Evaluation of the functional status of learning networks based on the dimensions defining communities of practice

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Abstract: Learning in professional networks is gaining popularity in teachers' professional development. To study how teachers evaluated their networks, we developed a questionnaire called the 'network barometer' to inquire functioning according to three dimensions based on communities of practice theory: domain, community and practice. We studied 21 face-to-face networks. The findings show that the networks were more focussed on topics (domain) and social cohesion (community) than on practical relevance (practice) and suggest that more attention should be paid to collective outcomes and building a shared repertoire of teaching practices. The findings were discussed in light of face-to-face networks as well as online communities.

Keywords: learning network; teacher; professional development; social learning; community of practice; CoP; professional learning community; online communities; face-to-face; networked learning; informal learning; workplace learning.

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1   Introduction

Traditionally, professional development of teachers has been organised in a formal manner. Teachers were often seen as passive consumers of pre-packed information that absorb presented information regardless of perceived relevance to their practice (Lieberman and Wood, 2002a). This attitude changed when it became increasingly acknowledged that teachers themselves need to be at the centre of their own professional development (Lieberman and Wood, 2002a). Moreover, Reeves (2008) reported that the larger part of influences on teachers' professional development (60%) does not come from books, seminars, and articles, but emerges from informal alternatives like contacts with colleagues, experiences with students and their families, and their everyday school-based experiences. Learning at the workplace and learning with and from each other are increasingly becoming preferred modes of professional development. Learning occurs when a practical problem or question arises that requires expertise from others, such as peers, and less as the result of formalised activities (Boud and Hager, 2012; De Laat, 2012; Vaessen et al., 2014). Additionally, Lieberman and Pointer Mace (2010) mention that teachers perceive their professional development as disconnected and irrelevant to the real problems that arise from their classroom practice. It has been argued that professional development activities need a fundamental shift from the traditional 'knowledge for practice' to 'knowledge of practice' and that professional learning communities are a way to accomplish this (Vescio et al., 2008).

In their workplaces, teachers are encouraged to build, enhance and share their professional knowledge and to participate in the global landscape of teacher practices (De Laat, 2012). Teachers now gain access to knowledge through their networks, via social (web-based) infrastructures. How this improves their practice, which dimensions of their community contribute to this, and how their networks function has not yet been amply studied (Hanraets et al., 2011). Additionally, teachers may not be aware of the beneficial effects on their professional development, and the impact of this beneficial effect on their daily practice may be even less clear. Increased reflection within teacher groups about their functioning as a network or community of practice (CoP) can shed more light on the relationship between group behaviour and the development of their teaching practices (Wenger et al., 2011).

2 Social learning, communities and networks

Solving practice-related problems in collaboration with fellow teachers is a form of social learning. Several definitions of social learning have been described in literature (for an overview see: Reed et al., 2010). The added value of social learning has been shown in many studies. In the area of teacher professional development, key studies have indicated that teacher networks add value during implementation of innovations, for teacher development, in school leadership, and for improving teaching practices (Dresner and Worley, 2006; Earl and Katz, 2007; Lieberman and Wood, 2002a). Networks create major opportunities for professional development (De Bruijn, 2008; Gellert, 2003; Lieberman and Wood, 2002b), and learning from others has been reported to be a productive approach to professional development (Dresner and Worley, 2006; Lieberman and Wood, 2002a, 2002b). When teachers become part of professional communities, this leads to meaningful changes in local knowledge and practices, and the exploration of solutions to problems occurring in particular contexts (Lieberman and Wood, 2002a). We argue, in line with Reed et al. (2010), that to label learning as social learning there are three conditions that have to be met. First, the learned information has to be acquired via interaction and contacts with others, such as teachers that work together to solve a work-related problem or jointly develop an instrument or method for teaching. These contacts can be face-to-face, but other forms of communication, such as via a computer, are possible also. Second, the learning experience has to lead to a change in the understanding of the learner. Examples of changes are teacher's improved understandings of student behaviour or the development of instruments that can be used during teaching. Third, the learning has to spread beyond a specific teacher. Other teachers (for instance, the other participants in the learning network) have to be able to make use of the learned information as well.

Social learning normally takes place in daily practice, in a dynamic social context. Within this context, there can be several forms of collaboration, including learning networks, professional learning communities, and communities of practice, face-to-face as well as online (Hanraets et al., 2011; Lieberman and Pointer Mace, 2010; Reed et al., 2010; Stoll et al., 2006; Vescio et al., 2008). Communities and networks are seen as two types of social structures in which participants learn (Wenger et al., 2011). Networks are all about connections, personal interactions and relationships. Networks facilitate the flow of information, support joint problem solving, the creation of knowledge and learning. The concept of community draws attention to how a group of teachers develops a shared identity around a common topic (Wenger, 1998). It represents the collective intention to collaborate in solving practice-based problems within a domain of knowledge and to sustain learning about it. In the literature, there is a distinction between pure communities and pure networks, but in reality, most social structures combine features of these two social formations. A community usually involves a network of relationships and many networks exist because participants are all committed to some kind of joint enterprise or domain (Wenger et al., 2011). The best social learning emerges when the important aspects of communities and networks aspects are combined. In the remaining part of this paper, we will refer to the collaborations of the teachers as learning networks, keeping in mind that (web-based) community aspects could also be applicable.

If the goal of the learning network or CoP is professional development, the focus should be on the facilitation and optimisation of learning (De Laat, 2012; De Laat and

Prinsen, 2014). One way to monitor the quality of learning is by evaluating the functional status of a learning network. The functional status of a learning network broadly refers to the level to which the network (and the way in which it is constituted) is able to perform its function for learning and changing teacher practice. In the present paper, we report findings of the administration of a questionnaire, called the network barometer (NB), which can be used to evaluate the functional status of several learning networks. In addition, we will show the relevance of using NB in practice as illustrated by examples of two learning networks in particular.

3   Research approach and aim

In addition to our aim of providing more (scientific) insight into the relation between teacher networks and professional development, the current study is deliberately practice-based (Kessels, 2012; Martens et al., 2012). Teachers need research to provide concrete answers to practical problems; for instance, they want to see how their efforts lead to intended effects. Scientific findings are often disseminated at a high level of abstraction, and thus may not be of immediate benefit to teachers. This is sometimes referred to as the gap between educational research and practice (for more information see: Vanderlinde and van Braak, 2010). Practice-based research is done in collaboration between teachers and scholars. The aim is to generate outcomes beneficial for both teachers (as they are building onto their practical knowledge) and scholars (operating from a scientific perspective). In the present study, teachers requested more insights in the workings of their networks. This would for instance improve their ability to make adjustments to factors that might be having a negative influence on the course of the network and it is outcomes. At the same time, the research will be able to contribute to the body of knowledge on networked/social learning and professional development.

In the following section, the theoretical framework underlying the construction of the NB will be described and we will explain how the dimensions that define communities of practice are reflected in the instrument. To show the practical relevance of the use of the NB for schools, networks, and teachers, the results for two specific networks will be presented as examples.

4   Theoretical framework of the NB

The NB was created as a practical tool, to be of immediate use in existing learning networks needing assistance (De Kruif et al., 2013). However, even though the items of the NB were constructed based on relevant questions emerging from those particular learning networks, and the items were developed with the teachers' problems in mind, the rationale was to place the content of the NB within a theoretical frame (further elaborated in the next paragraph), consisting of three dimensions, making it usable for web-based communities as well as face-to-face learning networks.

The theoretical basis for the NB is similar to that of another instrument; the community barometer first described by Smith and Coenders (2002). The community barometer was constructed based on the assumption that the dimensions that define a CoP, first posed by Wenger (1998), are applicable to a learning network. Wenger (1998) states that in order for a CoP to be successful it is important to focus on three dimensions:

domain (topics), community (social aspects), and practice (a developing, shared practical repertoire). The items of the NB similarly reflect these dimensions, and can be seen in Table 1.

Wenger (1998) described the first dimension, domain, as: what the community is about, the joint enterprise as understood and continually negotiated by its participants. The domain refers to the topics that are the focus of the network. One defining feature of a CoP is that the participants share a topic that binds them together as a social entity (Wenger, 1998). It is the common interest that binds people together (Potters and Poelmans, 2008). The activities undertaken by the network need to be meaningful, that is, they have to focus on the things that matter to the participants (Akkerman et al., 2008). Teachers' professional development can be advanced if these 'learning objects' emerge from practice, and are offered up by teachers themselves (Lieberman and Pointer Mace, 2010). Therefore, two domain items were included in the NB: 'the correct topics are addressed within the network' and 'topics that we encounter in our practice are addressed within the network'.

The second dimension described by Wenger (1998) is community: how the group functions as a unit, the relationships of mutual engagement that binds participants together into a social entity. It refers to the social aspect of the network, on what basis the participants interact. The social coherence of a network is important because it provides a basis for successful collaboration. If there is a sense of belonging to the group amongst the participants, shared activity emerges (Akkerman et al., 2008). A strong network values interactions and relations, based on mutual respect and trust (Potters and Poelmans, 2008). Trust in each other is important in situations where one might be vulnerable (Dechant et al., 1993; Kasl et al., 1997) and it is necessary because participants need to feel save to make mistakes, and need to give and receive feedback freely. Team cohesion is an important factor for building trust in (online) communities. High levels of trust enhance the spirit of cooperation and information sharing (Tseng and Yeh, 2013). To capture these community aspects, the items: 'within this network, we mean a lot to each other' and 'there is a good atmosphere within this network' were included.

Another important community aspect contributing to interaction between participants of a network is that they feel in charge of the processes undertaken within the network. The perception of having influence creates a feeling of autonomy for teachers, which is a factor related to motivation (Ryan and Deci, 2000). Highly perceived autonomy leads to more effort for success. Vescio et al. (2008) mention 'teacher authority', what refers to the ability of teachers to make decisions regarding processes within their learning communities. Higher teacher authority leads to changes in teacher cultures that enhance the success of their learning community. Therefore, the item: 'I influence the actions undertaken within the network', was included.

The ways in which participants impact upon the processes within the network is related to the composition of their networks, another community factor. An important aspect of the networks composition is the diversity of the participants. The possibilities for coming up with different approaches to practical problems can be narrowed by limited visions developing within professional circles, or due to practitioners being embedded in a certain educational system for a long time. Including in the network members from several ranges of professions (Vescio et al., 2008) increases the points of view necessary for a more complete picture of a certain topic. To improve the functional

status of a network, when there is too little diversity, new people with other viewpoints or professions could be added to the network. Next to that, communities can benefit from outside experts (Wenger, 1998). Diversity can be accomplished by diversifying the levels of expertise and age within in the network (e.g., by including both novices and veterans). This leads to rewarding and satisfying learning conversations (Reeves, 2008). Also, it has been reported that one of the best aspects of collaborating in online communities is the diversity of abilities represented there (Tseng and Yeh, 2013). Adding experts or otherwise enthusiastic people to an (online) knowledge network has been reported as a success factor (De Bruijn, 2008). Therefore, the item: 'within this network, there is a diversity of alternate angles from which the topics are addressed' was included.

The third dimension described by Wenger (1998) is practice: what capabilities the community produces. It refers to the gains of the network and the usefulness in practice; for instance, the shared repertoire of working routines and vocabulary (Akkerman et al., 2008; Wenger, 1998). There has to be integration in daily practice (Potters and Poelmans, 2008). We were predominantly interested in the perceived use of the network in daily practice. Therefore, the items: 'through participation in this network, I improved my competence (skills – knowledge – attitudes)' and 'in my own practice, I have made use of the knowledge I gained within the network' were included. Additionally, the item 'teachers outside the network also use the knowledge that our network generated' was included. This item, inquiring whether people outside the network made use of its gains, was included to study whether the information gathered by the network spreads through the school (i.e., carry-over). In order to generate shared knowledge, this has to be made public so others can not only make use of it, but can also critique and verify it (Lieberman and Pointer Mace, 2010). If more teachers are able to benefit from the knowledge, even teachers that are not part of the network, the gains of the network can be optimised.

When participation in a network does not lead to improvement of teachers' competence, the network is not functioning properly and a search needs to be undertaken as to where there are problems. These can be very diverse. For instance, it is possible that the problem lies in a community aspect such as no good atmosphere, but it might just as well be a domain aspect, such as focussing on the wrong topics. Detection of the problem is an important issue and activities to solve it will follow, to enhance the gains of the network. De Bruijn (2008) reported 'perceived practical relevance' as one of the major success factors for an (online) learning network. This can be placed in the dimension practice, or as perceived value, in evaluation.

To evaluate the value of the network as perceived by the participants, three additional evaluation items were included that measure this perceived value for:

a   the school

b   their own development

c   the classroom.

These items were: 'how important is this network for the development of your school?', 'how important is this network for your own development?', and 'how important is this network for improvement of your practice (your actions in the classroom)?'. A high score on this scale legitimises a beneficial effect of the network. This information is valuable since Vescio et al. (2008) reported that participation in a learning community leads to changes in teaching practice, classrooms and the professional culture of a school.

Comparing scores on the different dimensions gives insight in what dimension is best represented in the network and which dimension can be enhanced. For instance, a network can have a high evaluation of the 'community' dimension, but a low evaluation of the 'domain' dimension. This could mean that the meetings (whether face-to-face or online) of that network are very cosy and joyful, but that the topics that are subject in the network are not problems or questions that arise in daily practice. This will probably also reflect in the evaluation items that, consequently, will have a lower score.

However, not every dimension is represented by the same number of items in our instrument. It appeared that in the learning networks involved in the creation of the NB, more practical problems arose in the dimension 'community' and therefore, more items were formulated in that dimension. On the other hand, fewer items were formulated in the dimension domain because less practical questions emerged for this dimension. The items of the NB are therefore not evenly distributed over the three dimensions.

Table 1   The items of the NB and their dimensions

Item		
1	The correct topics are addressed within this network.	D
2	Within this network, there is a diversity of alternate angles from which the topics are addressed.	C
3	Through participation in this network, I improved my competence (skills – knowledge – attitudes).	P
4	Within this network, we mean a lot to each other.	C
5	There is a good atmosphere within this network.	C
6	I influence the actions undertaken within the network.	C
7	In my own practice, I have made use of the knowledge I gained within the network.	P
8	Teachers outside the network also use the knowledge that out network generated.	P
9	Topics that we encounter in our practice are addressed within the network.	D
10	How important is this network for the development of your school?	E
11	How important is this network for your own development?	E
12	How important is this network for improvement of your practice (your actions in the classroom)?	E

Notes: D = domain, C = community, P = practice, and E = evaluation.

5   Method

5.1   Respondents and procedure

All respondents were participants in a professional development project, administered by an institute for higher education; Welten Institute, Open University. To be able to monitor in person how the NB was applied, the NB was first applied in face-to-face learning networks. The NB was filled out during one of the regular meetings by teachers and other school-staff (e.g., management or special needs advisors). In the remaining part of the article, all participants will be referred to as teachers. In total, the NB was completed by 87 participants. All respondents reported to be active in a learning network,

centred around a certain topic. The topics of these learning networks were diverse, as can be seen in Table 2.

Table 2   Descriptives of the networks surveyed

Topics of the learning networks	Number of NB respondents taking part in this network	Carry-over possible?
Dutch grade 8	11	No
Digital blackboard	9	Yes
Special needs	8	Yes
Language/spelling Dutch grade 6/7	6	No
Management functions	6	No
ICT/IT	6	Yes
Choice of new mathematics method	6	Yes
Dutch grade 3	5	No
Dutch grade 3/4	4	No
Learning network more and high gifted students	4	Yes
Writing in kindergarten	4	No
Social-emotional development	4	Yes
Continuous education:	3	Yes
Self-regulated learning in Dutch grade 3/4	2	No
Mechanics in Kindergarten	2	No
Music teaching	2	No
Kindergarten	1	No
Dutch grade 3/4	1	No
Dutch grade 4/5	1	No
Dutch grade 5/6/7	1	No
Unknown	1	Unknown
Known = 21	Total n = 87	No = 46, Yes = 40
Unknown = 1		Unknown = 1

The NB was provided on a paper sheet. Answers could be given on a five-point-scale: (1) strongly disagree, (2) slightly disagree, (3) neutral, (4) slightly agree, and (5) strongly agree, for the items focussing on the dimensions of a CoP. The evaluation items regarding the experienced relevance of the network (10, 11 and 12 in Table 1) were also measured on a five point scale from very unimportant (1) to very important (5).

In total, we determined the functional status of 21 learning networks. Table 2 shows the overview of the topics of these networks, the number of NB respondents who took part in these networks, and whether or not the knowledge generated by the network was suitable for carry-over to teachers outside the network (for more information on carry-over, see the section on analyses). Carry-over was determined by examining the topic of the network and establishing whether the information was useful for teachers outside the network, i.e., teachers from other grades or other school-staff.

After completion, the NB data were analysed with SPSS (see analyses below). The participants received feedback on the results either through an oral presentation or by means of a written report.

5.2 Analyses

Reliability was established by calculating Cronbach's α for:

a   the total NB

b   the items divided over the dimensions and the evaluation items.

Even though factor analysis might have been the obvious choice to study whether the dimensions were indeed statistically separate factors, we were not able to perform it because of the low number of participants.

Next, we studied whether the means of the dimensions (scales) and separate items (for domain, because that scale was not sufficiently reliable) were significantly different by performing several paired T-tests with an α-level set to 0.01 to correct for multiple testing. We performed further analyses if the findings were remarkable (i.e., a remarkable lower score combined with a high standard deviation). This was the case for item 8, where the effect could possibly be due to differences in carry-over. Therefore, independent samples T-tests were performed with means score on the item 8 as test-variable and carry-over possibility of the networks (no = 0, yes = 1) as grouping variable.

Finally, we focused on two networks to study the scores per dimension in more detail and to show the practical implications of the NB. These networks were: digital blackboard (n = 9, carry-over: yes) and Dutch grade 8 (n = 11, carry-over: no). These networks were chosen because they had the largest numbers of participants that completed the NB and to show the differences in the effect of carry-over possibilities. Dutch grade 8 is the final grade of primary school (which is very specific), whereas digital blackboard is a more general topic on the use of a learning management system, concerning the school as a whole.

6   Results

6.1 Reliability

Reliability analyses show differential reliabilities: total NB (Cronbach's α = 0.820), community (Cronbach's α = 0.752), domain (Cronbach's α = 0.526), practice (Cronbach's α = 0.621), and evaluation (Cronbach's α = 0.831). This indicates that the total NB, and the scales for community and evaluation are reliable (Cronbach's α > 0.700). It has been argued in previous research that in case of complex concepts (such as neuroticism; Baarda et al., 2007; Field, 2009), a Cronbach's α of 0.60 is the minimal eligible Cronbach's α (Baarda et al., 2007; Field, 2009). Networked learning and the dimensions that define a CoP can be seen as complex concepts and therefore, the scale practice could, in that sense, be regarded as reliable. Domain exists of only two items, and is, with a Cronbach's α of 0.526, not reliable. Therefore, the items of domain will not be treated as a scale but will be considered separately in the following analyses.

6.2   Dimensions, evaluation and items

6.2.1   Interpretation of the means and standard deviations

The means and standard deviations of the total questionnaire, the scales and items can be seen in Table 3. Overall, the learning networks were evaluated with a score of 4.19; the participants agreed that the relevant (dimensional) aspects were present in their networks. Since a score of 5 is the highest possible score, this can be considered a positive appreciation of the overall functional status of these networks.

Table 3   Means and standard deviations of the scales and items

	Mean (SD) 21 networks	Mean (SD) Digital blackboard	Mean (SD) Grade 8
NB overall score	4.19 (*0.454*)	4.21 (*0.490*)	4.24 (*0.252*)
Item 1 (topics, domain)*	4.52 (*0.525*)	4.44 (*0.527*)	4.73 (*0.467*)
Item 2 (diversity)*	3.98 (*0.702*)	3.67 (*0.886*)	4.10 (*0.568*)
Item 3 (improvement)*	4.03 (*0.769*)	3.89 (*1.054*)	4.09 (*0.831*)
Item 4 (meaning)*	4.37 (*0.657*)	4.22 (*0.667*)	4.70 (*0.483*)
Item 5 (atmosphere)*	4.71 (*0.508*)	4.56 (*0.726*)	5.00 (*0.000*)
Item 6 (influence)*	4.29 (*0.687*)	4.22 (*0.667*)	4.50 (*0.527*)
Item 7 (knowledge use)*	4.20 (*0.872*)	4.33 (*0.707*)	4.20 (*0.789*)
Item 8 (carry-over) *	3.29 (*1.021*)	3.89 (*1.054*)	3.18 (*0.715*)
Item 9 (pract. topics, domain)*	4.41 (*0.675*)	4.56 (*0.527*)	4.73 (*0.467*)
Community scale	4.34 (*0.511*)	4.17 (*0.586*)	4.61 (*0.282*)
Practice scale	3.85 (*0.716*)	4.04 (*0.789*)	3.79 (*0.454*)
Item 10 (importance school)**	4.06 (*0.741*)	4.22 (*0.833*)	3.91 (*0.539*)
Item 11 (importance self)**	4.14 (*0.734*)	4.00 (*0.707*)	4.18 (*0.751*)
Item 12 (importance practice)**	4.25 (*0.758*)	4.56 (*0.527*)	3.82 (*0.874*)
Evaluation/importance scale	4.14 (*0.642*)	4.26 (*0.596*)	3.97 (*0.623*)

Notes: *1 = strongly disagree, 5 = strongly agree.
      **1 = very unimportant, 5 = very important.

To gather more information about which aspects scored highest and what can be improved, we focussed the analysis on the separate dimensions that constitute a CoP.

The domain items 'right topics' showed the second highest mean score, namely 4.52. The domain-item 'practical topics' also received a relatively high score of 4.41. The teachers agreed (more than slightly) that their learning networks are focussing on the right topics and that these were problems/questions they encountered in practice.

The scale community received a high score, namely 4.34. This is slightly below the mean scores of the items of domain. This indicates the participants experience a sense of community. The 'atmosphere' item (item 5; referring to a supportive team climate) had the highest mean score of all items (4.71). The second highest score within this scale (4.37) similarly indicated that the participants mean a lot to each other; the climate within the learning network seems to be very good. The participants indicated that they more than 'slightly agreed' feeling they had an influence on the actions undertaken in the learning network (4.29). The lowest score was on the 'diversity' item, but still participants 'slightly agreed' that there was enough diversity in their learning networks.

The scale practice showed the lowest mean score (3.85; which is below 'slightly agree'). This indicated that that the practice did not yet benefit as optimal as possible. The participants only 'slightly agreed' that participation in the learning network increased their competences.

Still, the score on the evaluation scale gives reason for optimism (4.14); the participants agreed that collaboration in the network in the network leads to improvement of their own development, in their classrooms and their schools.

6.2.2 Interpretation of the comparisons between the scales and separate items

We performed paired samples T-tests to compare the scores on the scales (community, practice, and evaluation) and separate items (domain; low α and hence could not be considered a scale) with statistical procedures to support the interpretations of the means and standard deviations (see Table 4).

First, we explored the comparisons between the scales. Community scored significantly higher than both practice and evaluation. Practice and evaluation also differed significantly, where evaluation scored higher than practice.

Domain could not be analysed as a scale, but was analysed as separate items. There were no significant differences between the two items that make up the domain-dimension (items 1 and 9). This indicates that there was no significant difference between the items that reflect domain. Both items show significant higher scores than the scales practice and evaluation. However, the two items differ in their relation to community. Whereas there was no significant difference between the domain item stating that 'topics that are encountered during practice are addressed in the network' (item 9) and the community scale, the item that states that 'the correct topics are addressed' (item 1) shows a significantly higher score than the community scale.

Thus, shortly stated, practice scores lowest on all analyses and the domain items highest. Community and evaluation are intermediate. This is an indication that the learning networks scored better on 'what' (domain) and the 'social values' (community) than on the relevance of the network (evaluation) and the usefulness of the gains of the network for practice and others (practice).

Table 4 Statistics paired samples T-tests

Pair	t	df	p	Sign
Item 1 (*Domain*)-Item 9 (*Domain*)	1.414	85	0.161	
Item 1 (*Domain*)-Community	3.305	86	0.001	*
Item 1 (*Domain*)-Practice	8.934	86	< 0.001	*
Item 1 (*Domain*)-Evaluation	5.222	86	< 0.001	*
Item 9 (*Domain*)-Community	.916	85	0.362	
Item 9 (*Domain*)-Practice	6.849	85	< 0.001	*
Item 9 (*Domain*)-Evaluation	3.344	85	0.001	*
Community-Practice	6.717	86	< 0.001	*
Community-Evaluation	2,771	86	0.007	*
Practice-Evaluation	−3.899	86	< 0.001	*

Note: *Indicates a significant difference.

6.3   Inspection of the low score for the scale practice: relation between carry-over and topic of the learning network

Participants indicated being slightly above 'neutral' on the statement that 'other teachers, outside of the network, made use of the knowledge gained by the network' (item 8). The lower score for practice might be partly explained by the remarkably lower score on this item. However it is possible that certain topics represented in these networks are more suitable for carry over than others. As can be seen in Table 3, the score on the carry-over item (8) is remarkably lower and its standard deviation is higher than the means and standard deviations of the other items. Therefore, we focussed in on this specific item. We performed independent samples T-tests to compare the scores on item 8 for networks with topics that were suitable for carry-over and networks with topics that were not suitable for carry-over. The results showed a significant effect ($t = -2.075$; $df = 77$; $p = 0.041$; see Table 4), indicating that learning networks regarding topics that are suitable for carry-over report more carry-over than learning networks regarding topics that are less suitable for carry-over.

To elaborate more on the effect of carry-over and to show the practical implications of the NB, we focussed in the next sections on two learning networks that differ in the amount of the possibility of carry-over. The following sections will show in more detail what the scores mean if the NB is used in practice and how to act on the basis of them. The descriptions will be based on the means and standard deviations because these data are most available in practical situations.

6.4   Interpretation of scores in a practical context: network digital blackboard

Mean and standard deviations of the scales and items of the learning networks can be seen in Table 3. The digital black board learning network focused on how to work with the digital blackboard and how it can be used in the classroom. The knowledge generated by this network can be useful for all teachers, and should, therefore, be spread throughout the school (i.e., high carry-over). The topic is also very relevant for practice, since the use of a black board is a returning daily activity for all teachers.

The overall mean score of the learning network was 4.21, so the participants agreed that the relevant (dimensional) aspects were present in this network. The mean scores for the dimensions that define a CoP (the scales, including the two separate items for domain) and evaluation were all between 'slightly agree' and 'strongly agree'. The score for evaluation indicated that the participants perceived the learning network relevant for their own development, the development of their practices, and for the development of the school (score: 4.26). This is important because this legitimises the learning network as a proper form of professional development having practical relevance. The dimension that scored highest was domain (both items respectively scores: 4.44 for item 1 and 4.56 for item 9), the lowest mean score was for practice (score: 4.04). This means that the participants of this network indicated that the topic of the network was correct and that problems/questions concerning the topic of the network were experienced in practice. However, the improvement of their skills, the use of the gained knowledge in their own practice and the use of the knowledge by others outside of the network scored lower. Even though the topic was suitable for carry-over, this is not what happened in practice. Considering the topic (black board), the carry-over could be higher in order to have an optimal benefit of the network for the school. An intervention to facilitate carry-over is

therefore recommended. Additionally, items 2 and 3 showed slightly lower scores compared to the other items (respectively scores: 3.67 and 3.89). Item 2 assessed whether there was diversity in the different angles/viewpoints in the networks. To enhance this diversity, participants from other schools or other disciplines could be invited in the future. More diversity leads to more viewpoints which, in turn, leads to a wider evaluation of the topic. Item 3 inquired whether the participants felt that they had enhanced their competences regarding the use of the blackboard. Even though they regarded the network as very important for their own development (evaluation item), they did not feel their competences had grown enough or at least not according to their expectations. A recommendation is to ask the participants why they thought this had not occurred and act accordingly. This could also explain why the carry-over effect was lower than expected, if the skills are not mastered, they cannot be transferred.

6.5 Interpretation of scores in a practical context: network Grade 8

Means and standard deviations of the scales and items of the grade 8 learning network can be seen in Table 3. The grade 8 learning network focused on specific problems/activities that are related to grade 8 (final primary school grade with important exams). The knowledge generated by this network was useful for teachers teaching grade 8 in particular, and therefore was not particularly useful for teachers in other grades. It was thus expected that the knowledge generated by this network would not be spread extensively throughout the school (i.e., low carry-over). This is an example based on the Dutch school system, but other school systems in other countries have specific grade-related topics as well.

The overall mean score of the network was 4.24, thus the participants agreed that the relevant (dimensional) aspects were present in this network. The mean scores for the items of domain were highest (both just below 'highly agree': 4.73 for both items 1 and 9). This means that the topics of the learning network were correct and that these were problems/questions that were encountered during practice. The next highest score was for community (between 'slightly agree' and highly agree'; score 4.61). Thus, within the network, the participants agreed that there was a good interaction. This was especially reflected by the item that inquired about the atmosphere within the network (item 5). All participants scored 'highly agree' on this item (score: 5), which is the most optimal score. This aspect is very important because it is the base for a good collaboration. It ensures social cohesion. The mean score for evaluation implied that they 'slightly agreed' with the relevance of the network for themselves, the classroom and the school (score: 3.97). The participants evaluated the relevance for their own development (score: 4.18) higher than the relevance for the school (score: 3.91) and for their own practice (score: 3.82). That the relevance for the school scored lowest (compared to the other two evaluation items) for this learning network is understandable given that the topic of the network was less suitable for carry over. In a similar vein, the score for practice was, compared to domain and community, relatively low (below 'slightly agree'; score: 3.79). Considering the topic, it was to be expected that other teachers did not make use of the knowledge gained by the network. This was also represented by the score on item 8 that posed that other people (outside of the network) made use of the gained knowledge. The mean score was slightly above 'neutral' (score: 3.18). However, the relatively low score for the relevance for their own practice (score: 3.82) is alarming. Perhaps, the topics of the

network were indeed encountered in practice, but might not be related to teaching situations. This can for instance be case when the topic discussed is, for instance, the organisation of the traditional group eight camp trip, or the transition to secondary education. These topics do not influence teaching directly. This might explain the lower scores for enhancement of their practice. If, however, the topics were related to teaching and teaching practice, then these lower scores should investigated further.

7   Conclusions and discussion

In this paper, we set out to contribute to insights about the usefulness of networked learning and CoPs, by developing an instrument to evaluate the functional status of a learning network. Through the application of this instrument we studied how teachers or other school-staff evaluated the relevance of their networks for their own practices, for their schools and for their own development. The NB evaluates relevant dimensional aspects; domain, community, practice, and evaluation. In total, we evaluated the functional status of 21 face-to-face learning networks. However, the NB is applicable for online communities as well. In the following paragraphs, the findings of the NB will be discussed per dimension and will be embedded in existing knowledge of online communities, elaborating on possible differences in interpretation between face-to-face and web-based communities.

The learning networks scored higher on the 'domain' and 'community' dimensions than on the items comprising the 'practice' dimension. Since statements indicating a focus on domain were so highly agreed upon the learning networks seem to be engaging around the right topics; this makes the actions undertaken by the learning network meaningful (Akkerman et al., 208), which in turn can increase the intrinsic motivation for learning together. Additionally, the feeling that the right topics are addressed also increases the intrinsic motivation to contribute to the networks' gains (Ryan and Deci, 2000). Potters and Poelmans (2008), in their study of virtual communities of practice in education, stress that it is the common interest for a topic that binds the people together. Thus, the appreciation of the correct topic is an important feature for both face-to-face and online learning networks. This is amplified by the fact that working towards the same goal (or topic) enhances trust (Tseng and Yeh, 2013).

The finding that the teachers agreed they collaborated in a good manner, and that the climate was good (indicated by the 'community' items in the NB) is beneficial since this builds trust. Trust is required to open up and not to be afraid to make mistakes (Dechant et al., 1993), which is a base feature for learning with and from each other (Hanraets et al., 2011). Trust is often harder to establish in online communities because they may lack a shared social context and there are limitations on personal interaction and communication (Tseng and Yeh, 2013). Outcomes of the items of the NB that inquire about what participants mean to each other and about the atmosphere might therefore show a potentially lower outcome for web-based communities. This makes these items relatively more important for web-based communities, because they represent base factors that need to be present in order for social learning to take place.

Furthermore, the teachers agreed that they had an influence on the actions undertaken in the learning network. Being able to determine the topics and the pace of their professional development enhances the benefits (Hunzicker, 2011), and they are reached by making their own decisions. In online communities, ownership is similarly important.

Hanraets et al. (2011) suggest that ownership could be facilitated when intrinsic motivation is high. They relate this, in turn to 'a feeling of togetherness and belonging'.

The fact that participants only slightly agreed that there was enough diversity in their learning networks could be seen as an indication that the learning networks might still be too homogeneous and could benefit from inclusion of people with different backgrounds. More views on a particular topic increase the quality of the results and De Bruijn (2008) reports that in an (online) knowledge network, the inclusion of experts and enthusiastic people are success factors. Also, Reeves (2008) suggests that adding novices and veterans to a network could enhance learning and Vescio et al. (2008) suggest to add different professions. Adding members to a network or community might be easier in an online community because there will be less boundaries of time and distance. Therefore, this item might receive higher scores in online communities than in face-to-face networks.

Additionally, the participants agreed that being part of a learning network leads to improvement of their own development, of their classrooms and their schools. This gives an indication that the teachers acknowledged the relevance of the learning networks, and legitimises the existence of the learning networks. This is in line with the report of De Bruijn (2008), who states that one major success factor of an (online) knowledge network is it's perceived practical relevance. Even though this is a subjective measure of the relevance of the learning networks, it is an indication that this is a beneficial form of professional development.

In the end, networked learning should provide benefits in terms of improvements in teaching practice. The relatively lower agreement on statements measuring the focus on improving practice indicates there is room for improvement. Still, the participants more than 'slightly agreed' that they made use of the gains of the learning network. This would indicate that the gains were usable (for themselves), but that they do not feel this relates to their competences. It should be explored further why teachers feel their competences do not increase more and how networked learning practices can be improved towards this end. Possibly, the gains up till now were not yet sufficient for increasing competence. Another possible explanation is that (informal) learning networks are not yet seen as a legitimate way to improve competences, because the dominant perspective still mainly values formal training for competence development and personal theories of learning still reflect the explanation of learning through more direct transmission rather than through networking among colleagues. Thus we conclude that more attention should be paid to (making visible of) the contributions of networks to the shared teaching repertoire.

It seems that the NB is a useful instrument for the evaluation of the functional status of specific networks; it can provide insight into those aspects of the network that are adequate and those that might need improvement or special attention.

8   Limitations and future research

In the current study, we created and applied the NB in face-to-face learning networks. In future research, web-based communities should be included as well. Even though, we expect, also based on the literature on online communities of practice, that largely the same factors play a major role in the success of a leaning network, the fact that there is no face-to-face contact and that the members in general do not know each other in person, might influence the community dimension. It might have an influence on the sense of

community, which, in turn, might influence factors such as trust within the learning network, which is suggested to be a delicate issue (Hanraets et al., 2011). A limitation of statistical nature is that the items that inquired after the three dimensions that define a CoP were not divided evenly over the three dimensions. The dimension community was represented by four items, practice by three, whereas domain was represented by two items only. This division of items was based on the problems that the learning networks were facing at the time of construction of the NB. A more even division would have made it possible to perform more elaborate analyses and to draw more statistically solid conclusions, but basing the instrument construction in actual learning practices is similarly important.

Another limitation is that we had no information whether the school (i.e., the other teachers or school staff) actually experienced beneficial results of the learning networks. The NB was filled out by the participants of the learning networks and hence is subjective. Thus, in future research it makes sense to study the objective merits of the learning networks by consulting the colleagues of the learning network members. Additionally, the facilitation and support that the networks receive from the schools and/or organisations needs to be included because this also influences the functioning of networks (Hanraets et al., 2011). By giving members time to participate, valuing what communities bring and recognising the work of sustaining them, organisations can support communities of practice (Wenger, 1998).

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