

Chapter 1

The Dialogue Between Emerging Pedagogies and Emerging Technologies

Begoña Gros

Abstract This chapter discusses the mutual influence of emerging technologies and emergent pedagogies. The potential of one specific technology or application has to be analysed in a particular scenario. We maintain that the dialogue between technology and pedagogy is absolutely necessary because there is a constant influence between them. The difference is that as technology becomes more invisible, pedagogy needs to make its practices visible offering practices that take into account the fundamental needs of modern society. This chapter is divided into three sections. Firstly, we will describe the main educational challenges of the networked knowledge society. Secondly, we will centre on the main directions and theories that support emergent pedagogies. Finally, we will conclude this chapter with an analysis of the implications and relationship between emerging pedagogies and emergent technologies.

Keywords Emerging pedagogies · Emergent technologies · Learning design · Network learning theories

1.1 Introduction

It is a fact that ICT is affecting what, how, where and when people learn. The ubiquity of technology provides new opportunities to fulfil individual learning needs. The standardization of traditional teaching and learning systems does not respond to the demands of the globalized world. Formal education should provide

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more flexible learning systems to accommodate the different needs and demands of students. A holistic change is urgently required to implement a fundamental shift in the learning paradigm for the twenty-first century. The potential of ICT for promoting learning opportunities depends on the skills used to design learning activities that align pedagogy and technology for the benefit of learners.

In 1980, Robert Taylor, an early pioneer in the field of educational technology, considered that there were three different ways to use computers in schools (Taylor 1980): (1) as a tutor in which the computer presents some subject material, the student responds and the computer evaluates the response; (2) as a tool in which the computer provides some functionality that facilitates the task for the students, for instance, the use of a word-processor; and (3) as a tutee in which the computer is “taught” something by being programmed by the learner. These types of uses have remained unchanged over the past decades in most pedagogical proposals. However, in all of them, technology is something external, an instrument to support different activities. Technology is either a replacement or a substitute for an already existing function. As a consequence, technology can be introduced using the same teaching methods. Moreover, there is an empirical determinism in how to evaluate the role of new technologies in education. This determinism is a result of simplistic notions of technology as a vehicle for efficiency. Much of the research on the use of ICT in education takes a rather naïve view based on the idea that technology transforms educational practice. What is clear is that no technology has an impact on learning in its own right; rather, its impact depends upon the way in which it is used.

In this chapter, we will sustain that emergent technologies and emergent pedagogies are interdependent. Technology is not something external; it is the context in which learning takes place. The Internet and digital media are the main infrastructures of the knowledge society. Learning is located in the connections and interactions between learners, teachers and resources. Consequently, technology does not determine the nature of its implementation, but rather evolves in accordance with evolving practice. The potential of one specific technology or application has to be analysed in a particular scenario. Therefore, we hold that the dialogue between technology and pedagogy is absolutely necessary because there is a constant influence between them. The difference is that as technology becomes more invisible, pedagogy needs to make its practices visible and to design practices that take into account that a fundamental shift is needed towards a “more personalized, social, open, dynamic, emergent and knowledge-pull model for learning, as opposed to the one-size-fits-all, centralized, static, top-down, and knowledge-push models of traditional learning solutions” (Chatti et al. 2010a: 67).

This chapter is divided into three sections. Firstly, we will describe the main educational challenges of the networked knowledge society. Secondly, we will centre on the main directions and theories that support emergent pedagogies. Finally, we will conclude this chapter with an analysis of the implications and relationship between emerging pedagogies and emergent technologies.

1.2 The Future of Learning

An important number of prospective studies have been published in recent years on future educational trends, taking into account technological issues as well as educational changes (Facer and Sandford 2010; Facer 2011; Fullan and Langworthy 2014; Mayes et al. 2009; Redecker et al. 2011; Sharples et al. 2012, 2013; Sinay and Yashkina 2012; Stoyanov et al. 2010). The main goal of these reports is to provide input for educators and to support new policies in education. It is important to stress that many of these studies coincide in pointing out similar directions, trends and challenges.

In 2002, The New Media Consortium (NMC) launched its Horizon Project, which is designed to help educators and leaders by providing them with expert research and analysis on emerging technologies for teaching, learning, research and information management.¹ All the reports have a similar structure; there is a description of six emerging technologies distributed over three periods of time: one year or less, two to three years, and four to five years. These reports have continued to be published annually and have diversified geographically, gaining extensive dissemination.

Analysing the evolution of the estimated impact of emerging technologies in the last five years (2010–2014), we have observed some patterns among the technologies present during this period which we have grouped in five trends (Table 1.1):

1. Mobile technologies. In 2010, mobile referred mainly to the portability of the device, but the concept evolved to include other importance aspects such as a permanent connection, and the availability of multiple applications designed to support learning.
2. Learning analytics. Within this trend, there are various tools and techniques for collecting, analysing and displaying data related to participation, performance and student progress.
3. Games and Gamification. Game-based learning appears in all the latest reports and in 2014 gamification appears, that is, the use of game mechanics in non-game contexts in order to engage students.
4. Hybridization is composed of several technologies that have the interconnection and integration of the physical and digital worlds in common: augmented reality (2010, 2011), the Internet of things (2012), *wearable-technology* devices (2013), and the *quantified self* (2014).
5. Natural interaction with devices. Systems to interact with devices through facial expressions, gestures or voice recognition.

Ng'ambi (2013) points out that although these reports are useful, they do not provide an answer to questions of whether the predicted adoption over time will be different for educators and students, or what institutional conditions and pedagogical needs will accelerate the adoption of the technologies, nor do they provide a

¹The first NMC Horizon Report was published in 2004.

Table 1.1 Trends in the implementation of emerging technologies in relation to their impact on higher education between 2010 and 2014

Emergent Technologies					
	2010	2011	2012	2013	2014
<i>Short term</i>	Mobile computing	Mobile devices	Mobile Applications	MOOCs	Flipped Classroom
	Open content	e-books	Tablets	Tablets	Learning analytics
<i>Medium term</i>	e-books	Game based learning	Game based learning	Gamification	Gamification
	Augmented reality	Augmented reality	Learning analytics	Learning analytics	3D-Printing
<i>Long term</i>	Visual data analysis	Learning analytics	Internet of things	Wearable technology	Quantified self
	Gesture-based computing	Gesture-based computing	Gesture-based computing	3D-Printing	Virtual assistants

Source Mas (2014)

model of use to transform practice. In similar direction, Veletsianos (2010) considers that emergent technologies are context-specific, what is emerging in one context or geographical location may not be emerging in another. “Employing emerging technologies to further educational goals may necessitate the development of different theories, pedagogies, and approaches to teaching, learning, assessment, and organization. If we employ emerging technologies in our work, we should also be prepared to experiment with different lenses through which to view the world and with different ways to explore such ideas and practices as knowledge, scholarship, collaboration, and even education” (Veletsianos 2010: 18).

Besides the analysis of emergent technologies, most of the reports analyse the evolution of society and the main educational trends. In the research entitled *The Future of Learning: New Ways to Learn New Skills for Future Jobs*, which has been published in different reports (Ala-Mutka et al. 2010; Stoyanov et al. 2010; Redecker et al. 2011), participants from the main stakeholders (policy makers, scientists, educators and learners) were asked to generate ideas about the future of education by reacting to the trigger statement: “One specific change in Education in 20 years will be that...” The resulting ideas were then sorted into groups according to similarity in meaning and rated on two scales: importance and feasibility. Multidimensional scaling and hierarchical cluster analysis were applied to depict

Table 1.2 Description of the clusters (Stoyanov et al. 2010)

Technology applied to education	Integration of various technologies (mobile devices, augmented reality, wearable technology, etc.). Or technology in general, educational activity
Tools and services to enhance learning	The role of technological tools (tools, resources, services, etc.) as facilitators of learning, includes social media and learning in online communities
Education and open educational resources	Open and universal access to education and knowledge as OER (Open Educational Resources), digital content for everyone (digital library services, universal access to the Internet, etc.). New forms of accessing training and educational content (recordings of lectures, online courses, e-portfolios, social networking, social bookmarking, etc.)
Education focused on driving individual and professional needs	Self-directed learning, personalization, adaptation and development of curricular itineraries according to individual needs and professional and employment needs, etc.
Teacher's role	Evolution of the role of the teacher to become the guide, facilitator and mediator of learning; the teacher as a learner
Learning throughout life	Access to training and learning through various deals and arrangements and in various contexts, including the concept of learning throughout life (integration of learning into everyday life, instead of work and through communities)
Moving towards the formal and informal	Increasing the role of informal learning in the training of individuals, emergence of new contexts and situations beyond classroom training and the limits of the traditional training scheme and interdisciplinary learning
Individual and social nature of learning	Caring for cognitive and social learning refers to flexibility in the application of different learning styles, empowerment strategies and skills related to learning capacity, and active learning based on the practice and forms of social and collaborative learning
Ontological and epistemological foundations of teaching methods	Theoretical foundations of learning methodologies, including, among others, gamification, the application of constructivist principles, and curricular design and interdisciplinary crossover, empirical and theoretical foundations of emerging pedagogies

emerging structure in the data. The result is a set of 12 thematic clusters, which summarize what experts consider, will be the main changes to education and training over the next 10–20 years (Table 1.2).

One of the most important findings is the central role of the lifelong learning cluster, indicating its vital role for the future of learning. This cluster is a nexus for all the others, suggesting that many of the envisaged changes to learning strategies

and pathways are related to the fact that skills and competences will be acquired in a lifelong learning process.

Statements were also rated by importance and feasibility, revealing some of the expected changes as being of particular importance. These include as follows:

- The nature of learning will become more learner-centred, individual and social;
- Personalized and tailor-made learning opportunities will address individual and professional training needs;
- Innovative pedagogical concepts will be developed and implemented in order to address, for example, experiential and immersive learning and social and cognitive processes;
- Formal education institutions will need to flexibly and dynamically react to changes and offer learning opportunities that are integrated into daily life; and
- Education and training must be made available and accessible for all citizens.

When comparing the cluster ratings on importance and feasibility, it becomes clear that while the experts are optimistic about the development of technology-enhanced learning opportunities, they are sceptical about the feasibility of implementing learner-centred approaches in formal education and, in general, the ability of formal education systems and institutions to keep pace with change and become more flexible and dynamic.

In a similar direction, Sinay and Yashkina (2012) released a new framework to enhance the development of twenty-first-century competencies. The framework underpins the holistic education notion that schools must better prepare students to thrive in a fast-changing and highly connected world. It is based on the premise that the use of technology to enhance learning provides a constructivist perspective through social interaction based on experiences, active participation and the use of complex environments. Four basic elements focus the training strategies: personalization, active learning, collaborative learning and self-directed learning.

The overall vision is that personalization, collaboration and informal learning will be at the core of learning. The central learning paradigm is thus characterized by lifelong and life-wide learning and shaped by the ubiquity of technology. With the emergence of lifelong and life-wide learning as the central learning paradigm for the future, learning strategies and pedagogical approaches will undergo drastic changes. With the evolution of ICT, personalized learning and individual mentoring will become a reality and teachers/trainers will need to be trained to exploit the available resources and tools to support tailor-made learning pathways and experiences which are motivating and engaging, but also efficient, relevant and challenging. Along with changing pedagogies, assessment strategies and curricula will also need to change (Fullan and Langworthy 2013).

As we have mentioned, there are many coincidences in the descriptions of future changes in education. Chatti et al. (2010a: 66–67) summarized very well when they said that the consequences of improving the use of technology include a new vision for learning. “Learning is fundamentally personal, social, distributed, ubiquitous, flexible, dynamic and complex in nature. Thus, a fundamental shift is needed toward a more personalized, social, open, dynamic, emergent and knowledge-pull

model for learning, as opposed to the one-size-fits-all, centralized, static, top-down, and knowledge-push models of traditional learning solution.” While these are desirable educational outcomes, the realization requires new learning designs based on the new pedagogical approaches, which is not an easy task. In fact, important investments have been made based on the assumption that technology-mediated learning environments provide better opportunities for students to achieve competencies that are relevant in society. However, the history of the use of technology in education suggests that integration is hampered by many different problems. Educational practices reveal organizational difficulties in incorporating digital technologies, but above all, there is an incorporation of digital technologies from a traditional perspective, technologies are used as vehicle and not as a medium for transforming educational practices. The integration of technologies is based on the low-level use, mainly for drilling and practice and looking up information.

1.3 Theoretical Foundations of Emerging Pedagogies

We use the term pedagogy, although its meaning is not unique and depends on the academic traditions developed in different countries. The European view of pedagogy brings together within one concept the act of teaching and the body of knowledge. In typical pedagogical studies, pedagogy encompasses a general vision of culture and society together with elements relating to children and their learning—psychology, child development and, as a third group of knowledge, what Alexander (2004: 10) describes as “aspects relating to the subjects to be taught” regarding content knowledge such as mathematics and languages. In Asia, pedagogy is also a general term for educational studies, including fields such as history of education, philosophy of education, school education, adult education, etc. According to Abiko (2011: 358), “if we need to discuss ‘pedagogy’ in Japan, we do this as problems or issues of curriculum and instruction, didactics or teaching methods, school or classroom management and assessment.” In the English-speaking world, pedagogy and education refer to the whole context of instruction and the actual operations involved therein. In summary, the word pedagogy expresses the relationship between teaching and learning and does not treat teaching as something that can be considered separately from an understanding of how learners learn.

Professional competencies encompass multiple pedagogical components including content knowledge, pedagogical knowledge, and more recently, technological knowledge and the knowledge generated within the intersections of these components (Mishra and Koehler 2006; Shulman 1987). All these approaches are equivalent to what Shulman (1987) calls “pedagogical content,” which in many countries is called didactics. In English, didactics suggest traditional direct instruction. For this reason, in Britain and the USA the term curriculum is more fully developed, partly because both of these countries inherited traditions of curriculum decentralization. In contrast, in many European countries the scope and balance of the school curriculum has long been centrally determined.

We are using the term pedagogy in a similar way to Alexander (2004) who defines pedagogy as the activity of education together with its attendant discourse. It is what one needs to know and the skills one needs to command in order to make and justify the many different kinds of decisions in which education is constituted.

Pedagogy is not only multidimensional, but also a complex evolving phenomenon based on the changing contexts of society. It has to provide a foundation for educators to develop transformative practices and to understand more about the evolving pedagogical contexts, exploring new meaning within the contexts. Currently, evolving pedagogical contexts include the networked knowledge society, the knowledge economy, diversity-oriented democracy and digital literacies. These contexts are generated within the interplay of pedagogical components (e.g. technology, pedagogy and content) and the contexts (e.g. network society), especially with the greater influence of the networked knowledge society and its constitutive elements. According to Gurung (2013, p. 10), “pedagogies become non-static practices requiring new reflections on them on a regular basis. This is why the notion of pedagogies should be framed as ‘emerging pedagogies’ that involve rethinking, transformative practices, and ‘routine’ new reflections entailing conceptual and practical shifts in the existing pedagogy.”

Thus, emergent pedagogy becomes a dynamic phenomenon that provides new scenarios for learning. Much of our understanding of how and why learning happens and the best ways to design effective learning activities are based on the theories about learning. There have been different approaches to explain the learning process (behavioural, cognitivist, sociocultural, sociomaterial, neuroscience, etc.). Each one has allowed new aspects and nuances to be introduced. The problem as Goodyear and Carvalho (2014: 13) point out is that “the new paradigm displaces rather than builds on the old. This has knock-on effects for pedagogy and educational practice.” Anderson (2010a) claims that some theories of learning continue to be useful because emerging technologies are often applied to the same challenges and problems that inspired educators and researchers. However, he establishes an important distinction between pre-net theories and Net-aware theories.

According to Anderson (2010b), pre-net theories were developed in a world in which communication was expensive, geographically restricted and the information and content scarce. In contrast to this situation, Net-aware theories try to understand learning in a connected society with abundant access to information and enormous communications capacity that have created many forms of interaction and collaboration. Some pre-net theories, such as constructivist or sociocultural theories, continue to be useful because emerging technologies are often applied to the same challenges and problems that originally inspired educators and researchers. In addition, some of these theories have evolved by incorporating elements of the Net.

Following Anderson’s (2010a) distinction, we will focus on the analysis of network-centric learning theories that can support emergent pedagogies. We have established a distinction among the theories that try to explain the network as a whole by analysing the interrelation among the different nodes and connections; the theories that are more focused on the social–personal interaction; and the theories focused on the design of the network (Fig. 1.1).

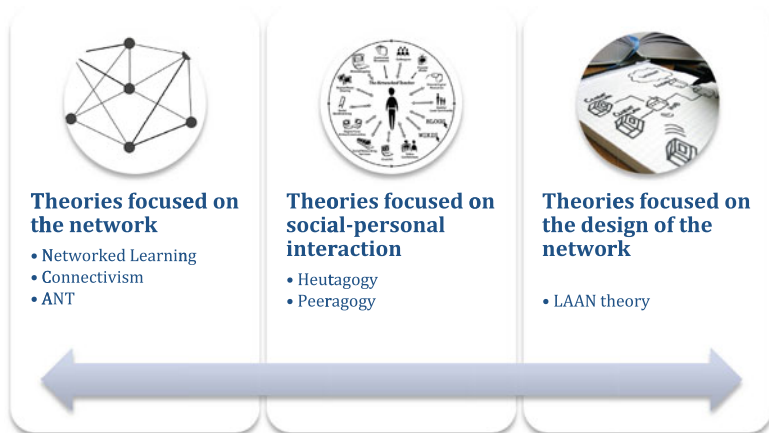


Fig. 1.1 The network learning theories

1.4 Theories Focused on Network Connections

According to Goodyear et al. (2004: 2), “networked learning is learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources.” This definition has had considerable influence, especially in European research where it has been developed in a number of publications and has been associated with the Networked Learning Conference² series since 1998.

The definition of networked learning goes beyond merely denoting “online learning” or “e-learning,” as it encompasses theoretical assumptions about learning and how to design for learning. Although there are particular values and ideals associated with networked learning, as expressed in the networked learning manifesto (Beatty et al. 2010), it does not privilege a particular pedagogical model. However, learning and knowledge construction is located in the connections and interactions between learners, teachers and resources, and seen as emerging from critical dialogue and enquiry. As such, networked learning theory seems to encompass an understanding of learning as a social, relational phenomenon, and a view of knowledge and identity as constructed through interaction and dialogue.

In many ways, connectivism (Siemens 2005, 2006) aligns well with networked learning theory. The concept of network is also prominent; it characterizes knowledge as a flow through a network of humans and non-humans (artefacts). A network comprises connections between entities (nodes), where the nodes can be individuals, groups, systems, fields, ideas, resources or communities. However, the

²<http://www.networkedlearningconference.org.uk/>.

difference is that the starting point of connectivism is the individual. “Personal knowledge is comprised of a network, which feeds into organizations and institutions, which in turn feed back into the network, and then continue to provide learning to individuals. This cycle of knowledge development (personal to network to organization) allows learners to remain current in their field through the connections they have formed.” (Siemens 2005). Along the same lines, Downes (2006) considers that knowledge is not only in the mind of an individual but is also distributed across an information network or multiple individuals.

According to Siemens (2005), knowledge and learning are today defined by connections; “know where” and “know who” are more important today than “know what” and “know how.” Learning resides outside the individual learner and is focused on connecting specialized information sets and the connections that enable us to learn more than our current state of knowing. As Siemens (2006: 29) points out “learning networks can be perceived as structures that we create in order to stay current and continually acquire experience, create, and connect new knowledge (external). And learning networks can be perceived as structures that exist within our minds (internal) in connecting and creating patterns of understanding.”

In summary, the individual’s capacity to filter, find and utilize various networks to retrieve resources and ideas is very important. In this approach, it is not clear what role dialogues, collaboration, social practice or mutual construction of knowledge play or how well connectivism can account for such patterns of learning.

Actor-network theory (ANT) (Latour 1997, 2005) proposes a sociotechnical account that makes no distinction in approach between the social, the natural and the technological. ANT explores the ways that heterogeneous networks of both human and non-human actors are constructed and maintained and focuses on tracing the transformation of these heterogeneous networks. ANT is based on the principle of generalized symmetry, employing a single conceptual framework when interpreting actors, both human and non-human. Latour (1997) writes “an ‘actor’ in ANT is a semiotic definition –an actant–, that is, something that acts or to which activity is granted by others. It implies no special motivation of human individual actors or of humans in general. An actant can literally be anything provided it is granted to be the source of an action.” An actor is also a simplified network. The central concept is the notion of an evolving, dynamic actor-network. It assumes that nothing lies outside the network of relations, and as noted above, suggests that there is no difference in the ability of technology, humans, animals or other non-humans to act.

Latour (2005: 16) claims “it is possible to render social connections traceable” (and that the role of ANT is to trace actor-networks). In complex knowledge systems, however, there is no chance to trace social connections, nor is it possible to follow the actors or their actions. Latour himself acknowledges that following the actors themselves is not an easy task since, as he writes, “the actors to be followed swarm in all directions like a bee’s nest disturbed by a wayward child” (Latour 2005: 121). Thus, there is no means to trace actors’ actions and connections because their actions are uncertain, unexpected and often hidden; their connections are varied, ubiquitous and open. The main problem of this approach is that it

reduces all actors into black boxes and thus ignores internal actions such as reflecting, self-criticizing and detecting/correcting errors.

1.5 Theories Focused on Social–Personal Interaction

The relationship between online and offline social networks and moving from physical communities to virtual networks is complex. Some authors refer to networked individualism. Bennett and Maton (2010) suggest that networked individualism places the focus on the individual who navigates through their own personal networks. In a society in which lifelong learning is basic, self-determined learning is crucial.

Self-determined learning (SDL) is an approach in which learners take control of their own learning processes and experiences. Tan et al. (2011) describe the processes of SDL based on a series of requisites or qualities: (a) ownership of learning; (b) self-management and self-monitoring; and (c) extension of own learning. The authors argue that providing opportunities to establish and control one's own learning objectives, as well as to direct and monitor the associated educational tasks, helps increase the subject's motivation and commitment to learning. Furthermore, they also insist on interaction between the different components.

A form of SDL with practices and principles rooted in andragogy has recently resurfaced as a learning approach after a decade of limited attention. In a heutagogical approach to teaching and learning, learners are highly autonomous and self-determined and emphasis is placed on the development of learner capacity and capability with the goal of producing learners who are well prepared for the complexities of today's workplace.

Hase and Kenyon (2000) define heutagogy as the study of self-determined learning. Heutagogy applies a holistic approach to developing learner capabilities, with learning as an active and proactive process, and learners serving as "the major agent in their own learning, which occurs as a result of personal experiences" (Hase and Kenyon 2007a, b: 112). As in an andragogical approach, in heutagogy the instructor also facilitates the learning process by providing guidance and resources, but fully relinquishes ownership of the learning path and process to the learner, who negotiates learning and determines what will be learned and how it will be learned.

A key concept in heutagogy is that of double-loop learning and self-reflexion. In double-loop learning, learners consider the problem and the resulting action and outcomes in addition to reflecting upon the problem-solving process and how it influences the learner's own beliefs and actions.

The heutagogical approach can be viewed as a progression from pedagogy to andragogy to heutagogy, with learners likewise progressing in maturity and autonomy (Canning 2010). More mature learners require less instructor control and course structure and can be more self-directed in their learning, while less mature learners require more instructor guidance and course scaffolding (Canning and Callan 2010).

Web 2.0 and social media have played an important role in generating new discussions about heutagogy within higher education. Web 2.0 design supports a heutagogical approach by allowing learners to direct and determine their learning path and by enabling them to take an active rather than passive role in their individual learning experiences.

1.6 Theories Focused on the Affordances/Design of the Network

The Learning as a Network (LaaN) theory represents a theoretical framework for PLE-based learning models. The PLE (Personal Learning Environment) is not an application, but rather an emerging concept and a new vision of learning. It represents a significant shift in pedagogic approaches towards constructivist and connectivist learning that puts the learner at the centre and provides more autonomy and control over the learning experience. A PLE is a more natural and learner-centric approach to learning that takes a small piece, loosely joined approach, characterized by the freeform use of a set of learner-controlled tools and the bottom-up creation of knowledge ecologies (Chatti et al. 2007).

LaaN builds upon connectivism, complexity theory and double-loop learning. It views knowledge as a personal network and represents a knowledge ecological approach to learning. LaaN has a number of points in common with other learning and social theories, mainly that knowledge and learning are inherently social. However, its focus on the learner and their personal knowledge network (PKN) is quite different. It implies that a learner needs to be a good knowledge networker as well as a good double-loop learner.

A good knowledge networker is one who can create and maintain an external network to embrace new knowledge nodes, identify connections between different knowledge nodes and locate the knowledge node that can help to achieve better results, in a specific learning context. Furthermore, a good double-loop learner is one who has the ability to detect and correct errors and eventually change his or her theories-in-use according to the new setting.

This approach implies new roles for the learning institution and the teacher. In LaaN, the learning institution needs to act as a hub connecting third parties providing personalized learning experiences for the learners. And, teachers need to step back from their traditional role of instructors and experts. The new role of the teachers is to act as co-learners and facilitators of the learning experience. Their major task is to help learners build their personal knowledge network in an effective and efficient way. According to Chatti (2013), the way to achieve this goal is to provide a freeform and emergent environment conducive to networking, inquiry and trial-and-error; it should be an open environment in which learners can make connections, see patterns, reflect, (self)-criticize, detect and correct errors, inquire, test, challenge and eventually change their theories-in-use.

In summary, the pedagogies underlying twenty-first-century learning need to meet the requirements of contemporary learners. Network-based pedagogies place the emphasis on the design of learning in the offline, online and networked world, which offers greater autonomy and flexibility for learners. In the next section, we will discuss the characteristics of emergent pedagogies.

1.7 Characteristics of Emerging Pedagogies

Veletsianos defines emergent technologies as “tools, concepts, innovations, and advancements utilized in diverse educational settings to serve varied education-related purposes” (2010: 33). This definition supports the mutual relationship between emergent technologies and emergent pedagogies. Employing emerging technologies to further educational goals may necessitate the development of different theories, pedagogies and approaches to teaching, learning, assessment and organization. If we employ emerging technologies in education, we should also be prepared to experiment with different lenses through which to view the world and with different ways to explore such ideas and practices as knowledge, scholarship and collaboration. The implications of emergent pedagogy for emerging technologies in education are twofold: on the one hand, technologies developed for purposes other than education find their way into educational institutions and processes, while on the other, once technologies are integrated into educational practice, they both evolve by practices.

Emerging pedagogies arise within the contexts of the networked knowledge society. They are based on the integrating digital technologies, exploring and modifying existing pedagogies and developing new theoretical and practical proposals. The theoretical foundations described previously support the main principals and approaches of emerging pedagogies. However, it is necessary to integrate pedagogical principles that provide better adjustment to the current needs of learners into educational systems and to evaluate their effectiveness. As all the components of emerging pedagogies including technology, pedagogy, content and society are evolving, educators need to develop adaptive expertise to understand how these components interplay with and influence their own practices. In this regard, the Teaching and Learning Research Programme (TLRP)³ has made a highly relevant contribution by developing an analysis of the evidence-informed principles for pedagogies.

TLRP uses the term *effectiveness* based on the idea that the results of pedagogical practices need to be evaluated by referencing the goals and values of society. According to James and Pollard (2011: 276), “within contemporary

³<http://www.tlrp.org/>.

Western democracies, three major strands of philosophical and political thinking on educational purposes are well established. The first concerns teaching and learning linked to economic productivity –and has taken various forms historically as labour market needs have evolved. The second concerns social cohesion and the inclusion of different groups within society –this remains important within our unequal and diverse communities today. The third concerns personal development, fulfilment and expression –with a contemporary manifestation perhaps in the term ‘wellbeing’. The three are, of course, deeply interconnected. Indeed, the view taken here conceptualizes ‘effectiveness’ as a mutually beneficial synergy among the three.” Along these lines, developing effective pedagogy means establishing the general principles of teaching and, in the light of these, determining what modifications of practice are necessary to meet specific individual needs.

In TLRP, the principles are conceptualized in a way that makes them applicable to all sectors. James and Pollard (2011) consider that it is not justifiable to make unequivocal claims about findings in terms of categorical knowledge or cause–effect relationships. However, it is possible to offer “evidence-informed principles,” which could engage with diverse forms of evidence while calling for the necessary application of contextualized judgement by teachers, practitioners and/or policy makers. Such principles could enable the accumulation and organization of knowledge in realistic and useful practical ways.

Along these lines, we propose ten characteristics to identify emergent pedagogies that we have grouped together based on the four main clusters used by James and Pollard (2008): educational values and purposes; curriculum, pedagogy and assessment; personal and social processes and relationships; and educators, policies and research⁴ (Table 1.3).

1.7.1 Emerging Pedagogies Support Lifelong Learning

Most educational systems are based on the stratified and segmented organization in which there is little connection between sectors, which might be regarded as contributing to the concept of lifelong learning. Emerging pedagogies provide practices to support lifelong learning. Dispositions and capabilities developed during the years of compulsory schooling can be enhanced or undermined by the opportunities and constraints experienced in later life. The curriculum must enable individuals to learn to work effectively within social networks for educational, social and civic purposes, and to develop strategies to establish social networks for their own purposes. According to Facer (2011), such a curriculum might comprise, for example, opportunities for learners to learn and work within meaningful socio-technical networks and not wholly within single educational institutions; to develop

⁴In the last case, the original is ‘teachers and policies’. We have extended the cluster to educators and researchers.

Table 1.3 Principals of effective pedagogy and emerging pedagogies

Clusters	Principals of effective pedagogy	Emerging pedagogies
Educational values	1. Effective pedagogy equips learners for life in its broadest sense	1. Emerging pedagogies support lifelong learning
Curriculum, pedagogy, assessment	2. Effective pedagogy engages with valued forms of knowledge	2. Emerging pedagogies support ecologies of learning
	3. Effective pedagogy recognizes the importance of prior experience and learning	3. Emerging pedagogies use different forms of knowledge
	4. Effective pedagogy requires learning to be scaffolded	4. Emerging pedagogies integrate the use of technology as mindtools
	5. Effective pedagogy needs assessment to be congruent with learning	5. Emerging pedagogies change the traditional role of teachers and learners
Personal and social process	6. Effective pedagogy promotes the active engagement of the learner	6. Emerging pedagogies integrate self-regulation, co-regulation and social share regulation
	7. Effective pedagogy fosters both individual and social processes and outcomes	7. Emerging pedagogies promote deep learning tasks
	8. Effective pedagogy recognizes the significance of informal learning	8. Emerging pedagogies are transparent
Educators, policies frameworks and research	9. Effective pedagogy depends on the learning of all those who support the learning of others	9. Emerging pedagogies are based on socioconstructivist pedagogies
	10. Effective pedagogy demands consistent policy frameworks with support for learning as their primary focus	10. Emerging pedagogies demands new forms of assessment

capacities to manage information and intellectual property, build reputation and trust, develop experience of working remotely; and, to explore the human-machine relationships involved in sociotechnical networks.

1.7.2 Emerging Pedagogies Support Ecologies of Learning

The new ecology of learning makes the assumption that learning is multidirectional and multimodal and learning is understood as part of living in different sociocultural contexts, not as something that takes place exclusively within the confines of formal education. Pedagogy should take account of what learners already know in order for them, and those who support their learning, to plan their next steps. This includes building on prior learning but also taking account of the personal and cultural experiences of different groups of learners.

It is important to work towards the creation of open, flexible and networked relationships across diverse educational institutions, both formal and informal. Such working arrangements would attempt to reduce the barriers to participation across institutions, increase the chances of learners enjoying high-quality educational experiences based on the shared understanding of learners' histories and prior understanding and ensure that education in workplaces and other settings is valued.

1.7.3 Emerging Pedagogies Use Different Forms of Knowledge

Emerging pedagogies are based on the knowledge creation metaphor of learning that highlights competencies in producing knowledge. Emerging pedagogies are “knowledge pull.” “The knowledge-pull approach to learning is based on providing learners with access to a plethora of tacit/explicit knowledge nodes and handing over control to them to select and aggregate the nodes in the way they deem fit, to enrich their personal knowledge networks” (Chatti et al. 2010b: 82). These skills are increasingly related to the use of digital technology which provides a flexible way to support modelling, sketching, testing and social interactions.

1.7.4 Emerging Pedagogies Integrate the Use of Technology as Mindtools

The ubiquity of technology calls for a shift away from “low-level” use of technology such as drilling and practice and looking up information. Rather, emergent pedagogies encourage the “high-level” use of technology, utilizing it as a “mind-tool” or “intellectual partner” for creativity, collaboration and multimedia productivity. Technology must enable and accelerate learning relationships between teachers and students and between students and other “learning partners” such as peers, mentors and others with similar learning interests.

1.7.5 Emerging Pedagogies Change the Traditional Role of Teachers and Learners

In the old pedagogies, a teacher's quality was assessed primarily in terms of their ability to deliver content in their area of specialization. Pedagogical capacity was of secondary importance. In contrast, emergent pedagogies are based on the foundation of teachers' pedagogical capacity—their repertoire of teaching strategies and their ability to form partnerships with students in mastering the process of learning.

Technology in the new model is pervasive, and it is used to discover and master content knowledge and to enable the deep learning goals of creating and using new knowledge in the world. It is necessary to choreograph the elements of the wider educational ecosystem into coherent educational experiences for learners. It requires expert mentors, able to work with students and families to think carefully about possible futures, and to build programmes of education around them.

1.7.6 Emerging Pedagogies Integrate Self-regulation, Co-regulation and Social Share Regulation

The metaphor of the personal learning environment (PLE) is useful for characterizing the need to integrate three types of processes: self-regulation, co-regulation and social share regulation. A PLE is conceptualized using Web 2.0 tools and networked technologies and refers to an individual's own knowledge management tools, services, resources and connections which shape their educational platform to direct learning. Such learning ecologies tend to be more open, personalized and networked. A PLE is, in fact, an approach to learning based on Web 2.0 applications and emerging technologies which has been discussed and studied by many researchers to emphasize the potential of these participatory media and to put more value on learner-controlled learning tools in contrast to institutionalized learning management systems (e.g. Attwell 2007; Chatti et al. 2010b; Downes 2006, 2010).

1.7.7 Emerging Pedagogies Promote Deep Learning Tasks

Deep learning tasks restructure learning activities from a singular focus on content mastery to the explicit development of students' capacities to learn, creates and proactively implement their learning. In their most effective instances, deep learning tasks are guided by clear and appropriately challenging learning goals, which ideally incorporate both curricular content and students' interests or aspirations; include specific and precise success criteria that help both teacher and student know how well the goals are being achieved; and incorporate feedback and formative evaluation cycles into the learning and doing processes, building students' self-confidence and "proactive dispositions."

1.7.8 Emerging Pedagogies Are Transparent

Pedagogy requires making practices visible. Pedagogical reasoning must be as transparent as possible and shared between students, teachers and others involved in students' learning.

Teaching is a design science and the full pedagogic description of an intervention must include the design criteria, the properties of the teaching–learning activities, and the capabilities of the conventional and digital tools and technology being used.

1.7.9 Emerging Pedagogies Are Based on Socioconstructivist Pedagogies

Most instructional elements of new pedagogies are not “new” teaching strategies; although we would say that the active learning partnerships with students are new. Many of the teaching strategies that have been advocated for at least a century by the likes of Dewey, Piaget, Montessori and Vygotsky are beginning to emerge. Previously, the conditions for these ideas to take hold and flourish did not exist. Today, there are signs that this is changing. Crucially, the new ideas, compared to the past ones, potentially have greater precision, specificity, clarity and, above all, greater learning power. We are seeing a form of positive contagion as these powerful teaching strategies begin to take hold in regular schools. They are emerging almost as a natural consequence of student and teacher alienation, on the one hand, and growing digital access, on the other hand. These developments have profound implications for curriculum and learning design and assessment.

Emerging pedagogies are not necessarily new pedagogies. Emerging pedagogies need to explore and re-examine existing pedagogies by looking into their contribution in the contexts of the networked knowledge society.

1.7.10 Emerging Pedagogies Demands New Forms of Assessment

There is a need to move beyond traditional forms of assessment, using new methods to combine different levels. Data from tracking and management of learning activities can inform learning design by providing evidence to support the choice of media and sequence of activities. Such analytical feedback to students can continuous during a course enable learners to focus on areas of weakness.

Besides the use of technology, emergent pedagogies emphasize the active engagement of students in their own learning, learner responsibility, metacognitive skills and a dialogical, collaborative model of teaching and learning. For this reason, self-assessment and peer assessment are also very important. Andrade and Du (2007) provide a helpful definition of self-assessment that focuses on the formative learning that it can promote: “Self-assessment is a process of formative assessment during which students reflect on and evaluate the quality of their work and their learning, judge the degree to which they reflect explicitly stated goals or criteria, identify strengths and weaknesses in their work, and revise accordingly” (2007, p. 160).

Peer assessment involves students taking responsibility for assessing the work of their peers. They can therefore be engaged in providing feedback to their peers. It is a powerful way for students to gain an opportunity to better understand assessment criteria. It can also transfer some ownership of the assessment process to them, thereby potentially increasing their motivation and engagement

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