Chapter 9
How to Design for the Materialisation of Networked Learning Spaces: A Cross-Case Analysis

Mette Wichmand, Magda Pischetola, and Lone Dirckinck-Holmfeld

Abstract The potential of a networked learning (NL) space comes into being when participants establish communication, build connections with one another and create a dialogic space. Moving from this premise, this chapter poses a complex question: *How to design for the materialisation of a networked learning space for professionals in education*? It bases its theoretical framework on Bakhtin's idea of centrifugal and centripetal forces, the concepts of network core and periphery as well as the idea of the strength of weak ties. Through these lenses, this chapter presents a cross-case analysis of two projects aimed at teacher/leader professional development in technology education in Denmark: Master of ICT and Learning (MIL) and Teknosofikum. The two cases are analysed qualitatively through the concepts of forces, connections and movements. Findings show that the materialisation of NL spaces occurs through the constant movement between centrifugal and centripetal forces; the core and the periphery meet in between, and new connections are created in this encounter. The newly materialised NL spaces will not survive the ending of the courses. They do, however, allow for experimenting with NL principles and for bringing new practices and ideas into the participants' own organisations.

Keywords Networked learning space · Centrifugal and centripetal forces · Core and periphery · Connections · Professionals in education

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Introduction

The long-standing concept of networked learning (NL) (Goodyear et al., 2004) has undergone a recent collective redefinition towards a more situated sensibility; it now comprises a broader conceptualisation of cognition and it acknowledges the 'messiness' that characterises learning processes (NLEC et al., 2021). The critical and emancipatory roots of NL have expanded to include socio-technical, sociomaterial, postdigital and postphenomenological perspectives (Pischetola & Dirckinck-Holmfeld, 2021). In this reconceptualisation, NL now stresses how learning is a complex, emergent and holistic process that appears inseparable from the surrounding environment; the network can be considered an assemblage of actors and organisations where agency is distributed and decentralised. On these grounds, it is crucial to understand how the connected actors taking part in a network can create a space for NL or, in other words, how their agency materialises in a specific, situated, and unique space-time (Orlikowski, 2007).

Thestrup et al. (2018) suggest that a NL space comes into being when participants become aware of the potential of NL, establish communication and build 'experimenting communities' (NLEC et al., 2021, p. 21). In this sense, a NL space is a dynamic ecosystem (Miranda & Pischetola, 2020), where participants take responsibility for their own and others' learning while navigating the networks multiple dimensions and layers (Blaschke et al., 2021). Thus, a NL space is first and foremost a relational space (Jones, 2004; Jones et al., 2008) – that is, it is made of elements and the relations between participants (Mol & Law, 1994). Yet a NL space escapes formal structures (Fawns, 2019) and cannot be conceived as stabilised through a set of well-identified nodes (Lamb & Ross, 2021), as its fluidity is essential to nurture the network itself. Bearing this in mind, this chapter poses a complex question: *How to design for the materialisation of a networked learning space for professionals in education?*

As Hodgson et al. (2012) pointed out, a community organised around a NL space must be 'designed into' learning events by teachers; it cannot assume to exist without an intention. In this chapter, design is thought of as a non-linear process in which ideas are developed, challenged and tested in order to generate new answers to complex questions – in this case, the question is how to enable the materialisation of a NL space (Dorst, 2012). Drawing on the tradition of design thinking, we see educational design as an iterative process; thus, the cases presented in this study should therefore be seen as 'proto-types', ideas to be tested, evaluated and open for redesign. The main intention of such a process is for the involved community to support one another in developing a shared process of learning (Hodgson et al., 2012).

To inform the designs presented here, we embrace Bakhtin's concept of centrifugal and centripetal forces (Bakhtin, 1986), the concepts of network core and periphery (Borgatti & Everett, 2000; Freeman, 1979; Hargadon, 2005) as well as the idea of strong and weak ties (Granovetter, 1973). Building on these theoretical grounds, we present two cases of design for the materialisation of a NL space and examine their potential for the creation of living and experimenting communities of

networked learners. The cases are bound together by a shared focus on educating teachers and leaders from the educational sector to have a critical and reflective approach to the role of technologies in education. Furthermore, both cases intend to design NL spaces and facilitate the establishment of a relational dialogue among the participants that supports the learning process during the course. But the cases also work as a structure for continuous learning after the course has ended.

Materialising a Networked Learning Space: Forces, Movements and Connections

In the NL tradition, dialogic communication has often been highlighted as the main element for the establishment of connections among the nodes (Goodyear et al., 2004; Hodgson & Watland, 2004; McConnell et al., 2012). However, despite the well-accepted idea that the construction of knowledge is a socially negotiated activity, in educational settings, dialogue can also be seen in an instrumental way, as a tool (Mishra, 2015; Pischetola & Dirckinck-Holmfeld, 2021), rather than understood as a necessary condition for any human relationship (Matusov, 2011). These issues resulted in the need to redefine NL in the first place (NLEC, 2021).

In this chapter, we adopt Bakhtin's theoretical perspective on dialogue, understanding its material power (Naumann & Pischetola, 2017) for the creation of NL spaces. In fact, a Bakhtinian perspective on dialogic communication can help us analyse the forces at work in this materialisation and discuss the value of any type of relationship, including those between people and resources (Jones et al., 2008), those that have been defined as 'weak ties' in literature (Granovetter, 1973) and those that are defined by their positions at the core or in the periphery of the network (Borgatti & Everett, 2000; Freeman, 1979; Hargadon, 2005).

Centripetal and Centrifugal Forces: Creating Meaning

According to Bakhtin (1986), dialogue is shaped both by *centripetal* and *centrifugal* forces (Mishra, 2015). Centripetal forces lead towards unification, homologation and monologism (Matusov, 2011), whereas centrifugal forces lead towards complexity, diffusion, and multivoicedness (Elden, 2007). These forces might 'open the pathway for ideological becoming' (Mishra, 2015, p. 79), as they comprise more than one unified truth about the world.

The movement between these forces also has a relationship with the creation of meaning in time. Bakhtin argues that an utterance made in the present is always related to utterances made in the past. In this sense, every utterance carries with it traces of history – of previous meanings. At the same time, an utterance is also always connected to the future, as every utterance contains the seeds for future utterances and meanings (Bakhtin, 1986).

In an educational perspective, Bakhtin's argument is relevant because it becomes possible to understand learning as a dialogical process of continuous meaning making. A process where the centrifugal forces challenge our centripetal movement towards a self-authored voice characterised by unification, homologation and monologism by introducing us to a multi-voiced space, characterised by complexity and diffusion (Bakhtin, 1986).

Taking Bakhtin into account when one wants to design for the materialisation of a NL space makes it important to design for the participants' movement between centrifugal and centripetal forces as well as between unification, homologation and monologism on one side and complexity, diffusion and multivoicedness on the other.

Movements Between Core and Periphery: Facilitating Access to New Resources

Individuals mutually constitute one another, as through dialogue, they build meaning and knowledge about themselves (Bakhtin, 1986). This view is in line with a relational understanding of networks, in which individuals acquire an identity in a context depending on the position they occupy in the network (Jones et al., 2008).

According to Dahlander and Frederiksen (2012, p. 989), a person's position in the network 'can range on a continuum from core to peripheral'. Individuals positioned at the core are often considered to hold an advantageous stable position with many connections to other nodes in the network; they therefore have an empowering access to resources (Borgatti & Everett, 2000; Freeman, 1979; Hargadon, 2005).

The intention in both cases is to design for the materialisation of a NL space by using core members' access to resources to enable more peripheral members to move closer to the core and form newer or stronger ties. In both cases presented in this study, we see the universities offering courses where both core position members and peripheral actors move closer together. And we have seen that this materialisation of a network can provide participants with access to new resources. In both cases, the intention was to create a network that would last longer than the course itself and provide the members with continuous access to the resources needed to translate the knowledge created during the course to the participants' context and everyday practice.

Connections as Constellations of Ties: Giving Value to Knowledge Creation

In a NL perspective, it becomes important that educational settings – seen as knowledge-creating contexts – bring people together in new networked constellations. However, it is not clear how these constellations are built or how they come to being.

In the attempt to find a bridge between micro-level interactions and macro-level patterns of networks, Granovetter (1973) characterised the strength of interpersonal ties through four key elements: amount of time dedicated to the interaction; emotional intensity of the exchange; intimacy; and reciprocal services. According to his analysis, 'weak ties are more likely to link members of *different* small groups than are strong ones, which tend to be concentrated within particular groups' (Granovetter, 1973, p. 1376). The major implication of these findings, the author concludes, is that individuals' experiences are tied up with larger social structures: weak ties, often dismissed as irrelevant in sociological theory, are the connections that mostly provide integration into communities and local cohesion.

Four decades after this theoretical contribution, Jones et al. (2008) applied this model to virtual networks and found the strength of weak ties to be even more relevant for the materialisation of NL spaces.

In the following sections, we will explore and discuss what materialises a NL space. We will emphasise three aspects, related to forces, movements, and connections, respectively: (1) shared meaning making through dialogues shaped both by *centripetal* and *centrifugal* forces; (2) space for innovation through movements between *core* and *periphery;* and (3) the value of knowledge exchange and knowledge creation in the dynamics that acknowledge the *strength of weak ties*.

Research Methods

Our methodological approach is structured around a cross-case model of analysis. Khan and VanWynsberghe (2008) propose that mobilisation of new knowledge occurs when studying different cases at the same time. According to Byrne (2005), a comparative method of analysis is well suited to explain the complexity of a phenomenon, and it also has the potential to reshape the investigative tools in human and social sciences. Particularly, case-based methods can offer us 'a new way of seeing how things have come to be' (Byrne, 2005, p. 101) – that is, their process of materialisation. This idea recalls the dialogic space theorised by Wegerif (2011), which understands knowledge as the result of the clash between different perspectives, seen from both the outside and the inside. In a cross-case analysis, we operate with the same principles of dialogic and relational theories: we look at the *relationship* between the cases rather than consider the studies as separate parts or compare/contrast their results.

In a review of cross-case analysis approaches, Khan and VanWynsberghe (2008) divide them in two main categories: (1) a variable-oriented approach, where similar factors are used to evaluate both cases independently before comparing them; and (2) a case-oriented approach, where similar processes are highlighted in diverse sets of studies. The latter 'can show how a story unfolded in different cases, how researchers can make sense of the original case, or suggest new typologies, classes or families of a social phenomenon' (Khan & VanWynsberghe, 2008, p. 9). A key strength of a case-oriented approach is that it is a holistic approach, meaning that it

considers each case in its complexity; it considers all different combinations of conditions that can produce a certain outcome (Rihoux & Lobe, 2009). Such an approach also forces researchers to justify their choices from a theoretical perspective, with additional observable implications than the original one-case analysis (Beach & Rohlfing, 2018). In this sense, it proves to be an interesting methodology for the purpose of our research, which explores the process of designing for the materialisation of NL spaces.

It is important to underline that the authors of this chapter have come together in a shared interest in digital technology and learning. We are all involved in the two cases presented as teachers, educational designers, researchers and managers. This constellation has a strength in that we are all internal observers of the two cases described, but we also provide an outside-in view to each other's project. In this sense, we are trying to create our own small NL space through the cross-case analysis that follows.

Cases

Both cases refer to courses held in higher education for professionals working in different educational settings. The courses are offered with a similar structure/duration and in a hybrid format, which comprises both physical and online activities.

We will report the two cases through a narrative based on participant observations during physical workshop activities (Case 1 and Case 2). We also use student-produced materials from the physical and the online activities, as well as the knowledge shared during the seminar, for Case 1. Qualitative group interviews (Cohen et al., 2002), posters, and video-recorded presentations are used for data collection in Case 2.

For Case 1, Master in ICT and Learning (MIL), we draw on rich data materials from the workshops and course activities. These materials were constructed in the participants own organisations as well as in collective activities during the course. The detailed materials were: 30 to 40 photos taken by the students from their educational setting and organisation; workshops discussing the concept and use of technology based on the photos, including plenary sessions where students produced post-it reflections on their observations and learnings; teachers' notes on the whiteboard from their observations; and plenary discussions. During the online period, the students worked side by side in groups of three to four with a supervisor. This was followed by a knowledge-sharing seminar with group presentations based on slides and discussions. Furthermore, each student had to deliver a short reflection paper (4 p.). All produced materials were kept on the virtual learning platform for shared use, and the process was documented by photos; main points of discussions were kept on whiteboards or Padlets. All the researchers participated in all physical and online activities. After the main sessions, researchers were sharing notes and

observations guided by the research questions and a hermeneutic 'reading' and mutual discussions. The educational process provided an authentic glimpse into how networked learning unfolds, and it produced a rich dataset with a high ecological validity (Andrade, 2018).

The workshops were designed to 'produce the best learning experience for the students and as such designed to amplify certain elements while reducing others' (Ørngreen & Levinsen, 2017, p. 73). However, at the same time, they served as research workshops, where the participants 'along with their expected and performed agency, become part of the research design and the data-producing apparatus' (ibid, p. 73). Ørngreen and Levinsen discuss how these dual purposes with regards to roles, expectations and interests can sometimes contradict each other; however in our case, the two purposes went hand in hand as we as teachers (as well as the students) were also engaged in understanding the materialisation of NL spaces, and we as researchers could use the produced data and materials in the research.

For Case 2, Teknosofikum, we draw on the data collected along three iterations of the course, through five qualitative online group interviews (Cohen et al., 2002) with course participants (first iteration), as well as through observation of group activities during four physical workshops (second and third iterations). The interviews were recorded and afterwards analysed through the methodology of design-based research, which involves preparation of a prototype, experimentation (the trial itself, where data are collected) and reflective analysis (Pischetola & Møller, 2023). Participant observation (Cohen et al., 2002) was carried out by two educational designers and a postdoctoral researcher during both online activities and physical workshops. Interviews and observations were complemented by other materials collected along the course. Posters produced by course participants were stored and photographed by the researchers for later additional analysis, and group presentations were video recorded with the permission of the course participants. The researchers also took field notes of the discussions in plenum during the workshops. The data were analysed inductively through the methodology of grounded theory (Glaser & Strauss, 1967).

For the purposes of this chapter, we examine what emerges in both cases about centripetal/centrifugal forces, their movement between the core and the periphery, and the emergence of a strength among weak ties in NL spaces.

Case 1: Master of ICT and Learning

Master of ICT and Learning (MIL) is a two-year, 60 ECTS, part-time continuing adult education program, which was established in 2000 as a collaboration between four universities in Denmark: Aalborg University, Aarhus University, Copenhagen Business School and Roskilde University. Over the years, MIL has produced more

than 450 degrees, and more than a thousand students have participated in its modules[1].

For Case 1 in this study, we describe a six-week, 5 ECTS, elective course, which was offered in the spring of 2022. The elective is called 'Leadership, education and technologies – Post COVID-19' and is aimed at managers and executives in the educational sector who have an interest in the interplay between technologies, organisational learning and pedagogical development. The elective is organised as a mix of physical, online and hybrid participation, individual fieldwork and group work. The assessment criterion is pass/no pass based on an uploaded portfolio documenting the students' work and learning throughout the elective subject.

Over the years, technological development has become faster, and technologies are no longer 'nice to have' in an educational setting; they are more or less a prerequisite. Due to COVID-19 and the shift to remote learning, educators and educational institutions have gained much experience with teaching with technologies. This development calls for practitioners who not only can use and design with technologies but can also feel empowered to instigate and facilitate critical discussion about the access and use of technologies in education as well as what we want future technologies to enable. These are discussions that need to take place at all levels and in all corners of the educational system – also among managers and executives.

A total of 17 (12 women and five men) students signed up for the elective representing different types of educational institutions: high schools; business school; health educations; agricultural schools and university colleges. Some were leaders and head teachers, and others were teachers. Some took the elective as part of their full MIL; others only joined for the elective.

The development and execution of the module was done by three teachers. Two of the teachers have personal experience as leaders. The elective is designed to enable a NL space – a space where not only a collective exploration of the influence and management of digital technologies in educational organisations can take place but also where a network among the participants and the resources present is formed. In what follows, we describe the design of the three phases of the course: the physical seminar, the online period and the final presentation. We show how the design around centripetal and centrifugal forces was used to enable the participants to form connections with one another as well as with the materials offered during the course. The intention was to make them move between individual and multi-voiced networked processes and allow them to formulate new questions connected to the interplay between technologies, education and leadership. Questions that can guide future technological developments in their home organisations as well as within the educational sector as a whole.

[1] For a full description of the program, see https://www.aau.dk/uddannelser/efteruddannelse/master/ikt-laering

The Physical Seminar

The course brings together 17 people from different parts of the country and different educational organisations. In order to support the formation of connections between them, the participants are invited to a short online introduction before the official start of the course takes place as a physical meeting from 10 am to 3.30 pm at Aalborg University, Copenhagen. During the online meeting, the teachers talk a bit about the course design,

but the main goal is for the participants to start building connections.

When meeting physically for the first course day, the participants encounter several centripetal and centrifugal forces. As preparation, the participants are asked to produce 30 to 40 printed photos of technologies existing in their home organisation. The assignment brings both centripetal and centrifugal forces into play: centripetal in the sense that the participants work with a shared focus and centrifugal in the sense that the created material is multifaceted depicting many different technologies and organisational contexts.

As the participants meet, share and introduce their pictures, a centrifugal process is instigated – a process in which the participants in groups of three examine the organisations and technologies represented in the pictures. During the process, the participants are introduced to a theoretical model for analysis (i.e., activity theory, see e.g., Engeström & Sannino, 2010) and are asked to continue their analysis using the model. At the beginning, the participants find themselves in a centrifugal process where they get insight into the technological practices of other organisations, but slowly they move into a centripetal movement, as they discover the similarities and the shared experiences with technologies across their organisations – as when they discover that they have a picture of the same technologies or when they share the challenges they experience with the technologies.

At the end of the physical seminar, the participants are asked to bring the analysis and reflections from the day together in a centripetal process of formulating a 'research question' that can guide their work for the coming 6 weeks of the course.

The Six-Week Online Period

After the initial physical seminar, the course continues online with a mix of online seminars for the participants as a whole and online group work supported by a supervisor.

During the first 2 weeks of the online period, the participants are asked to interview actors in their home organisations, with the aim of creating a new centrifugal process that will allow the encounter of more and various voices.

After creating data in the home organisations, the participants will enter into a period of analysing, discussing and reflecting on their collective material (i.e., pictures, theory and interview data), with the aim of bringing the many and diverse voices present in the material together – a centripetal movement leading to new

findings, understandings, questions and wonderings related to the interplay between leadership, education and technologies.

The Final Presentation

At the end of the course, a hybrid meeting is organised, where some participants are present together physically, and some participate via Zoom. The participants then present and discuss their group work.

One of the last assignments the participants are asked to produce is a post for the social network LinkedIn (actual posting is voluntary). The goal of the post is to disseminate to others outside the course what was learned as well as instigate a dialogue between the participants and a larger network of actors in the educational sector about the findings produced and issues raised by the participants during the course.

Master of ICT and Learning and the Networked Learning Space

Figure 9.1 illustrates how the design of the course is intended to enable movements between the centripetal and centrifugal forces during the course and facilitate the connections between the participants and the materials. The centripetal forces are illustrated by the lines moving into a crossing and the centrifugal forces by the lines moving to the points where the lines are the furthest apart.

The centripetal and centrifugal forces come into play in the design through the use of the photo method, theory and analysis. It is important to understand that all of the elements can enable both centrifugal and centripetal forces. The photo method, for example, allows for both the centripetal movement of strengthening the participants' focus on the course's theme and a centrifugal process where the participants get a look into each one another's organisations.

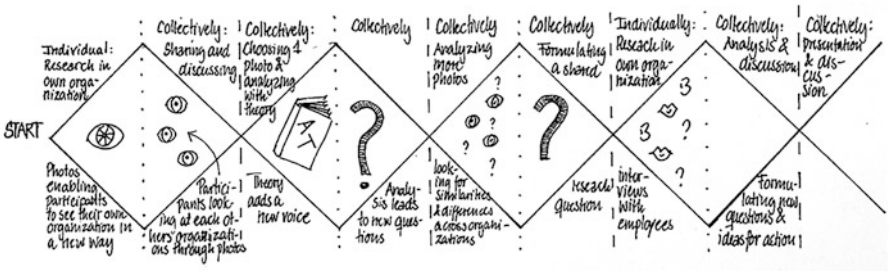

Fig. 9.1 Design for movements between centripetal and centrifugal forces during the course

During the course, the centripetal and centrifugal forces are used to generate connections between the participants and between the participants and the materials presented and created during the course. An example of this is from the beginning of the course, when the participants present their individual stack of photos. In this process, the participants discover that some of their photos are nearly identical and that they share with others some of the same challenges and questions connected to the role of technologies in their organisation. This discovery of communality is reflected in the following quotes from some of the participants.

> *I discovered that we share some of the same questions across organisations, but that we have different views on those common problems in the groups* (M, physical seminar. Translated by the authors).

> *In the dialogue that emerged around our pictures in the group, it became clear that despite the differences between our schools, we had a common interest in what is seen as good teaching in the organisations and how technology plays a role in that* (K, final portfolio. Translated by the authors).

The shared experience allows for the formation of ties not only between the participants but also between the participants and the material. These connections develop during the analysis of the photos and later the interviews. As the similarities become clear, the sharp divide between yours and my photos or interviews gets perforated, and the material becomes a shared resource.

Together, the centripetal and centrifugal forces and the connections formed during the course take the participants through a learning process, which enables the materialisation of a NL space.

This process is exemplified by the movement of the participants' perspective during the course. As they enter the course, they do so as individuals representing individual organisations, believing that they have individual challenges with leadership, education and technologies. By the end of the course, however, they feel more connected with one another and acknowledge that the challenges they face are shared by other leaders and organisations, which cannot be solved by individual leaders. Instead, the solutions are best created in a multi-voiced and networked process. This belief is exemplified in the following quote, in which a participant describes how the participants collectively start to identify points of interest across their organisations that they would like to explore further.

> *Last but not least, my knowledge and findings have been expanded by the collaboration in the group, which through discussion has found several points of interest among our organisations that could be worth exploring further* (M, MIL final portfolio. Translated by the authors).

However, a new reflection for us as designers was that we should not focus on designing for the formation of new stable or long-term NL spaces but instead design for the participants' meta-learning about the NL principles and their ability to put these principles into play in other contexts. This reflection is based on a quote like the following where the participant applies some of the design principles from the course – like e.g., multivoicedness.

> *How can I catapult this* [red. Learning from the course] *into the organisation?* [...] *I would like to be the colleague that hears the many voices present in the organisation and brings them forwards when needed and possible. I am present in other parts of the organisation than the teachers.* [...] *I can direct the focus and attention of others to something that is invisible to them but exists in the organisation.* [...] *I can bring different understandings into the light so that everyone can get a more nuanced and broader perspective* [...].
>
> (H., MIL final portfolio. Translated by the authors).

Case 2: Teknosofikum

Teknosofikum is a three-year project (2020–2023) funded by the Danish Ministry of Higher Education and Science as a follow-up to the national action plan in higher education named 'Digital Competences and Digital Learning' (UFM, 2018). The plan emphasises the need for teachers to understand digital technologies in a critical way and with ethical considerations, which will drive their teaching practices in all disciplines and subjects. The outcome of the project is a professional course in technology education for higher education teachers held in a hybrid format with a total duration of 37 hours. Four institutions are working collaboratively at this task: the IT University of Copenhagen; the Royal Danish Academy of Architecture, Design and Conservation; Design School Kolding and University of Copenhagen – Faculty of Law[2].

At the moment of writing, Teknosofikum has undergone five iterations – twice a year starting in May 2021 – with a sixth and last iteration scheduled for October 2023. For the cross-case analysis presented here, the first three editions of the course are taken into consideration, with a total number of 64 course participants, of which 22 have participated online and 44 in the hybrid format. The participants belong to the four partner institutions and since the third iteration from an additional higher education institution: University College Copenhagen.

The duration of the hybrid Teknosofikum course is 6 weeks in total; the learning path starts with a full-day physical workshop and ends in the same way. In between the two workshops, the participants are required to attend 20 hours of online self-paced study on a virtual learning platform and a midway online meeting, which is facilitated by educational designers. Inter-institutional groups are formed at the first workshop and they are maintained until the last physical workshop. In the second edition of the course, we have tried to make the groups also collaborate also during the online work, but this initiative did not work as planned, given that not all of the meetings were facilitated.

In what follows, we present the designing process of Teknosofikum, which has taken into account forces, movements, and connections at work in materialising a NL space.

[2]For a full description of the project, see https://www.teknosofikum.dk

The Physical Workshop

The first workshop is organised around two activities in groups, which aim at disclosing the theoretical framework (i.e., science and technologies studies [STS]) proposed along the Teknosofikum learning path.

In the first activity (morning), the course participants are asked to fill out a survey that will frame their pedagogical beliefs, intentions and actions as teachers belonging to a certain learning theory tradition. The survey was not used to collect research data, only as a conversational tool. Based on the survey results, the participants discuss in groups their teaching styles, their proposals to students and the challenges they face in teaching (with and without technologies). Most often, there is a convergence of forces (and understanding) around shared experiences, and the participants find themselves amused by the similarities they have with colleagues who teach different subjects at a different organisation.

In the second activity (afternoon), the course participants focus on digital technology and discuss it through a list of questions that explore different dimensions: economic, material, pedagogical, political, symbolic etc. They bring their professional expertise from different disciplinary fields – for example, design, humanities, IT, law and social sciences – to discuss the same object or artifact (e.g., digital tools, material objects, platforms and software) and its relationship to their daily pedagogical practice.

The purpose of both exercises is to find a correlation between theories and practices, which are not separated but entangled and co-created in an STS perspective. In a Bakhtinian sense, we see in both activities multiple forces at work in the creation of new meanings. A disciplinary field that would be at the core of a specific knowledge domain (e.g., computer science and discussing an object such as a wi-fi router) proves peripheral when discussing a political or a legal dimension of the same object. Thus, the course participants are constantly displaced between the core and the periphery of their own abilities of interpretation and sense making.

The Six-Week Online Period

In the virtual learning platform, the course participants work individually and in a self-paced mode. They are initially asked to pick at least 10 small topics to study (e.g., machine learning, computational trends and AI in higher education), which usually consist of a short video lecture or a podcast with a final debate in an online forum. In a few cases, the participants are also challenged to try new digital tools in their own teaching and then tell the others how the experiment worked out. Despite the debate in the online forum not being innovative in its format, the participants' engagement is high.

The Final Workshop

At the final workshop, the participants share the new knowledge that they have acquired. They may not have had enough time to go in depth with many topics, but some of the forum debates have made an impression on them, and their critical views on digital technology in education have sharpened. They meet in groups one more time, and they give each other feedback on a small assignment that they develop throughout the day: the creation of a teaching plan for a subject that they are teaching/will teach. The concreteness of the task makes the connections work, as their mutual superficial knowledge – the weak ties – proves now to be enough to give one another advice. The task also involves enacting one or more digital tools that they have used in the virtual learning platform, thus giving voice to their own creativity.

The Networked Learning Space at Teknosofikum

Figure 9.2 below shows the designing process of Teknosofikum along the first three iterations of the course. The forces at work are illustrated by a continuous line that expands towards centrifugal forces and a movement to the periphery in the first two iterations and towards the core in the third iteration. This process was due to a gradual transformation of the learning path from linear and predetermined to a more non-linear experience of attendance. In fact, the initial project description provided a list of eight modules that should be developed in the course, which were divided roughly into four disciplinary fields (i.e., computer science, design, law and pedagogy). In the project development, the educational designers decided to divide those modules in smaller 'topics', to facilitate a self-paced mode of learning based on concentrated content and in a cross-disciplinary perspective. However, after the third iteration, with more than 30 topics to choose from, it became evident that the course

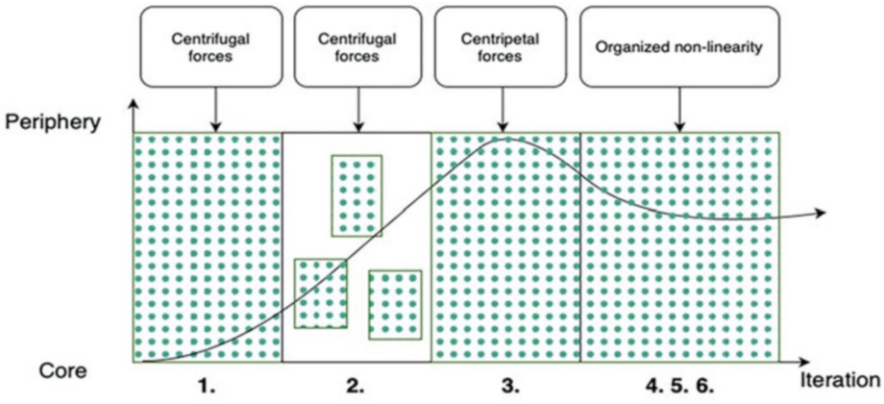

Fig. 9.2 Movements between centripetal/centrifugal and core/periphery

participants needed some sort of direction, and the topics were clustered into categories. The final design of Teknosofikum shows a learning path driven by the principle of 'organised non-linearity' (Pischetola & Møller, 2023).

One more element defines the development of the course in terms of what connections are facilitated. In Fig. 9.2, the connections are represented by the dots in the background. At the second iteration of the course, the course participants were divided in groups for the whole duration of the project, and this has proved to limit the interaction with other participants. Thus, this restriction was removed, and the groups were maintained only for the physical workshops, enhancing a more spontaneous dialogue among the participants.

In the following excerpts, we report some of the feedback received by the participants during the examined three first editions of the course:

> *I liked this exchange in the forum where I can also see different views from different professions. For me, it's very valuable to see the different view angles on some things because when we had the first meeting in person, there was this one exercise, this implosion thing, which we did, and I actually liked that. But I don't see how I could apply this in my field with the specific things I'm teaching'* (S., midway interview, trial 2).

> *What I like about our group is the age distribution. (...) You see the older people coming with experience and the younger ones with 'let's just try something' because they can. And you see that this exchange would also work the other way around* (H., midway interview, trial 2).

> *I did not expect to hear that colleagues that work with such different subjects had experiences so similar to mine with students, with the institutional challenges. I learned a lot today* (M., workshop 1, trial 3).

> *It is so much easier now to call any of you because we have been in the same room. We have shared this experience before going online, so you are not total strangers. This aspect is very important, as networking is always relevant for us academics* (H., workshop 2, trial 3).

In these briefs opinions about the Teknosofikum experience, we can delineate some results that highlight important aspects for the initial materialisation of a NL space.

First, interactions and communication among the participants – both online and in physical meetings – are mentioned as drivers for reflection, inspiration and potential change for teachers' practices. In these results, we find evidence of the importance of weak ties. Teknosofikum course participants mostly did not know each other before the course. Not only do they belong to different institutions, but they also work in different fields: law, design, IT and social sciences. Nevertheless, they appreciate the opportunity to connect with peers and to exchange ideas about teaching; in conversation with their peers, they found common challenges and common goals.

Second, on some occasions, the participants defined Teknosofikum as a 'safe space', where they were challenged with new activities (which they both liked and disliked), but failure was also accepted and even encouraged. The possibility to build such a protected space, where rules are different from the established institutional norms and outside of structural assessment and evaluation, provided participants with eagerness to try. They experienced being pushed by divergent, centrifugal forces, and they experimented with teaching in their own disciplines. This happened because of the course requirements (e.g., in terms of producing a video or a mind map) but also because of differences between the participants. In many cases, in fact,

the participants mentioned how they learned from being with colleagues that were completely different from them in age, discipline and even teaching perspective. Instead of representing an obstacle, this difference triggered their curiosity and made them try (or plan) something new.

The short duration of the Teknosofikum course trials did not allow for the (re)-combination of roles and positions in the NL space. However, it is relevant to mention that the participants at the final workshop requested that the online course remain available to them for future incursions and that the educational designers plan Teknosofikum not only as a 37-hour course but as lifelong and continuous learning experience.

Based on these findings, and since the second edition of the course, the team of educational designers has discussed the need to create a closer dialogue among participants of the same institution (e.g., by forming pairs of colleagues that will support one another along the course so that weak connections can become stronger). After the third iteration of the course, the facilitation process of the online meetings has also been strengthened. The online meetings are no longer considered as an optional 'drop-in' method of supervision, as they were initially designed, but as a required step that will support the self-paced individual learning during the 6 weeks online.

Discussion

The cross-case micro-analysis of interactions presented in this study is insightful in showing the fundamental materialisation of NL spaces, which can inform the future design of activities within the two projects.

In the case of MIL, the materialisation of a NL space is generated in the movement away from an individualised perspective towards a space, where listening to and connecting with multiple voices (Elden, 2007), represented by human and non-human actors (Pischetola & Dirckinck-Holmfeld, 2021), become meaningful for the participants. The analysis shows that the materialisation took place when the participants were enabled to move from their initial self-referential perspective, represented by their 40 images, through various centrifugal and centripetal processes (Bakhtin, 1986), which allowed them to hear both their own voice and that of others, see their own organisation from a new perspective and challenge their existing perspectives as well as develop new ones based on the presented resources. In these movements, the participants formed connections (Goodyear et al., 2004), as they discovered that the challenges they face are shared by their peers and other organisations.

In the case of Teknosofikum, the networking aspect of the project was underlined by many participants who pointed at the importance of having a space, both physical and online, both metaphorical and concrete, where they could exchange ideas and experiences about their own practices. In this perspective, the connections proved themselves powerful and useful for a cross-institutional exchange of voices and points of view. The forces at work (Mishra, 2015) showed how dialogue can be built

across disciplines and even disciplinary fields (i.e., law, design, IT, social sciences and humanities), on a different level than the usual institutional teacher professional development courses. This aspect was stressed, for example, by junior course participants who were pleased to exchange ideas with more experienced teachers. They mentioned that they had not had this chance before, even within the compulsory teacher development program (in Danish: adjunktpædagogikum) at their own institution. Perhaps, these connections are initially more volatile and unstable, but they are nevertheless meaningful for the course participants. These are the reasons to redesign the final format of Teknosofikum with a stronger focus on continuous dialogue and feedback among the participants, group activities along the course, and collaborative outcomes to present in plenary at the end of the process (Pischetola et al., 2022).

The cross-case analysis shows that in both cases, the strength of the design for the materialisation of a NL space lies in the movements between the centripetal and centrifugal forces as well as in the dialogic communication established in new connections among the nodes (McConnell et al., 2012).

The movements in the two cases are, however, different. In the case of Teknosofikum, the design followed an increasing centrifugal process, until a centripetal force was needed towards the end of the project and the final format of the course. In the case of MIL, the design followed a continuous alternation between the centrifugal and centripetal forces. On the other hand, the designed communication processes are quite similar in the two courses. In both cases, the focus was on the materials and activities that exposed the participants to a cross-institutional and cross-disciplinary dialogue in a way that made every group of participants unique (Pischetola & Møller, 2023). As we mentioned before, the ultimate intention of this design was enabling the participants to form connections that were strong enough to last beyond the duration of the course.

The analysis has illustrated that a NL space materialised during both courses, with an increasing value being put by the participants on multi-voiced dialogue and both familiar and unfamiliar perspectives on teaching and technologies. However, an open question remains, about the possibility for these NL spaces to survive after the end of the courses: Will the participants eventually integrate some of the new meanings emerged in the course into their own present and future teaching? That is, will the 'enactment of educational design' (Yeoman & Carvalho, 2019, p. 66) happen later on? We have no clear answer to that, only some indications worth reflecting on.

In the case of MIL, the course ended with the call for the participants to meet again online after 4 weeks. A meeting was organised, but only two participants attended. In the case of Teknosofikum, the participants asked for a prolongation of the collaboration among groups, but there is no evidence yet that they succeeded in creating such a practice. This indicates that the designs for NL spaces presented enabled the formation of weak ties that could last for a while – during the course and the formalised project activities – but they failed to move the participants into a more stable position with stronger ties.

This reminds us of the importance of the role of some peripheral members of a network, which Dahlander and Frederiksen (2012) call 'cosmopolitans'. This is a

role characterised by the member only visiting the network for a while and moving on to other networks. During the visit, the cosmopolitan explores the practices and ideas of the core members in the network, which enables them to 'transfer, translate, and transform experiences from one community to another' (ibid, p. 990). This concept calls for future studies not on how to design for the materialisations of NL spaces but on how to design for the long-term materialisation of NL spaces – facilitated by the empowerment of cosmopolitans.

Another aspect that appears crucial in the process of NL space materialisation is communication. Getting to know each other, even on a superficial level, allows the participants to connect and to possibly collaborate on future projects. Their shared experiences around activities aimed at discussing teaching practices and technologies mean the participants are no longer strangers. The new weak ties have potential strength for them (Granovetter, 1973).

Conclusion

This chapter took its point of departure in the research question *How to design for the materialisation of a networked learning space for professionals in education*? It presented two cases of teacher/leader professional development in Denmark, which have the common purpose of creating a NL community. A cross-case analysis (Khan & VanWynsberghe, 2008) has made it possible to highlight similar processes emerging from the two cases, despite their differences in theoretical foundations, target group, and pedagogies.

First, MIL and Teknosofikum have pointed, in two different ways, to the same conclusion that if one wishes to design NL spaces it is important to allow for the movement between centripetal and centrifugal forces and between core and periphery. In fact, it is this movement that facilitates the formation of new connections and triggers unexpected outcomes, such as the participants' surprise of sharing teaching practices, institutional challenges and pedagogical proposals in different organisations and across disciplines. The first outcome of our analysis is thus the unexpected meeting with the familiar, which was experienced by most participants.

Second, the analysis indicates that the networks created during the courses are based on weak ties that do not seem to endure after the courses have ended. As the intention of both MIL and Teknosofikum is to make the NL space last beyond the duration of the course, this outcome is obviously disappointing. However, we understand that this result is in line with the most recent reformulation of the NL concept, which emphasises the potential to build 'experimenting communities' (NLEC et al., 2021, p. 21). It is important to acknowledge that a newly materialised NL space displays core and periphery upside down and allows for movements and connections that constitute an opportunity to talk, share, work, discuss, learn, and think in a new way. In this sense, the unexpected meeting with the unfamiliar becomes a chance for professional development.

Third, the analysis has raised the question of when designing for the materialisation of NL spaces, whether one should be more focused on moving the participants towards the core or on supporting them to take the role of cosmopolitans. In our understanding, exploring and experimenting within the newly created NL space and empowering participants to bring their experiences into life in new contexts that could benefit from being pollinated with some of the characteristics of a NL space is worth pursuing.

In conclusion, we acknowledge that working with the theoretical concepts introduced in the chapter could make it easy to place them in a dualistic relationship with one another – with the centripetal, the core and the strong ties on the one hand and the centrifugal, the periphery and the weak ones on the other. This presents a dichotomy that would call for a choice between what is better, more useful and/or more effective in relation to NL spaces. However, based on our analysis, we believe that in a networked perspective, it is not a matter of choosing but a matter of finding a way to *move between* the two kinds of forces and 'beings' in the network. In fact, in line with the reconceptualisation of NL (NLEC et al., 2021), we argue that it is in the movement *between* the modes of being that a NL space materialises.

It is not the centripetal or centrifugal forces that matter in the design process but rather the composition of both. It is not specifically the institutional core (which in our cross-case analysis includes many institutions) that makes the NL space materialise, but rather the possibility for the periphery to experiment being at the core and for the core to move and align with more external input. Even the long-term survival of the NL is not important, when we look at the strength of the new weak ties. The new materialised NL spaces may be ephemeral, but they are part of the professional development process that allows the participants to implement new ideas, tools, methods, and techniques into their teaching practices after the courses.

In conclusion, we note that further research on this topic should also include an effort to broaden the scope of teacher professional development programmes, with the aim to establish NL spaces beyond formal programmes and across disciplinary and/or institutional boundaries (Pischetola, 2021).

Following the Bakhtinian concept of dialogue as 'the interanimation of real voices where there is no necessary "overcoming" or "synthesis"' (Wegerif, 2011, p. 3), we suggest avoiding the choice between accepting dualistic positions or synthetising them into one. Instead, we advocate accepting the messiness of NL processes and designing to support the creation of these spaces.

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