Chapter 11
Analysing Learning Ties to Stimulate Continuous Professional Development in the Workplace

Bieke Schreurs

Introduction

In this chapter we look at Networked Learning in the context of continuous professional development of teachers in the workplace. Networked learning involves the use of information and communication technology (ICT) to promote collaborative connections between learners, their tutors/instructors and learning resources (Goodyear, Banks, Hodgson, & McConnell, 2004). As ICT drives increasingly varied forms of mediated collaboration and contact, the field of Networked Learning seeks to provide accounts of how learners appropriate these new tools to learn on and through the Internet. The field's focus is on how learners (or learning designers) can build and cultivate social networks, seeing technology as just one (albeit critical) enabler, rather than ICT-innovation as an end in itself (Schreurs, Teplovs, Furgeson, Buckingham-Shum, & De Laat, 2013).

To know how to support Networked Learning in the workplace, it is important to get insight in how professionals learn from each other by building up connections to support their continuous professional development. Networked Learning Theory provides a lens to look at continuous professional development from this social perspective. We believe that greater awareness of how professionals are connected, and how these connections are driven by their work-related problems, may help to raise awareness about the presence of learning spaces, populated by the networks/communities, in which professionals participate (De Laat, 2012). This awareness facilitates learning between professionals as they can (independently, or with the help of a facilitator) jointly utilise the architecture of these professional development networks (Schreurs & De Laat, 2012). To do so, professionals first need to get insights into their own learning relationships and the networks that exist around them. Therefore we will represent a methodology to capture continuous professional development

B. Schreurs (✉)
LOOK, Open Universiteit, Heerlen, The Netherlands
e-mail: bieke.schreurs@ou.nl

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activities in the workplace. The description of the methodology will show how the insights gained by the teachers in their own social learning activities as part of their continuous professional development can help them to organise their learning space to support their own professional development. This methodology to capture continuous professional development in the workplace resulted in the development of a web 2.0 tool, The Network Awareness Tool (De Laat & Schreurs, 2011). We will describe how the tool can be applied in the field of Networked Learning and can be designed as a plugin in online learning environments visualising data to understand and stimulate networked learning activities both online as in the workplace.

A Networked Learning Perspective on Continuous Professional Development

Organisations, when thinking of continuous professional development, often rely on refreshment courses given by experts, in-service training, or personalised learning trajectories. But formal learning activities like training and workshops are often seen as less effective due to the fact trainings are to 'far' away from the daily practice and teachers find it difficult to transform the insights gained in formal trainings to concrete expertise usable in their daily teaching. Therefore both research literature and educational institutions are moving beyond the restriction of traditional activities such as workshops and short trainings to encompass a more complex and broader view on continuous professional development. At the same time there is a large body of research that convincingly shows that forms of informal work-related learning are important drivers for professional development (Berings, 2006; De Laat, 2011; Eraut, 2000; Marsick & Watkins, 1990; Smith, 2008). Also teachers themselves place a high value on learning informally (yet strategically) with and from each other (Armour & Yelling, 2007). But until now, there is no common agreement on what informal learning characterises or how it can be measured. Recently a shared notion is that the social aspect of informal learning is often overlooked and that we need to pay attention to the cultural and social relations that characterise informal learning in the workplace (Eraut, 2004; Smith, 2008).

In our view the pedagogical framework for Networked Learning, based on the work of McConnell (1994, 2006), provides us the lens through which we look at the social learning component of continuous professional development. The learning component here is seen as a form of informal learning situated in practice, where people rely strongly on their social contacts for assistance and development (De Laat & Coenders, 2011). In schools, continuous professional development involves opportunities for teachers to share their expertise, learn from peers, and collaborate on real-world projects (Vrasidas & Glass, 2004). Continuous professional development can be regarded as a form of bottom-up knowledge creation, because teachers themselves learn from and with each other and develop learning outcomes through their interactions.

Networked learning focuses on the *diversity of social relationships* that people develop, the *strategies* they use to maintain them and the *value* this creates for learning (De Laat, 2012). Networked learning stresses the importance of an evaluation of the ongoing learning process and the creation of a supportive (online) learning environment (McConnell, 2006). But continuous professional development in the workplace is difficult to evaluate because it is often invisible to others and even the learners themselves may not be aware of the learning that occurs. The knowledge acquired can be tacit and the learning activities are not corresponding to the traditional idea of learning as codified propositional knowledge (Eraut, 2004). As a consequence continuous professional development activities in organisations go undetected, remain off the radar of HR departments and management staff and are therefore hard to assess, manage and support (De Laat & Schreurs, 2013) and for that reason there is little practical evidence how continuous professional development in the workplace can be supported by the use of ICT. Therefore a great need is recognised in research, policy and practice for tools that can visualise continuous professional development activities in the workplace. By so implementing these tools, we can make the bottom-up learning more visible and create insights into how we can support the learning networks to become more efficient and embedded within an organisation.

This leads to the following main research question in this chapter: How can Networked Learning Theory help to visualise teachers' professional development?

A Methodology to Investigate Continuous Professional Development in the Workplace

The methodology we present is designed to allow professionals to visualise their continuous professional development networks in the workplace and assess it collaboratively to optimise their learning environment. The type of continuous professional development we investigate is open, self-determined and based on collaborative learning activities. The methodology is based on former work in the field of Networked Learning (De Laat, Lally, & Lipponen, 2007; Haythornthwaite & De Laat, 2010; Toikkanen & Lipponen, 2011) and is closely linked to and uses methodologies of Social Network Theory and Sociometric, Social Capital Theory and Communities of Practice. The methodology makes use of a mixed methods approach to triangulate several data sources (De Laat, 2006). The aim of the multi-method approach is to paint a more complete picture of social processes teacher in professional development networks are engaged in.

First we will present the methodology and the philosophy behind it. Secondly we will present the results of the paper-based method that has been applied with over 150 teachers and management staff in 5 different projects. The method is designed to triangulate, validate and contextualise our findings and to stay close or be connected to the first-hand experiences of the participants themselves.

This multi-method research framework combines data collection methods based on social network analysis (SNA) to find out 'who is talking to whom', content analysis (CA) to find out 'what they are talking about', and contextual analysis (CxA) focusing on the experiences and settings of the participants to find out 'why they are talking as they do' (De Laat, 2006).

Step 1. Social Network Theory: Who Is Talking to Whom

According to Moreno (1947), Sociometric tests show 'in a dramatic and precise fashion that every group has beneath its superficial, tangible, visible, readable structure an underlying intangible, invisible, unofficial structure, but one which is more alive, real and dynamic than the other' (Moreno, 1947, p. 268). To investigate continuous professional development, it is exactly this invisible and informal structure this study wants to bring to light. Social Network Theory asserts that the constitution of a network may influence the accessibility of information and resources and that the social structure may offer potential for the exchange of resources (Borgatti, Mehra, Brass, & Labianca, 2009; Granovetter, 1973). Understanding the network constitution can reveal important evidence on the information flow and shared knowledge within an organisation (Daly, 2010). Constitutions of networks exist when people interact with each other by communicating, sharing resources, working, learning or playing together, supported through face-to-face interaction as well as through the use of ICT (Haythornthwaite & De Laat, 2010). Each interaction defines a connection between people, known as a social network tie. These ties vary in strength from weak to strong according to the range and types of activities that people engage in. In other words, networked relationships—ties—connect the dots between otherwise isolated people. The total of all the dots (people) and ties is the constitution of the overall network. Social Network Theory tries to explain both the antecedents and the consequences of social networks. Following Social Network Theory, we can investigate, for example, if teachers with a central role in a network learn more from their colleagues (consequence) or investigate if teachers who learn a lot, get a central position in a network (antecedent) (Moolenaar, Daly, & Sleegers, 2011). The structure of a network can be investigated by using SNA. The impact of the structure of social networks can be studied on three levels: first the positions people have in a network (individual level), the type of ties people have (ties level), and finally the overall network structure (network level). In this study we only study one type of tie, i.e. the learning tie. Frequently used network concepts are: actor centrality; network brokers, structural holes and isolates; strong and weak ties; network density; network centralisation; and network density. But there is little evidence on which SNA measures are applicable in the field of learning (Toikkanen & Lipponen, 2011). To give value to the results of the SNA outcomes, it is important to know more about the content and the context in which the learning takes place.

Step 2. Social Capital Theory: What They Are Talking About

While social network theory highlights the structural dimensions of learning networks, we also use social capital theory to frame social network studies from the perspective of content. Networks are always about something (Coburn & Russell, 2008; Jones, Asensio, & Goodyear, 2000). Social capital theory provides a lens through which we can examine the relational resources embedded in social ties and the ways in which actors interact to gain access to these resources (Moolenaar, 2010; Nahapiet & Ghoshal, 1998). The first systematic analysis of social capital was produced by Bourdieu (1985) who defined the concept as the aggregate of the actual or potential resources existing within the relationships of a durable network. According to Lin (2001), the common denominator of all major social capital theories can be summarised as: The resources embedded in social relations and social structure which can be mobilised when an actor wishes to increase the likelihood of success in purposive action.

For this step, we conduct an interview to find out what these learning relationships are about. During this step, a lot of attention is paid to the questions referring to the content of a learning tie, how they are created and maintained, what learning strategies and competencies are used.

Step 3. Communities of Practice: Why They Are Talking as They Do

The third step of the methodology is based on the idea that learning relationships (in our context of continuous professional development in the workplace) are emergent. This explicitly assumes continuous professional development to be already present, in the form of everyday social relationships (De Laat, 2012). This bottom-up approach is different from the top-down approach that, for instance, Sloep et al. (2012) employ. They view a learning network as a tool that supports the professional, for example, by facilitating peer support in a virtual learning environment (e.g. Sie et al., 2012). Contrary to this view, we see learning networks as existing social phenomena. From this perspective, learning cannot be designed: it can only be designed for—that is, it can be facilitated or frustrated (Wenger, 1998, p. 229). In the theory of Communities of Practice Wenger (1998) believes that communities enable the learners to develop a space for a shared activity in which their learning is situated. Here they connect ideas, share problems and insights in a constructive way, and connect with concepts with which they are already familiar, using new knowledge that is collaboratively constructed through their dialogues and social interactions. This means that tools and spaces can be designed to

facilitate learning and indeed here is a place for learning architecture and we are in need of:

> Those who can understand the informal yet structured, experiential yet social, character of learning—and can translate their insights into designs to service learning—[as they] will be the architects of tomorrow (Wenger, 1998, p. 225).

In our (bottom-up) view, professionals and their managers ideally need to become the architects of their own professional learning spaces. For example, to design for learning the architect can make sure that (1) the desired artefacts are in place, like curricula, expert advice, procedures, tasks ICT Tools, etc. and (2) the right people are at the right place, in the right kind of relation to enable learning to happen (Wenger, 1998). To support the creation of a fruitful learning environment for the professionals, we organise a focus group discussion with all stakeholders involved.

Research Method

Participants and Procedure

We investigated the continuous professional development activities within a team of 24 teachers from a secondary vocational school in the Netherlands. The school participated in the study as part of a school improvement plan focused on teacher professional development in the use of ICT in their teaching practices. Twenty-two teachers participated in the study. The members of the team work in two different locations (9 versus 13 teachers).

Step 1 Method: Who Is Learning from Whom

Based on the methodology described in the previous paragraph, we developed a method to collect the data on learning ties formed between the teachers as a form of continuous professional development. The aim of this method is to visualise teacher professional development networks using a paper-based version for drawing network connectivity on the so-called contact cards. To fill in the contact cards, we ask participants to draw a graphical presentation of the people they engage and learn from around a particular topic and how frequent (1–5) they meet (see Fig. 11.1 for an example of a contact card).

This task is done with one or maximum two teachers at a time, preceded by an elaborated instruction, both oral- and paper-based. We asked participants to start from the individual perspective (ego-network), by putting him or her name at the centre of his own social learning space, and asked them to draw all social connections (as lines between themselves and their fellow teachers as learning sources)

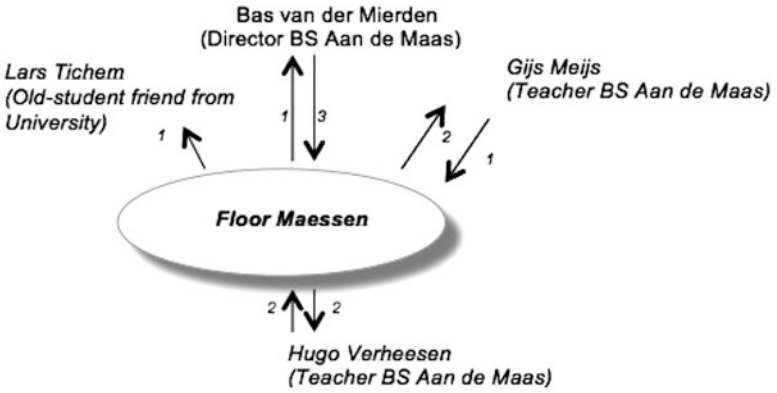

Fig. 11.1 Example of a paper-based contact card. The informal network of Floor Maessen on using white a board

they rely upon for one particular learning challenge or work-related problem. This method has been applied with over 150 teachers and management staff in 5 different projects to study their networks for informal learning.

By connecting the contact cards of personal networks into organisational networks, we traverse between ego- and whole network perspectives and shed a light on the information flow between informal learning networks within the organisation and the expertise the organisation taps into related to particular learning topics.

In our research 22 of 24 team members filled in the contact cards. Based on the drawings in the contact cards, we build a case-by-case matrices for the team we investigated.

Step 1 Results: Who Is Learning from Whom

We used UCINET (Borgatti, Everett, & Freeman, 2002) to conduct SNA. The network data is used to measure the density of a network, the centrality of persons within a network, detect key persons and to visualise overall the structure of the network (Borgatti et al., 2002; Scott, 1991).

Individual Level: Who Are the Key Persons? Indegree and Outdegree

First we looked at the individual level. We started with calculating the outdegree centrality (number of ties that an actor directs to others) which indicates the extent to which an individual interacts with other members in the network (Wasserman &

Table 11.1 Freeman's degree centrality measures

		Outdegree	Indegree
16	Govinda	6	3
18	Grady	5	1
8	Gordon	5	0
4	Gomer	5	2
6	Gonzalo	3	1
11	Gorman	3	0
2	Golding	3	1
22	Grandpro	3	7
20	Graham	3	5
3	Goliath	2	0
17	Gower	2	0
15	Gough	2	1
19	Graeme	2	1
5	Gomez	1	1
13	Gorran	1	0
1	Godwin	0	5
10	Gore	0	5
7	Gopal	0	4
14	Gottfried	0	2
9	Gordy	0	1
21	Gram	0	6
12	Goronwy	0	0

Faust, 1994). To investigate continuous professional development activities, we also gathered data about the reciprocity of the relations. In this respect we cannot only see if a person reaches out to colleagues to learn with, we can also measure if an individual is approached by others to learn from. To indicate the number of ties going to a person, we calculated the indegree centrality. In Table 11.1 you can see the indegree and outdegree of the individuals involved in the network. Two teachers have an outdegree of 0 because they did not fill in the contact card (12 Goronwy and 7 Gopal) the other teachers with an outdegree of 0 did not indicate any form of learning relation with one of their team members. However from a learning perspective, for example, it is interesting to see that Gopal, although he did not fill in the contact cards, has an indegree of 4. This means that four teachers indicated Gopal as a person they learn from. Therefore it is important we keep Gopal in our dataset, even though he did not fill in the contact cards. Teacher 16, 18, 8 and 4 are the ones that reach out the most to others to learn from about the use of ICT in education. On the other hand teacher 22, 20, 1, 10 and 7 are the ones who are most approached by other teachers to learn from. Based on this information, we could say that teacher 16, 18, 8 and 4 are the most active building learning ties around the topic of ICT. Teachers 22, 20, 1, 10 and 7 are the most important sources to learn from about the topic of ICT. We could assume that these persons are experts in the field of ICT. However at this point this is pure speculation. Content analysis conducted in step 2 could help explain why these persons are considered as important learning sources by their colleagues.

The Overall Network Structure Level

In Table 11.2 we can see an overview of the data. Within this population of 24 teachers, the teachers indicated a total of 46 learning ties amongst peers. The average number of learning ties formed is 2.09. We can see that the standard deviation for outdegree (1.88) and indegree differ (2.17) so we can say that teachers differ more in the amount of learning ties they receive then they form themselves. So teachers are on average similar in seeking out to colleagues to learn from, but they differ in the amount of peers who approach them as learning sources. This result is also explained by the overall network centralisation of indegree and outdegree.

Centralisation represents the percentage how much the networked learning ties are centred around one person. Our results indicate that the distribution of learning ties of people reaching out to other colleagues to learn from is not so much centralised (19.50 %) around the same persons. This could mean that all team members are equally active in learning ICT from their colleagues. The indegree centralisation is a bit higher. So people reach out more to the same central persons, although the indegree centrality is also only 24.49 %. If all colleagues would reach out to one person, the indegree centrality would be 100 %. This could be the case, for example, if this school had only one teacher everyone turned to learn to use ICT in the classroom.

By calculating the density of the network, this is the proportion of ties within the network, we know how well the networked learning activities is distributed within the team. If all the team members indicate they learn from each team member, the density would be 100 %. If no one would learn from each other, there would be no ties and the density would be 0 %. In our research the density of the learning network is 11 %, see Table 11.3. This means there are 46 learning ties out of the 399 (*N* of Obs) possible learning ties, see Table 11.3. The density of the learning network is dependent on the total number of respondents. Smaller populations tend to have denser networks than larger populations. There is no common agreement of network measures make a learning network effective. Is high density or low density for a learning network effective? To make a statement on solid ground, we need more data to triangulate the results. This data is collected in step 2 and step 3 of our methodology.

Table 11.2 Descriptive statistics of Freeman's degree centrality

		Outdegree	Indegree
1	Mean	2.09	2.09
2	SD	1.88	2.17
3	Sum	46	46
4	Variance	3.54	4.72
8	Minimum	0	0
9	Maximum	6	7
10	*N* of Obs	22	22

Network centralisation (Outdegree) = 19.501 %
Network centralisation (Indegree) = 24.490 %

Table 11.3 Density statistics of the informal network of project 2 based on a whole network perspective

Density	SD	No. of Ties	Variance
0.11	0.31	46	0.10

The Visualisation of the Network Structure

To move to step 2 and 3, we need a concrete artefact for the teachers to understand and reflect how they develop their continuous professional development around the topic of ICT in the workplace. We believe that an important first step to analyse continuous professional development is to make the learning activities visual as represented in Fig. 11.2. By visualising the learning ties teachers develop, teachers can see who is involved, assess what they produce, participate and value it. As such these learning tie visualisations serve as a kind of mediating artefact boot strapping conversations about continuous professional development activities in organisations and strengthen their learning relationships. This we feel is needed in order for bottom-up continuous professional development to become recognised, supported and legitimised as a powerful form of bottom-up learning alongside formal learning initiatives. We also use these visualisations as a reflection tool for the teachers and a working instrument to get more in depth data for step 2, the content analysis and step 3 the context analysis.

Based on the data gathered with the contact cards and represented in Tables 11.1, 11.2 and 11.3, we created, with the use of Netdraw (Borgatti et al., 2002), a graphical representation of the ICT informal learning network present within the school (see Fig. 11.2). The team members are represented as nodes and the learning ties between the colleagues as ties. Next to the nodes and ties, you can also visualise attribute data of the nodes. These attributes can show additional properties embedded within the network. For example, you can use different colours, different node sizes or different shapes. In our research project we received additional data about the two different locations where these teachers are working.

In the visualisation you can easily see the results represented in the tables. The network is not so dense, you see four central people in the network, getting the most ties in their direction (direction of the arrow). Including the additional information in different shapes, you can also see in Fig. 11.2, teachers indicate proportionally more to have a learning tie with teachers working at the same location (location 1 is indicated with a bullet, location 2 with a square).

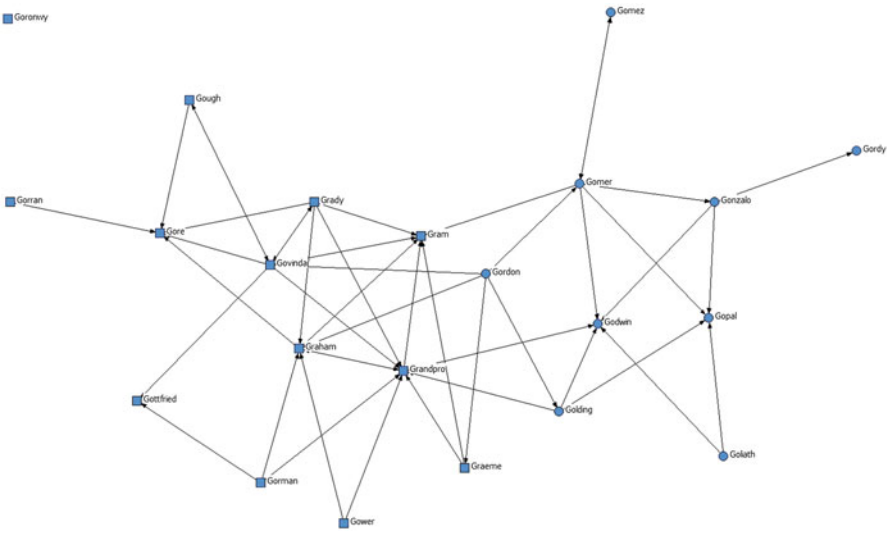

Fig. 11.2 A multidimensional graph of informal professional development networks

Step 2 Method. Content Analysis: What Are They Learning About

For step 2, we conducted an interview to find out what these learning relationships are about. During this step, a lot of attention is paid to the questions referring to the content of a learning tie, how they are created and maintained, what learning strategies and competencies are used. To stimulate the bottom-up approach, we decided to organise a group interview with all 24 team members. The visualisation of the first step was used as a mediating artefact to guide the discussion. The visualisation helped to identify certain positions people hold in the network and during the group interview these positions were explained by identifying the reasons why. The following questions were asked to get more insights into the individual level:

1. Who do you go to, to learn from and is this reflected in the visualisation?
2. Is it surprising that certain people are more in the centre of the visualisation?
3. Why would that be, what do they have to offer?

Because we only investigate one type of learning tie the following question was asked:

4. What kind of expertise and experiences around the topic of ICT do you share in these learning relations?

And last the following question was asked to get more insights into the overall structure of the network:

5. Do you have the feeling this is a dense network? Do you learn about ICT from many colleagues? Why? Why not?

Step 2 Results. Content Analysis: What Are They Learning About

The centrality of the key persons (individual level) was explained during this group interview by the content of the learning ties (tie level). In the bullet team Gopal was identified by the teachers as the overall informal ICT expert, in the square team Grandpro had the highest indegree because she has the knowledge about integrating videos into PowerPoint, an ICT application most teachers need in their classroom teaching. Graham (highest indegree) was responsible for the support of the online environment of the square team. In general they did not perceive the learning network as dense. Only four main subjects were mentioned as learning topics in the overall learning network: the use of PowerPoint in the classroom, the use of video in the classroom, the import of video material in PowerPoint and the use of the new online Learning environment for teachers. The limited amount of ICT use and related learning questions around ICT could be an explanation for the perceived low network density of 0.11.

Step 3 Method. Context Analysis: Why They Are Learning as They Do

To get an insight into the context, the following questions were asked during the same team meeting, again using the visualisation as a tool to guide the conversation:

1. Do you think the network visualisation represents the real setting?
2. What strikes you in this visualisation?
3. What is your explanation for this?
4. What can be done to optimise the workplace for learning?

On top of the group interview, we held an interview with the team manager to reflect on the results of the team session.

Step 3 Results. Context Analysis: Why They Are Learning as They Do

During the team discussion, all team members agreed that the visualisation represented the real setting, except for the two team members who did not fill in the contact cards. The first thing that striked the team members the most was that the network structure represented their physical division. They also pointed out that they saw in the visualisation that the density of the network in location square is much higher than in location bullet. They mentioned two reasons for this distinction: The teachers in the square location, the one with a higher density, use an online learning environment to support their teaching. The teachers assumed that the use of this learning environment triggers more learning questions about the use of this online environment in their teaching and therefore stimulate teachers to create more learning ties around the use of ICT. Secondly the bullet location team said that Gopal, the most central person in the bullet team network, is really the informal ICT expert in the team and everybody goes to him for questions, rather than asking and sharing expertise amongst the whole team.

To further stimulate the bottom-up approach, we asked the team to formulate solutions to stimulate the uptake of ICT in the classroom and therefore stimulate the knowledge exchange and relation building around the topic within the team. To stimulate the exchange amongst the overall network and to stimulate the knowledge sharing between the two locations, the team suggested to implement the use of the online learning environment in both locations. At the same time, the teachers suggested to use this environment to share information across the two locations. Secondly they proposed to use team meetings to share information about the use of ICT, to stimulate the informal learning around this topic. The key persons (with highest indegree), the central informal ICT experts, were asked to share their knowledge and distribute their expertise throughout the overall learning network through information sessions during the team meetings. In this respect the team members proposed to use formal meetings to initially spread information about the topic of ICT. This new information can then create new insights amongst all team members to stimulate the informal learning around the topic of ICT.

To end, we also wanted to investigate what value these learning ties create for the continuous professional development of the teachers. Therefore we included three questions at the bottom of the contact cards to collect data on how teachers value bottom-up continuous professional development activities. Therefore we asked the participants to fill in a question about the importance of the learning ties they develop for their personal development (1 = not important at all; 2 = not important; 3 = neutral; 4 = important; 5 = very important). As you can see in Table 11.4, the mean is very high. Most respondents find their learning ties very important revenues for their own professional development.

The interview with the team manager confirmed the results of the context analysis we did together with the team members. He added that the density of the learning network 11 % was indeed low. Not only because of the lack of physical

Table 11.4 Descriptive statistics importance of learning network for own professional development

N	Minimum	Maximum	Mean	SD
18	2	5	4.05	0.80

proximity between the teams, but also because some colleagues are still reluctant to integrate ICT in their practice. He was surprised by the creative solutions suggested by his team. Agreements were made to create the necessary arrangements to start up the use of the online learning environment in both locations. Finding out about peoples position in this learning network was also perceived as an interesting insight in the informal learning network. In the beginning of the key district project, three key persons were approached to promote the use of ICT in their team. The SNA showed that instead of only three key persons we see that five actors who are being frequently approached. This finding is supported by an indegree centralisation of 24.5 % (see Table 11.2). This helped the manager to set up a bigger core team of ICT experts, identify different roles and strategies of the actors within the network that could influence networked learning activities.

The Network Awareness Tool

The paper-based version of the contact cards is a good starting point for visualising and studying continuous professional development activities in the workplace. The use of the contact cards indicates the added value of such a practice for the teachers in schools (De Laat, 2011). But the paper version also has some shortcomings. With the paper version, the overall network data is collected in a semi-structured interview. This has the downside that the data is dependent on the memory and reflection capacity of the actor: actors often forget names, persons and/or conversations. The collected data we gathered using the paper version of contact cards is only a snapshot of an existing dynamic practice taken at a certain point in time. To understand the reasons behind informal learning network developments and how they evolve over time, we need to gather data on the dynamics of networked learning. Therefore we found it necessary to improve our research practice for finding ways to collect more realistic and accurate solutions to collect data over time to represent continuous professional development activities in all its dimensions and simultaneously finding ways to provide the participants with instant feedback (Schreurs & De Laat, 2012). To do so we designed an online tool, the Network Awareness Tool (De Laat & Schreurs, 2011), with web 2.0 features which could address the shortcomings of a paper-based research method for visualising informal networked learning activities (Schreurs & De Laat, 2013).

On the other hand, online learning environments or online networking sites to support learning automatically record a digital path of users' social behaviour within the online community. The data provide information on users interactions,

are abundant, time-stamped and free of human memory biases (Glasgow, 2013). This methodology heals the potential to be adopted and plugged into the virtual world (Schreurs & De Laat, 2012) and investigates online teacher or student professional environments (Schreurs et al., 2013). Semantic analysis can be conducted for creating tag clouds dealing with the content of the networks. Social networks analysis can be applied to datasets who interacts with whom and who downloads resources, etc. If we use this set-up, a more holistic and full story can be created about the online informal learning activities of people and organisations can therefore analyse their users and see how to support and encourage online communities to share and learn from each other. Tools like these can extend the discussion on the application of Networked Learning.

Conclusion and Discussion

This chapter is an attempt to stimulate a discussion amongst researchers within the area of Networked Learning to think about technological solutions and methodologies to gather and analyse relational data on learning to create a holistic view of peoples off-line and online informal lifelong learning activities in education, work and society. In our research on social professional development networks amongst teachers in and between schools, we presented a methodology to be used as a reflection tool, to give professionals opportunities to gain insights into their own social learning activities and that of others in and beyond their organisation. The methodology also holds the potential to stimulate new networked learning ties and give insights into the social learning content and social capital of an entire organisation. In addition, the methodology design aims at assisting continuous professional development in the workplace at three distinct levels of the organisation's network. Firstly, on the individual level, it allows a professional to identify her ego-network. The visualisation of the ego-network promotes professionals' *self-reflection* by making them aware of the people that they learn from and what knowledge they hold. Secondly, on the group level, the methodology can detect and visualise relationships that revolve around a specific topic. The visualisations can also be used to identify key persons within a network based on the number of ties (incoming and outgoing). Teachers become aware that they are not alone in their classroom and that professional development is a social activity; one that is spontaneous and deeply connected to day-to-day challenges in the workplace. Another advantage of these visualisations is that they serve as very concrete artefacts for the teachers to help them reflect on how they act as networkers building a social space for informal learning. This research shows that the presented methodology is a useful research-driven intervention tool to detect, connect and facilitate informal networked learning. With this methodology, we can detect multiple (isolated) networks in the organisation and connect ideas and stimulate participants to think of solutions to support their own professional development in certain domains. Using this approach, organisations can link in with existing informal

networks of practice and unlock their potential for organisational learning by giving them a voice and make their results more explicit within the organisation. With this approach, we create the possibility to evaluate how the continuous professional development could benefit the teachers and therefore the quality of the school. Having insights into the learning ties formed in the workplace gives the possibility to create or optimise the space professionals need to learn from each other (De Laat, 2012). This perspective gives rise to a more bottom-up—self-governing—understanding of learning where workers with their colleagues interact about their work experiences through sharing their experiences, knowledge and contacts providing access to new or alternative resources.

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