrate	Case studies, scenarios, procedures	Video with self-evaluations, and problem set.
5. Understanding	Classify, describe, explain, translate	Readings demonstration, discussion	Presentations, short-answer questions.
6. Remembering	Define, duplicate, list, recall, recite, state	Lecture, memorization, video, web information	Student recitations, labeling graphics.

4. Material Design Models

4.1 Foundations of Educational Theory for Material Design

Based on the main schools of thought on learning Mohamed Ally (2011), proposed an educational theory for the design of effective e-learning materials, and suggests a model showing the important learning components that should be used when designing online instructions. This model suggests how behaviorist, cognitivist, and constructivist theories can be used to select the most appropriate instructional strategies and develop effective online materials. Mohamed Ally (2011) claims that "*behaviorist strategies can be used to teach the facts (what); cognitivist strategies, the principles and processes (how); and constructivist strategies to teach the real-life and personal applications and contextual learning*". Mohamed Ally also concludes that there is a shift toward constructive learning, in which learners are allowed to construct their meaning from the information presented during the online sessions.

In instructional design practice, designers use a combination of the main theories of learning to develop e-learning processes, activities, and materials. These frameworks describe principles of effective learning using technological tools to motivate learners, facilitate deep processing, promote meaningful learning, encourage interaction, provide relevant feedback, facilitate contextual learning, and provide support during the learning process. Apart from the three more popular learning theories – behaviorism, cognitivism, and social constructivism, some researchers agree that new theories are needed for the emerging age of distributed and network learning (Anderson, 2011). A recent example of such a theory, Ally presents the connectivism theory. The Connectivism theory founded by George Siemens (2005) states that learning can happen over networks online. As previously indicated the development of effective e-learning materials should be based on proven and sound learning theories.

Table 10. *Learning Theories and Implications for E-Learning Material Design (Source: Ally, 2011)*

Theory of Learning	Short Description	Implications for Material Design
Behaviorist Learning Theory (Thorndike, 1913, Pavlov, 1927, Skinner, 1974)	Learning is an observable change in the behavior of the learner that originates from external conditions.	• Learners should be told the explicit outcomes of the learning. • Learners must be tested to determine whether or not they have achieved the learning outcome. • Learners must be provided with feedback so that they can monitor how they are doing and take corrective action if required. • The learning materials must be sequenced appropriately to promote learning. • Online testing or other forms of testing and assessment should be integrated into the learning sequence to check individual learners' achievement levels and provide appropriate feedback.
Cognitive Learning Theory	Learning involves different kinds of memories, motivation, and thinking.	• Strategies used should allow learners to perceive and attend to the information such as attributes of the screen (e.g., color, graphics, size of text), the pacing of the information, the proper location of the information on the screen, and the mode of delivery (audio, visuals, animations, or video).

(Craik & Tulving, 1975, Ausubel, 1974)		• Information should be chunked to prevent overload and be presented in different modes to facilitate processing and memory transferring. • Strategies should be used that require learners to apply, analyze, synthesize, and evaluate to promote higher-level learning • A variety of learning strategies should be included in online instruction to accommodate individual differences and learning styles • Strategies should focus on attention, relevance, confidence, and satisfaction for motivating learners during learning • Strategies that facilitate the transfer of learning should be used to encourage application in real-life situations (simulations and real-life applications)
Constructivism (Cooper, 1993, Wilson, 1997)	Learners interpret and encode the information based on their perceptions and experiences	• Learners should be given control of the learning process • Learning should be an active process. • Learners should construct their knowledge. • Collaborative and cooperative learning should be encouraged. • Learners should be given time and the opportunity to reflect. • Learning should be interactive to promote higher-level learning and social presence and to help develop personal meaning
Connectivism (Downes, 2006, Siemens, 2004)	Connectivist theory is for the digital age, where individuals learn and work in a networked environment	• Learners should be allowed to explore and research current information. • Learners must therefore be able to unlearn old information and mental models and learn current information and mental models. • The learner must be able to identify important information from unimportant information • Learners must be allowed to connect with others around the world to examine others' opinions and to share their thinking with the world. • Learning should be delivered in a multi-channel system to deliver the learning materials to facilitate optimal learning • Online teaching strategies must allow learners to research and locate new information in a discipline so that they can keep up-to-date in the field.

Grounded in learning theories, Ally (2011) proposed a model that shows the important learning components that should be used when designing online materials. This model highlights the importance of learner's preparation, learner's activities and interactions as well as the opportunities for learners to transfer what they learned to real-life applications, as follows:

- **Learner preparation**: A variety of pre-learning activities can prepare learners for the details of the lesson, and to connect and motivate them to learn the online lesson. These activities include:
  - A rationale to inform learners of the importance of taking the online lesson and to show how it will benefit them.
  - A concept map to incorporate the details of the online lesson
  - A content map to give learners the big picture of the lesson.
  - An advance organizer to inform Learners of the learning outcomes of the lesson (prerequisite requirements of the lesson).
  - A self-assessment activity at the start of the lesson to allow learners to check whether they already have the knowledge and skills taught in the online lesson.
- **Learner activities**: A variety of learning activities lies at the core of this model, in particular as regards the use of learning objects to promote flexibility and reuse of e-learning materials to meet the needs of individual learners. These activities include:

  - Reading textual materials, listening to audio materials, viewing visuals or video materials, and searching on the Internet or linking to online information and libraries to acquire further information.
  - Application exercises to establish the relevance of the materials
  - Practice activities, with feedback to allow learners to monitor how they are performing, so that they can adjust their learning method if necessary
  - A summary to promote higher-level processing and to bring closure to the lesson
- **Learner interaction activities**: As learners complete the learning activities, they will be involved in a variety of interactions. These interactions include:
  - Learner's interaction with the interface to access the online materials.
  - Learner's interaction with the content to acquire the information needed and to form the knowledge base.
  - Learners interact within their context to personalize information and construct their meaning
  - Learner's interactions with other learners, with the instructor or other experts to collaborate, participate in shared cognition, form social networks, and establish a social presence.
- **Learner's transfers**: Opportunities for learners to transfer what they learned to real-life applications so that they can be creative and go beyond what was presented in the online lesson.

The primary goal of this model is to encourage learning designers to include main learning theories, such as cognitivism, behaviorism, constructivism, and connectivism to support knowledge acquisition, effective interactions, and real-life learning experiences (Ally, 2019). In addition to effective design for learning activities, materials should be designed in small coherent segments, so that they can be redesigned for different learners and different contexts. Furthermore, the integration of 3D interactive graphics and web technologies allows educators to develop highly interactive and realistic learning environments to enhance e-learning. The contributions of this model to instructional design practices are significant by identifying forces that are shaping material and developing learning activities for the e-learning systems (Lou & Xu, 2022, Benali & Ally, 2020, Chen, Yu & Feng, 2016).

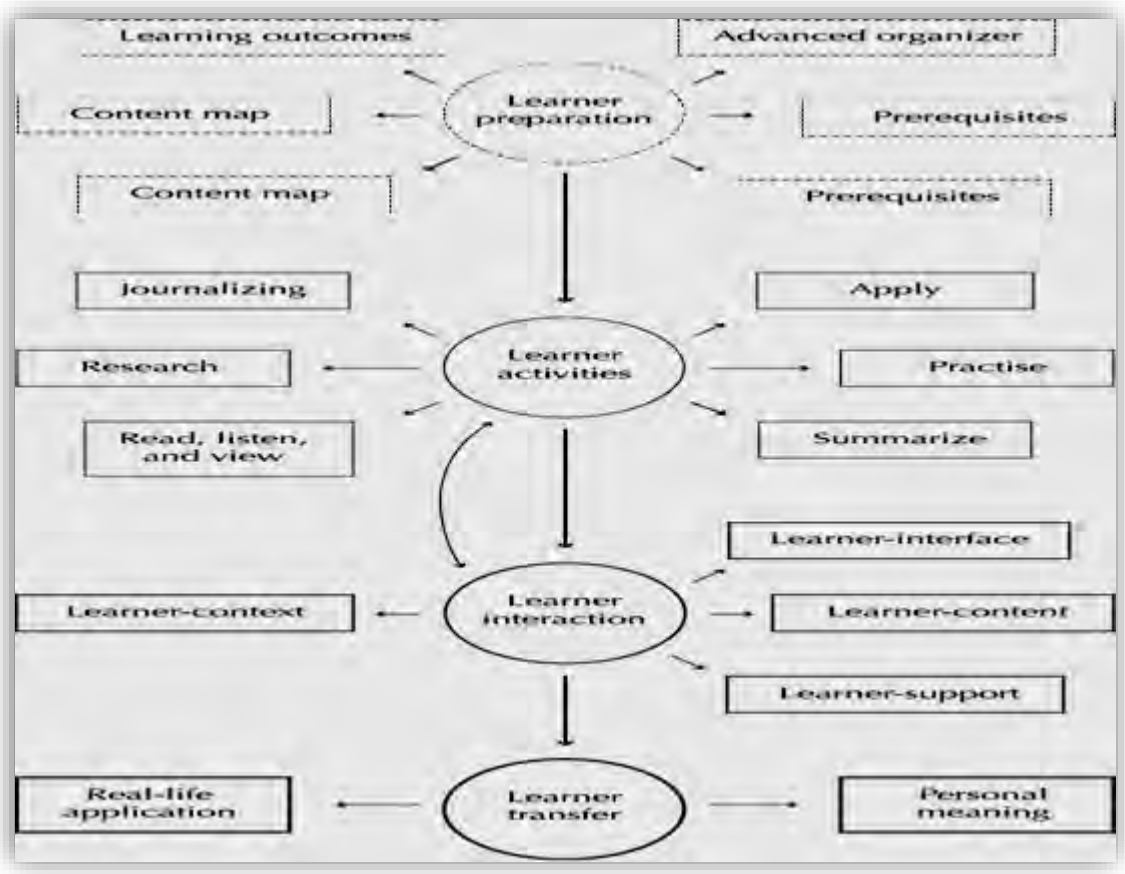


Figure 11. *Components of effective online learning (Source: Ally, 2011)*

4.2 The Open Learning Package

In 1969, Derek Rowntree was appointed as one of the founding members of the Open University and played his part in developing new kinds of teaching to meet the challenges posed by the innovative concept of open learning and distance education. According to Rowntree (1992), the "*package*" has become the feature that distinguishes open learning from ordinary learning. In the early 90s, he explained that "*packages are materials designed so that learners can learn from them without much help from a teacher. A package may be a single workbook. It may be a videotape or audiotape with a study guide. It may be a computer (CBD) disk or practical kit together with backup notes. Almost anything that stores recorded information can be a package*"(Rowntree, 1992, p. 124).

Since then, the British Open University has created a comprehensive package of study content including printed materials such as module handbooks and blocks, audio-visual material including video/TV programs, DVDs, audio CDs and cassettes, multimedia such as DVD-ROMs and CD-ROMs, and associated materials including a selection of home experiment kits, set books, transcripts of audio/visual materials, prospectuses, and broadcast calendars. These study materials are also available online through the Open Learning platform (https://www.open.edu/openlearn/).

It is firmly established in the literature that materials play a prominent role in open learning (Mphahlele & Makokotlela, 2020, Krämer, et al., 2015, Ludwig-hardman & Dunlap, 2003). Morgan, 1995). In distance education settings, packages are designed for learners with less access to a teacher than learners in a face-to-face course. The package can be used as an effective alternative vehicle for helping the learner to learn. The package encloses a teacher in a state of suspended animation: "*Once the learner opens the package, that teacher is instantly at their service*" (Rowntree, 1992, p. 125). Rowntree's model is constructed and illustrated by techniques used by open-learning designers to help learners to learn:

- Clearly stated objectives
- Advice about how to study the material
- Friendly, "You" & "I" style of writing
- Shortish chunks of learning
- Fewer words than usual per page (or screen)
- Plenty of examples
- Quoted remarks from other learners
- Illustrations used where they are better than words
- Heading to help learners find their way around
- Links to other media were appropriate
- Relating the material to learners' needs
- Exercises that get the learners to do something
- Space for learners to write down their ideas

These techniques highlight the importance of the main features of open learning materials including learning objectives, activities, feedback, and examples, as well as signals. Even though "learning objectives" are a dominant requirement to achieve a diverse range of learning outcomes, "activities" are often the most visible feature of open learning materials (Race, 1992). Activities take the form of questions or suggestions inviting learners to do something and they can take different designs or layouts. "Feedback" is also an important feature of an open learning package. Feedback may take various forms to help learners assess what they have done and perhaps compare their thoughts with those of the author or other people. Qualitative materials always include plenty of "examples". Examples may take several forms e.g. references to things learners already know, anecdotes and stories, case studies, pictures, audio, and video records, graphs, experiences provided by other learners, quotations from other people, e.t.c. (Morgan, 1995).

The designers of open-learning packages should pay a lot of attention to layout and graphics. In this respect, "signals" help learners find their way around the package. Signals in open learning materials usually include headings, bulleted lists, boxes, and icons used in many different ways (Rowntree, 1994, 1990). Although the aforementioned icons can be seen more clearly in printed open learning material (workbooks, study guides, e.t.c.), they also underpin the audiovisual material, the display features, and the interface of e-learning materials (Su, 2021, Anonson & Walker, 2013).

4.3 West – Lionaraki's Typology

West-Lionarakis Typology consists of a framework for open and distance learning material design and implementation (Lionarakis, 2001). In the context that the content is about teaching at distance (and delivered to learners so they can learn), this typology highlights the importance of realizing that the design of this content has to fulfill the necessary standard for teaching. In particular, for the design and development of distance education content are specifically theoretical principles and ideas applied, such as Aristotle's approach of Rhetoric (spoken word), the taxonomy of text (written word), and Bordwell's classical Hollywood (audiovisual word).

The typology has the written TEXT at its core to teach and develop the distance teaching material. Around this main core, there is the CO-TEXT consisting of the contents, explanatory titles, aims, objectives, keywords and senses, tests, and activities. The METATEXT also supports the CO–TEXT with abstracts of units, appendices, further reading, study guides, glossaries, and control activities. The TEXT should be clear, explanatory, and friendly, with a fragmented presentation of contents, presenting small in extent funds, sections, and subsections, to have scientific consistency and provide an open and active learning process.

West-Lionaraki's typology also pays attention to the CONTEXT to bridge the learners' knowledge before and after. This typology also incorporates the "HYPERTEXT" as a tool of synthesis of explanatory, and the "The PARATEXT" that includes non–verbal and semi–verbal parts of text development. In addition, the "RETRO–TEXT" consists of independent objects which connect and support the main text, and the "MULTI–TEXT" or "PORTFOLIOS" are produced by the learners and based on assignments and projects they have to do during their studies. The main elements of West-Lionaraki's typology are depicted in the following Figure 6 (Lionarakis, 1998).

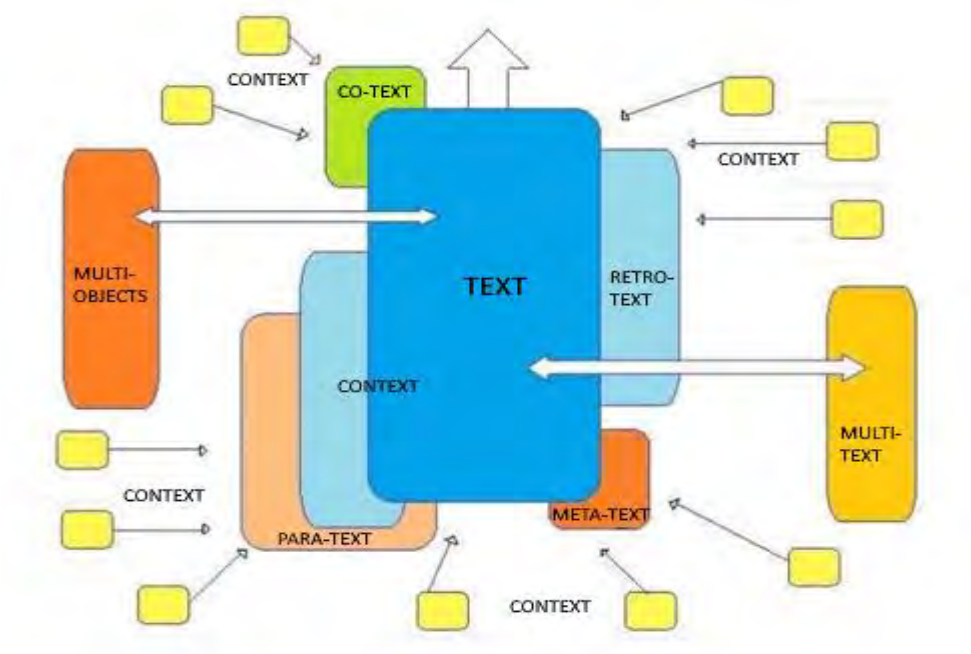


Figure 12. *The Elements of West-Lionarakis Typology for Content Design (Source: Λιοναράκης, 2001, σ. 48)*

The audiovisual language text (written word) and the vision (picture) are the central axes of this typology because these elements incorporate the main elements of Bordwell and the 'classical Hollywood' principles: Pedagogical issues, directing, editing, and postproduction of audiovisual teaching material.

Table 11. *The Taxonomy of Text Model West & Lionarakis (Lionarakis, 2001)*

Model	Distance Learning Material Design Attributes
The Taxonomy of Text Model West & Lionarakis (Lionarakis, 1998)	• The main body, part, and center of a written text to teach and develop the distance teaching material is the TEXT. • The CO-TEXT consists of the content of the text, explanatory titles, aims, objectives, keywords and senses, and tests and activities. • The METATEXT supports the CO–TEXT with Abstracts of units, appendices, further reading, Study guides, glossaries, and control activities. • The CONTEXT is the bridge between the learners' knowledge before and after. • The HYPERTEXT is a tool for the synthesis of explanation. • The PARATEXT are non–verbal and semi–verbal parts of text development. • The RETRO–TEXT are independent objects which connect and support the main text. • The MULTI–TEXT or PORTFOLIOS are produced by the learners and based on assignments and projects they have to do during their studies.

5. Theory-Based e-Learning Models

5.1 The Community of Inquiry Model

The Community of Inquiry (CoI) model was developed from a study by Garrison, Anderson, and Archer that was conducted in 2001. The Community of Inquiry theoretical framework represents a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three independent elements – social, cognitive, and teaching presence (Garrison, Anderson, & Archer, 2000).

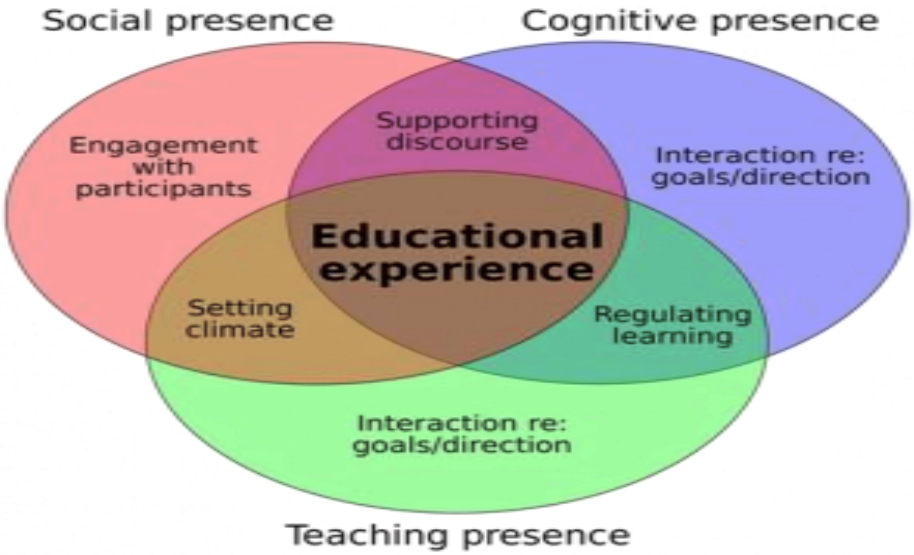


Figure 13. *Elements of an educational experience (Garrison, Anderson & Archer, 2010).*

According to Garrison et al. (1999), it is through the skillful of these forms of presence that online academic staff and students, in collaboration, develop a productive online learning environment through which knowledge is constructed (Table 11).

Table 12. *Forms of Presences According to the CoI Model (Garrison, 2007).*

Forms of Presence	Description
Social Presence	• Social presence is the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting individual personalities.
Teaching Presence	• Teaching Presence is the design, facilitation, and direction of cognitive and social processes to realize personally meaningful and educationally worthwhile learning outcomes.
Cognitive Presence	• Cognitive Presence is the extent to which learners construct and confirm meaning through sustained reflection and discourse.

In an online learning environment, specific features of the technology can Instructional practices can be enhanced by using the CoI model and technology that can support all three presences of the framework (Chen, Lei & Cheng, 2019). Thus, the Community of Inquiry (CoI) framework has been one of the most used and researched educational frameworks (Cooper & Scriven, 2017, Swan, Garrison & Richardson, 2009).

5.2 Collaborative and independent study model

Terry Andreson (2011) presents a model of e-learning in which the two predominant forms of distance learning – collaborative and independent study modes – can be supported by the new tools and affordances of the educational Web and emerging social software solutions. The model that Anderson characterizes "as the first step towards a theory", illustrates the two major human actors: learners and teachers, and their interactions with each other and with the content. In the collaborative mode, learners interact directly and spontaneously with content using multiple formats, especially on the Web. Their learning is also sequenced, directed, and credentialed through the assistance of a teacher like a formal education system. Learners-teachers interactions can take place within a community of inquiry, using a variety of synchronous and asynchronous communication tools (video, audio, computer conferencing, chats, or virtual world). Collaborative environments are particularly influential and allow for the learning of social skills, collaboration, and the development of personal relationships among learners.

The independent study mode illustrates the structured tools associated with the processes in which learners have ownership and control of their learning. In this mode, texts in print – and now distributed and read online, are still the main essential component of an effective e-learning course. The learning process can implement computer-assisted learning tutorials, drills, and simulations. Virtual labs, where students complete simulations of lab experiments and have access to sophisticated search and retrieval tools, are also becoming common tools. – have long served as the basis for conveying teacher interpretations, insights, and knowledge in an independent study. Although engaged in independent study, the learner is not alone. Often colleagues in the workplace, peers located locally or Internet distributed, formal and informal groups, and family members, have been significant sources of support and assistance to independent study learners. In addition, emerging social media apps and platforms promote study-group relationships or engaging in cooperative course-related activities even while learners engaged in independent study programs.

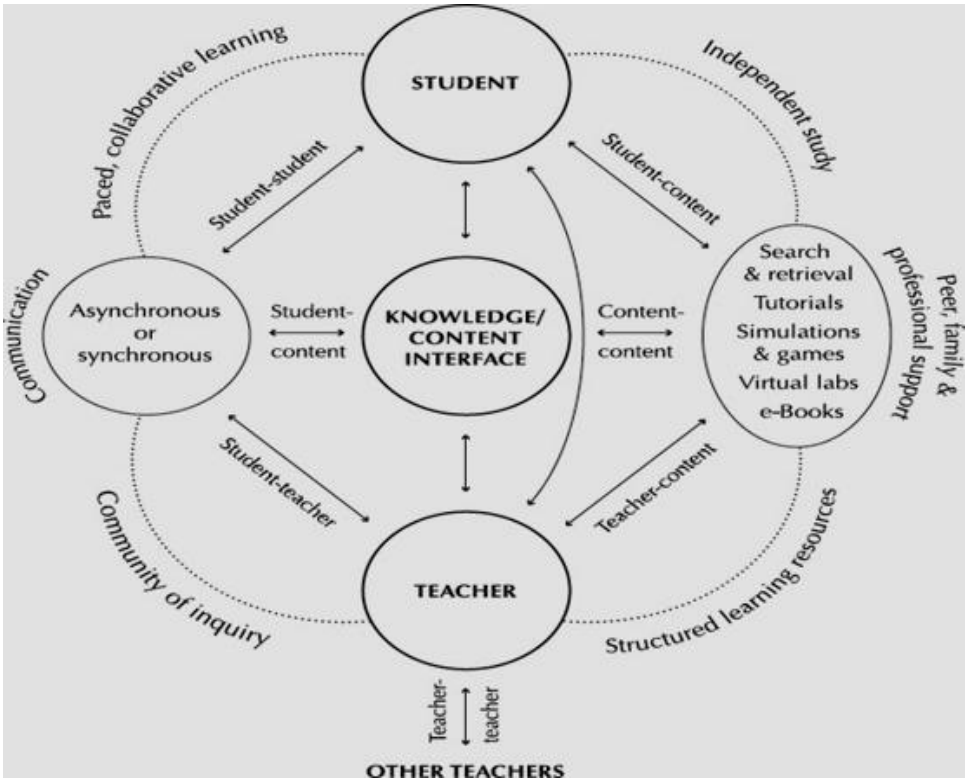


Figure 14. *A model of online learning (Source: Anderson, 2001)*

The challenge for scholars and course developers working in an e-learning context is to design and structure learning experiences that are simultaneously learner-centered, content-centered, community-centered, and assessment-centered. E-learning designers should be ready to envision an e-learning environment that is rich with student-student, student-content, and student-teacher interactions that are affordable, reusable, and facilitated by active agents.

Table 13. Components *for effective e-Learning environments and Implications*

Components	Implications e-learning design
Learner-centered learning	• Use diagnostic tools and activities to understand the students' knowledge base. • Assessing student preconditions and cultural contexts.
Knowledge-centered learning	• Provide scaffolding for the students' pre-existing knowledge • Provide opportunities for learners to gather almost limitless knowledge resources, benefiting from exposure to thousands of formats and contexts. • Learning is about making connections with ideas, facts, people, and communities. • Students need to be able to locate the knowledge that they require and use it to create meaningful connections to society
Community-centered learning	• Characteristics of participants in online learning communities can share a sense of belonging, trust, expectation of learning, and commitment to participate in and contribute to the community
Assessment-centered learning	• Includes formative and summative evaluations that serve to motivate, inform, and provide feedback to learners and teachers. • Encouraging students to reflectively assess their learning is key to assessment-centered learning.

- Enhanced communication capacity of online learning provides good opportunities to create assessment-centered activities that are workplace-based, and also constructed collaboratively, and infused with opportunities for self-assessment.

5.3 E-Learning Integrated Multimodal Model

After a review of learning theories as applied to distance and online education, a model for an integrated model for e-learning based on pedagogical purposes. The includes many of the major attributes of learning and online education theories and models to describe the phenomenon of pedagogically driven online education. In contrast to approaches that consider e-learning as today's version of distance education (Barbour, 2021, Li, 2018, Kentnor, 2015), the key to Picciano's model is the assumption that e-learning has evolved as a subset of learning in general rather than a subset of distance learning. The primary goal of this model is to encourage practitioners and course developers to realize the importance of various pedagogic objectives, activities, and approaches within multiple modalities of instruction.

The model contains six basic pedagogical goals and approaches for achieving them, to form learning modules. The most important feature of this model is that pedagogy drives the approaches that will work best to support student learning. The model is flexible and suggests that other modules can be added as needed and where appropriate. The modules are also shown as intersecting but this is optional; they may or may not intersect or overlap depending upon the approaches used. Ultimately important is that all the modules are used together into a coherent whole. The Table below briefly reviews each of these modules.

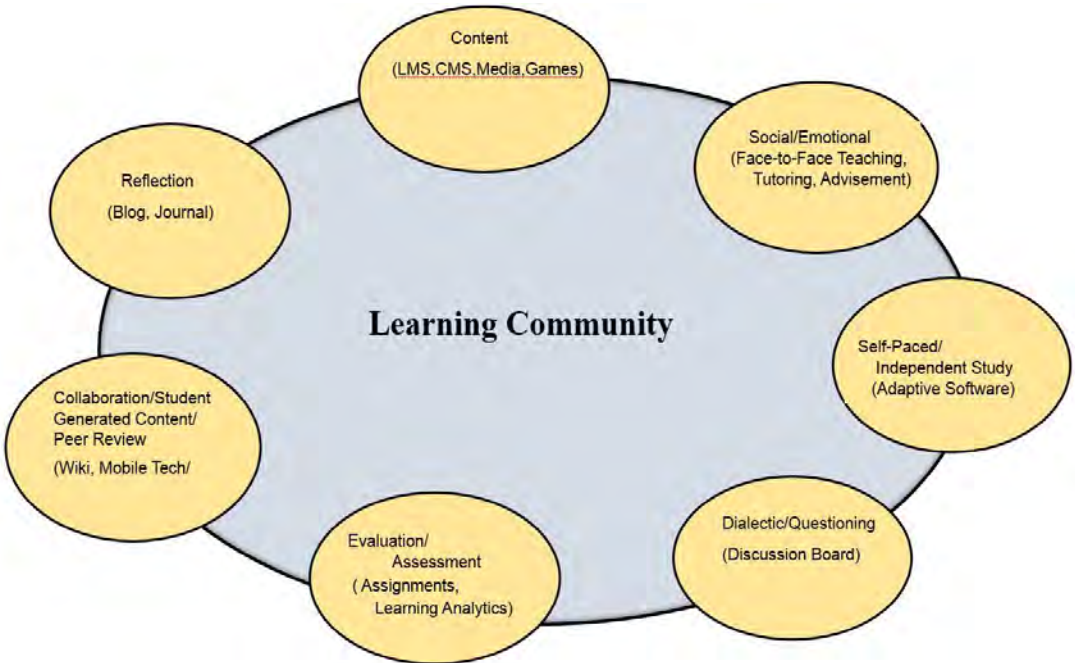


Figure 15. An Integrated Multimodal Model for Online Learning (Source: Picciano, 2017)

Table 14. *Picciano's integrated Multimodal Model*

Components	Implications e-learning design
Content	• Course/learning management systems (CMS/LMS) such as Blackboard, Canvas, or Moodle provide basic content delivery mechanisms for blended learning and easily handle the delivery of a variety of media including text, video, and audio. • Games have also evolved and now play a larger role in instructional content. • In providing and presenting content, the blending with the pedagogical model suggests that multiple technologies and media be utilized.
Social/emotional	• Social and emotional development must be acknowledged as important to learning. • Face-to-face learning, tutoring, and advisement.
Dialectic/questioning	• Dialectics or questioning is an important activity that allows faculty members to probe what students know and to help refine their knowledge. • For dialectic and questioning activities, a simple-to-use, threaded electronic discussion board or forum such as VoiceThread is an effective approach • A well-organized discussion board activity generally seeks to present a topic or issue and have students respond to questions and provide their perspectives while evaluating and responding to the opinions of others • The simple, direct visual of the "thread" allows students to see how the entire discussion or lesson has evolved.
Self-paced/Independent Study	• Adaptive learning software, an increasingly popular form of self-study, can stand alone or be integrated into other components of the model. • Adaptive software is also integrated into traditional, face-to-face classes, such as science, where it is possible to have the instructor assign a lab activity that uses adaptive learning simulation software.
Assessment/evaluation	• CMSs/LMSs and other online tools and platforms provide several mechanisms to assist in this area. • Papers, tests, assignments, and portfolios are among the major methods used for student learning assessment and are easily done electronically. • Essays and term projects pass back and forth between teacher and student without the need for paper • Assignments and learning analytics.
Collaboration/ Student-generated content/ peer review	• E-mail, mobile technologies, and other forms of electronic communication alleviate some of these logistical issues. • Wikis have grown in popularity and are becoming a staple in group projects and writing assignments. • They are seen as important vehicles for creating knowledge and content, as well as for generating peer review and evaluation.
Reflection	• The ability to share one's reflections with others can be beneficial. Pedagogical activities that require students to reflect on what they learn and to share their reflections with their teachers and fellow students extend and enrich reflection. • Blogs and blogging, whether as group exercises or for individual journaling activities, have evolved into appropriate tools for student reflection and other aspects of course activities.

6. Educational Technology Approaches for e-Learning Design

6.1 Laurillards conversational model

Laurillard's conversational model (1993, 2002) can be considered both a learning theory and a practical framework for designing conventional and distance education programs. The framework throws light upon three approaches to generating a principled teaching strategy in higher education: (a) Instructional design theory, (b) intelligent tutoring systems theory, and (c) constructivist approaches. Laurillard approaches the concept of a teaching strategy as an iterative dialogue between teacher and student focused on a topic goal. The teaching strategy has been refined into a set of requirements for any learning situation (Laurrillard, 2002, p.86):

- it must operate as an iterative dialogue
- which must be discursive, adaptive, interactive, and reflective
- and which must operate at the level of descriptions of the topic
- and at the level of actions within related tasks

These descriptions are presented in Figure 10. Teacher and student are represented as interacting through some medium —it may be a face-to-face tutorial, it may be conducted entirely through correspondence, or it may employ a combination of several media.
Teacher and student each operate at the level of descriptions of the topic goal, and actions in a task environment. The arrows represent learning and teaching activities that constitute the dialogic relationships within and between the two participants, as follows:

- The discursive process is represented as a series of activities by teacher and student at the level of descriptions of the topic goal: describing and redescribing each participant's conception of it (activities 1–4).
- The adaptive process is represented as activities (5 and 10) internal to both teacher and student, each of whom adapts their actions at the task level in the light of the discursive process at the description level.
- The interactive process is represented as a series of activities (6 to 9) by teacher and student at the level of the task environment, setting and aiming to achieve the task goal, and giving and acting on feedback in the light of the task goal.
- The reflective process is represented as activities (11 and 12), internal to both teacher and student, each of whom reflects on the interaction at the task level to redescribe their conceptions at the level of descriptions of the topic goal.

This Conversational Framework for describing the learning process is intended to apply to any academic learning situation: to the full range of subject areas and types of topics.

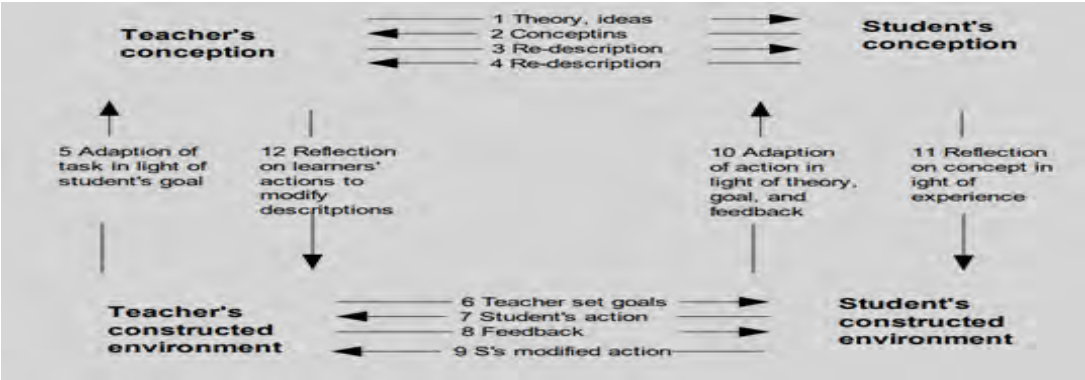


Figure 16. *Laurillard's conversational Model of e-Learning (Source: Laurillard, 2008)*

Associated evaluation and design studies have to consider how different educational mediums serve the needs of principled teaching strategies. Table 6 presents a classification of educational media according to their essential pedagogical characteristics.

Table 15. *A Classification of Educational Media (Sources: Laurillard, 2008)*

Media Forms	Methods/Technologies	Learning Experience
Narrative	• Print, TV, video, DVD	• Attending, apprehending
Interactive	• Library, CD, DVD, and Web resources	• Investigating, exploring
Communicative	• Seminar, online conference	• Discussing, debating
Adaptive	• Laboratory, field trip, simulation	• Experimenting, practicing
Productive	• Essay, product, animation, mode	• Articulating, expressing

For learning to take place, the core structure of the Conversational Framework must remain intact in some form: The dialogue must take place somewhere, and actions must happen somewhere, even if it is all carried out by the student. All the activities identified in the Conservational model can be supported by the five forms of educational media. E-learning designers should consider which educational media can support the Conversational Framework and thereby address all the activities essential for learning in the full context of the teaching process (Sathish & Nethravathi, 2022, Raveti, 2021).

6.2 Mayer's Multimedia Learning Theory

Mayer's model consists of three aspects that help students learn more effectively. The first aspect is that there are two separate channels, namely audio and visual, for processing information. The second aspect is that each channel is considered to have a limited capacity to process information. The third aspect is that learning is an active process of selecting, organizing, and integrating information based on existing knowledge. Mayer (2002) explains that there are two channels used to process information, the auditory and visual channels. The auditory channel processes information in the form of sounds, and the visual channel processes visible objects. These two channels combine to process the incoming multimedia information. The short term memory is the first place where information is processed. After that, all the information (sounds and pictures) is transferred to the working memory.
The multimedia learning theory proposes that, by combining information from the two channels, the information is transferred from short-term to working memory to be processed in-depth with the help of prior knowledge, and that processing helps the information stay in the learners' long-term memory. Mayer also stated that integrating the information with prior knowledge is significant to successfully transfer the knowledge.

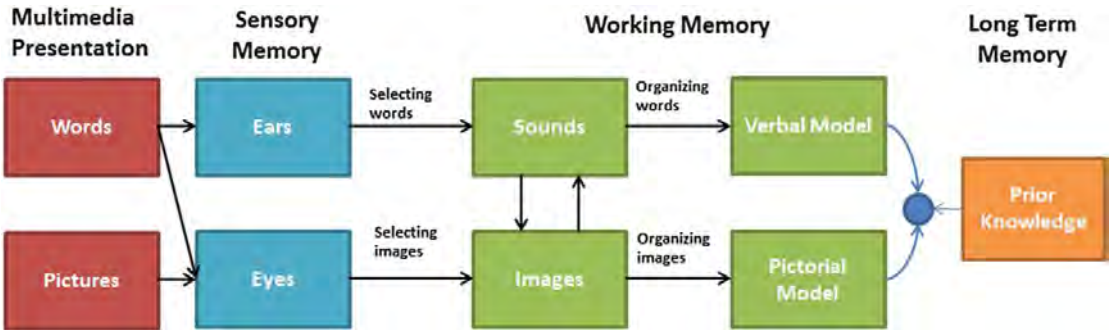


Figure 17. *Mayers' (2001) Cognitive theory of learning*

Mayer discusses twelve principles that shape the design and organization of multimedia learning experiences to maximize learner comprehension. These principles are presented in the Table below.

Table 16. Mayer's Twelve Multimedia Principles

Principles	Implications for Multimedia Learning Design
Multimedia Principle	• People learn better from words and pictures than from words alone
Pre-Training Principle	• People learn better from new lessons when they have pre-requisite knowledge
Signaling Principle	• People learn better when cues that highlight the organization of the essential material are added
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
Temporal Contiguity Principle	• People learn better when corresponding words and pictures are presented simultaneously rather than successively
Segmenting Principle	• People learn better from a multimedia lesson is presented in user-paced segments rather than as a continuous unit
Personalization Principle	• People learn better from multimedia lessons when words are in conversational style rather than formal style
Redundancy Principle	• People learn better from graphics and narration than from graphics, narration, and on-screen text.
Modality Principle	• People learn better from graphics and narrations than from animation and on-screen text.
Coherence Principle	• People learn better when extraneous words, pictures, and sounds are excluded rather than included.

In e-learning practice, this model can provide research-based guidelines on how best to present content with text, graphics, and audio as well as the conditions under which those guidelines are most effective. Multimedia principles are also used as a psychological basis to describe the applications for ways to improve learning through personalization techniques, coherence, and animations or how to leverage e-learning practice, online collaboration, and learner control to optimize learning (Sudatha, Pudjawan, & Simamora, 2021, Clark and Mayer, 2016, Greer, Crutchfield & Woods, 2013).

7. (e)Creativity in K12 Education

7.1. The new emerging social environment

In the era of globalization and the Internet, knowledge is the main productive factor of the new form of social and economic organization (Tapscott, 1999; Anderson, 2008). The goal of societies should be to strengthen social capital, i.e. the set of real and potential resources embedded, available and derived through the network of relationships maintained by an individual or group (Nahapiet & Ghoshal, 1998) and the role of creativity is important in achieving this goal (Walberg, 1988, p. 342). Knowledge is one of the goods traded through this network and ICT plays an important role (Van Bavel etal, 2004), reducing the distance between centre and periphery (Westlund & Kobayashi, 2013) but creating new kinds of social inequalities based on age and internet access (Brandtzæg, Heim & Karahasanović, 2011).

In today's school we educate tomorrow's citizens of a society about which we have no idea what it will be like in a few years' time.

The rapid changes at the economic and social level contribute to the emergence of a new reality whose characteristic features are:

a. Information Overload Shock: the ever-increasing amount of information available on the Internet has resulted in the phenomenon of "information overload shock" (Brown & Duguid, 2000; Bawden & Robinson, 2008).

The aim is therefore to:

1. to cultivate information literacy, i.e. the ability to recognize, identify, evaluate, organize and creatively synthesize and utilize disseminated information in order to process an issue or provide a solution to a problem (Unesco, 2003), based on validity and timeliness (Anastasiades, 2007). This requires the cultivation of information search skills, imagination and originality.
2. cultivate the ability to evaluate and identify important or authentic information (Siemens, 2004). This requires the cultivation of critical thinking.

b. The rapid obsolescence of knowledge: in the so-called society of knowledge and uncertainty (Hargreaves, 2003) knowledge is rapidly depreciated (Kaufman, 2006), which forces us to rethink the way we deal with the concept of teaching and learning by focusing on teaching our students how to learn (Laurillard, 2002; Anderson, 2008).

c. The multiplicity of information in today's era urges us (Johnston, 1998):

-seek new knowledge from different sources,

- to realize that there are different types of knowledge and multiple ways of looking, interpreting and solving problems,

- to focus on creating new forms of perception and acquisition of meaning for the world around us (Makrakis, 2000, p.247).

A prerequisite for the above is to encourage the release of thought from its leveling standardization, cultivating in teachers and students the ability to see things alternatively and solve multiple ways of solving problems.

d. Global networking-collaboration: The possibility of global networking of researchers, teachers and students creates the conditions for a new participatory culture (Jenkins, 2006) with respect to individual social and cultural environments.

In this context:

-we seek constant contact and cooperation with others who have common interests and worthwhile practices (Lovat & Smith 2003)

- cultivate a culture of sharing our knowledge, experiences and experiences, with the help of social networking environments and web2.0 (Anastasiades & Kotsidis, 2013).

In summary, based on the above four characteristics of the new social reality that is emerging, teachers and students should focus on cultivating critical thinking, highlighting originality, imagination and innovation, encouraging an alternative view of things, pedagogical

exploitation of error, in order to build collaborative learning environments and creative expression.

7.2 Creativity Definition

Creativity is a complex phenomenon that has been defined in various ways, but is generally understood as the ability to produce work that is both novel and appropriate (Sternberg & Lubart, 1998). It involves shifting between divergent and convergent modes of thought (Gabora, 2020) and is influenced by cognitive, personality, and environmental factors (Isinova & Massaldjieva, 2020). While some view creativity as a mystery (Boden, 2005), others argue it can be nurtured and developed (Kim, 2019). Creativity is not limited to the arts and does not necessarily require mental illness or divine inspiration (Kim, 2019). It has been studied using various approaches, including cognitive neuroscience and computational modeling (Gabora, 2020). Some researchers propose dynamic definitions of creativity (Valcheva, 2019), while others question its inherent value (Hills & Bird, 2018). Understanding creativity is crucial for addressing societal challenges and fostering innovation (Sternberg & Lubart, 1998; Veale, 2016).

Creativity theories have evolved significantly over time, encompassing diverse perspectives and approaches. Early theories focused on the tension between knowledge and creativity (Weisberg, 1998), while more recent frameworks integrate multiple dimensions. Runco (2006) proposed a comprehensive model considering person, product, process, and place. Sternberg & Karami (2021) expanded this to an 8P framework, adding purpose, press, propulsion, and public. Some researchers have explored creativity through quantum physics (Goswami, 1996) or comparative analysis of different theories (Amraee et al., 2021). The field acknowledges the complexity of creativity, recognizing it as an interdisciplinary phenomenon involving identity, process, product, and environment (Shymanovska-Dianych & Ishcheikin, 2021). Implicit theories held by non-experts, such as parents and teachers, have also been studied alongside explicit scientific theories (Runco, 2018). Despite extensive research, a unified definition of creativity remains elusive, reflecting the multifaceted nature of this concept.

Cognitive theories of creativity emphasize the role of regular cognitive processes in creative thinking, challenging traditional views that creativity requires unique mental abilities (Bink & Marsh, 2000). These theories explore various aspects of creative cognition, including idea generation, synthesis, and selection (Bink & Marsh, 2000), as well as divergent and convergent thinking (Jung et al., 2013). Researchers have investigated the relationship between knowledge and creativity, with some suggesting a tension between the two (Weisberg, 1998). Multiple approaches to studying creativity have emerged, including psychometric, clinical, and cognitive perspectives (Weisberg, 2006). The creative cognition approach examines mental processes underlying creativity, such as problem-solving, concept formation, and thinking (Smith et al., 1995; Finke et al., 1996). Recent research suggests that creativity may be domain-specific, challenging the notion of general creative thinking skills and impacting creativity assessment and training methods (Baer, 2012). Comprehensive creativity assessment requires multiple measures of cognitive processes, motivations, and environmental factors (Feldhusen & Goh, 1995).

Constructivist theories of creativity emphasize the role of cognitive development, social interaction, and personal experience in fostering creative thinking. Piaget's reflective abstraction and Vygotsky's interplay between imagination and abstract thinking are highlighted as key mechanisms for creativity (Kim, 2006). Implicit theories of creativity vary across cultures, with Indian perspectives emphasizing creativity as a holistic, self-expressive process (Sen & Sharma, 2011). In education, constructivist approaches recommend collaborative projects, scaffolding, and authentic tasks to enhance creativity in programming (Kiesler, 2022). University teachers' implicit theories of creativity encompass individualistic,

activity-oriented, result-oriented, relational, and growth perspectives (Pavlović & Maksić, 2019). A rational constructivist view defines creativity as potentially valuable improbable constructions, applicable to both adults and children (Fedyk & Xu, 2021; Xu, 2020). Constructivism also provides insights into the lived experience of artistic creation, emphasizing themes such as validation, unseen processes, and audience management (King, 2008).

Creativity has become a crucial focus in education, recognized as essential for innovation and adapting to an uncertain future (Kaplan, 2019; Susnea et al., 2014). Research on creativity in education has grown exponentially since 2000, with contributions from various disciplines (Hernández-Torrano & Ibrayeva, 2020). Educators are encouraged to foster creativity by applying theories in instructional design (Kaplan, 2019) and creating supportive learning environments (Susnea et al., 2014). Creativity is viewed as ubiquitous and vital for problem-solving across all subjects, not just the arts (Livingston, 2010; Jeffrey & Craft, 2001).

Many countries have implemented policies to promote creativity in education (Shaheen, 2010; Collard & Looney, 2014). Teaching creativity involves nurturing original thinking, combining existing ideas in new ways, and developing higher-level thinking skills (Kanematsu & Barry, 2016). This shift towards creativity requires changes in pedagogical approaches, emphasizing investigation, cooperation, and synthesis (Livingston, 2010).

7.3. The concept and importance of creativity in K12 Education

As it is understood, the concept of creativity acquires particular added value for educational systems in today's era of constant change and structural upheavals Hargreaves, 2003; Ball, 2008, p. 39). This is reflected both at European (Work Programme Education & Training 2010) and at national level (Pedagogical Institute, 2011, Leonidou, 2006, Xanthakou, 1998; DCMS, 2001).

From the review of international and Greek literature, the concept of creativity could be conveyed through four tangential conceptual cycles (Figure 18).

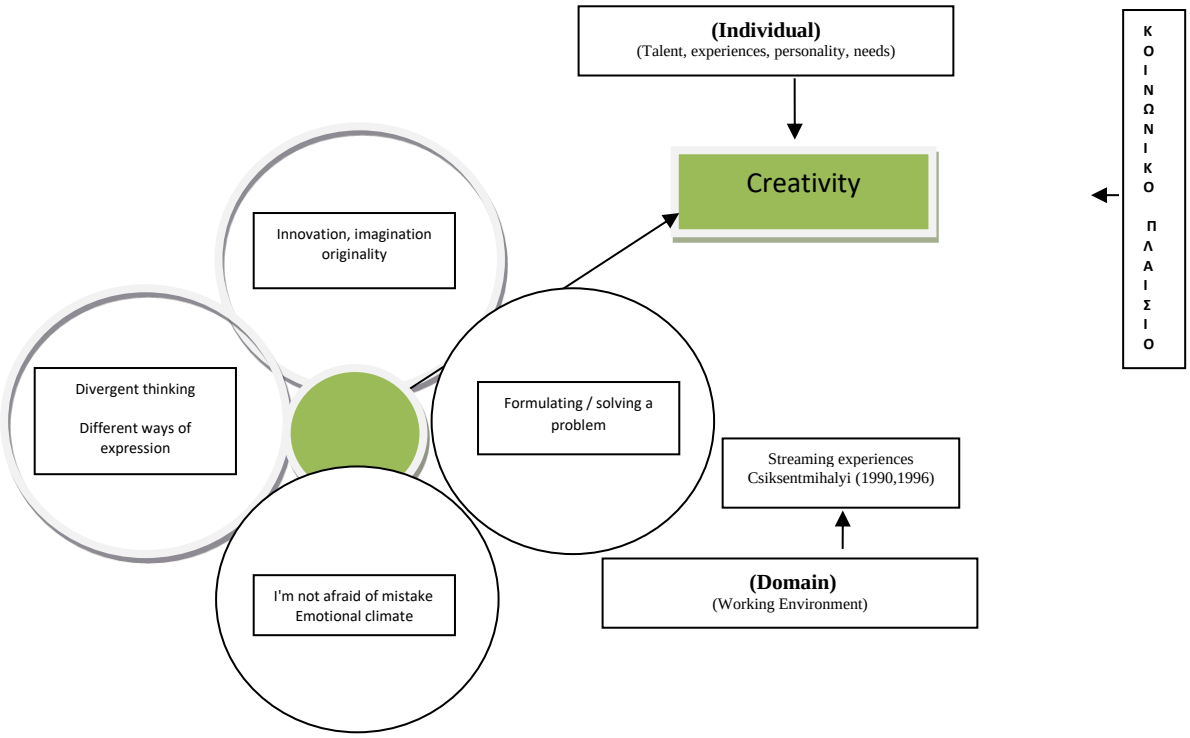


Figure 18: Conceptualisation of creativity

Cycle 1: A large number of researchers focus on imagination, originality and innovation as the hallmarks of creative thinking (Bruner, 1962; Getzels and Jackson, 1962; Torrance, 1966; Lytton, 1971, Reber, 1985; Vernon, 1989).

2nd cycle: An important prerequisite for cultivating creativity is encouraging a different view of things (Lee, Webberlen and Litt, 1987; De Bono,1967; Trilianos, 1997), the development of divergent thinking (Guilford, Fontana, 1996: 163-164) and the formation of new correlations (Salla-Diakoumentzidis, 1966). The different modes of expression (metaphorical: such as..., analogue (not/are), symbolic (poetry/art), practical (problem solving), figurative (shape), etc.) combined with the active participation of students in building knowledge (Makrakis, 2000: 247), are important factors for the development of creativity in education.

Cycle 3: According to several researchers, formulating the problem is a much more important process than solving it (Piaget, 1960; Fontana, 1996: 166) and contributes to the development of creative thinking (Kaila & Xanthakou, 2002). .

4th cycle: Pedagogical exploitation of error, emotional climate: the standardization of thinking, the absolute dominance of logic, the lack of confidence in our creative abilities, the fear of error and ridicule, the social context that pushes for compliance and finally the psychological insecurity for the new and the unknown, are the most important obstacles according to Paraskevopoulos (2004) in relation to creativity.

According to Kampylis (2010), Greek primary school teachers do not have a clear picture of creativity and often perceive it with such recruitments that do not help its further development, which is due both to the context of their initial education and to the content and methodology of their training. This conclusion is consistent with similar research by Loveless, A., Burton, J., & Turvey, K. (2006) which highlights the importance of teacher training in fostering creativity, while Webster, Campbell, & Jane (2009) point out the necessity of a well-prepared preparation period for teachers.

7.4. Collaborative Creativity (CM) and the role of ICT: eCreativity

According to sociocultural approaches, creativity acquires particular added value when it takes place in collaborative environments (Littleton & Miell, 2004; Sawyer, 2007) without negating the fact that individual creative activities have a strong social dimension (Ivinson, 2004).

In the context of ED the focus is on reciprocity between group members, the exchange of ideas, experiences and experiences, the exploration of a common perspective, the negotiation of a collective meaning (Grossen, 2008, 248 p.; Glăveanu, 2011), while research focuses not only on the content (what and how) of creativity but also on the sociocultural context of mediated communication in which it takes place (De Laat & Lally, 2004).

Especially in the context of school promotion, ED is nowadays one of the most important prerequisites for the critical inclusion of students in the Knowledge Society (Craft, 2008; Daskolia, Lambropoulos, & Kampylis, 2009), as it contributes to their socio-emotional development and the emergence of strong internal motivations (Littleton & Miell, 2004; Moran & John-Steiner, 2004).

ICT under pedagogical prerequisites can support the development of ED in the modern school through three interrelated practices (Loveless, 2003; 2011) which are illustrated in Figure 19 :

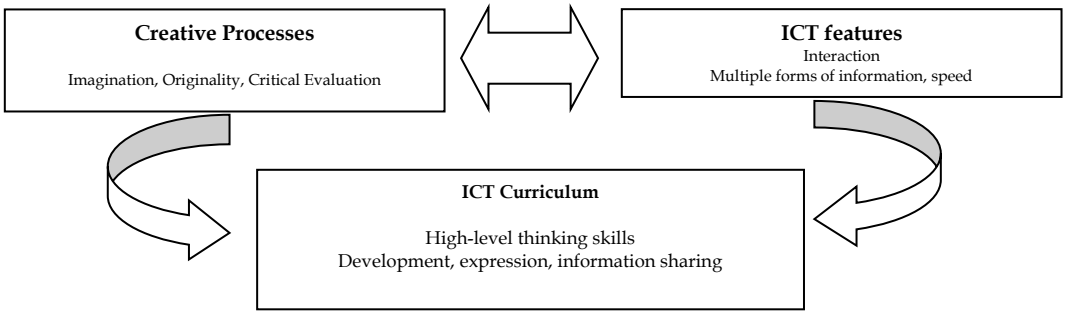


Figure 19: ICT framework to support creativity

According to Wheeler et al. (2002), ICT can contribute to the development of creative thinking through three interrelated dimensions: problem solving, creative knowledge and social interaction. Howell (2012) argues that creative activities combined with knowledge exploration maximize expected results in both knowledge and skills of students

In recent years, the development of Web 2.0 gives a new impetus to the support of creativity, as these applications allow ordinary users to create, publish, and exchange content (eg text, image, video, etc.). (Bush & Hall, 2011; Daud & Zakaria, 2012; Kurtz, et al,2012).

The important feature of web2.0 is that it encourages and supports the casual user to create content together with others (collaborative creation), promoting interaction and communication between them (O'Reilly, 2005). In fact, Jenkins (2006) states that "Web 2.0 signifies the participatory culture in which there are many opportunities for one to create and participate in collaborative learning and become a global citizen (citizen of the whole world), able to communicate and work in different contexts."

In conclusion, the contribution of web 2.0 consists in encouraging participatory culture through the creation and sharing of content in different social and cultural contexts and therefore can contribute under pedagogical conditions to the development of collaborative creativity in the classroom

8. Equity, diversity, and inclusion (EDI) in K12 Education:

Introduction

Recent research highlights the importance of equity, diversity, and inclusion (EDI) in education.

EDI is crucial for creating inclusive learning environments and improving educational outcomes (Iniesto & Bossu, 2023; Nwachukwu, 2023). Strategies to promote EDI include addressing unconscious bias, embracing student voices, and implementing support structures (Nwachukwu, 2023). In higher education, EDI initiatives can facilitate the transition from education to work and promote European values (Siri et al., 2022). Integrating technology and innovative curricula can address diversity challenges in universities (Mimirinis & Bhattacharya, 2008). Systemic changes in curriculum, textbooks, and teacher training are essential for accommodating diversity and promoting social and economic development (Smith, 2006). International declarations and national policies, such as those in South Africa, provide frameworks for balancing unity and diversity in education systems (Smit & Oosthuizen, 2006). Overall, EDI in education is a complex, multifaceted issue that requires ongoing research and policy development (Wolbring & Nguyen, 2023; Banks, 2012).

8.1 Equity in K-12 education

Equity in K-12 education remains a critical issue, with research highlighting persistent disparities based on race, socioeconomic status, and language background (Thompson & Thompson, 2018; Hill & Burke, 2020, 2021). Studies emphasize the importance of addressing inequities in access to quality education, particularly in STEAM fields (Kumar & Mehta, 2024). The complex terrain of equity for multilingual learners requires a nuanced approach to categorization, curriculum, and instruction (Grapin, 2023). Personalized learning has been proposed as a potential solution, though its effectiveness in achieving equity outcomes is debated (Dumont & Ready, 2023). Digital equity in schools is another crucial aspect, with leadership playing a vital role in ensuring equitable access and practices (Liu et al., 2024). Researchers argue that addressing educational inequities requires a holistic approach that considers broader societal issues, such as housing segregation and economic disparities (Hill & Burke, 2020, 2021). Despite challenges, schools continue to serve as spaces for resistance and social change.

8.2 Inclusion in K-12 education

Inclusive education aims to integrate students with disabilities into mainstream classrooms, promoting diversity and equal opportunities (Jardinez & Natividad, 2024). The theory of planned behaviour (TPB) has been applied to understand teachers' intentions and practices in inclusive education (Yan & Sin, 2014; Opoku et al., 2020). While TPB can predict teachers' intentions, the link to actual behavior remains unclear (Opoku et al., 2020). Implementing inclusive education faces challenges such as lack of professional development, insufficient facilities, and inadequate policies (Jardinez & Natividad, 2024). Various theoretical approaches, including social constructivism and universal design for learning, can address these challenges (Jardinez & Natividad, 2024). However, inclusive education is complex and problematic, involving dilemmas arising from contradictory imperatives in mass education systems (Clark et al., 1999). Despite these difficulties, inclusive education and positive behavior support share similar values and goals, aiming to support all students in positive inclusive schools (Anderson, 2003).

Cognitive theories play a significant role in inclusive education, emphasizing the importance of adapting teaching strategies to meet diverse learning needs. Cognitive Load Theory can be applied to tailor mathematics instruction in inclusive classrooms, addressing varying cognitive profiles (Banerjee & Gautam, 2024). The Social Cognitive Theory and Theory of Planned Behavior have been used to examine factors influencing teachers' willingness to implement inclusive practices (Pace & Aiello, 2016). Inclusive education faces challenges such as insufficient teacher training and inadequate facilities (Jardinez & Natividad, 2024). However, it promotes diversity, empathy, and acceptance among students (Jardinez & Natividad, 2024). The implementation of inclusive education is complex, involving dilemmas arising from contradictory imperatives in mass education systems (Clark et al., 1999). To address these challenges, cognitive education and mediated learning can be used to enhance teaching and learning processes (Lebeer, 2006). Overall, cognitivism provides valuable insights for developing inclusive educational practices (Attfield, 2020).

Constructivism theories in inclusive education emphasize collaborative learning, diversity, and student-centered approaches. Social constructivism promotes peer interaction to reduce rejection in inclusive classrooms (Jardinez & Natividad, 2024). The constructivist framework can be applied to support international students through inclusive pedagogy (Stipanovic & Pergantis, 2018). Action research and social constructivism can be combined to develop inclusive practices through practitioner research (Armstrong, 2019). Constructivism challenges traditional special education methods while offering opportunities for reform in school organization, pedagogy, and human services (Skrtic et al., 1996). However, implementing inclusive education faces barriers such as lack of teacher training and inadequate facilities (Jardinez & Natividad, 2024). The No Child Left Behind Act's mechanistic approach conflicts with constructivist inclusive education (Hulgin & Drake, 2011). Understanding inclusive education can be enhanced through social system theory and institutionalism perspectives (Rapp & Corral-Granados, 2021). Constructionism's inclusiveness for students with disabilities is explored through technology integration and pedagogical approaches (Urschitz & Moro, 2014).

Inclusive education in K-12 settings aims to provide equal learning opportunities for all students, regardless of their abilities, backgrounds, or special needs (Kumari, 2022; Kumari & Prasad, 2024). This approach faces challenges such as inadequate teacher preparation, insufficient resources, and lack of supportive policies (Kurth & Foley, 2014; Jardinez & Natividad, 2024). However, it offers numerous benefits, including promoting diversity, empathy, and social justice (Subban et al., 2022; Ashokan, 2023). Effective strategies for implementing inclusive education include Universal Design for Learning, differentiated instruction, collaborative teaching, and individualized education plans (Mastropieri & Scruggs, 1999; Ashokan, 2023). Additionally, fostering supportive relationships, positive teacher and school leader beliefs, and accessible learning environments are crucial for successful inclusion (Subban et al., 2022). Inclusive pedagogies in science education can help address educational inequities and increase academic rigor for all students (Mensah & Larson, 2018). Overall, inclusive education requires ongoing professional development and a shift in educational paradigms to create truly equitable learning environments.

Inclusive education strategies aim to create equitable learning environments for all students, including those with special needs. Key approaches include differentiated instruction, Universal Design for Learning, and collaborative teaching (Ashokan, 2023; Rahmi et al., 2024). Effective implementation requires comprehensive teacher training, supportive classroom environments, and the use of assistive technology (Sholihah, 2024; Sudarso et al., 2024). Challenges such as limited resources, lack of teacher skills, and societal attitudes must be

addressed through continuous professional development, improved infrastructure, and community engagement (Anggreani et al., 2024; Bessarab et al., 2023). Successful inclusive education depends on clear policies, institutional support, and collaboration among educators, parents, and the community (Ireri et al., 2020; Bintang et al., 2024). By adopting these strategies, schools can foster environments where diversity is celebrated, barriers to learning are eliminated, and all students have the opportunity to succeed academically, socially, and emotionally.

8.3 Diversity in K12 Education

Diversity in education encompasses various dimensions including race, gender, socioeconomic status, language, culture, and exceptionality (Banks, 2012). It presents both challenges and opportunities for educational systems worldwide (Smith, 2006). The concept has evolved from focusing on specific demographic categories to recognizing individual uniqueness (Šušterič, 2017). Diversity education aims to address issues like segregation, achievement gaps, and structural inequalities (Chisholm & McKinney, 2006). Approaches include multicultural, intercultural, and antiracist education, among others (Chisholm & McKinney, 2006). The diversity framework in Indian education, for instance, emphasizes national integration, equality, and developing a common culture (Joshee, 2003). In multilingual education, diversity is influenced by linguistic, sociolinguistic, and educational factors (Cenoz & Gorter, 2010). As student populations become increasingly diverse, especially in STEM fields, educators must adapt to meet varied needs (Ruggs & Hebl, 2012). Effective diversity education has the potential to promote social and economic development while reducing conflict (Smith, 2006).

Diversity in K-12 education encompasses racial, ethnic, socioeconomic, linguistic, and cultural differences among students (Ruggs & Hebl, 2012). While traditionally framed as desegregation, recent arguments emphasize the educational benefits of diverse learning environments (McDermott, 2001). However, the dominant discourse often positions difference as deficit (Swartz, 2009). Addressing diversity requires rethinking teacher preparation, curriculum, and school policies to ensure educational equity and equal opportunities for all students (Sharma & Lazar, 2019). This includes considering age as a diversity issue (Wircenski et al., 1999) and adopting a critical race approach to explore how race influences educational equity (Shimomura, 2013). As schools become more racially isolated, some districts have implemented race-conscious student assignment policies to mitigate segregation, though these face legal challenges (Welner, 2006). Ultimately, diversity in K-12 education aims to prepare students for a multicultural world while addressing longstanding inequalities in the education system.

Multicultural education is a critical approach to addressing diversity in schools and preparing teachers to work with culturally diverse students (Alismail, 2016; Bennett, 2006). It aims to promote academic excellence, equity, and democratic values in an increasingly interconnected world (Banks, 2015; Banks, 2011). However, implementing multicultural education can be challenging, with some practices inadvertently sustaining or exacerbating problems (Ngo, 2010). Effective strategies include developing culturally responsive teaching practices, fostering positive interracial contact, and creating a multicultural curriculum (Bennett, 2006; Acosta et al., 2015). Interventions like diversity dinner dialogues can help educators develop multicultural competence, though they may initially decrease multicultural attitudes as participants engage in racial identity development processes (Merlin-Knoblich &

Dameron, 2021). Ultimately, multicultural education seeks to bridge differences, foster unity in diversity, and prepare students for a pluralistic world (Tulungagung, 2020; Banks, 2011).

Intercultural education has emerged as a critical approach to address cultural diversity in educational settings (Olivencia, 2011; Zembylas, 2023). It aims to promote dialogue, understanding, and respect among individuals from different cultural backgrounds (Rapanta & Trovão, 2021). The concept has evolved from multiculturalism to a more dynamic and inclusive model that recognizes the fluid nature of cultural identities (Otten, 2003; Olivencia, 2012). Intercultural education emphasizes positive interactions between cultures, equality of opportunities, and the rejection of discrimination (Cárdenas-Rodríguez & Terrón-Caro, 2021). It challenges traditional views of cultural diversity and encourages the integration of differences into all aspects of education (Fleuri, 2003). In higher education, various models have been proposed to nurture cultural diversity, including intercultural, multicultural, and anti-racist approaches (Guo & Jamal, 2007). Implementing intercultural education requires a shift in pedagogical practices and institutional policies to create inclusive learning environments that value and leverage cultural diversity (Zembylas, 2023; Otten, 2003).

This collection of papers explores antiracist and diversity education across various contexts. Critical Race Theory emerges as a foundational framework for understanding racism in educational spaces (Sandiford, 2024; Gillborn, 2006). Several authors emphasize the need for racial literacy and antiracist pedagogy in curricula, from K-12 to higher education (Adhikari-Sacré & Rutten, 2021; Ash et al., 2020). The gap between antiracist theory and practice is highlighted, with calls for improved teacher education and professional development (Sandiford, 2024; Solomon & Levine-Rasky, 1996). The papers also discuss the limitations of traditional diversity initiatives and the importance of addressing systemic inequities (Ash et al., 2020; Chisholm & McKinney, 2006). Comparative studies reveal varying approaches to multicultural and antiracist education across different countries (Lund, 2006). Overall, these works advocate for transformative educational practices that challenge existing power structures and promote social justice (Thompson, 1997; Gillborn, 2006).

8.4 European policies on equity, diversity, and inclusion (EDI) in education.

European policies on equity, diversity, and inclusion (EDI) in education emphasize the importance of creating inclusive systems that provide equal opportunities for all students, regardless of their background (Galindo & Rodríguez, 2015; Hippe et al., 2016). Research highlights the need for tailored approaches, as one-size-fits-all policies are ineffective in addressing diverse learner needs (Hippe et al., 2016). Early childhood education and teacher quality are crucial for achieving equity (Hippe et al., 2016). Higher education institutions are implementing EDI strategies to facilitate the transition from education to work (Siri et al., 2022). Active learning and autobiographical methods have shown promise in promoting self-awareness and empowerment among students (Aleandri & Fiorentini, 2022). The European Commission emphasizes both competitiveness and social cohesion in education systems (Demeuse & Baye, n.d.). Recent research also highlights the importance of involving all stakeholders in EDI development and considering culture, language, and location in creating open educational resources (Iniesto & Bossu, 2023).
European policy on diversity in education has become increasingly important, with EU institutions playing a key role despite the principle of subsidiarity (Faas et al., 2014; Hadjisoteriou et al., 2015). The EU emphasizes cultural diversity, inclusion, and anti-discrimination in its education policies and programs, such as Erasmus+ (Volkan Çatir, 2023). However, approaches to diversity vary across European countries, reflecting different historical and social contexts (Brooks, 2020). The Council of Europe has also addressed

religious diversity in education, particularly following the events of 9/11 (Jackson, 2009). Integration of migrant students and fostering social cohesion are major focuses of European-level policies (Faas et al., 2014). The EU promotes intercultural education philosophies and aims to tackle educational attainment gaps through soft-law tools like the Open Method of Coordination (Hadjisoteriou et al., 2015). Overall, managing cultural diversity has become a central concern for European states, with education playing a crucial role in this process (Fuentes, 2016; Mitsilegas, 2007).

Intercultural education has become increasingly important in Europe due to growing cultural diversity from migration (Hadjisoteriou et al., 2015; Faas et al., 2014). The EU has taken an active role in shaping intercultural education policies across member states, despite the principle of subsidiarity (Hadjisoteriou et al., 2015; Sikorskaya, 2017).
The principle of subsidiarity advocates for decision-making at the lowest effective level, promoting decentralization and local autonomy (Melé, 2004; Kotalik, 2010). Rooted in Catholic social teaching, it emphasizes human dignity, solidarity, and the common good (Evans, 2013). Subsidiarity is a fundamental principle in European Union law, influencing governance and power allocation (Simon, 2024; Watrin, 2003). It has been applied to various fields, including bioethics, public health, and organizational management (Kotalik, 2010; Melé, 2004). The principle is also relevant to constitutional structures, as seen in New Zealand's Treaty of Waitangi and historical constitution acts (Gussen, 2014). Some scholars argue that subsidiarity embodies economic efficiency, influencing EU case law and policy-making (Portuese, 2010). Despite its importance, the principle's legal and political valence has been debated (Schütze, 2009). Overall, subsidiarity remains a multifaceted concept with applications in politics, economics, and social organization.
Eu policies aim to promote social cohesion, address educational inequalities, and foster respect for cultural differences (Catarci, 2014; Papaioannou, 2022). However, challenges remain, including structural segregation of immigrant students and a gap between progressive principles and assimilationist practices (Catarci, 2014; Frangoudaki & Dragonas, 2019). Scholars argue that intercultural education is the most appropriate response to globalization and interdependence (Portera, 2008), emphasizing dynamic interaction among cultures rather than mere coexistence (Rocha-trindade et al., 2019). Despite progress, there is a need to overcome Eurocentric perspectives and develop more effective strategies for implementing intercultural education across European education systems (Catarci, 2014; Sikorskaya, 2017). Several studies emphasize the importance of inclusive education practices, addressing the needs of diverse student populations, including Muslim minorities in Greece (Magos, 2007) and immigrant students across Europe (Catarci, 2014). The research reveals challenges such as structural segregation and inequalities between immigrant and native students (Catarci, 2014). Some papers present best practices, like workshops developed by the Muslim Minority Education Project in Greece (Magos, 2007) and the ETUCE study on embracing diversity in education (Danau, 2023). However, a gap between intercultural principles and assimilationist practices is noted (Catarci, 2014). The studies also stress the need for teacher training in intercultural education (Magos, 2007; Danau, 2023) and the importance of overcoming Eurocentric perspectives in education systems (Catarci, 2014). Additionally, the changing landscape of international educational exchange is highlighted (Bennett, 2009).

9. The Pedagogical Framework

9.1The Key Features of Interactive Video Conferencing

The proposed pedagogical framework (Anastasiades, 2003, 2006, 2008, 2010, 2015) is the result of systematic efforts and evaluation of fifteen years of experience in primary schools in Greece and Cyprus utilizing modern transmission learning technologies and especially Interactive Video Conferencing.
Interactive Videoconferencing (IVC) allows learners and trainers located in two or more remote locations, not only to communicate by exchanging views or sharing data, but to actively participate in a dynamic interactive environment, the main feature of which is the collaborative building of knowledge from a distance in real time (Anastasiades, 2008) (Figure 20).

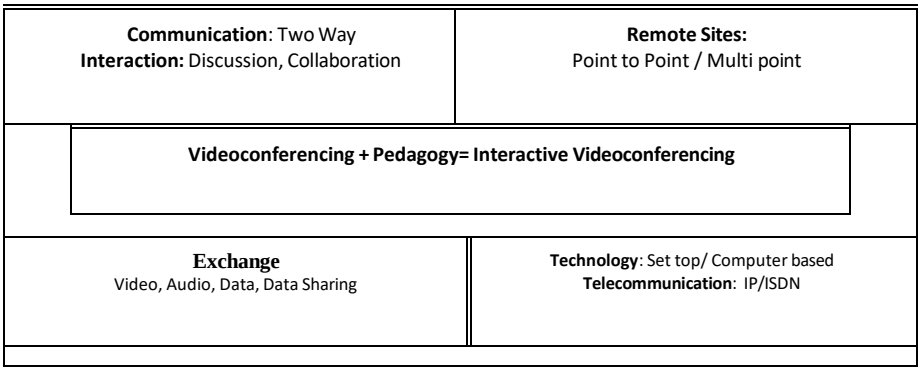


Figure 20: The key features of Interactive Video Conferencing (Anastasiades, 2008)

9.2 The Pillars of the Pedagogical Framework

The proposed Pedagogical Model is based on the following pillars (Anastasiades, 2003, 2006, 2008, 2010):
A. Interdisciplinary Approach to Knowledge
The emergence of the cross curricular thematic approach from contemporary pedagogical theories is the result of the transition from the philosophical framework of determinism, Cartesian perception of things and technological determinism to the current era of interpretative schemes, interdisciplinary approach, morphological psychology and social transformation (Matsagouras, 2002).
According to the interdisciplinary approach, scientific knowledge in the form of issues, issues and problems is the means in the effort of the individual to understand both himself and the reality that surrounds him with the aim of personal development and social integration through the acquisition of knowledge, perceptions and attitudes (Beane, 1997)
B. Knowledge building theories
The implementation of cross-curricular approaches should be accompanied by the design of a non-linear model of teaching system development, focusing on experiential, holistic and collective approaches. Based on this approach, it is proposed to utilize the theories of

constructivism, situated learning and learning communities. The theory of constructivism can serve interdisciplinary didactic approaches for two main reasons (Matsagouras, 2002: 37):

1. According to the principles of constructivism, learning should take place in authentic situations and thus be linked to the personal interests of the learners, a practice favored by the interdisciplinary approach.
2. The constructivist approach considers that knowledge is built on the basis of integration, i.e. the integration of new information into pre-existing mental schemas and that learning is promoted through the correlations of parts and holistic views of wholes.

The theory of situated learning argues that learning is realized through the participation of learners in "communities of practice" or else
"learning communities" and is the result of combining the activity, context environment and culture in which it takes place (Lave, 1997; Lave & Chaiklin, 1993; Wenger, 1999; Wenger & Snyder, 2000).

The development of social and cognitive skills can be cultivated through the approach of cognitive apprenticeship (Brown, Collins and Duguid, 1989), which focuses on cooperative social interaction, the connection of knowledge and action and the social construction of knowledge through the involvement of the trainee in authentic situations.

Γ. Μέθοδος Project

The Project method encourages the creation of dynamic environments that support collaborative learning through research-discovery learning, and the engagement of the learner in authentic situations, prioritizing the development of the student's personality, agency and critical thinking, based on a holistic approach to knowledge (Maxim,1999; Knoll, 1997). Planned collective action within cross-curricular approaches can be supported by the project teaching method (work plan or action plan) (Matsagouras, 2002; Kanakis, 2001).

D. The basic principles of the DL

The proposed approach adopts the framework of principles of the American Distance Education Consortium (ADEC, 1999; 2003) which are summarized as follows: 1. We should define precisely the goals and objectives of the teaching approach which should be open, flexible, student-centered and self-regulating. 2. The learner should be involved in authentic real-life situations. 3. We should use a variety of technological means and teaching methods in order to take into account the learner's particular learning styles Axis

9.3 The methodological framework for implementation

According to the development phases of the proposed pedagogical approach (Anastasiades, 2003; 2006; 2008, 2010) and for the needs of this thesis, we will focus on the design phase of the methodological framework and especially on the phases of designing the teaching stages, defining the communication model, designing the architectural location of the classroom and shaping polymorphic educational material.

9.3.1 Design of Stages of Methodological Approach (The Pyramid of Interactive Video Conferencing)

Based on the proposed methodological approach (Anastasiades, 2003; 2006; 2008; 2010?), four main steps are proposed (Figure 3):

First stage (1st teleconference): Introductory Activities

Aim: The first acquaintance of students of remote classes and the highlighting of the central theme through specially designed activities that cultivate the development of linguistic, kinesthetic and musical intelligence of students.

The objectives of the 1st teleconference are:

1. teachers and students to become familiar with the new learning and teaching environment,
-students of remote classes to get to know each other through the presentation of their place, their school and their class.
2. After the end of the presentations, students of remote classes are encouraged to have a dialogue with each other on topics that piqued their interest.
3. The students, with the help of their teachers, discuss and choose a topic that really interests them and involves them in authentic situations. This topic will be addressed in the next teleconferences.
A formative assessment follows.

Important note: Based on the methodological framework, before the first teleconference, teachers and students work in their local classes, for about a month, in order to prepare their presentations based on the above objectives.
Especially:
1. Students work in groups (my place, my school, my class) and depending on their topic they look for evidence either online, in printed sources, or through fieldwork.
2. With the guidance of their teachers, the students in their groups collect the data, evaluate the most important ones that they will include in their presentations and finally decide the type of presentation that each group will make, e.g. power point, video creation, photo collage, interviews, theatrical play, music, dance, singing, painting, constructions, etc.
3. The students in their groups complete their presentation and make the necessary test presentations, discuss with each other ideas and suggestions for possible improvements, etc.

Second stage (2nd video conference): virtual (potential) class.
Aim: The collaborative exploration of the topic, and the emergence of sub-units through specially designed interdisciplinary activities aiming at engaging students in authentic learning situations, creating situations of cognitive conflict and reflection. Teachers provide appropriate support and feedback in the form of cognitive apprenticeship and scaffolding.

The objectives of the 2nd Teleconference are:
1. The students, with the support of their teachers, attempt a first investigation of the topic utilizing pre-existing knowledge.
2. With the help of structured activities (designed jointly by teachers of remote classes) students explore and discover the structural elements of the topic (combination of free and guided exploration).
3. This is followed by a dialogue (combination of free and directed) in which teachers ask students to analyze and relate the data of the topic.
4. Teachers encourage students to engage and explore problematic situations through which the subunits will arise.
5. Each subunit will be assigned for detailed investigation to a group of students (from the local and remote classroom).
A formative assessment follows.

Important note: Based on the methodological framework, before the 2nd teleconference, teachers and students work in their local classes, for about a month, in order to prepare the required actions based on the above objectives.
Especially:
6. Remote classroom teachers collaborate to create joint activities both before and during the 2nd video conference.

7. Pupils and teachers have about a month to make an initial investigation of the issue in their local classes.

- The pupils of their local classes search in their groups for information either from the internet or from other sources, discuss with each other and formulate their first conclusions.

Third Stage: (3rd Video Conference): Remote team collaboration

Purpose: The collaboration of local and remote groups (intergroup collaboration) in order to exchange some first thoughts on how they think to work within the subunits they have undertaken.

The objectives of the 3rd teleconference

Students in local and remote classroom groups collaborate via video conferencing in order to

1. co-formulate the topics they will develop within the framework of the common subunit they have undertaken.
2. exchange some first thoughts about the way they think about working.
3. agree on a common timetable. A formative assessment follows.

Important note: Based on the methodological framework, before the 3rd teleconference, teachers and students work in their local classes, for about a month, in order to prepare the required actions based on the above objectives.

Especially:

Based on the subsections that emerged in the 2nd teleconference, students in their local classes are divided into groups (intragroup collaboration) and:

4. explore the relevant topics of the sub-module they undertook
5. They come up with the way they will work
6. and co-decide the type of presentation they will make (script creation, animation, comics, collaborative fairy tale, events, etc.).

Stage Four (4th Teleconference): Interactive presentation of the results

7. argumentation:

Purpose:

Students present their collaborative creations to significant others. This is followed by a dialogue and argumentation on the issue.

In the fourth stage, the last teleconference is implemented, during which students present the results of their work, trying to substantiate their positions with arguments in an interactive - interactive environment of collaborative knowledge building.

This is followed by a formative and Concluding Assessment

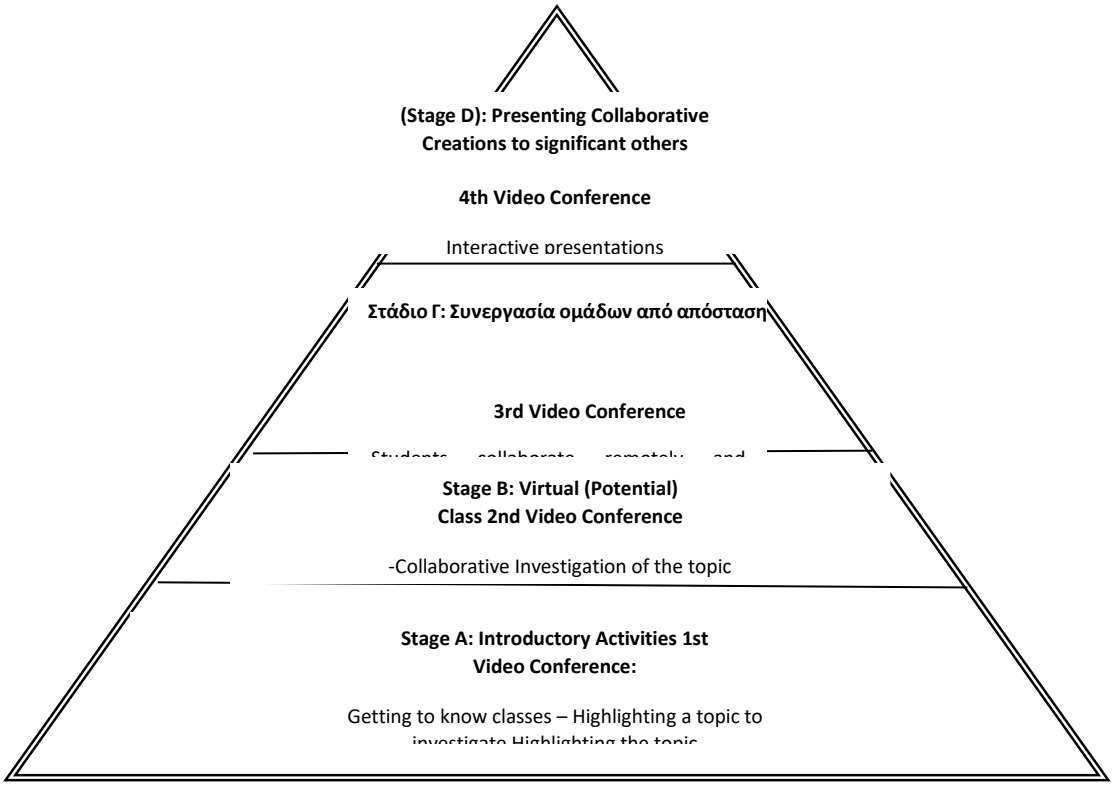


Figure 21: The Stages of Teaching (The Pyramid of Education) (Anastasiades, 2003; 2006; 2008, 2010,2015)

9.3.2 Communication Model Design

Depending on the topic chosen, the initial goals set and the technological capabilities of the schools involved, the communication model (Figure 22) within which the educational teleconferences are implemented is determined.

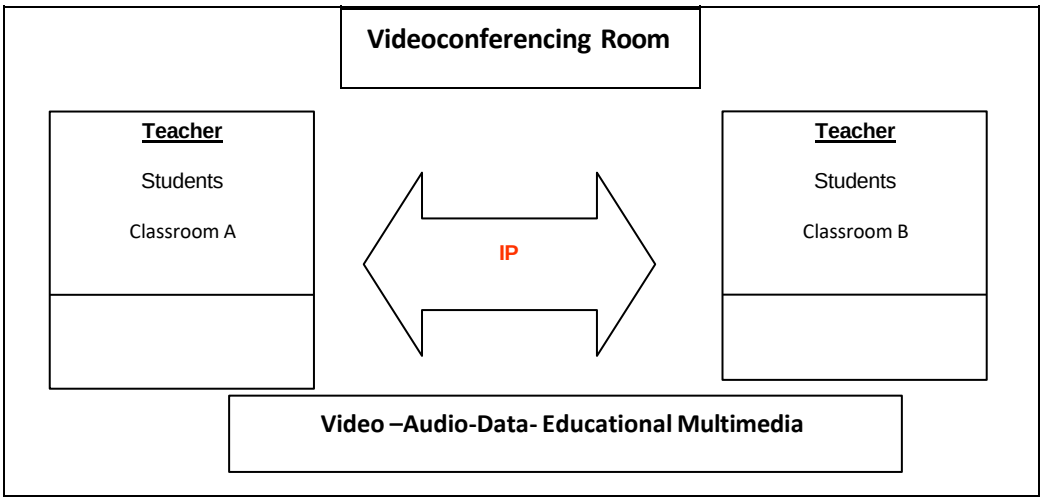


Figure22: The proposed communication model (Anastasiades, 2003; 2008, 2010, 2015)

The communication model defines the following (Anastasiades, 2003, 2008, 2010):

1. The number of classes taking part per videoconference: Teleconferences are proposed to take place in two classes for both pedagogical and practical reasons 2. The role of teachers in each classroom: The role

of teachers is coordinating, advisory and supportive in the discovery, exploratory effort of students to build knowledge collaboratively. In each class there is one teacher 3. The role of students: Students are at the center of the learning process, planning, exploring, discovering and building their knowledge by implementing their activities in groups. 4. The type of communicative connection. From 2000 to 2004 the realization of teleconferences supported by ISDN connections. From 2004 onwards the transition to IP connections gradually began. 5. The type of video conferencing systems: from 2000-2007 the implementation of video conferencing required expensive hardware-focused equipment. Since 2010, video conferencing is based on web based applications with significant cost reduction and excellent quality in audio and video.

9.3.3 The Design of the Architectural Location of the Classroom

The location of the classroom (Figure 23) is a very important parameter for the success of a video conference. The proposed framework is an improvement on a previous effort (Anastasiades, 2003) and takes into account the fact that the videoconference room is located inside the school.

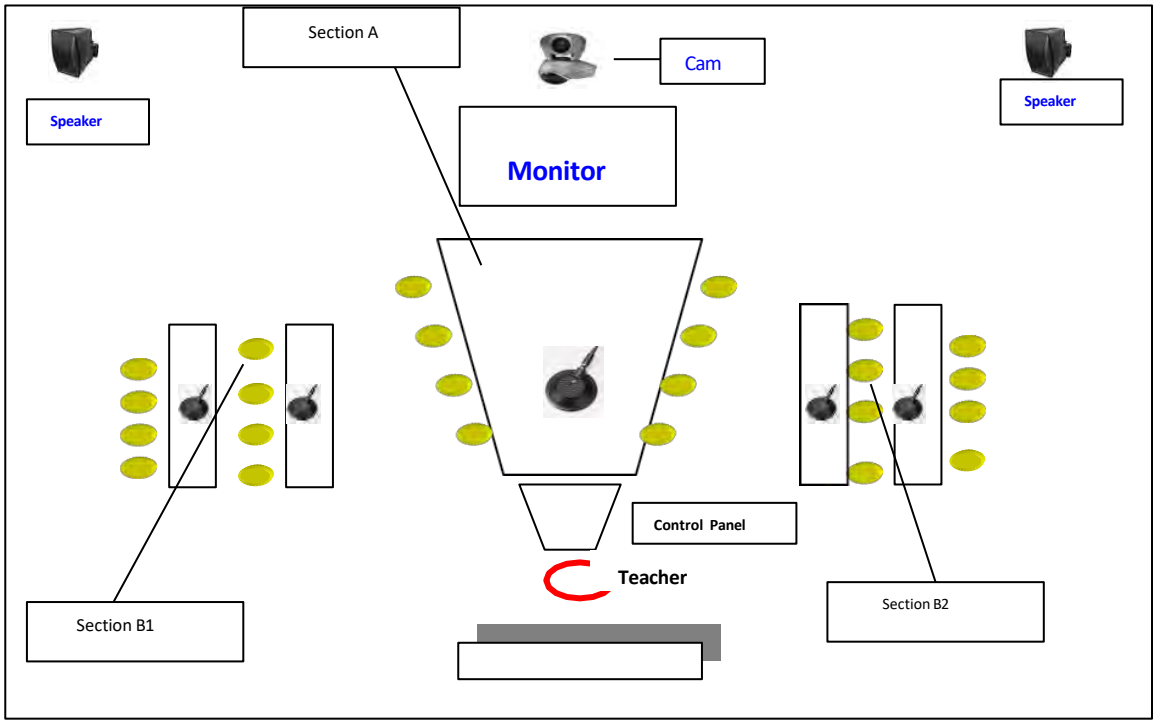


Figure 23: The architecture of the conference room (Anastasiades, 2003; 2008, 2010, 2015)

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11-39). Springer-Verlag.

Alajmi, M. (2009) History of Architecture in Kuwait: The Evolution of Kuwaiti Traditional Architecture Prior to the Discovery of Oil. Unpublished Ph.D. Thesis, University of Nebraska, Nebraska.

Alexander, W., Higgison, C., & Mogey, N. (Eds.). (1999). Videoconferencing in teaching and learning: Case studies. LTDI and TALiSMAN, *Institute of Computer-Based Learning.* Heriot-Watt University Edinburgh*, SCT*. Retrieved June, 4, 2004, from www.icbl.hw.ac.uk/ltdi

Allen, M. W. (2006). *Michael Allen's guide to e-learning: Building interactive, fun, and effective learning programs for any company*. Wiley.

Ally, M. (2008). Foundations of educational theory for online learning. In T. Anderson (Ed.), *The theory and practice of online learning* (2nd ed., pp. 15–44). Athabasca University Press. http://www.aupress.ca/index.php/books/120146

Ally, M. (2011). *Foundations of educational theory for online learning*. In T. Anderson (Ed.), *The theory and practice of online learning* (2nd ed., pp. 15-44). Athabasca University Press.

Ally, M. (2019). Competency Profile of the Digital and Online Teacher in Future Education. *International Review of Research in Open and Distributed Learning*, *20*(2). https://doi.org/10.19173/irrodl.v20i2.4206

Alman, S. W., & West, R. E. (2022). *Designing effective digital learning environments*. Routledge.

Alonso, F., López, G., Manrique, D., & Viñes, J. M. (2005). An instructional model for web-based e-learning education with a blended learning process approach. *British Journal of Educational Technology*, 36(2), 217-235.

American Distance Education Consortium [ADEC]. (2003). ADEC guiding principles for distance teaching and learning. Retrieved July 20, 2014 from http://www.adec.edu/admin/papers/distance-teaching_principles.html

Anastasiades P. (2016). ICT and Collaborative Creativity in Modern School towards Knowledge Society. In Anastasiades P, Zaranis N (Editors). Research on e-Learning and ICT in Education. Springer.

Anastasiades, P. (2003a). Distance Learning in Elementary Schools in Cyprus: The evaluation Methodology and Results ». Computers & Education, volume. 40, no. 1, pp. 17-40(24). Elsevier Science. (January 2003)

Anastasiades, P. (2003b). Building up a pedagogical model for synchronous distance learning courses. In J. A. Chambers (Ed.), Selected Papers Publication from the 14th International Conference on College Teaching and Learning. Jacksonville, FL: Florida Community College at Jacksonville. (April 2003)

Anastasiades, P. (2009). Interactive Videoconferencing and Collaborative Distance Learning for K-12 Students and Teachers: Theory and Practice. NY: Nova Science Publishers, Inc ISBN: 978- 1-60692-185-2.

Anastasiades, P. (2010). K-12 Educational Videoconferencing Applications in Greece and Cyprus. NOVA. In A.Rayler (Ed), Videoconferencing: Technology, Impact and Applications. NY: Nova Science Publishers, IncIDEA ISBN: ISBN: 978-1-61668-285-9

Anastasiades, P. S., & Kotsidis, K. (2013). The Challenges of Web 2.0 for Education in Greece: A Review of the Literature. International Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 8(4), 19-33.

Anastasiades, P., Christou, C., Hambiaouris, C., Georgiou, S., Papadopoulou, E., & Papachristou, K. (2003). Teaching Mathematics through Collaboration at a Distance between two Elementary Schools in Cyprus. Proceedings of the Sixth International Conference on Computer Based Learning in Science (CBLIS). July 5 – 10 2003, University of Cyprus, Nicosia, Cyprus.

Anastasiades, P., Constantinou, C. P., Sevastidou, A., Eleutheriou, A., Philipidou, Ch., Hristophoridis,

Anastasiades, P., Eleutheriou, A. & Hambiaouris, K. (2001). The new hybrid school environment: Experiences from the pilot use of communications and IT technologies by pupils of two primary schools in Cyprus. Proceedings of the first International Organization for Science and Technology Education (IOSTE), on Science and Technology Education, Vol I, (pp.315- 323), 29 April-2 May 2001. Paralimni, Cyprus. ISBN 9963-8519-1-6.

Anastasiades, P., Eleutheriou, A., & Xambiaouris, K. (2001). Implementing the first pilot program of DistanceLearning between two elementary schools in Cyprus: workout of the teaching methodology. Proceedings of the 8th International Literacy & Education Research Network Conference on Learning.

Anderson, L. W. and Krathwohl, D. R., et al (Eds.) (2001) A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon.

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., ... & Wittrock, M. C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives, abridged edition. *White Plains, NY: Longman*.

Anderson, T. (2001). The hidden curriculum in distance education: An updated view. *The International Review of Research in Open and Distributed Learning, 2*(1), 1-9. https://doi.org/10.19173/irrodl.v2i1.16

Anderson, T. (2003a). Getting the mix right again: An updated and theoretical rationale for interaction. *The International Review of Research in Open and Distributed Learning, 4*(2), 9-14.

Anderson, T. (2003b). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore & W. G. Anderson (Eds.), *Handbook of distance education* (pp. 129-144). Lawrence Erlbaum Associates.

Anderson, T. (2011). *The theory and practice of online learning* (2nd ed., pp. 15-44). Athabasca University Press

Anderson, T., & Garrison, D. R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), *Distance learners in higher education: Institutional responses for quality outcomes* (pp. 97-112). Atwood Publishing.

Anderson, T., & Rivera-Vargas, P. (2020). A critical look at educational technology from a distance education perspective. *Digital Education Review, 37*, 208–229.

Anderson, T., Rourke, L., Garrison, R.D. & Archer, W. (2001). Assessing Teaching Presence in a Computer Conferencing Context. Journal of Asynchronous Learning Networks, 5(2).

Andreoli, P., Smith, J., & Brown, L. (2017). Applying instructional design principles to online learning. *Journal of Online Learning Research, 3*(2), 123-145.

Anohina, A. (2005). Analysis of the terminology used in the field of virtual learning. *Educational Technology & Society, 8*(3), 91-102.

Anonson, J. M., & Walker, M. E. (2013). The effectiveness of multimedia learning tools in nursing education. *Journal of Nursing Education, 52*(6), 345-350. https://doi.org/10.3928/01484834-20130521-04

Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-learning theoretical framework. *Journal of Educational Technology & Society, 19*(1), 292-307.

Arbaugh, J. B. (2007). An empirical verification of the Community of Inquiry framework. Journal of Asynchronous Learning Networks, 11, 73–85.

Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages, and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning, 12*(1), 29–42.

Arshavskiy, M. (2017). *Instructional design for eLearning: Essential guide to creating successful eLearning courses*. CreateSpace Independent Publishing Platform.

Ashokan, V. (2023). Empowering Diversity: Innovative Practices and Strategies in Inclusive Education. *Humanities*, *11*(S1), 129-34.

Ball, S. J. (2008). The Education Debate: Policy and Politics in the Twenty-First Century London: Policy Press.

Bandura, A. (1977). *Social learning theory*. Prentice-Hall.

Barbour, M. K. (2021). The evolution of online and distance education in the United States. *Journal of Online Learning Research, 7*(1), 1-20.

Barker, R. G. (1968). *Ecological psychology: Concepts and methods for studying the environment of human behavior*. Stanford University Press.

Baron, G. L., Bruillard, É., & Pair, C. (1996). L'informatique et ses usagers dans l'éducation. Presses universitaires de France.

Bateman, D.F., & Bateman, C.F. (2002). What Does a Principal Need To Know about Inclusion? ERIC Digest.

Bates, A.W. (2005). *Technology, e-Learning and distance education* (2nd ed.). London: RoutledgeFalmer.

Benali, M., & Ally, M. (2020). Towards a Conceptual Framework Highlighting Mobile Learning Challenges. *Int. J. Mob. Blended Learn., 12*, 51-63.

Bermejo, S. (2005). Cooperative electronic learning in virtual laboratories through forums. *IEEE Transactions on Education*, 48(1), 140-149.

Bloom B. S. (1956). Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain. New York: David McKay Co Inc

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals* (1st ed.). Longman Group.

Branch, R. M., & Kopcha, T. J. (2014). Instructional design models. In M. Spector, D. Merrill, J. Elen, & M. Bishop (Eds.), *Handbook of research on educational communications and technology* (4th ed., pp. 77-87). Springer.

Brand, J. L. (2013). Cognition of Creativity. In *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship* (pp. 229-235). Springer New York.

Brandtzæg, P. B., Heim, J., & Karahasanović, A. (2011). Understanding the new digital divide—A typology of Internet users in Europe. *International journal of human-computer studies*, *69*(3), 123-138.

Brouwer, J., Jansen, E., Flache, A., & Hofman, A. (2022). The role of social networks in students' learning experiences and academic performance in higher education: A systematic review. *Educational Research Review, 35*, Article 100433.

Brucker, P.O. (1994). The Advantages of Inclusion for Students with Learning Disabilities. *Journal of Learning Disabilities, 27*, 581 - 582.

Bruner, J. (1962), On Knowing: Essays for the left hand.Cambridge, MA: Harvard Press.

Bruner, J. S. (1961). *The act of discovery*. Harvard Educational Review, 31(1), 21-32.

Bruner, J. S. (1996). *The culture of education.* Harvard University Press.

Bush, L., & Hall, J. (2011, March). Transforming teaching with technology: Using Web 2.0 tools to enhance on-line communication, collaboration, and creativity. In *Society for Information Technology & Teacher Education International Conference* (Vol. 2011, No. 1, pp. 3887-3890).

Cachia, R., Ferrari, A., Ala-Mutka, K., & Punie, Y. (2010). *Creative learning and innovative teaching: Final Report on the Study on Creativity and Innovation in Education in EU Member States* (No. JRC62370). Institute for Prospective and Technological Studies, Joint Research Centre.

Carliner, S. (2004). An Overview of Online Learning (2nd ed.). *European Business Review*. 16. 10.1108/09555340410561723.

Carswell, A. D., & Venkatesh, V. (2002). Learner outcomes in an asynchronous distance education environment. International Journal of Human-Computer Studies, 56(5), 475-494.

Chandler, G., & Hanrahan, P.. (2000). Teaching using interactive video: creating connections. *Journal of Nursing Education* 39 , pp. 73–80.

Chen, B., Lei, Q., & Cheng, G. (2019). Exploring the relationship between teaching presence and learning outcomes in online learning environments. *Educational Technology Research and Development, 67*(4), 839-857. https://doi.org/10.1007/s11423-019-09692-2

Chen, M., Yu, S., & Feng, C.K. (2017). A dynamic ubiquitous learning resource model with context and its effects on ubiquitous learning. *Interactive Learning Environments, 25*, 127 - 141.

Clark, R. (1983). Reconsidering research on learning from media. Review of Educational Research, 53(4), 445–459.

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Wiley.

Clark, R. E. (1994). Media will never influence learning. *Educational Technology Research and Development*, 42, 21-29.

Cohen, L., & Manion, L. (1994). Μεθοδολογία Εκπαιδευτικής Έρευνας, μτφρ. Χρυσούλα Μητσοπούλου,& Μάνια Φιλοπούλου. Αθήνα: Μεταίχμιο

Coleman, J. S. (1990). *Foundations of social theory*. Harvard University Press.

Collis, B., & Margaryan, A. (2005). Multiple perspectives on blended learning design. *Journal of Learning Design, 1*(1), 12-20. https://doi.org/10.5204/jld.v1i1.3

Commission of the European Communities (2008). *Improving competences for the 21st Century: An Agenda for European Cooperation on Schools*. Brussels.

Commonwealth of Learning. (2020). *An introduction to distance education and e-learning*. Retrieved from https://www.col.org

Cooper, A., & Scriven, R. (2017). The community of inquiry framework: A systematic review of the literature. *Journal of Asynchronous Learning Networks, 21*(3), 1-19.

Craft, A. (2005). Creativity in schools: tensions and dilemmas. London; New York:Routledge.

Craft, A. (2008). Studying collaborative creativity: Implications for education. Thinking Skills and Creativity, 33, 241–245.

Craft, A. (2010). *Creativity and Education Futures: Learning in a Digital Age.* Trentham Books Ltd

Csiksentmihalyi, M. (1990). *Flow: The psychology of optimal experience* New York: Harper and Row.

Csiksentmihalyi, M. (1997).*Finding Flow:* T*he psychology of engagement with everyday life* . New York: Basic Books.

Csiksentmihalyi, M . (1996). *Creativity* . New York: HarperCollins

Curry, D., Johnson, M., & Peacock, S. (2020). Gagné's nine events of instruction: Enhancing online learning. *Journal of Educational Technology Development and Exchange, 13*(1), 45-60. https://doi.org/10.18785/jetde.1301.04

Dabbagh, N., & Bannan-Ritland, B. (2005). *Online learning: Concepts, strategies, and applications*. Pearson Education.

Daskolia, M., Lambropoulos, N., & Kampylis, P. (2009, June). Advancing collaborative creativity in the context of Greek teachers' in-service training in environmental education. In *Proceedings of the 9th international conference on Computer supported collaborative learning-Volume 2* (pp. 85-87). International Society of the Learning Sciences.

Daud, M. Y., & Zakaria, E. (2012). Web 2.0 application to cultivate creativity in ICT literacy. *Procedia-Social and Behavioral Sciences*, *59*, 459-466.

Davis, G. A. & Rimm, S. B.(1998). *Education of the gifted and talented* (4th ed). Englewood Cliffs, N. J.: Prentice Hall.

Davis, G. A. (1992).*Creativity is forever* (3rd ed.). Dubuque, IA: Kendall/Hunt.

DCMS. (2001a). Culture and Creativity – The Next Ten Year. London: DCMS.

De Bono, E. (1967), New think: The use of lateral thinking in the generation of new ideas, New York: Basic Book.

De Bono, E. (1973). *CoRT Thinking*. Elmsford, NY: Pergamon.

De Laat, M. & Lally, V. (2004). Creativity and the Net: How do researchers collaborate creatively using the Internet? In D. Miell & K. Littleton (Eds.), Collaborative creativity: Contemporary perspectives (pp. 126-143). London: Free Association Books.

Debattista, M. (2018). A comprehensive rubric for instructional design in e-learning. *International Journal of Information and Learning Technology*, 35, 93-104. 10.1108/IJILT-09-2017-0092.

Driscoll, M. and Carliner, S. (2005). *Advanced Web-Based Training Strategies. Blended Learning as a Curriculum Design Strategy*. ASTD Press, New York.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2013). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255-284.

Finke, R. A., Ward, T. B., & Smith, S. M. (1992). Creative cognition : theory, research, and applications. Cambridge, Mass. ; London: MIT Press

Fraser, A. (2007). *Creativity and innovation in education: Moving beyond best practice.*

Friesen, N. (2009). *Re-thinking e-learning research: Foundations, methods, and practices*. Peter Lang Publishing.

Gardner, H. (1983). Frames of Mind: A Theory of Multiple Intelligences. New York: Basic Books.

Gardner, H. (1993). *Multiple intelligences*. New York: Basic Books.

Garrison, D. R. (1997). Computer conferencing: The post-industrial age of distance education. *Open Learning: The Journal of Open, Distance and e-Learning, 12*(2), 3–11. https://doi.org/10.1080/0268051970120202

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*(1), 61-72.

Garrison, D. R. (2011). *E-Learning in the 21st Century: A Framework for Research and Practice*. Taylor & Francis.

Garrison, D. R., & Anderson, T. (2003). E-Learning in the 21st century: A framework for research and practice. London: Routledge/Falmer.

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. The Internet and Higher Education, 2(2-3), 87–105.

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. *The Internet and Higher Education, 13*(1-2), 5-9. https://doi.org/10.1016/j.iheduc.2009.10.003

Garrison, R., Anderson, T., & Archer, W. (2000). Critical thinking in a text-based environment: Computer conferencing in higher education. The Internet and Higher Education, 2(2-3), 87- 105.

Getzels, J. W. & Jackson, P. W. (1962), Creativity and Intelligence: Explorations With gigted students, Wiley.

Ghislandi, P. (2012). adAstra: A rubrics' set for quality eLearning design. In P. Ghislandi (Ed.), eLearning: Theories, Design, Software and Applications (pp. 91-106). Rijeka: InTech - Open Access Publisher

Giannakos, M. N., Mikalef, P., & Pappas, I. O. (2022). Systematic literature review of e-learning capabilities to enhance organizational learning. *Information Systems Frontiers, 24*(3), 619–635. https://doi.org/10.1007/s10796-020-10011-y

Glasersfeld, E. von. (1995). *Radical constructivism: A way of knowing and learning*. Falmer Press.

Goodyear, P. (2002). Psychological foundations for networked learning. In C. Steeples & C. Jones (Eds.), *Networked learning: Perspectives and issues* (pp. 49-75). Springer.

Gowda, S., & Suma, V. (2017). Implementing Gagné's nine events in e-learning environments. *International Journal of Advanced Research in Computer Science, 8*(5), 1234-1240. https://doi.org/10.26483/ijarcs.v8i5.1234

Graham, C. R., Henrie, C. R., & Gibbons, A. S. (2013). Developing models and theory for blended learning research. In A. G. Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspectives, volume 2* (pp. 13-33). Routledge.

Greer, D. L., Crutchfield, S. A., & Woods, K. L. (2013). Cognitive theory of multimedia learning, instructional design principles, and students with learning disabilities in computer-based and online learning environments. *Journal of Education, 193*(2), 41-50. https://doi.org/10.1177/002205741319300205

Greer, K., Crutchfield, J., & Woods, A. (2013). Designing for deep learning in online courses. *Journal of Online Learning and Teaching, 9*(4), 515-527.

Guri-Rosenblit, S. (2005). 'Distance education' and 'e-learning': Not the same thing. *Higher Education, 49*(4), 467-493.

Harasim, L. (2017). *Learning theory and online technologies* (2nd ed.). Routledge.

Hernández-Torrano, D., & Ibrayeva, L. (2020). Creativity and education: A bibliometric mapping of the research literature (1975–2019). *Thinking Skills and Creativity*.

Huang, R., Spector, J. M., & Yang, J. (2019). *Educational technology: A primer for the 21st century*. Singapore: Springer.

In Networked learning: Perspectives and issues (pp. 323-341). Springer London.

Janelli, M. (2018). E-Learning in Theory, Practice, and Research. *Educational Studies*, 81-98.

Jardinez, M. J., & Natividad, L. R. (2024). The Advantages and Challenges of Inclusive Education: Striving for Equity in the Classroom. *Shanlax International Journal of Education*, *12*(2), 57-65.

Jeffrey, R., & Craft, A. (2001). The Universalization of creativity.

Jonassen, D. H. (2001). How can we learn best from multiple representations? *The American Journal of Psychology, 114*(2), 321–327.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development, 47*(1), 61-79. https://doi.org/10.1007/BF02299477

Jones, S. G. (2001). *Virtual culture: Identity and communication in cybersociety*. Sage Publications.

Kaplan, D. (2019). Creativity in Education: Teaching for Creativity Development. *Psychology*.

Kaptelinin, V., & Nardi, B. (2006). *Acting with technology: Activity theory and interaction design*. MIT Press.

Karthik, M., Kumar, S., & Raj, R. (2019). Enhancing e-learning effectiveness using Merrill's first principles of instruction. *Journal of Educational Technology Systems, 48*(1), 5-23. https://doi.org/10.1177/0047239519874012

Kentnor, H. E. (2015). Distance education and the evolution of online learning in the United States. *Curriculum and Teaching Dialogue, 17*(1-2), 21-34.

Kim, J., Chang, Y., Chong, A. Y. L., & Park, M.-C. (2020). Perceived Use Context Measure. *PsycTESTS*. https://doi.org/10.1037/t78583-000

Koohang, A. & Harman, K. (2005) Open Source: A Metaphor for E-Learning. *Informing Science: International Journal of an Emerging Transdiscipline*, 8, 75-86.

Kozma, R. B. (1994). Will media influence learning? Reframing the debate. *Educational Technology Research and Development, 42*(2), 7–19

Krämer, B. J., Bente, G., & Eschenburg, F. (2015). The impact of multimedia on learning outcomes in higher education. *Journal of Educational Multimedia and Hypermedia, 24*(2), 123-145.

Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, m-learning, and d-learning: Conceptual definitions and comparative analysis. *E-Learning and Digital Media, 15*(4), 191–216. https://doi.org/10.1177/2042753018785180

Kurth, J., & Foley, J. A. (2014). Reframing teacher education: Preparing teachers for inclusive education. *Inclusion*, *2*(4), 286-300.

Lam, S. S. K., Schaubroeck, J., & Brown, A. D. (2004). Esteem maintenance among groups: Laboratory and field studies of group performance cognitions. *Organizational Behavior and Human Decision Processes, 94*(2), 86-101. https://doi.org/10.1016/j.obhdp.2004.03.004

Lapre, M. A., Mukherjee, A. S., & Van Wassenhove, L. N. (2000). Behind the learning curve: Linking learning activities to waste reduction. *Management Science, 46*(5), 597-611. https://doi.org/10.1287/mnsc.46.5.597.12047

Laurillard, D. (1993). Rethinking University Teaching: A framework for the effective useof educational technology. London: Routledge.

Laurillard, D. (2002). Rethinking university teaching in a digital age.

Lave, J. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Leontjev, A. N. (1983). *Activity, consciousness, and personality*. Prentice-Hall.

Levy, J. (2006). Therapist skills: A cognitive model of their acquisition and refinement. *Behavioural and Cognitive Psychotherapy, 34*(1), 57-78. https://doi.org/10.1017/S1352465805002420

Levy, P. E. (2008). Development of a model of the feedback process within executive coaching. *Consulting Psychology Journal: Practice and Research, 60*(1), 42-56. https://doi.org/10.1037/1065-9293.60.1.42

Li, C. (2018). The impact of online learning on student performance: A meta-analysis. *Educational Research Review, 24*, 1-10. https://doi.org/10.1016/j.edurev.2018.01.001

Li, F. W. B., Lau, R. W. H., & Dharmendran, P. (2009). A three-tier profiling framework for adaptive e-learning. In *Proceedings of the 17th International Conference on Computers in Education* (pp. 403-410). Asia-Pacific Society for Computers in Education.

Lionarakis, A. (2008). The theory of distance education and its complexity. European Journal of Open, Distance and E-Learning, I. Retrieved on 27 July, 2020 from: http://www.eurodl.org/materials/contrib/2008/Lionarakis.pdf

Lionarakis, A. (2001). *Open and distance education: Theory and practice*. Propobos.

Livingston, L.M. (2010). Teaching Creativity in Higher Education. *Arts Education Policy Review, 111*, 59 - 62.

Lou, J. & Xu, Q. (2022). The development of positive education combined with online learning: Based on theories and practices. *Front. Psychol*. 13:952784. doi: 10.3389/fpsyg.2022.952784

Ludwig-Hardman, S., & Dunlap, J. C. (2003). Learner support services for online students: Scaffolding for success. *International Review of Research in Open and Distributed Learning, 4*(1), 1-15. https://doi.org/10.19173/irrodl.v4i1.131

M. & Ahileos, M. (2003). Development Of Children's Investigative Skills Through Collaboration At A Distance Between Two Elementary Schools In Cyprus. Proceedings of Sixth International Conference On Computer Based Learning in Science (CBLIS). July 5 – 10 2003, University of Cyprus, Nicosia, Cyprus.

Martin, F., Sun, T., & Westine, C. D. (2020). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers & Education, 159*, Article ID 104009.

Mason, R., & Rennie, F. (2006). *E-learning: The key concepts*. Routledge.

Mayer, R. E. (2001). *Multimedia learning.* Cambridge University Press.

Mayer, R. E. (2002). Multimedia Learning. In Psychology of Learning and Motivation (Vol. 41, pp. 85-139). Academic Press.

Mayes, T., & de Freitas, S. (2004). Review of E-Learning Theories, Frameworks and Models (43 p). London: Joint Information Systems Committee.

McDonald, J., & West, R. E. (2020). *Designing effective digital learning environments*. Routledge.

Merchant, G., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education, 70*, 29-40.

Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development, 50*(3), 43-59.

Merrill, M. D. (2018). Using a task-centered instructional strategy to design effective e-learning. *Educational Technology Research and Development, 66*(4), 883-901. https://doi.org/10.1007/s11423-018-9579-4

Merrill, M. D., Tennyson, R. D., & Posey, L. O. (1992). *Concept teaching: An instructional design guide* (2nd ed.). Educational Technology.

Molenda, M., Pershing, J. A., & Reigeluth, C. M. (1996). Designing instructional systems. In R. L. Craig (Ed.), *The ASTD training and development handbook* (4th ed., pp. 266-293). McGraw-Hill.

Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *Internet and Higher Education, 14*(2), 129-135. https://doi.org/10.1016/j.iheduc.2010.10.001

Morgan, A. (1995). *Improving your students' learning: Reflections on the experience of study*. Kogan Page.

Morten, T., Mukherjee, A., & Van Wassenhove, L. N. (2002). Behind the learning curve: Linking learning activities to waste reduction. *Management Science, 46*(5), 597-611. https://doi.org/10.1287/mnsc.46.5.597.12047

Mphahlele, M. L., & Makokotlela, M. V. (2020). Open learning and distance education: A review of the literature. *International Journal of Educational Technology in Higher Education, 17*(1), 1-15. https://doi.org/10.1186/s41239-020-00212-3

Nardi, B. A. (1992). *Context and consciousness: Activity theory and human-computer interaction*. MIT Press.

Nardi, B. A. (1996). *Context and consciousness: Activity theory and human-computer interaction*. Cambridge, MA: MIT Press.

Nichols Hess, A. K., & Greer, K. (2016). Designing for engagement: Using the ADDIE model to integrate high-impact practices into an online information literacy course. *Communications in Information Literacy, 10*(2), 264-282. https://doi.org/10.15760/comminfolit.2016.10.2.27

Nilholm, C. (2021). Research about inclusive education in 2020–How can we improve our theories in order to change practice?. *European Journal of Special Needs Education*, *36*(3), 358-370.

Nilholm, C., & Göransson, K. (2017). What is meant by inclusion? An analysis of European and North American journal articles with high impact. *European Journal of Special Needs Education, 32*, 437 - 451.

Opoku, M. P., Cuskelly, M., Pedersen, S. J., & Rayner, C. S. (2021). Applying the theory of planned behaviour in assessments of teachers' intentions towards practicing inclusive education: A scoping review. *European Journal of Special Needs Education*, *36*(4), 577-592.

Palloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace: Effective strategies for the online classroom*. Jossey-Bass.

Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. New York: Basic Books.

Pappas, C. (2017). *The ultimate guide to e-learning design*. eLearning Industry.

Peters, J. (1999). What is Inclusion. *The Review: A Journal of Undergraduate Student Research, 2*, 15-21.

Piaget, J. (1976). *The grasp of consciousness: Action and concept in the young child* (S. Wedgwood, Trans.). Harvard University Press.

Picciano, A. (2002). Beyond Student Perceptions: Issues of Interaction, Presence, and Performance in an Online Course. *JALN*, 6, 10.24059/olj.v6i1.1870

Picciano, A. G. (2001). *Distance learning: Making connections across virtual space and time*. Prentice Hall.

Picciano, A. G. (2017). Theories and frameworks for online education: Seeking an integrated model. In A. G. Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspectives, volume 2* (pp. 13-33). Routledge.

Race, P. (1992). *Making Learning Happen,* SAGE Publications Ltd.

Ravenscroft, A. (2003). From conditioning to learning communities: Implications of fifty years of research in e-learning interaction design. *British Journal of Educational Technology, 34*(4), 469-487. https://doi.org/10.1111/1467-8535.00343

Raveti, S. (2021). Applying Laurillard's conversational framework to online learning environments. *Journal of Online Learning Research, 7*(3), 45-60.

Roca, J. C., & Gagné, M. (2008). Understanding e-learning continuance intention in the workplace: A self-determination theory perspective. *Computers in Human Behavior, 24*(4), 1585-1604. https://doi.org/10.1016/j.chb.2007.06.001

Rodrigo, M. M. T., Iniesto, F., & García-Serrano, A. (2020). A systematic review of the use of learning analytics in higher education. *British Journal of Educational Technology, 51*(4), 1075-1093.

Rodriguez, M. C., Ooms, A., & Montañez, M. (2019). Students' perceptions of online-learning quality given comfort, motivation, satisfaction, and experience. *Journal of Interactive Online Learning, 7*(2), 105-125.

Rogers, C. R. (1969). *Freedom to learn*. Merrill.

Rogers, Y. (1997). A brief introduction to distributed cognition. In G. Costabile & S. Levialdi (Eds.), *Proceedings of the International Workshop on Co-operative Buildings* (pp. 1-6). Springer-Verlag.

Rosbottom, J. (2001). Hybrid learning—a safe route into web-based open and distance learning for the ComputerScience teacher. Sigcse Bulletin, 33(3), 89–92.

Rose M. Padugar, A., E. Gloria, R., & Eva E. Diongco, M. (2022). E-Learning Materials in Earth and Life Science for Struggling Learners. *International Journal of Research Publications*.1,

Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. The Internet and Higher Education, 5(4), 319-332.

Rowntree, D. (1990) Teaching through self-instruction: How to develop open learning materials (Rev.ed.). Nichols Publishing, New York.

Rowntree, D. (1992). Exploring Open and Distance Learning.

Rowntree, D. (1994). Preparing materials for open, distance and flexible learning : an action guide for teachers and trainers.

Saba, F. (2011). Distance Education in the United States: Past, Present Future. *Educational Technology, 51*(6), 11-18

Sangrà, A., Vlachopoulos, D., & Cabrera, N. (2012). Building an inclusive definition of e-learning: An approach to the conceptual framework. *International Review of Research in Open and Distributed Learning, 13*(2), 145-159.

Sathish, M., & Nethravathi, P. (2022). The impact of Laurillard's conversational framework on e-learning design. *Journal of Educational Technology Systems, 51*(2), 123-140. https://doi.org/10.1177/00472395211012345

Shaheen, R. (2010). Creativity and Education. *Creative Education, 01*, 166-169.

Siemens, G. (2004). Connectivism: A Learning Theory for the Digital Age. *International Journal of Instructional Technology and Distance Learning, 2*.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. International *Journal of Instructional Technology & Distance Learning*, 2, 3-10.

Siemens, G. (2008). Learning and knowing in networks: Changing roles for educators and designers. Paper 105: University of Georgia IT

Singh, J. K. N. (2021). Academic resilience among international students: Lived experiences of postgraduate international students in Malaysia. *Asia Pacific Education Review, 22*(1), 129-138. https://doi.org/10.1007/s12564-020-09657-7

Skinner, B. F. (1963). Operant behavior. *American Psychologist, 18*(8), 503-515. https://doi.org/10.1037/h0045185

Smith, P. L., & Ragan, T. J. (2005). *Instructional design* (3rd ed.). Wiley.

Steeples, C., Jones, C., & Goodyear, P. (2002). Beyond e-learning: A future for networked learning.

Stipanovic, N., & Pergantis, S. (2018). Inclusive Education for International Students: Applications of a Constructivist Framework. *The International Education Journal: Comparative Perspectives, 17*, 37-50.

Strauss, A. & Corbin, J. (1990). Basics of Quality Research: Grounded Theory, procedure and Techniques. Newbury Park, CA: Sage Publications

Su, B. (2021). The role of multimedia in enhancing learning outcomes in online education. *Journal of Educational Technology Systems, 49*(3), 321-340. https://doi.org/10.1177/00472395211012345

Sudatha, I. G. W., Pudjawan, K., & Simamora, A. H. (2021). The impact of multimedia learning on students' cognitive load and learning outcomes. *Journal of Educational Technology Development and Exchange, 14*(1), 1-15. https://doi.org/10.18785/jetde.1401.01

Susnea, I., Pecheanu, E., Tudorie, C., & Cocu, A. (2014). The education for creativity - the only student's t ool for coping with the uncertainties of the future.

Susnea, I., Pecheanu, E., Tudorie, C., & Cocu, A. (2014). The education for creativity - the only student's t ool for coping with the uncertainties of the future.

Swan, K. & Shih, L. F. (2005). On the nature and development of social presence in online course discussions. Journal of Asynchronous Learning Networks 9(3), 115-136.

Swan, K., Garrison, D. R., & Richardson, J. C. (2009). A constructivist approach to online learning: The community of inquiry framework. In C. R. Payne (Ed.), *Information technology and constructivism in higher education: Progressive learning frameworks* (pp. 43-57). IGI Global.

Swan, K., Shen, J., & Hiltz, S. R. (2006). Assessment and collaboration in online learning. *Journal of Asynchronous Learning Networks, 10*(1), 45-62.

Swartz, E. (2009). Diversity: Gatekeeping knowledge and maintaining inequalities. *Review of Educational Research*, *79*(2), 1044-1083.

Thompkins, R., & Deloney, P. (1995). Inclusion: The Pros and Cons.

Tsai, C. C., & Machado, P. (2002). E-learning, online learning, web-based learning, or distance learning: Unveiling the ambiguity in current terminology. *eLearn Magazine, 2002*(7).

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wagner, E. D. (1998). Interaction strategies for online training designs. *Educational Technology, 38*(3), 29-34.

Watson, J. B. (1976). *Behaviorism* (Rev. ed.). Norton.

Wegerif, R. (1998). The social dimension of asynchronous learning networks. Journal of asynchronous learning networks, 2(1), 34-49.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

West, R. E. & Allman, B. (2022). Designing Technology-Enhanced Learning Experiences. In G. Mora, R. Wadham, B. Sandberg, K. Dinsmoor, E. Measom, I. Munoz, K. Jackson, & R. Kimmons (Eds.), *Light + Learning*. EdTech Books.

Wilson, A. (2012) Categorizing E-learning. *Journal of Open, Flexible and Distance Learning*, 16, 156-165. https://www.learntechlib.org/p/147979/

Yan, Z., & Sin, K. F. (2014). Inclusive education: teachers' intentions and behaviour analysed from the viewpoint of the theory of planned behaviour. *International journal of inclusive education*, *18*(1), 72-85.

Yeh, Y. C., & Tseng, H. W. (2019). The impact of the ADDIE instructional design model on the learning outcomes of e-learning. *Journal of Educational Technology Development and Exchange, 12*(1), 1-15.

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 25*(1), 3-17.