Networked learning and problem and project based learning – how they complement each other

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Abstract

Networked learning is both a pedagogy and a philosophy, and so is problem and project-based learning. Both approaches have been greatly influenced by the traditions of open learning and other radical pedagogies and humanistic educational ideas of Dewey, Freire, Giroux, Rogers, Negt and others. However, despite similarities in their educational ideas and pedagogies, the two approaches differ considerably. From the beginning, networked learning has focused on the integration of information and communication technologies as well as the promotion of connections – between learners, between learners and tutors and between the learning community and learning resources. On the other hand, problem and project-based learning has been characterised by a number of combined pedagogical principles: problem formulation and enquiry of exemplary problems (anomalies), participant control, interdisciplinarity, joint collaborative projects and action learning stressing the interdependencies among learners and their engagement in the research of ill-structured and open societal problems. Building on Nicolajsen and Ryberg (2014) and Tambouris et al. (2012), the overall changes and potential in the educational digital landscape and in NL can be summarised as follows: (1) a move from hierarchical structures based on courses and topics toward more student-centred networks; (2) a change from dissemination toward horizontal patterns of knowledge exchange and peer learning; (3) a change from learning management systems (LMSs) toward personal learning environments (PLEs); (4) a move toward encouraging exchange, sharing and students' production of knowledge and artefacts; and (5) a shift from classical curriculum toward 21st-century skills and networked digital scholarship. Within this landscape of change, the paper discusses the core principles of networked learning and problem based learning design, respectively, addressing the ethical claim of dialogue as an I-You relation, omnipresent digital technologies and social media as connecting the learner, Castells' concept of "space of flows" as the material arrangements of simultaneity of social practices without territorial contiguity, personal learning environments, and the positive means of interdependencies in project work. The aim of this paper is to examine the two approaches and discuss on a conceptual level how they may complement each other in the endeavour to further develop a critical pedagogy while still providing guiding principles for a practical approach to university teaching and learning.

Keywords

Problem and project based learning, networked learning, interdependencies, connections, space of flows.

Networked learning and problem and project based learning – two approaches to critical and transformative learning

Networked learning (NL) is both a pedagogy and a philosophy (Dirckinck-Holmfeld, Hodgson, & McConnell, 2011), and so is problem and project-based learning (PBL)[1]. Both approaches have been largely influenced by the traditions of open learning and other radical pedagogies and humanistic educational ideas from the likes of Dewey, Freire, Giroux, Rogers and Negt. However, despite similarities in their educational ideas and pedagogies, the two approaches also differ the way they approach learning. From the beginning, NL has focused on the integration of information and communication technologies (ICT) as well as the promotion of connections – between the learners, between the learners and the tutors, and between the learning community

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[1] I am using PBL as the abbreviation for "problem and project based learning." This is the official abbreviation at Aalborg University. However, it may lead to some confusion as the mainstream concept of PBL is more closely related to a problem solving methodology.

and the learning resources (ibid.). On the other hand, PBL developed as an on-campus pedagogy combining a number of pedagogical principles: problem formulation and enquiry of exemplary problems (anomalies), participant control, interdisciplinarity, joint collaborative projects and action learning (Dirckinck-Holmfeld, 2002). In order to further develop the integration of NL and PBL practices both on-campus and off-campus, this paper will explore which principles of NL should be integrated in PBL and further examine how to design a learning environment based on both NL and PBL. The research questions can therefore be formulated in this way: What are the core principles of NL that should supplement PBL in order for the pedagogy to best cope with the morphology of a networked society? How can the learning environment be designed so it reflects the core principles of NL and PBL?

Networked learning

NL is becoming an established area of research and pedagogy. It has its own international conference (the International Conference on Networked Learning) as well as a book series in Springer and an active research community. NL is highly relevant to the current networked and digital world. It is generally restricted to learning that is mediated by digital networks, including social networking and other Web 2/3 virtual spaces that support user interaction and content generation.

McConnell, Hodgson, & Dirckinck-Holmfeld (2012) provide a historical overview of the development of the philosophy and pedagogy of NL, describing it as "an approach that takes a critical and inquiring perspective and focuses on the potential of information and communication technology (ICT) to support connections and collaborations" (ibid, p. 7). This description is rooted in the first definition of NL from 1999 from the JISC project: "We define networked learning as learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources" (ibid, p. 7). In their historical review of NL, McConnell et al. (2012) explain that this definition has persisted remarkably well and was reiterated in the book that resulted from the JISC project (Steeples & Jones, 2002) and was later confirmed by (Goodyear, 2004). However, as Goodyear commented, "while the richest examples of networked learning involve interaction with on-line materials *and* with other people. But use of on-line materials is not a *sufficient* characteristic to define networked learning" (cited in McConnel et al., 2012, p. 7). As such, NL is social networking and social knowledge construction made possible through information and communication technologies.

For the further discussion in this article, I will specially focus on two aspects of these early definitions of NL. One is the focus on *information and communication technology*, specifically the networking aspects, and the second is the focus on *promoting connections*. Here I will focus on *promoting connections*, and later I will return to the focus on information and communication technology.

When I first learned about these early definitions of NL I found their focus on connection a little weak: What does it mean to connect? Perhaps this was based on linguistic and translational reasons? I was using the concept in its technical translation (e.g. electricity, when switching on the light). However, I later learned from Vivien Hodgson that connection also connotes attachment and affiliation, as in dialogues. The 2002 Manifesto of Networked Learning explicitly states that technologies should support distributed interaction and dialogues, and the NLC's calls for papers in 2002 and 2010 also focus on learning as dialog and dialogical learning (McConnell et al., 2012).

This wider and comprehensive use of the concept of connection as dialogues adds an important dimension to NL. It implies that the people (teachers, supervisors and students) invest themselves in connecting dialogues. In that sense, NL implies an ethical claim and a response to the political-ethical discourse. The learners enter into connecting dialogs with each other, the teacher and supervisor as well as the material. However, as highlighted by Levinsen and Nielsen (2012) this taking place in an overall climate dominated by the economic-pragmatic discourse. In the concluding chapter of the *Networked Learning* book (2012), this paradox is expressed in this way that NL has to navigate in an environment of opposing demands of the political-ethical discourse and the economic-pragmatic discourse, but also that NL should continue to question the nature of society and how we develop new knowledge of the world we live in, including societal form and how to take learning into the wider world (Hodgson, McConnell, & Dirckinck-Holmfeld, 2012).

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NL is entrenched in technology, not in a determinist way but as a relational mediation of learning (Dirckinck-Holmfeld, Jones, & Lindström, 2009; Jones, 2015). Today, education is saturated with omnipresent and pervasive access to digital networked technologies via various devices (phones, tablets, etc.) and in various locations (at home, on public transport, on campus or in the lecture hall). Contemporary NL actively crosses the boundaries of traditional settings to understand how mobile and ubiquitous technologies can allow learners to couple learning and everyday living contexts (Jones, Ryberg, & de Laat, 2015). As such, NL occurs in complex settings of collocation (face to face) and distributed settings (cafes, homes, work and in transition spaces), simultaneously collaborating online. From an NL and institutional perspective, the challenge is to cope with all available technologies and ensure that they are accessible, taken into use and apprehended by the participants: students, professors and admin personnel.

The societal perspectives and arguments for NL can be found in the seminal and paradigmatic work of Manual Castells, professor of Sociology and Planning at Berkeley, who discusses the transformative morphology of networked societies (Castells, 2000). According to Castells, a networked society is a society where the key social structures and activities are organised around electronically processed information networks. In his characterisation of a networked society, the "space of flows" plays a defining role: "Space of flows' means that the material arrangements allow for simultaneity of social practices without territorial contiguity" (Castells, 1999, p. 295). This does not refer to purely electronic spaces, although cyberspace is a component of space of flows. The space of flows are networks of interaction, and the goals and tasks of each network configure a different space of flows, which crisscross in nodes and hubs. Berkeley, Stanford and MIT are examples of hubs in computer science. "However, what characterizes the new roles of these hubs and nodes is that they are dependent on the networks, that their logic depends on their place in the network, and that they are sites to process signals that do not originate from any specific place but from endless recurrent interactions in the network" (ibid, p. 296). Thus, the hubs are not given but are rather something to become because of the repeated and persistent interactions in the networks. These hubs/networks then become the new localisation of power. Due to Castell the space of flows comprises electronic spaces such as websites, spaces of interaction, as well as spaces of one-directional communication, such as information systems (and we can add massive open online systems (MOOCs), but it is also made of habitats for the social actor that operate the networks be it residential spaces, VIP lounges, computing on the run, standardized hotel chains.

According to Nicolajsen and Ryberg (2014) and Tambouris et al. (2012), the overall changes and potential in the educational digital landscape and in NL can be summarised as follows: (1) a move from hierarchical structures based on courses and topics toward more student-centred networks; (2) a change from dissemination toward horizontal patterns of knowledge exchange and peer learning; (3) a change from learning management systems (LMSs) toward personal learning environments (PLEs); (4) a move toward encouraging exchange, sharing and students' production of knowledge and artefacts; and (5) a shift from classical curriculum toward 21st-century skills and networked digital scholarship.

Problem and project-based learning

PBL is often traced back to the ideas developed in the McMaster University Medical School in Canada in the 1960s (Kolmos, Fink, & Krogh, 2004), which have since spread around the world. In the Danish context, the development of the concept of PBL was integrated in the establishment of two reform universities in the 1970s, Roskilde University (1972) and Aalborg University (1974). From the beginning, the scope of PBL was broader in Denmark than it was in McMaster. In Aalborg University, the concept was closely linked to the foundational philosophy of the university: *Breaking new ground.*

The establishment of reform universities was part of a political agenda seeking to develop a new kind of university more in line with the pragmatic Anglo-American universities, relating to the needs of society and business and providing access to new student groups (beyond the cultural elite). Moreover, the student rebellion in the 1960s inspired a new knowledge-producing approach within universities, the so-called "fagkritik" (curriculum critique). Fagkritik refers to the criticism of subjects and the underlying prevailing methods and paradigms. In the Danish setting, new research studies focused on less privileged groups, especially in relation to Marxism, were taken up.

PBL became the unifying concept for this radical transformation of university culture and the development of new knowledge, teaching and learning approaches. Today, few educational programme leaders would consider

themselves to be doing fagkritik, however the PBL approach per se is a potentially critical pedagogy, where the students are asked to present and critically discuss the underlying theories and paradigms behind the problem they are exploring. Moreover, societal linkages are built into the didactical principles. Because the students use real-life problems as a point of departure and are encouraged to work with real-world stakeholders, linkages to their future practices are built in. As such PBL is a collaborative research-based approach to teaching and learning. From the very first semester, students apply the PBL principles.

The core teaching and learning mechanisms in PBL are the strong interdependencies among the students that are built into the collaborative group work during research. McConnell et al. (2012) explain it in this way:

> Much higher education learning is abstract and often unrelated to real situations, and many students struggle to see the purpose of it. If learners have a real purpose in learning, they engage with the learning process in a qualitative different way. Problem-based learning (PBL) and action learning/research are two ways in which learners can define the focus of their learning in meaningful and relevant contexts. (ibid, p. 8-9)

This promotes positive interdependencies and helps learners relate to the group and its tasks. McConnel et al. (2012) refer to this as outcome interdependence and means interdependencies, where outcome interdependence is related to the shared project and means interdependencies to the actions and contributions from each group member.

In order to stimulate a learning environment based on PBL, the structure of the educational programmes, the social relations between researchers and students and the physical layout of the reform universities were greatly changed from traditional, Humbolt-inspired universities. Aalborg University was designed around "big semester groups" uniting research and teaching, with special project rooms for all the student groups and a culture of collaboration between students and between students and supervisors. These project groups were equipped with advanced tools of that time: a typewriter, a display board, a shared workspace for the groups and easy access to books and journals at the library as well as copy and print facilities. I mention this to underline that PBL as a pedagogy uses and prerequisites a number of societally available tools. In less privileged contexts, these resources are not always available, and this must be taken into account when applying the principles. When ICT was introduced in the mid-1980s, a number of research projects were launched to examine how to integrate ICT and PBL. These produced many research insights and cases showing the integration of ICT and PBL; however, the systematic integration of ICT and PBL in various contexts, particularly as institution-based strategies, is an area requiring significant attention, not least because the continuing developing of new tools and delivery modes e.g. Massive Open Online Courses (MOOCs) provide a crucial foundation for radical transformation of PBL.

Combining principles of NL and PBL

So, despite many research projects, it is fair to say that ICT had not been integrated in a systematic way into mainstream PBL. Thus, there seems to be an obvious opportunity to combine the two approaches of NL and PBL as the pedagogical principles for learning design. However, before coming back to a learning design, I would like to consider the two approaches from a didactical point of view.

Dialogues are taken for granted in PBL as a way for students to construct knowledge and as a prerequisite for working together. However this issue has only been sparsely addressed from an ethical point of view, and then often in relation to how PBL can afford appreciation of ethical aspects in relation to a profession or domain, especially within health care (Koh, Khoo, Wong, & Koh, 2008). Seen from a humanistic perspective, further development of PBL is relevant and necessary, as in NL, to focus on dialogues as a core didactic principle. Inspiration for further development may be found in existentialism (Buber, 1970), and the very obvious and important distinction between I–You and I–It relations. In I-You relations, each person confirms the other as having unique value, whereas in I-It relations the other becomes a mean or an instrument. Especially in times where our educational systems are challenged by declining resources and a domination of the economic-pragmatic discourse, I–You relations may be an abstract claim, requiring careful attention on how to implement and practice NL and PBL.

Castells' concept of space of flows might also be further explored in relation to PBL. Projects in PBL have a tendency to lock up the group around the (research) problem they are exploring. In a sense, this is a strong and

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important competence the students are gaining – to be able to focus, and to skip all other activities – which is not contributing to the project. On the other hand, as knowledge production is in a state of constant flow, the students may subsequently realise that while they have been concentrating on their project, important knowledge within reach has not been integrated. Designing for PBL therefore implies a need to work with students in regard to how to adapt to this concept of space of flows as a new networked scholarship competence. As the space of flows is made up of networks of interaction, and as the goals and tasks of each network configure a different space of flows, students have to learn to situate their (research) problem in these networks of interactions. This could be a new way of addressing the need for a systematic "state-of-the-art" chapter in the projects. What kind of network does the project belong to? What knowledge is already available about these projects? How can the space of flows be located and anchored in the relevant practitioners' communities? Further, the space of flows might also serve as a metaphor helping individual students develop a flexible mind able to both relate to and add to these knowledge streams – on one hand without getting totally lost in cyberspace, and on the other not getting locked into preconceptions and traditional ways of problem solving.

Designing for NL and PBL
When combining these two approaches, we have to design for the principle of social networking, connections mediated by and afforded by omnipresent and pervasive digital networked technologies, space of flows and an orientation towards personal learning environments as well as all the principles of PBL, including the positive means of interdependencies in the project work. The following will not cover all aspects and details of the learning design, but I will highlight some core principles. The main core principle will be a dialectic between i) designing for interdependencies between students in studying and researching shared societal problems (PBL) and ii) designing for personal and socially constituted NL environments. Institutions should both facilitate and provide the necessary resources and structures for their realisation.

The two approaches may be seen as contradictory, combining collective dependencies on one hand with a personalised learning environment (PLE) on the other. On an institutional level, it becomes more affordable to gain merit across universities due to the ECTS system. And there are examples of the tuition fee funded by the national government following the students when applying for international university programmes, for example in the Danish system. Students also attend MOOCs, although there is still no developed institutional framework for how to handle them. The development of learning and career portfolios (Concepts, 2013), can also be seen as a step in developing institutionalised tools to support personalised learning.

When it comes to the didactical level, the principles of NL and PBL may benefit each other, and their combination seems to be an obvious answer to the overall changes and potential in the digital education landscape. In previous work, we have described a basic design model for the integration of NL and PBL based on the educational design and experiences from a Master in ICT and Learning (MIL), see Dirckinck-Holmfeld (2002). This model is still working and proved successful. It combines principles of PBL, learning in communities of practice (Wenger, 1998) as well as Brenda Laurel's (2014) principles of rhythm, constraints and dramaturgy in learning design. In the following paragraph I'm going to discuss how this model could be further developed applying the NL- and PBL principles presented here.

The basic didactical principles for a combined NL and PBL design should be based on the principles of PBL, learning in communities of practice, connections as mediated dialogues, omnipresent digital networked tools and space of flows. The core principle is to establish strong interdependencies between the learners and between learners and teachers based on the principle of a shared engagement in researching societal problems (PBL) and the principle of I–You relations. These relations imply to design for strong ties in the network for example following the principles of learning in communities of practice and the PBL-principles. However, at the same time, principles of open networking and principles of weak ties should be designed for to expand the learning environment beyond the institutional boundaries, using all available technologies[2] to immerse the learners in the space of flows of new ideas, new perspectives and new peers, linking them to the leading nodes and hubs within their field of research.

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[2] An open source platform is important when scaling up, for example, to offer students and researchers the opportunity to work with partners outside the university. Moreover and equally as important, the idea of openness in open source is in line with the basic idea of NL as an open learning philosophy.

The basic design is a large group up to 80–90 students[3] organised in project groups (4-5 students) supported by a learning management system e.g. Moodle and a number of supporting tools for collaboration and effective digital scholarship. Examples are (Davidsen & Ryberg, Thomas, n.d.)

- collaboration tools (ex Evernote, Google Drive, Droptask)
- reference tools (ex Zotero, Mendely)
- presentation/visualization tools (ex. Mindmeister, Prezi)
- networking tools (ex Diigo, Twitter, LinkedIn, Google +)
- word processing (ex Word, Google Docs)
- information search tools (ex library research databases, Google Scholar)

These tools should be provided and managed by the institution to give students equal access to a dynamic and effective learning environment. However, as important, the institution should also develop strategies for the students to appropriate these tools in developing digital networked PBL scholarship. See also (Konnerup, Ulla & Dirckinck-Holmfeld, L., n.d.)

At the same time, the project groups should be stimulated to go beyond institutional boundaries and explore and utilise networked tools and technologies that suit their specific academic and societal engagement. The smart institution would establish a feedback mechanism so these tools, which the students track down, might be integrated in an on-going renewal of the information ecology supporting the learning environment (Nicolajsen & Ryberg, 2014).

Summary and conclusion

NL and PBL share ideas of formation and educational principles. At the same time, the two approaches also have some distinct features, which may be combined. This paper has focused on NL from the perspective of PBL in order to determine what should be taken from NL and brought to PBL. A number of principles are suggested that may be added to the didactical principles of PBL: designing for "connection," which is understood as dialogues; "space of flows," as formulated by Castells, to engage with knowledge hubs beyond the institutional offers; and employing and exploiting the omnipresent and pervasive access to digital NL, both in communication of practice and when dealing with the subject and problem area of study. Based on this, a sketch for learning design principles has been proposed.

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[3] The number of 80 students has been suggested by (Andersen & Heilesen, 2015). If there are more students in a year group, they should be divided in manageable big group sizes.

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