Chapter 8
Design Principles for Professional Networked Learning in 'Learning Through Practice' Designs

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Abstract The aim of this chapter is to present a coherent theoretical conceptualization of the ways in which learning designs organized as 'learning through practice' can prepare students for future professional practice as well as facilitate different patterns of engagement and knowledge transformation. Three prototypical learning designs are analysed: (1) case-based learning, (2) design-based learning and (3) simulation-based learning. Networked learning is understood as learners' connecting of contexts in which they participate and as their resituation of knowledge, perspectives and ways of acting across these contexts. Learning designs of 'learning through practice' are distinguished by engaging practices outside the formal educational system as ways of developing curricular understanding and, reciprocally, as providing grounds for concretization of curricular content through its enactment in practice. By viewing these learning designs as networked learning, the intention is to highlight their potential for supporting certain connection forms between learners' experiences in target practice and educational practice. The chapter argues that case-based learning establishes a relationship of inquiry between learner and target practice. The relationship established in design-based learning is one of innovation with the aim to support learners in developing understanding of practice through changing it. Finally, in simulation-based learning, relationships of imitation of target practice and engagement in 'as-if' practice are established.

Introduction: Clarifying Central Terms

The aim of this chapter is to present a coherent theoretical conceptualization of the ways in which learning designs organized as 'learning through practice' can prepare students for future professional practice as well as facilitate different patterns of engagement and knowledge transformation. Laurillard (2012) characterizes

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learning through practice as a 'way of enabling the learner to understand and use the knowledge and skills of a discipline. It is sometimes referred to as "learning by doing", or "learning through experience", where the learner adapts their actions to the task goal, and uses the result to improve, without teacher intervention' (Laurillard, 2012, p. 162). The chapter broadens this understanding through pointing out that by engaging with the knowledge and skills of a discipline, more may be learned than the knowledge and skills themselves. Learning through practice need not only be *practicing* practice, that is, learners may also develop a resonance field of practice meanings that can inform curricular content within education. Work practice can act as leverage for different patterns of participation and knowledge transformation also within educational practice.

This is shown by analysing the different connections and approaches to practice involved in the three learning designs of (1) case-based learning, (2) design-based learning and (3) simulation-based learning. These learning designs are all examples of learning through practice because of the following defining characteristics: they engage practices outside the formal educational system as ways of developing curricular understanding and, reciprocally, as providing concretization of curricular content through its enactment in practice. This defining characteristic furthermore determines the learning designs as forms of networked learning in the sense developed by Dohn (2014). They have been chosen, as they differ markedly in the specific way connections are formed between educational and work practices and therefore also in the resulting epistemological possibilities they present to learners. Thus, between them, they illustrate the learning potentials of 'learning through practice'.

Recent literature highlights that several traditions and understandings of Networked Learning have emerged over the years, with different conceptions of what constitutes the nodes and edges in the 'network' and how the 'network' may be supportive of learning (Dohn, 2018; Hansen, 2018; Jones, Ryberg, & de Laat, 2017). The often-cited definition by Goodyear, Banks, Hodgson, and McConnell (2004, p. 1) uses 'network' to refer to both a technological infrastructure (ICT) and a social structure of relationships between people. Correspondingly, the definition is ambiguous as concerns what make up the edges of the network: ICT mediation or the relationship of 'knowing'. On both readings, the nodes are constituted by people and resources. This definition has been particularly useful for investigating ICT-mediated learning taking place within designated online spaces offered by educational programmes.

Within this book's overall focus on connections between people, some chapters concentrate on those connections which breach institutional walls or contextual boundaries (see Chap. 5 by Nørgård, Mor and Bengtsen and Chap. 6 by Pedersen, Caviglia, Gislev and Hjortskov Larsen (this volume)). In these chapters, different people are representatives of different contexts; still, this need not be the case, as the crucial point is the development of understanding through juxtaposition of diverging perspectives. The approach taken in this chapter brings this last focus to the fore. Instead of viewing nodes as people, nodes are contexts, and the learner is the one connecting the nodes. The edges consist in the drawing of knowledge from one

context in making sense of the other ones. 'Networked learning' is thus the learning enabled by the connecting of contexts. In particular, it is the learning supported by drawing on contextual meaning from one context to make 'deeper' sense of propositional knowledge in others. Designing for networked learning on this view is designing for learners' coupling of contexts and for them to draw on knowledge, perspectives and ways of acting across these contexts.

The concept of learning design is slippery and is used in a number of overlapping ways, ranging from the *process* of creating rather detailed educational patterns to support specific actions in typical situations (Mor, Mellar, Warburton, & Winters, 2014), to, at the other end, the whole *domain* of designing for learning (Conole, 2013). As Konnerup, Ryberg and Thyrre Sørensen (Chap. 7, this volume) point out, within the field of networked learning, the term has been widely used to designate 'plans for facilitating learning' which can be shared between educators. Typically, the indirect nature of design is emphasized, i.e. that learning can be designed *for*, but not be predetermined (cf. Parchoma, 2018; Parchoma & Deaver-Charles, 2018). For a full discussion of different conceptions of design within the educational field, see Dohn and Hansen (2018). In accordance with the distinctions drawn in this work and the general use of the term within the field of networked learning, 'learning design' can be defined as a *plan for a course sequence which articulates the intended overall organization of learning possibilities for the course sequence*. A learning design, thus understood, has four primary dimensions: (1) purpose, (2) content, (3) methods (including intended learning activities and roles for students and teachers), and (4) underlying learning-theoretical basis. The four dimensions reflect basic aspects of the intended learning situation: its why (purpose), its what (content), its how (method) and its reason for the why, what and how (theoretical basis). The theoretical basis should explain how the use of the content and methods in question can lead to learning of the desired kind for the learners. A learning design is operationalized through *design principles* which explicate what teachers should do to enable the intended learning possibilities to emerge. Design principles are thus operational guidelines for teachers' construction of learning possibilities. Furthermore, they designate intended learning trajectories for learners. Design principles therefore both refer to intended learning activities for students and to teachers' facilitation of these activities. The models presented in the following sections accordingly depict both an intended trajectory for learners and the corresponding guidelines for teachers' facilitation hereof.

Konnerup, Ryberg and Thyrre Sørensen (Chap. 7, this volume) argue that learning designs can be understood to have two primary uses: as plans for action and as tools for reflection. Actually, a third use can be discerned: experimental development of educational practice. Firstly, teachers can try to realize the plan in practice to support students' learning. Secondly, because the learning design explicates intended objectives, content, activities, and roles of learners and teachers, it can be used as a tool for communicating: To oneself and others in planning course sequences, with others in sharing ways of organizing learning possibilities, and with oneself and others in reflecting on ensuing educational practice. Thirdly, because realization in practice often leads to new insights about the learning design and

about teacher and learner interaction, it can be used experimentally to develop pedagogical practice. Focusing on this aspect, Bell, Hoadley, and Linn (2004) state that design principles are 'generated inductively from prior examples of success and are subject to refinement over time as others try to adapt them to their own experiences' (p. 83). This goes for learning designs themselves, too. However, the quote underestimates the significance which theoretical deduction may have in deciding which learning designs should be tried out in the first place, for there to be 'prior examples of success' at all. Instead, learning designs develop in an interplay of theoretical considerations and practical experimentation. This chapter contributes to the interplay by articulating a theoretical conceptualization of 'learning through practice' at this moment in the development of educational research, given the practical experimentation that has already taken place. The conceptualization is provided utilizing the understanding of networked learning presented above.

The research questions for this chapter thus are:

For each of the three learning designs:

- How can the purpose, content, methods and theoretical basis of the learning design be conceptualized and what types of connections between target and educational practice can be established?
- What design principles can guide the educational operationalization of these learning designs?
- How can these learning designs prepare students for a future professional practice?

In the following, 'practice' and 'practices' are understood at two levels, corresponding to the level of the activity itself (narrow sense) and the overall context in which activities take place (broad sense) (cf. Dohn, 2007):

1. Micro-level of action: Human activity of some regularity, i.e. a bodily-mental engagement with the social and material environment where it is possible to discern between the (more or less) adequate and the (more or less) inadequate.
2. Meso-level of action: The sense-bearing context(s) within which human activity (micro-level) takes place, e.g. the context of an educational programme or of a workplace.

The term 'target practice' refers to the practice (at both levels) outside of the educational system, which the learning design engages and aims at. The target practice may be a specific workplace or type of professional context (both meso-level) or it may be an activity within the workplace or professional context such as the writing of a report for one's employer or the teaching of genre theory to a fifth grade (both micro-level). The point of the approach to networked learning taken here is that engaging in activities (micro-level) within sense-bearing contexts (meso-level) will supply the learner with tacit experience which may be drawn upon in new contexts. This is so, both at the concrete level of doing the activities, and at the overall level of the sense and value accorded to the activity within the sense-bearing context.

The Learning Design of *Case-Based Learning*

Case-based learning is a well-established learning design in both nursing and medical education (Ertmer & Koehler, 2014) and business (Barnes, Christensen, & Hansen, 1994) where it is used to facilitate the development of professional skills. The purpose of working with case-based learning is to develop understanding through inquiry and hereby engage learners in active and reflective participation in a sense-making process. Case-based learning is thus based on a learner-centred inquiry approach also involved in Problem-Based Learning (PBL) (Savery, 2015). However, essential to PBL is investigation of problems with the aim of solving them. In contrast, case-based learning does not necessarily involve problem-solving but focuses on developing an understanding of the case with its possibilities, challenges and dilemmas.

Case-based learning may be used to support different objectives and may involve different kinds of content and methods. Firstly, cases can be pedagogical examples of academic knowledge concerning concepts, principles and theory. This potentially gives learners a richer understanding of e.g. an abstract concept. Secondly, cases can be used as tasks where learners are asked to apply a theoretical approach, e.g. organizational analysis, in order to develop certain analytical skills. Thirdly, cases from target practices can provide detailed descriptions rich in contextual information, what Geertz (1994) would call 'thick descriptions' and Shaffer and Resnick (1999) 'thick authenticity'. The learner is challenged to make sense of the thickly described situation and thereby to theoretically 'deal with the complexity of workplace situation' (Jonassen & Hernandez-Serrano, 2002, p. 68). This latter form is used in nurse education as an effective learning and teaching method (Kantar & Massouh, 2015; Yoo & Park, 2015). Fourthly, the learners can themselves undertake an inquiry of situations in target practice outside of education. Cases will then not be decontextualized or well-structured but involve experiences of an everyday professional context. This may stimulate learners' situational awareness. Case-based learning of this latter kind is based on the methods of a case study, which Yin defines as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 2003, p. 13). Typical methodological features of a case study are that it calls for an in-depth focus on a specific unit of analysis that occurs in a natural context. The investigation of the unit of analysis is based on multiple data sources and is described with highly contextual details (Van Wynsberghe & Khan, 2007).

Working with the different kinds of case-based learning has the potential of informing learners about a practice they do not have experience with. At the same time, cases may help learners recall their own experience of similar situations. Cases can therefore forge connections between learners' own experiences in other contexts and the curricular content, allowing learners to develop an understanding of the experiences through the lenses of the academic field (Tawfik & Kolodner, 2016).

In terms of philosophy of science, the approach of case-based learning is hermeneutic, since the basic purpose is to gain an understanding of the practice, both at the micro- and at the meso-level. 'Hermeneutic' may here be understood in the classical methodological sense from Dilthey (1927) of simultaneously letting individual data and overall understanding of the practice inform each other. Each new piece of information is interpreted in the light of one's overall understanding, and, conversely, the overall understanding is adjusted along the way, as new information becomes available. Learning theoretically, this methodological view aligns with a basic constructivist approach of 'knowledge building' through assimilation of new input, and accommodation of the overall scheme/knowledge structure, as recalcitrant input is encountered. Alternatively, 'hermeneutic' may be understood in the ontological sense from Gadamer (1990) that an essential characteristic of us as humans is that we are interpretive beings: we are always already in an understanding of the world, and practice will open to us as meaningful on the basis of our Vorgriff ('pregrasp') and Vorurteile ('prejudices' – to be understood positively as the necessary condition for there to be understanding at all). Developing an understanding of practice engages our interpretive being in the 'fusion of horizons' between the horizon of our pregrasp and the horizon of the practice. Learning theoretically, this view lends itself rather to a sociocultural view in line with, e.g. Säljö's (2000) version of activity theory. On this view, the use of cases will allow access to the same overall sociocultural world as the practice that is to be understood. This will supply an initial grasp, to be developed as students become familiar with the more specific activities undertaken (micro-level) within the sense-bearing contexts (meso-level).

Viewed as networked learning, case-based learning allows the learners to interpret the academic concepts and theories which they work with in their education, with the concrete experiential sense of the target practice. Case-based learning prepares learners for future professional practice by providing them with examples of target practice meanings to 'fill out' the words of their academic learning. This will be supported best in the type of case use where learners engage in inquiry in target practice and thus form their own experiences of this practice. The other three kinds of case use will depend on learners' vicariously imagining practice experiences based on descriptions and/or on them recalling experiences from other situations. Students' imaginings are reflected on solely from within the educational context, and they will therefore not experience the 'reality check' of target practice as concerns the imaginings' validity. These types of case use will therefore not prepare students for the need to search out reality checks in their future professional practice, nor for how to accommodate their actions to such reality checks. For these kinds of case use, Dilthey's (1927) classical methodological rendering of case-based learning seems the appropriate one.

For case-based learning as inquiry-in-target practice, the Gadamerian ontological rendering of case-based learning appears most pertinent: it is through engagement of one's own interpretive being that the learners are able to draw the connections that they do, including making initial sense of the target practice through their general background understanding of this kind of sociocultural practice. Immersing themselves in the target practice for extended study can provide learners with at

least some experiential knowledge, if not of the undertaking of the activities themselves (which the learners perhaps only observe), then of the way the activities play out when undertaken by others. This experiential knowledge will supply concrete sense to what participants say about their practice. The concrete sense can resonate in the learners' understanding of the participants' words, and help them develop an adequate contextual perspective on what goes on in practice. Traversing back into the academic context, e.g. to write a report, the experiential knowledge and the contextual perspective may provide concretized sense to the academic theories. This allows the learners a fuller understanding of the theories because they resonate with tacit practice meaning – if learners 'see the connection'. This is due to the fact that dealing with academic theories within education is itself a practice. Therefore, the experiential knowledge and contextual perspective of the target practice have to be resituated to 'fit' into the report. The problem is amplified by the fact that others will not have the same experiential sense to draw on in their understanding of what the learner writes in the report. It may also be amplified by the fact that unless learners are allowed to engage in the actual doing of the activities themselves, the tacit knowledge that they develop will be limited and somewhat vicarious. To the extent that it is, it will not be essential for sense-making for the learners and thus will not 'spring to mind' with the same readiness as experiential knowledge does which has been developed in contexts with which they are actively and emotionally engaged.

The intended student trajectory in this learning design thus is the following: gain access to a case, define an issue of inquiry, engage in inquiry and finally develop understanding of the case. The design principles for teachers guiding students' activities correspond to this trajectory and are illustrated in Table 8.1, together with the intended student trajectory (Fig. 8.1).

The Learning Design of *Design-Based Learning*

The purpose of design-based learning is twofold: to innovate practice and to gain understanding of practice through the process of changing it. The method is used in different domains, e.g. counselling (Hansen & Remvig, 2016), engineering (Barab, 2014) and teacher development (Wang, Hsu, Reeves, & Coster, 2014). The basic method in design-based learning is the design experiment (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; Collins, 1992). A design experiment on the one hand reflects an existing practice with its problems and challenges and on the other hand the innovation of this practice through the design experiment. This two-pronged approach to practice is the content focus of design-based learning. The design experiment is both a process of learning and of problem-solving and will typically include several stages such as defining the problem and identifying the need, collecting information, introducing alternative solutions, choosing the optimal solution; designing and constructing a prototype, and evaluating it. This is an experimental way of working where the learner in working with alternative solutions has a role as a '*bricoleur*' (Gravemeijer & Cobb, 2006, p. 51), who uses the available materials to invent new applications. This process involves the learner in

Table 8.1 Case-based learning: intended student trajectory and design principles for teachers

Intended student trajectory	Design principles for teachers
Gain access to a case: Get a case description by the teacher, get access to a target practice case by the teacher or find a target practice case herself	*Provide access to a case*, either directly or by supporting students in finding one
Define an issue of inquiry, relevant to curricular content, for the case	*Support* students in formulating *an academically relevant issue of inquiry* for the case
Engage in inquiry: experience the case, either in target practice or through vicarious imaginings, and *develop a contextual perspective* through the experiences	For case-based learning in the educational context: *Support* students in their *vicarious imaginings* of experiences and in the development of a contextual perspective through supporting them in making thick descriptions of the case
	For case-based learning in target practice: *plan* the course sequence so that students have *time to actually experience* target practice and develop a contextual perspective
Develop understanding: let experiential target practice sense inform academic theories and concepts	*Support* students in *connecting* experiential target practice sense and academic theories through *questioning their imaginings* (case-based learning in educational context) or *supporting academic reflection* on experiential knowledge (case-based learning in target practice)

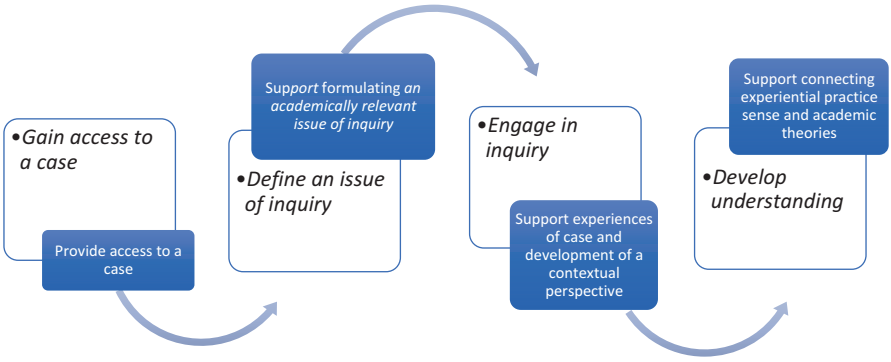

Fig. 8.1 Case-based learning: model of the intended student trajectory and the corresponding design principles for teachers

investigating the target practice as well as in developing and negotiating prototypes in collaboration with practitioners. Design-based learning shares basic characteristics with Design-based Research, in that learners should address

> ...complex problems in real contexts in collaboration with practitioners; integrating known and hypothetical design principles with technological advances to render plausible solutions to these complex problems; and conducting rigorous and reflective inquiry to test and refine innovative learning environments as well as to define new design principles. (Reeves, 2006, p. 58)

That is, like Design-based Research, design-based learning is *pragmatic* with the goal to solve real-world problems. It is *grounded* in both theory and real-world context and utilizes an *iterative and flexible process* of investigation based on collaboration between researchers and practitioners. It integrates a *variety of research methods* and data sources. Finally, the results of the learning process are understood both within the context where the investigation is conducted and envisioned for use in new contexts, as is the case in Design-based Research (Wang & Hannafin, 2005, p. 7).

Design-based learning builds upon the thesis that there is a strong connection between design and learning. There are several possible theoretical underpinnings to this thesis. One is the constructionist claim: that (only) by building something in the world do you understand it. This claim can be justified in different ways: One rationalization would build on Papert's (1993) Piaget-inspired view, according to which constructing something in the physical or virtual world is paralleled and enabled by a corresponding construction of mental schemas. These schemas are then challenged if the physical/virtual construction does not behave as expected. Another version is a variant of diSessa's (2000) point that by taking something apart and rebuilding it, you develop an understanding of the mechanisms by which it works. This can, again, be explained in terms of Piagetian/Papertian (Papert, 1993) mental constructions, but other conceptualizations of what is involved in 'understanding the mechanisms' are possible as well. The dictum often attributed to Lewin (1973) that 'if you want to truly understand something try to change it' signals a rather different way of justifying the aim, especially given Lewin's (1973) Gestaltist approach to understanding organizations and social groups: systemic constraints that are not initially evident become apparent as they effect resistance to change. The point is that a phenomenon may be determined in its complexity, through disclosing concealed factors effecting resistance. Yet another way of justifying the claim would be from the perspective of situated learning, according to which practice has its concrete meaning in participation. Engaging as a participant in practice will necessarily imply changes – for the learner and for the practice – because participation always is a negotiation of positions and appropriate actions. The situated learning justification would focus on the actual changes that come about as a result of participation.

Viewed as networked learning, the basic characteristic of design-based learning is the possibility it offers learners to (1) actually engage in the target practice and develop experiential knowledge and contextual perspectives in the course of this engagement and (2) engage in imaginative processes of designing for an anticipated future practice. Further, these experiences are not just vicarious, based on observation of and dialogue with participants. Instead they are embodied, lived understandings of practice meanings. Design-based learning can thus prepare students for future professional practice by supplying an experiential basis of how to 'do practice', as well as experiences of analysing status quo and working to change it for the better. From this perspective, the situated learning rationalization and the Lewinian (Lewin, 1973) insight that designing for change will bring forth hidden aspects are more adequate learning-theoretical underpinnings of design-based learning than

constructionism. Being engaged themselves in the practice all things equal will be more supportive of learners' developing commitment to and emotional involvement in the practice. The experiential knowledge developed will be available much more readily as tacit semantic content to draw on for the learners in other contexts, too, though prompting, facilitation and scaffolding may still be needed. In particular, it may more easily inform their understanding of academic concepts and theories within educational contexts. Similarly, the contextual perspective of the target practice may supply a concretization of academic texts.

There remains, however, the question of what practice positions learners have in the target practice. Will they be expected to participate alongside participants, partaking in the practice activities, performing participant actions, as they negotiate the design and its realization? Or will they only be allowed to supply ideas – perhaps in the form of a design developed on beforehand and perhaps counselling on their implementation? How these questions are answered in the design-based learning project is decisive for which experiential knowledge and contextual perspectives the learners are de facto able to develop. If they are accorded a position more as commentator and counsellor and less as practitioner, the embodied understanding developed will only to a lesser degree be able to 'fill out' academic theories and concepts with action practice meaning. For the same reason, the design-based learning will also only to a lesser degree prepare them for future professional practice.

On the other hand, there is the risk that learners' involvement in the target practice happens at the expense of their engagement in their education. This may lead to the latter losing significance for the learners. In turn, this may make it more difficult for the learners to 'traverse back' and resituate their experiential practice knowledge in concretized sense-making of academic perspectives.

The intended student trajectory in this learning design is the following: gain access to a target practice, observe or participate in this practice and hereafter develop, test and evaluate design principles and finally develop new knowledge of the target practice. This trajectory and the corresponding design principles for teachers are illustrated in Table 8.2 and Fig. 8.2.

The Learning Design of *Simulation-Based Learning*

Simulation may be defined as tasks within the educational context which mimic tasks in the work situations of target practice. Such tasks are common in learning designs in professional disciplines such as health, medicine and engineering education (Laurillard, 2012, p. 180). The purpose is to 'learn to do practice'. More specifically, the purpose is to develop complex skills and to reflect on action. This is done by involving learners in realistic scenarios from the target practice. Simulation can be used to simulate workplace dynamics and can support the learners' future on-the-job experience and point to 'the essential dynamics of a workplace in a way that allows learners to explore different approaches, test diverse strategies, experience various outcomes, and build a better overall understanding of key aspects of the real

Table 8.2 Design-based learning: intended student trajectory and design principles for teachers

Intended student trajectory	Design principles for teachers
Gain access to local, target practice, either through teacher mediation or of own accord	*Support students in gaining access to a local, target practice*, either directly or by supporting students in finding one
Observe or *participate* in local, target practice with the aim of detecting a problem. *Analyse problem*	*Plan* the course sequence so that students have *time to actually participate in* target practice. *Support* them in detecting and analysing problems by *drawing on academic* theories and concepts and *research literature* on similar target practice problems
Develop, test and evaluate design principles for local, target practice; develop experiential knowledge and contextual perspective in the process	*Plan* the course sequence so that students have *time to develop, test and evaluate design principles. Support* them by *drawing on academic* theories and concepts and *research literature* on similar target practice problems
Develop understanding: *of target practice* based on its resistance to employment of design principles; *of curricular content*: let experiential target practice sense inform academic theories and concepts	*Support* students in *connecting* experiential target practice sense and academic theories through *supporting academic reflection* on experiential knowledge, especially of target practice' resistance to employment of design principles
Develop generalized design principles for target practice beyond the local instance of it	*Support* students in developing generalized design principles by *supporting academic reflection* on the limitations of the local, target practice and its (lack of) representivity for target practice in general

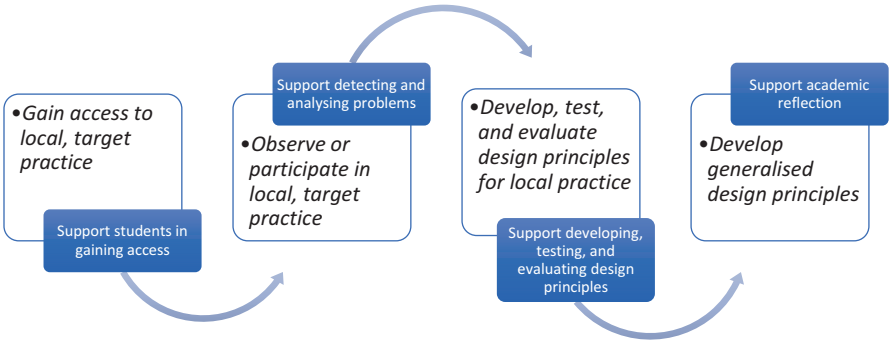

Fig. 8.2 Design-based learning: model of the intended student trajectory and the corresponding design principles for teachers

world' (Shapira-Lishchinsky, 2015, p. 3). Simulation-based learning supports learners in learning important target practice skills.

However, it is also important for learners to step out of the simulation and reflect on their problem-solving and on the skills learnt. Learners should in this situation be supported in reflecting on the workplace identity which they engage in and on its relation to their own identity as future practitioners. Simulation-based learning

therefore involves two connected learning spaces: the simulation space and the reflection-on-action space. The method of simulation-based learning is characterized by the learner conducting a process in response to a sequence of tasks simulating a typical target practice issue. The learner gets to act similarly to a practitioner and to make use of knowledge appropriate to the target practice issue. Depending on how much of target practice the simulation emulates, it may enable learners to experience participation 'as-if' in a professional practice and 'involvement in a yet-to-be-fully-experienced activity' (Beach, 2003, p. 46).

The aim of simulation is to 'learn to do practice'. Again, there are several ways in which this may be conceptualized learning theoretically, depending not least on what one construes 'doing practice' as involving. From a behaviourist, instructional design viewpoint, simulation is training of practice skills, relatively narrowly construed, as behaviour that solves specified tasks (Grierson, 2014). A criterion for simulation-based learning is therefore that there is functional task alignment between learning and future use situation rather than high fidelity understood as physical faithfulness of the former to the latter (Hamstra, Brydges, Hatala, Zendejas, & Cook, 2014). From a constructivist viewpoint, learning to do practice involves constructing the relevant cognitive and behavioural schemas that skilful acting consists in. Simulation may be utilized to develop these schemas and will be particularly relevant if experimentation in target practice is dangerous (e.g. aviation, medicine), unethical (e.g. medicine) or not easily accessible (e.g. space flight). From a sociocultural viewpoint, 'doing practice' involves the broader participatory understanding of the value ascribed to such skills by practitioners and of their significance to the broader sense-bearing contexts in which they are used. It also involves the development of practice-specific ways of engaging with other practitioners and of understanding the sense-bearing contexts and one's place in them. Simulation from a sociocultural point of view should therefore concern not only specific tasks but the practice as such. However, there are decisive limits to the degree to which one can establish 'functional practice alignment' (to paraphrase the behaviourist term) between a simulated practice and the target practice, because the significance of activities (micro-level) will always be determined to some extent through the broader sense-giving context (meso-level). In particular, simulating a target practice e.g. through role-play within an educational practice will endow the activities with a complex mediational status (resulting e.g. in 'breakdowns' in the form of laughter on the part of role-playing participants). This status is perhaps better captured by the term 'as-if-and-yet-not' activity rather than by Beach's (2003) phrase 'yet-to-be-fully-experienced activity'.

Viewed as networked learning, the basic characteristic of simulation-based learning is the possibility it offers learners to develop experiential knowledge of activities (micro-level), which have their counterpart in target practice, though in very different sense-bearing contexts (meso-level). The networked learning perspective here again sides mostly with the sociocultural construal of simulation. On the other hand, it stresses that the micro-level of specific activities is significant, too, and should not be overlooked. Importantly, the experiential knowledge attained e.g. through role-playing different practitioner perspectives will also supply a tacit dimension to

descriptions of the target practice as well as to academic concepts and theories, and in particular to descriptions of the practitioner roles. These experiences will help prepare students for their future professional practice.

However, given that the sense-bearing contexts involved in simulated and target practice are very different, learners' experiences of practitioner roles (and thus the tacit semantic content they supply) cannot be expected to align closely with actual practitioner experiences. For the same reason, it is debatable to which extent simulation-based learning offers the possibility of developing contextual perspectives to inform academic concepts and theories. Arguably, what simulation may facilitate in this regard is the development of mediational contextual perspectives, which are neither those of the target practice nor fully those of the educational practice, but rather ones of the mediational practice of target practice as contextualized in education. In Beach's (2003) terms, simulation-based learning supports learners in making mediational transitions between educational and target practices. Through doing this, the learning design may support learners in transforming and resituating their academic knowledge as actionable knowledge in the simulated practice. Conversely, it may also support them in resituating their simulation experiences as tacit semantic content to resonate in their understanding of the academic perspectives. When the target practice is accessed within the educational practice it opens rich possibilities for learners and teachers to reflect together on the differences between target and simulated practice at both micro- and meso-level. In comparison with the other learning designs, where the learner can be relatively alone in establishing the connections between target and educational practices, simulation-based learning allows much more direct teacher support. This constitutes a clear advantage of simulation-based learning that may outweigh the lack of real experiences with target practice and the resulting lack of development of target practice contextual perspectives and experiential knowledge at the meso-level.

The intended student trajectory in this learning design is for the student to engage in simulated target practice, reflect on skills, values and identity of simulated and real target practice and finally develop practical and academic understanding of target practice. This trajectory is depicted in Table 8.3 and Fig. 8.3, along with the corresponding design principles for teachers.

Concluding Remarks

This chapter has analysed three different examples of 'learning through practice' as forms of networked learning: the learning designs of 'case-based learning', 'design-based learning' and 'simulation-based learning'. Through the analysis of the purpose, content, method and theoretical basis of the learning designs, it has been identified which connection forms the different learning designs facilitate between learners' experience in target practice and educational practice. This has further allowed the articulation of design principles for each learning design. For the teacher, the analysis contributes with theoretical conceptualizations which may

Table 8.3 Simulation-based learning: intended student trajectory and design principles for teachers

Intended student trajectory	Design principles for teachers
	Devise simulated target practice work situations, either directly or support students in devising them
Engage in simulated target practice work situations, develop experiential knowledge, resituate academic knowledge as actionable knowledge, train specific skills and/or participation in the practice as such	*Plan* the course sequence so that students have the *time needed to train skills/participate in simulated practice. Support* them in carrying out the tasks as target practice practitioners would (engaging academic knowledge in resituated form)
Reflect on skills, values and identity of simulated and real target practice; on *mediational practice of simulation*; and on *differences* between educational context and target practice context	*Support* students in *reflecting* on skills, values, identity and mediation in simulatio
Develop understanding: let experiential simulation knowledge inform academic theories and concepts	*Support* students in *connecting* experiential simulation knowledge and academic theories by *supporting academic reflection* on experiential simulation knowledge

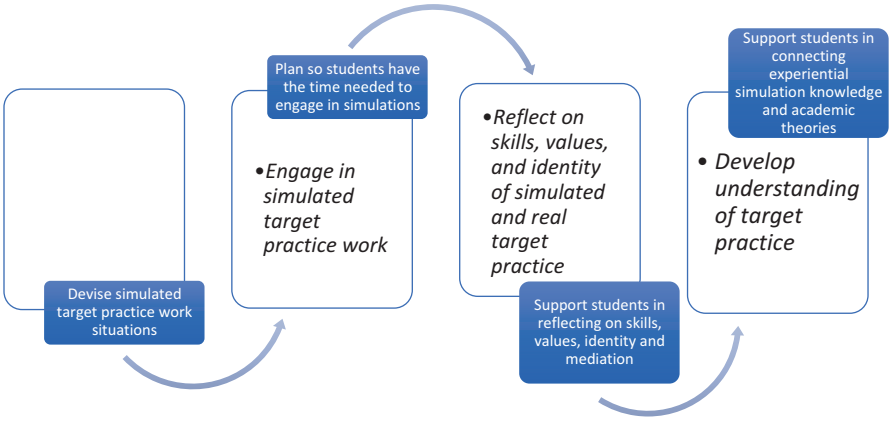

Fig. 8.3 Simulation-based learning: model of the intended student trajectory and the corresponding design principles for teachers

support pedagogical planning, reflection and experimentation. Table 8.4 summarizes the rationale, theoretical basis and considerations for practical use for the three learning designs. Because of space limits, it has not been possible to discuss challenges for educational institutions involved in implementing the designs in practice which go beyond these considerations.

By way of conclusion, a few last points about the learning spaces and the roles of practice in the three learning designs should be made. Firstly, the three learning designs create different spaces for learning: Case-based learning creates a study space supporting a relationship of inquiry between learner and target practice aimed

Table 8.4 Summary of rationale, theoretical basis and considerations for practical use for the three learning designs

	Case-based learning	Design-based learning	Simulation-based learning
General rationale	Students develop understanding through inquiry, by connecting academic knowledge and target practice meanings	Students innovate practice through design experiments and develop understanding of practice through changing it	Students develop experiential and practical knowledge and learn to do practice by mimicking tasks in the work situations of target practice
Theoretical underpinning	Hermeneutic theory, constructivistically or socioculturally construed	Constructionism, Lewinian systems theory or situated learning theory	Behaviourism (training of practice skills), constructivism (construction of schemas) or sociocultural theory (participatory understanding of skills, values and identity)
Considerations for practical use	There is no automaticity for students in establishing connections between their experiential case-related knowledge and the academic theories and concepts. Therefore, they need to be supported	Students need to take on four different roles (analysing practice, developing solutions, testing solutions, generalizing findings) when engaging in design-based learning. They need to be supported in negotiating and manoeuvring between these roles and in resituating knowledge across them	Unreflective combinations of guidelines from different learning-theoretical positions may result in tensions for learners. It is important to create a space for reflection on the mediational character of simulation practice

at the development of understanding. Design-based learning creates a workshop space supporting a relationship of innovation between learner and target practice aimed at the development of understanding through change. Simulation-based learning creates a space for role-play, simulation and reflection-on-action by establishing a relationship of imitation and engagement in 'as-if' practice. The different learning spaces support different learning trajectories and enable learners to experience practice from a student point of view and to develop knowledge through active engagement with it. They thus allow learners different perspectives on curricular knowledge from the ones they can get within education and, in particular, allow them to make connections between experiential and curricular knowledge.

Secondly, the different roles of practice in relation to education and learning should be pointed out: (1) Practice is a curricular object or domain, i.e. something that students must *learn about* and develop relevant skills and knowledge to understand. (2) Practice is an organizational unit which students *participate in* as a part of

vocational and professional training for a limited period of time. (3) Practice is also a set of purposeful activities which students can *learn through* by engaging in its problems and challenges through epistemological activities of understanding, solving and/or innovating. In this role, practice is not just an example to illustrate academic knowledge or the application of it to a concrete work situation. Instead, practice constitutes a potential learning opportunity for *situated knowledge transformation*. Involved in this is the transformation of knowledge from particular academic disciplines into 'patterns of participatory processes' in target practice (Tuomi-Gröhn & Engeström, 2003, pp. 33–34).

From a meta-perspective, the approach of analysing learning designs through a specific understanding of networked learning helps qualify both: It allows the perspective of networked learning, understood as learners' connecting of contexts in which they participate, to become clearer through use. Similarly, for learning designs, it disclosed the specific ways in which different connection forms between target practice and educational practice can facilitate distinct forms of learning, participation and the situating of practice. As a result, it is possible to reformulate the definition of learning design presented earlier more specifically for networked learning: Learning design for networked learning is a *plan for a course sequence which articulates the intended overall organization of learning possibilities as a matter of facilitating learners in creating connections between contexts,* e.g. *work life practice and educational practice*.

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