2

THEORETICAL UNDERPINNINGS OF LEARNING DESIGN

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Introduction

This chapter provides an overview of some theoretical underpinnings of Learning Design and describes how Learning Design is distinct from, but related to, the more established field of Instructional Design. Essentially Learning Design draws on two theoretical perspectives: sociocultural thinking and an ecological perspective. This chapter will describe the origins of these perspectives and consider how they are being used in a Learning Design context. The focus of this chapter relates mostly to the Learning Design Conceptual Map of the Larnaca Declaration on Learning Design, particularly the "Theories and Methodologies" box.

It is important to understand the theoretical underpinnings to make sense of the approach adopted in the development of Learning Design research. The sociocultural perspective emphasizes that design is context based and shaped by the environment and the designers' background and preferences. The concept of Mediating Artefacts emphasizes that design is dialogic and mediated by tools. The ecological perspective draws on the concept of affordances; i.e. that technologies have affordances or characteristics, which will shape how they are used. It also emphasizes that design occurs in a constantly changing dynamic environment.

Sociocultural Perspectives

A sociocultural perspective emphasises the social and contextual nature of cognition and meaning (Barab, Evans et al., 2004, p. 199). This is in contrast to a cognitive perspective, which is based on the belief that knowledge exists solely in the

head and instruction involves finding the most efficient means for facilitating the "acquisition" of knowledge. Sfard (1998) described the shift in cognitive science and educational theory as a move away from the "acquisition" metaphor towards a "participation" metaphor, where knowledge, reconceived as "knowing about", is considered a fundamentally situated activity.

The concept of Mediating Artefacts can be traced back to the work of Vygotsky (1962, 1978). Central to Vygotsky's work were the following three questions: i) What is the relationship between human beings and their environment (both physical and social)? ii) What new forms of activity were responsible for establishing labour as a fundamental means of relating humans to nature and what are the psychological consequences of these forms of activity? iii) What is the nature of the relationship between the use of tools and the development of speech?

A central feature of a sociocultural perspective is the triadic relationship between the object of cognition, the active subject and the tool or instrument that mediates the interaction. Vygotsky stated:

> The use of artificial means (tools and symbolic artifacts), the transition to mediated activity, fundamentally changes all psychological operations just as the use of tools limitlessly broadens the range of activities within which the new psychological functions may operate. In this context, we can use the term higher psychological function, or higher (truly human) behavior as referring to the combination of tool and sign in psychological activity.
>
> (Vygotsky, 1978, p. 55)

In other words, Vygotsky contended that all psychological activity is mediated by a third element, which he referred to as a tool or an instrument. There are two types: material tools (such as hammers or pencils) and psychological tools (such as signs and symbols).

Central to Vygotsky's ideas is the notion that social interactions play a fundamental role in the process of cognitive development. Vygotsky (1978) argued that what distinguishes humans from other animals is their use of speech in relation to practical activity and that words can shape an activity into structure. He described the analogy of signs as tools. Signs can be used as a means of solving a given psychological problem (to remember, compare, report, choose etc.) and, he claimed, this is analogous to the use of tools. Therefore, signs act as an instrument of psychological activity in a manner analogous to the role of a tool in labour. He referred to this as subcategories of Mediating Artefacts (Figure 2.1). He argued that a tool's function is to serve as a conductor of human influence on the object of activity; i.e. it is externally orientated. Whereas a sign changes nothing in the object of psychological operation, it is internally orientated. Therefore humans use tools that are developed from a culture, such as speech and writing,

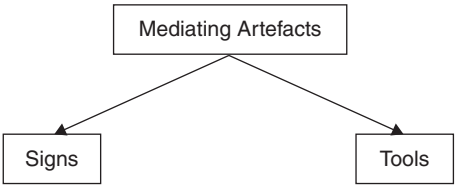

FIGURE 2.1 Mediating Artefacts

to mediate their social environment. Minick quotes the follow important facet of Vygotsky's ideas:

> [H]igher mental functions are based on the mediation of behaviour by sign systems, especially speech. Signs are represented as a special form of stimuli which functions as psychological tools, tools that are directed toward the mastery or control of behavioural processes in the same sense that ordinary tools are directed toward the control of nature.
>
> (1997, p. 120)

Figure 2.1 shows the two types of Mediating Artefacts, namely tools and signs. A fundamental premise of Vygotsky's theory is that tools and signs are first and foremost shared between individuals in society and only then can they be internalized by individuals.

> Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relationships between individuals.
>
> (Vygotsky, 1978, p. 57)

In other words, everything we do in terms of developing understanding or creating something new is mediated in some way. If we are involved in a discussion with someone, the Mediating Artefacts are the words and language we use to communicate with each other. If we are being guided to learn something new, the Mediating Artefacts are the learning resources we use and the dialogue we have with peers and teachers.

Figure 2.2 represents Vygotsky's concept of mediated activity. The subject refers to the individual whose agency is selected as the analytical point of view. The object refers to the goals to which the activity is directed. Mediating Artefacts include artefacts, signs, language symbols and interaction with others.

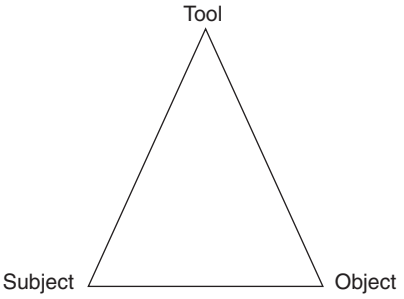

FIGURE 2.2 Vygotsky's concept of mediated activity

Learning Design Mediating Artefacts

The concept of Mediating Artefacts in relation to Learning Design, then, is in terms of the things we use to guide the design process. Learning Design research is interested in establishing what Learning Design Mediating Artefacts practitioners use and what new ones can be created to help guide the design process. The design process guides the creation of learning activities (which are what the learners will engage with in order to achieve the intended learning outcomes). Learning activities can be codified in a number of different representations (Conole, 2013):

- Text-based narrative case studies, describing the key features of the learning activity, and perhaps barriers and enablers to implementation.
- More formal narratives, against a specified formal methodology such as the concept of pedagogical patterns, which provide a structured mechanism for representing good practice (Goodyear, 2005; Goodyear & Retalis, 2010).
- Visual representations, such as a mind map or formalized UML[1] use case diagram.
- Vocabularies (Currier, Campbell et al., 2005), such as taxonomies, ontologies or folksonomies.
- Models (Conole 2010; Mayes & de Freitas, 2004), foregrounding a particular pedagogical approach (such as instructivism, Problem-Based Learning or an emphasis on a dialogic or reflective approach).

Each of these is useful in different contexts, and each provides a different level of abstraction/detail about the learning activity. Figure 2.3 shows the role a Mediating Artefact has in the design process. On the left-hand side of the figure is the designer, on the right-hand side the outcome of the design process, and this process is guided by Mediating Artefacts.

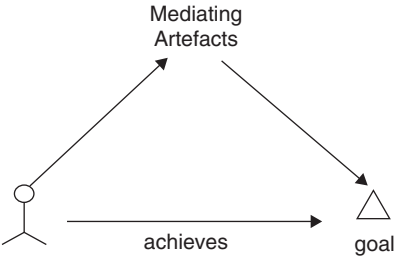

FIGURE 2.3 The role of a Mediating Artefact in the design process

Barab, Evans et al. (2004, p. 205) list the following design guidelines that arise from taking a sociocultural perspective:

1. The instructor's role is to support learners in becoming active participants in the learning process.
2. Instructional materials should be structured to promote student collaboration.
3. Instruction should be designed to reach a developmental level that is just above the students' current developmental level.
4. The use of a wide variety of tools, such as raw materials and interactive technology (for example computers), should be encouraged, in order to provide a meaningful learning context.
5. The student evaluation should focus on the students' understanding based on application and performance.

Activity Theory

Activity Theory (Cole, Engeström et al., 1997; Daniels, Cole et al., 2007; Engestrom, 2001; Engeström, Punamäki-Gitai et al., 1999) built on and expanded Vygotsky's work; of particular interest is the well-known Activity Theory triangle, which helps situate and contextualize the Learning Design process. Figure 2.4 shows an Activity Theory representation of the Learning Design process. In the centre of the diagram is the subject or designer who is intent on achieving a particular goal, namely the design of a learning activity. This is guided by Mediating Artefacts, which could be case studies of good practice, pedagogical patterns, visual representation, models etc. This design process occurs within a context; it is governed by rules, in this instance—institutional constraints and any discipline-specific professional requirements. These will have an impact on the way the learning activity is designed and what can be achieved. It occurs within a community, for example the community of peer practitioners and other institutional stakeholders. Finally, there will be a division of labour; it may be that the design

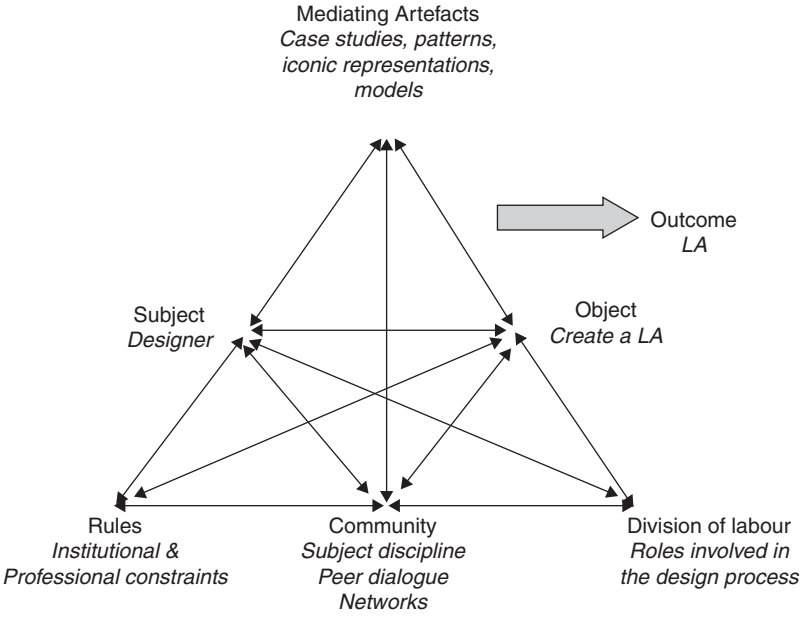

FIGURE 2.4 An Activity Theory representation of the Learning Design process

process is carried out solely by the practitioner, or they may be working in a team, or alongside a learning technologist.

Symbolic Languages

We develop understanding and communicate with others through a variety of "languages". The most common, of course, is speech, the utterances which relate to particular objects and actions; over time we have come to a consensus on the meaning of words. So for an English speaker "apple" refers to a particular edible fruit, whereas the same object is referred to as "manzana" by Spanish speakers. Written languages evolve over time and there are a number of different representations, such as Roman, Cyrillic, Chinese etc. Another language is mathematical notation, a means of understanding concepts through numbers and symbolic representations. Mathematics describes the world in a different way than the written word and can explain concepts that cannot be understood through words. For example, when describing the world at a subatomic level, Newtonian concepts make no sense and quantum mechanisms must be used instead. The fact that an electron can be both a particle and a wave makes no sense, but can be easily represented and described through quantum mechanics, which is based on probabilities. Mathematics, like the written word, has evolved over time. For example

in early mathematical languages, algebraic manipulation was not possible. The way music is represented through musical notation is yet another language. Today's musical notation is relatively new; before it was developed, music was passed from person to person aurally, with the consequential loss of fidelity. Today's musical representation not only perfectly represents music written hundreds of years ago, but can convey not just the sounds, but the emotion and beat of the music. Each representation has a meaning which can be shared with others. The question is, can learning designs be codified and shared? Can we develop a learning design language?

An Ecological Perspective—the Concept of Affordances

In addition to the sociocultural perspective, it is useful to consider Learning Design from an ecological perspective, where the emphasis is on designing in a constantly changing, dynamic environment, where the designers and the design process change and adapt over time. In particular the term "affordances" is useful. The term originated in an ecological context, in relation to visual perception (Gibson, 1977, 1979). Gibson argued that affordances in an environment always lead to some course of action. Affordances are perceived by an individual and are culturally based. He defined affordances as:

> The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnished*, either for good or ill. … something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment.
>
> (Gibson, 1979, p. 127)

> All "action possibilities" latent in the environment, objectively measurable and independent of the individual's ability to recognize them, but always in relation to the actor and therefore dependent on their capabilities. For instance, a set of steps which rises four feet high does not afford the act of climbing if the actor is a crawling infant.
>
> (Gibson, 1977, pp. 67–82)

For example, a tall tree has the affordance of food for a giraffe because it has a long neck, but not for a sheep, or a set of stairs has the affordance of climbing for a walking adult, but not for a crawling infant. Therefore affordances are always in relation to individuals and their capabilities; this includes individuals' past experiences, values, beliefs, skills and perceptions. Therefore a button may not have the affordance of pushing if an individual has no cultural context or understanding of the notion of buttons or related objects and what they are for.

> The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill.
>
> (Gibson, 1979, p. 127)

Gibson goes on to argue that it implies a complementarity between the animal and the environment. Salomon describes Gibson's concept of affordances as follows:

> "Affordance" refers to the perceived and actual properties of a thing, primarily those functional properties that determine just how the thing could possibly be used.
>
> (Salomon, 1993, p. 51)

Therefore affordances are properties of the world that are compatible with and relevant for people's actions (Gaver, 1991). He argues when affordances are perceptible, they offer a direct link between perception and action. Furthermore, he suggests that hidden and false affordances can lead to mistakes. Wijekumar et al. (2006) state that affordances describe the interaction supported by the tool for each individual and are affected by the individual's prior experiences. They add that technologies prompt, guide or constrain users depending on their previous experiences. In other words, affordances describe the possible uses individuals may make of particular technologies.

Conole and Dyke (2004) argued that digital technologies have affordances. For example, they may have affordances to foster communication and collaboration or to encourage reflection. However, the inherent affordances associated with a particular technology will only be realized in relation to an individual. Each person approaches the use of a technology with a set of personal preferences and competences and these determine whether a particular affordance is realized. Conole and Dyke described 10 types of affordances: accessibility, speed of change, diversity, communication and collaboration, reflection, multi-model and nonlinear, risk, fragility and uncertainty, immediacy, monopolization and surveillance. They argued that this affordance taxonomy has a number of uses. Firstly, that establishing a clearer understanding of the affordances should help to inform practitioners in their use of technologies to achieve particular goals. Secondly, that it can also help to identify potential limitations and inappropriate uses of the technologies. Thirdly, by making the inherent affordances of technologies explicit, the taxonomy can act as a discussion point for critique and further refinement. Fourthly, it can be used as a checklist to help practitioners understand the advantages and disadvantages of different technologies. Fifthly, it can be used as a mechanism for staff development and improving practice—for example by

providing a checklist of potential benefits and drawbacks of different technologies, which can be used to inform choice and the ways that practitioners might choose to use them. Fewster (n.d.) argues that the benefit of articulating technological affordances is that it enables practitioners to unpack the different attributes of a learning technology so that they can determine its suitability for use in a particular learning context to achieve a set of intended learning outcomes.

Similarly, Gaver (1991) argues that affordances can be used as a way of focusing on the strengths and weaknesses of technologies with respect to the possibilities they offer the people who might use them. Conole (2013) developed a more up-to-date list of positive affordances and potential constraints. She cited the following as positive affordances: collaboration, reflection, interaction, dialogue, creativity, organization, inquiry and authenticity. The constraints included: that a technology was time-consuming (in terms of development), time-consuming (in terms of support), difficult to use, costly to produce, had associated assessment issues, suffered from a lack of interactivity or that it was difficult to navigate.

Numerous classification schemes have been developed for affordances. One of the most useful is the one developed by Kirschner, Strijbos et al. (2004), consisting of three types of affordances: technological, educational and social:

- Technological affordances: the characteristics of a particular digital technology and what it enables the user to do in terms of interaction, communication, collaboration, reflection etc.
- Educational affordances: characteristics of an education resource that indicate if and how a particular learning behaviour could possibly be enacted within a particular learning context.
- Social affordances: aspects of the online learning environment that provide social-contextual facilitation relevant to the learner's social interaction.

Bower (2008) suggests 11 types of affordances:

- Media affordances: i.e. the characteristics associated with text, images, audio and video.
- Spatial affordances: the ability to resize elements within an interface and move and place elements within an interface.
- Temporal affordances: access anytime, anywhere, the ability to record and play back, synchronous versus asynchronous.
- Navigational affordances: i.e. the capacity to browse to other sections of a resource.
- Emphasis affordances: the capacity to highlight aspects of a resource.
- Synthesis affordance: the capacity to combine multiple tools to create a mixed-media learning environment.

- Access-control affordances: the capacity to allow or deny who can read/edit/upload/broadcast/view/administer.
- Technical affordances: the capacity to be used on a variety of platforms.
- Usability: the intuitiveness of the tool, the ease with which the user can manipulate the tool.
- Aesthetics: the appeal of the design and the appearance of the interface, and how it relates to user satisfaction and the ability to hold attention.
- Reliability: the robustness of the platform.

The concept of affordances is contested and has different meanings. Conole and Dyke (2004) describe a set of 10 affordances associated with technologies. Cook and Boyle contest their description, which Conole and Dyke respond to (Conole et al., 2004). Despite these different views, this chapter has argued that the concept of affordances is useful because it highlights the interrelationship between technologies (and their associated characteristics) and individuals (and their preferences). This interplay has an important influence on the way design is carried out.

Pedagogical Approaches and Technologies

The HoTEL project provides a useful visualization of learning theories and links them to different theoretical perspectives; these are listed as: theology, psychology, linguistics, cybernetics, design science, philosophy, education and organizational theory.[2] The key concepts that emerge from these different perspectives include: educational objectives, scaffolding, the zone of proximal development, genetic epistemology, scientific pedagogy, interpersonal relations, double-loop learning, text and conversational theory and communities of practice. In addition is a range of learning paradigms or world views, namely: radical behaviourism, mastery learning, multiple intelligences, meaningful learning, discovery learning, expansive learning, connectivism, social constructivism, constructionism, constructivism, radical constructivism, expressive constructivism, experiential learning, Montessori education, critical pedagogy, home schooling/unschooling, de-schooling society, learning styles, experiential learning, organizational learning and situated learning.

Conole (2010) draws on Mayes and de Freitas' (2004) review of pedagogical approaches. Mayes and de Freitas characterize learning theories into three types:

- Associative: where the focus is on the individual, learning as activity through structured tasks and learning through association and reinforcement
- Cognitive/Constructivist: where the focus is on learning through understanding and learning building on prior knowledge; the learning is task orientated
- Situative: where the learning is through social interaction and dialogue, in a context and as social practice.

Conole (2013) added a fourth, connectivist, which is based on learning in a networked context. Although the term is contested, it is useful in terms of learning in a distributed network of others through social and participatory media and may be particularly useful in terms of describing learning through massive open online courses (MOOCs).

Each of these has associated with it a number of pedagogical approaches, which emphasize different aspects of learning. The associative category includes behaviourist and didactic approaches, such as learning through drill and practice. The cognitivist/constructivist approach includes constructivism (building on prior knowledge) and constructionism (learning by doing). This includes inquiry-based learning and resource-based learning. The situative category includes social constructivism and situated learning, through, for example, experiential learning, Problem-Based Learning and role play. Connectivist learning includes reflective and dialogic learning and personalized learning. Technologies can be used to foster these different pedagogical approaches. For example, drill and practice can be achieved through use of interactive materials and e-assessment. Inquiry-based learning and resource-based learning can be achieved by effective use of search tools to find relevant learning materials, through media sharing repositories and by user-generated content. Experiential, Problem-Based Learning and role play can be achieved through use of location-aware devices, virtual worlds and games. Finally reflection, dialogic learning and personalized learning can be achieved through the use of blogs, e-portfolios, wikis and social media.

Table 2.1 maps the different pedagogical approaches along with their key characteristics and which aspects of learning and teaching they foreground. The ways technologies can facilitate each of these is then described, along with salient theoretical models and frameworks. The table lists the four pedagogical approaches (associative, cognitive/constructivist, situative and connectivist), along with a general category on assessment approaches. For each of these the key characteristics of the approach are listed, along with the ways these can be facilitated through the use of digital technologies. Finally, key models and frameworks associated with each pedagogical approach are listed.

The Associative Perspective

The associative perspective focuses on behaviour modification via stimulator-response pairs, trial-and-error learning, learning through association and reinforcement and observable outcomes. This relates to instructional design, based on Gagné's deconstruction of learning into components designed to build up knowledge and skills through a series of steps (Gagné et al., 1988). Merrill (2002) reviewed instructional design theories and models and abstracted a set of interrelated prescriptive instructional design principles:

TABLE 2.1 Pedagogical approaches' key characteristics and learning/teaching applications

Perspective	*Approach*	*Characteristics*	*E-learning Application*	*Models and Frameworks*
Associative	Behaviourism Instructional design Intelligent tutoring Didactic E-training	Focuses on behaviour modification, via stimulus-response pairs; Controlled and adaptive response and observable outcomes; Learning through association and reinforcement	Content delivery plus interactivity linked directly to assessment and feedback	1. Merrill's instructional design principles 2. A general model of direct instruction
Cognitive/ Constructivist	Constructivism Constructionism Reflective Problem-Based Learning Inquiry-learning Dialogic-learning Experiential learning	Learning as transformations in internal cognitive structures; Learners build own mental structures; Task-orientated, self-directed activities; Language as a tool for joint construction of knowledge; Learning as the transformation of experience into knowledge, skill, attitudes, values and emotions	Development of intelligent learning systems and personalized agents; Structured learning environments (simulated worlds); Support systems that guide users; Access to resources and expertise to develop more engaging active, authentic learning environments; Asynchronous and synchronous tools offer potential for richer forms of dialogue/interaction; Use of archive resources for vicarious learning	3. Kolb's learning cycle 4. Laurillard's conversational framework 5. Community of inquiry framework 6. Jonassen's constructivist model 7. n-Quire model

(*Continued*)

TABLE 2.1 (Continued)

Perspective	*Approach*	*Characteristics*	*E-learning Application*	*Models and Frameworks*
Situative	Cognitive apprenticeship Case-based learning Scenario-based learning Vicarious learning Collaborative learning Social constructionism	Take social interactions into account; Learning as social participation; Within a wider sociocultural context of rules and community	New forms of distribution archiving and retrieval offer potential for shared knowledge banks; Adaptation in response to both discursive and active feedback; Emphasis on social learning and communication/collaboration; Access to expertise; Potential for new forms of communities of practice or enhancing existing communities	8. Activity Theory 9. Wenger's Community of Practice 10. Salmon's 5-stage e-moderating model
Connectivist	Networked learning, distributed learning, social and participatory learning	Learning in a network environment, through interaction with others, filtering and personalization	Use of social and participatory media to engage in a distributed community of peers, adopting technologies to create a personalized learning environment for dialogue and reflection, harnessing the power of a global, distributed network	11. Preece's framework for online community 12. Connectivism 13. Wenger's Community of Practice
Assessment		Focus is on feedback and assessment (internal reflection on learning, and also diagnostic, formative and summative assessment)	E-learning applications range from in-text interactive questions, through multiple choice questions up to sophisticated automatic text marking systems	14. Gibbs and Boud models 15. Nicol and the REAP framework

- Demonstration principle—learning is promoted when learners observe a demonstration.
- Application principle—learning is promoted when learners apply the new knowledge.
- Task-centred principle—learning is promoted when learners engage in a task-centred instructional strategy.
- Activation principle—learning is promoted when learners activate relevant prior knowledge or experience.
- Integration principle—learning is promoted when learners integrate their new knowledge into their everyday world.

Merrill's "five first principles" model suggests that the most effective learning environments are those which are problem-based, where the students are involved in four distinct stages: activation of prior knowledge, demonstration of skills, application of skills and integration into real-world activities. To these Collis and Margaryan (2005) have added six contextual criteria relating to effective implementation in specific (business) environments: supervisor support; technology support; reuse; differentiation; collaboration; and learning from others.

Huitt et al. (2009) summarize research into approaches to instruction. In particular they describe a general model, which consists of four phases:

- Presentation phase
    - Review of previous material
    - Statement of skills or knowledge to be learnt (what they are learning)
    - Rationale for the approach/material (why they are learning this)
    - Explanation of the skills or knowledge to be learnt
    - Opportunities for students to demonstrate their understanding
- Practice phase
    - Guided practice
    - Independent practice
    - Periodic review
- Assessment and evaluation phase
    - Formative assessment
    - Summative assessment
- Monitoring and feedback
    - Cues and prompts
    - Corrective feedback

The Cognitive/Constructivist Perspective

The cognitive/constructivist perspective views learning as transformations in internal cognitive structures. It is characterized by processing and transmitting information through communication, explanation, recombination, contrast, inference and problem solving. It gives rise to constructivist and experiential/reflective positions.

One mechanism for promoting a constructive environment that has been widely adopted in the creation of e-learning environments is cognitive scaffolding, where the activities that learners engage with are supported by a series of guidelines to help them to reflect on their actions. Many e-learning environments provide forms of cognitive scaffolding that guide learners' actions and promote reflection. This is also the principle on which wizards such as Word's "paper clip" are based, by providing the user with support, prompted by a series of questions.

Kolb's (1984) learning cycle is probably the best-known experiential model. Building in particular on the work of Dewey (1916) and Lewin (1942), it presents an action-based or "learning by doing" approach through a four-stage cycle (experience, reflection, abstraction and experimentation). Recently, Cowan (2002) has extended Kolb's' learning cycle by considering explicitly how to plan interactive activities to support each of the four stages.

Pask's (1975) conversation theory centres on the idea that learning occurs through conversation and the notion of "teachback" where one person teaches another what they have learned. Laurillard's conversational framework is derived from this and has been widely cited and used as both a design template and an analytic tool. Laurillard describes the stages involved in the dialogic interaction between a teacher and student, demonstrating the way each internalizes and adapts concepts in the process.[3]

The Community of Inquiry (COI) is an example of a framework for modelling Problem-Based Learning and in particular facilitating collaborative learning (Garrison & Anderson, 2000). The diagram is adapted from http://communities ofinquiry.com/model. The framework consists of three interconnected parts:

- Social presence—in terms of identification with the community
- Teaching presence—i.e. the design, facilitation and directing of learning
- Cognitive presence—i.e. to what extent learners can construct their own meaning through reflection and discourses.

A good example of a framework that promotes constructivism is one developed by Jonassen et al. (1999, 2003). It can be used as a guideline to develop Constructivist Learning Environments (CLEs). The key argument is that learning occurs when students are actively engaged in meaning making. The framework consists of five parts:[4]

- Active and manipulative: learning takes place when learners develop knowledge and skills in response to their environment, manipulating objects and observing and learning from the results.
- Constructive and reflective: learning occurs as learners reflect on activity and observations and articulate what they have learned.
- Intentional: learning occurs when learners are motivated to achieve a cognitive goal.
- Authentic (complex and contextualized): learning is situated in a meaningful context rather than being oversimplified and presented in isolation.
- Cooperative (Collaborative/Conversational): learning relies on socially negotiated understandings that help learners build on and learn from their own and each other's knowledge in order to construct new knowledge.

The Personal Inquiry project developed a personal inquiry framework (n-Quire)[5] for supporting inquiry learning across formal, non-formal and informal learning contexts. The framework is the basis for a toolkit, which is used to support schoolchildren in using inquiry-based learning as a means to developing an understanding of science. The inquiry process is represented as a set of iterative, interdependent phases. The dashed lines between the phases graphically represent the iterative nature of the inquiry process.

The Situative Perspective

The situative perspective views learning as social participation, and emphasizes interpersonal relationships involving imitation, modelling and the joint construction of knowledge. It views the ultimate objective of learning as enabling us to experience the world as meaningful.

Although described as a theory, Activity Theory can also be considered and used as a framework. Activity Theory starts from the premise that activities occur within a context and that this context needs to be taken into account if we are to make meaning of the situation and come to an appropriate interpretation of the results. It enables conceptualization of both individual and collective practices in the wider sociocultural context within which they occur. Mwanza (2002) has described a model for activity consisting of eight parameters: activity of interest; objective; subjects; tools; rules and regulations; divisions of labour; community; outcome. One of the most common ways of representing Activity Theory is as a "triangle diagram", which has at the centre the subject—object being considered and associated mediating artefacts. Qualifying this is the community within which this takes place and the associated rules and divisions of labour.

Although not specifically developed for a learning context, Wenger's theory of communities of practice is valuable as it considers the ways communities of practice are formed and developed. He sees four main aspects: learning as community;

learning as identity; learning as meaning; learning as practice. Therefore each is valuable in that it helps to foreground particular aspects of learning, which can then be used to provide guidance. This is very much an example of a socially situated theory of learning where learning is seen as social participation.

A specific e-learning model that describes the stages of increasing competence in participating in an online learning community is Salomon's (2003) five-stage framework for supporting effective e-moderating in discussion forums, which emphasizes the dialogic aspects of socially situated theoretical perspectives. The five stages are:

- Access and motivation
- Online socialization
- Information exchange
- Knowledge construction
- Development

The Connectivist Perspective

Siemens (2005) has developed connectivism as an approach that emphasizes the connected and networked nature within which modern learning occurs. This includes a learning ecology model that considers the elements involved in the learning process and how they can be facilitated within a networked ecology. It emphasizes the networking affordances of technologies. In particular it addresses the question: How does learning change when knowledge growth is overwhelming and technology replaces many basic tasks we have previously performed?

Preece (2001) has developed a framework for establishing and supporting online communities which focuses around two key dimensions—sociability and usability. These can then be considered in terms of a number of design criteria and associated determinants of success, namely: purpose, people, policy, dialogue/social support, information design, navigation and access. She argues that little attention has been given to evaluating the success of online communities. She suggests that the determinants of sociability include obvious measures such as the number of participants in a community, the number of messages per unit of time, members' satisfaction, and some less obvious measures such as amount of reciprocity, the number of on-topic messages, trustworthiness and several others. Measures of usability include numbers of errors, productivity, user satisfaction and others.

Conclusion

This chapter has provided an overview of some of the key theoretical perspectives associated with Learning Design. First and foremost the field is socioculturally located drawing on the work of Vygotsky and others and in particular the

TABLE 2.2 An abridged version of Preece's framework

Framework	*Design Criteria*	*Determinants of Success*
Sociability	Purpose	Types of messages and comments; types of interactivity; quality of contributions
	People	Who is participating?
	Policy	What policies are in place?
Usability	Dialogue and social support	How long does it take to learn about dialogue and support?
	Information design	How long does it take to learn to find information?
	Navigation	How long does it take to navigate around?
	Access	Can users get access to everything they need?

concept of mediating artefacts for design. The work of Gibson, from an ecological perspective, is also drawn on and in particular that digital technologies have affordances, which may or may not be applied, depending on the context and the characteristics, skills and preferences of individuals. The methodology most used in the field is design-based research (Barab, 2006; Wang & Hannafin, 2005), an agile approach, where a problem is identified and addressed. The central problem in Learning Design research is that teachers need support and guidance to make pedagogically informed design decisions and to make appropriate use of technologies. There are three facets to this: guidance, visualization and sharing. The Larnaca Declaration[6] articulates the nature of the field and in particular how it is distinctive from but complementary to the more established field of Instructional Design. The Larnaca Declaration is a descriptive framework for Learning Design, centring on the notion of the development of an educational notation for design, which teachers can use to create and share good teaching practice. Figure 2.5 represents the field of Learning Design and its key components. The challenge for the field is to help teachers create effective learning experiences that are aligned to particular pedagogical approaches and learning objectives. It focuses around the teaching cycle, which consists of: design and plan, engage with students, reflection and professional development. It can work at any level of granularity, from micro learning activities up to whole programmes. The three key concepts of Learning Design are: guidance, representation and sharing, which translate into a range of Learning Design tools and resources.

One of the distinctive features of the Learning Design approach is that it is activity focussed rather than content focussed and helps the teacher design for a particular learning context. There is now a plethora of Learning Design tools and resources, from implementation tools such as LAMS,[7] the Learning Designer[8] and ILDE[9] through to resources and activities, such as those associated with the 7Cs of Learning Design framework.[10] Evaluation of the use of

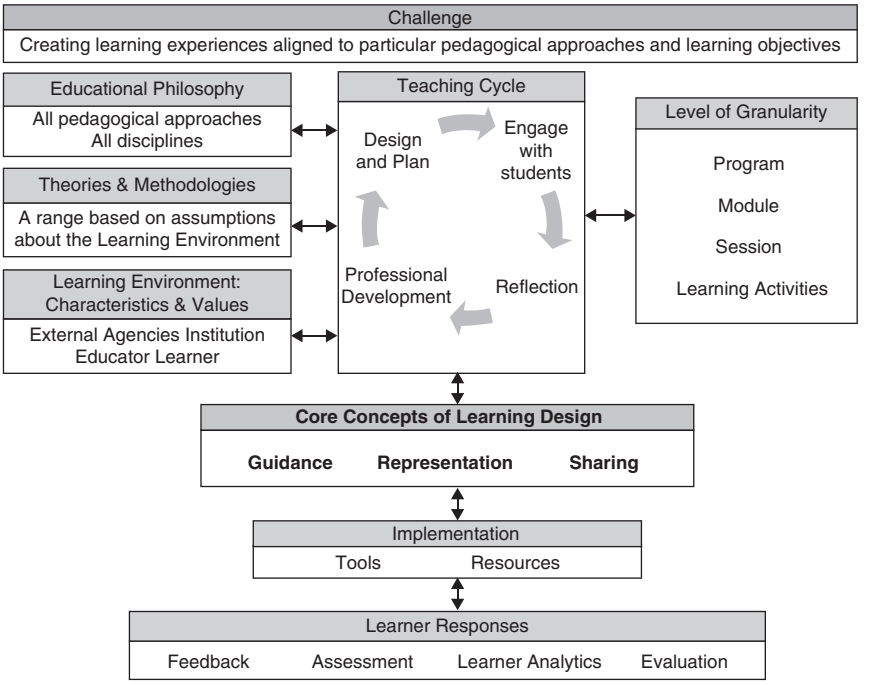

FIGURE 2.5 Conceptual map of Learning Design

these tools has been positive. Teachers state that they help them think more creatively, beyond content to a focus on activities. The tools and resources help guide their design practice and help them to make their designs explicit and hence shareable. Visualization in particular is seen as very powerful, enabling the teachers to explore their design from different perspectives. Whether or not we will ever achieve our dream of having a standardized educational notation, it is clear the current suite of Learning Design tools and resources are useful in helping improve design practice.

Notes

1 www.uml.org/
2 See http://phd.richardmillwood.net/en/portfolio/media/Learning%20Theory.pdf.
3 See www2.smumn.edu/deptpages/~instructtech/lol/laurillard/ for an interactive diagram of the Conversational Framework, mapping technologies for each of the components.
4 Adapted from Clough and Ferguson (2010).
5 www.nquire.org.uk/home
6 See Chapter 1 and www.larnacadeclaration.org/
7 http://lamsfoundation.org/
8 https://sites.google.com/a/lkl.ac.uk/ldse/

9 http://ilde.upf.edu/
10 www2.le.ac.uk/projects/oer/oers/beyond-distance-research-alliance/7Cs-toolkit

References

Barab, S. (2006). Design-based research—a methodological toolkit for the learning scientist. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 153–169). Cambridge, UK: Cambridge University Press.

Barab, S. A., M. A. Evans, et al. (2004). Activity theory as a lens for characterizing the participatory unit. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology, second edition* (pp. 199–214). New York, NY: Lawrence Erlbaum Associates.

Bower, M. (2008). Affordance analysis—matching learning tasks with learning technologies. *Educational Media International*, ***45***(1), pp. 3–15.

Boyle, T. & Cook, J. (2004). Understanding using technological affordances: A response to Boyle and Cook. *ALT-J*, ***12***(3), pp. 301–308. Available online at http://oro.open.ac.uk/6980/.

Clough, G., & Ferguson, R. (2010). Virtual worlds are authentic sites for learning. In K. Sheehy, R. Ferguson & G. Clough (Eds.), Virtual worlds: Controversies at the frontiers of education. New York, NY: Nova Science Publishers.

Cole, M., Y. Engeström, et al. (1997). *Mind, culture and activity: Seminal papers from the laboratory of comparative human cognition*. Cambridge, UK: Cambridge University Press.

Collis, B., & Margaryan, A. (2005). Merrill Plus: Blending corporate strategy and instructional design. *Educational Technology 45*(5), pp. 54–58.

Conole, G. (2010). Review of pedagogical frameworks and models and their use in e-learning. Available online at http://cloudworks.ac.uk/cloud/view/2982.

Conole, G. (2013). *Designing for learning in an open world*. New York, NY: Springer.

Conole, G., & Dyke, M. (2004). What are the affordances of information and communication technologies? *ALT-J*, ***12***(2), pp. 113–124. Available online at http://oro.open.ac.uk/6981/.

Cowan, J. (2002). *The impact of pedagogy on skills development in higher education—or—should we facilitate the Kolb cycle constructively or socio-constructively?* Keynote paper. Skills Development in Higher Education: Forging Links, University of Hertfordshire, Hatfield.

Currier, S., L. Campbell, et al. (2005). JISC pedagogical vocabularies project—report 1: pedagogical vocabularies review. London: JISC. Available online at www.jisc.ac.uk/uploaded_documents/PedVocab_VocabsReport_v0p11.doc.

Daniels, H., M. Cole, et al. (2007). *The Cambridge companion to Vygotsky*. New York: Cambridge University Press.

Dewey, J. (1916). *Experience and nature*. New York, NY: Dover.

Engeström, Y. (2001). Expansive learning at work: Toward an activity-theoretical reconceptualization. *Journal of Education and Work*, ***14***(1), pp. 133–156.

Engeström, Y., R. L. Punamäki-Gitai, et al. (1999). *Perspectives on activity theory*. New York: Cambridge University Press.

Fewster, E. (n.d.). Technology affordances. *The making of a 21C teacher: Exploring technology based learning*. http://makinga21cteacher.wordpress.com/technology-affordances/.

Gagne, R., & Driscoll, M. (1988). *Essentials of Learning for Instruction* (2nd Ed.). Englewood Cliffs, NJ: Prentice-Hall.

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

Gaver, W. W. (1991). *Technology affordances*. CHI '91 conference proceedings, New Orleans, Lousiana.

Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds)., *Perceiving, acting, and knowing: Toward an ecological psychology* (pp. 67–82). Hillsdale, NJ: Lawrence Erlbaum.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum.

Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, ***21***(1), 82–101.

Goodyear, P., & Retalis, S. (2010). *Technology-enhanced learning: Design patterns and pattern languages*. Rotterdam: Sense Publishers.

Huiitt, W., Monetti, D.M., Hummel, J.H. (2009) Designing direct instruction. Available online at http://www.edpsycinteractive.org/papers/designing-direct-instruction.pdf

Jonasen, D. 1999, Designing constructivist learning environments, in C.R. Reiguluth (Ed), *Instructional-design theories and models: A new paradigm of instructional theory.* Hillsdale, NJ: Lawrence Erlbaum.

Kirschner, P., J. W. Strijbos, et al. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development*, ***52***(3), pp. 47–66.

Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.

Lewin, K. (1942). Field theory and learning. In D. Cartwright (Ed.), *Field theory in social sciences: Selected theretical papers*. London, Social Sciences Paperbacks, pp. 60–86.

Mayes, T., & de Freitas, S. (2004). Review of e-learning frameworks, models and theories, JISC e-learning models desk study. Available online at http://www.jisc.ac.uk/uploaded_documents/Stage%202%20Learning%20Models%20(Version%201).pdf

Merill, D. (2002). First Principles of instruction, ETR&D, Vol. 50, No. 3, 2002, pp. 43–59. Available online at http://mdavidmerrill.com/Papers/firstprinciplesbymerrill.pdf

Minick, N. (1997). The early history of the Vygotskian school: The relationship between mind and activity. In M. Cole, Y. Engeström & O. Vasquez (Eds.), *Mind, culture and activity* (pp. 117–127). Cambridge, UK: Cambridge University Press.

Mwanza, D. (2002). Conceptualising work activity for CAL system design, *JCAL,* ***18***(1), 84–92.

Pask, G. (1975). Conversation Theory developed by the cybernetician Gordon Pask in Realizing the heavenly Jerusalem, Yitzhak I. Hayut, March 1995.

Preece, J. (2001). Sociability and usability: Twenty years of chatting online. *Behavior and Information Technology Journal,* ***20***(5), 347–356.

Salomon, G. (Ed.). (1993). *Distributed cognitions—pyschological and educational considerations*. Cambridge, UK: Cambridge University Press.

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, ***27***(2), p. 4.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning,* ***2***(1), 3–10.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

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

Wang, F., & Hannafin, M. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, ***53***(4), pp. 5–23.

Wijekumar, K. J., B.J.F. Meyer, et al. (2006). Technology affordances: The "real story" in research with K-12 and undergraduate learners. *British Journal of Educational Technology*, ***37***(2), pp. 191–209.