

# Chapter 12

## Analysing Social Learning of Teacher-Learning Groups That Aim at Knowledge Creation



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**Abstract** Teacher-learning groups (TLGs) are an emerging type of collegial collaboration in teacher training colleges. A TLG of teacher educators that was studied aimed to develop a new curriculum for aspirant primary school teachers. This TLG created a sustainable knowledge base necessary to implement a new teacher training curriculum. An extended version of the *Dimensions of Social Learning Framework* (Vrieling et al., *Teach Teac Theory Pract* 22:273–92, 2016) was used to reveal indicators for sustainable knowledge creation. The adapted framework – in this chapter abbreviated as DSL-E Framework (E, extended) – was informed by the *Social Capital Model* (Ehlen, *Co-creation of innovation: Investment with and in social capital* (Doctoral dissertation). Open University of the Netherlands, Heerlen, The Netherlands, 2014) and the *Value Creation Framework* (Wenger et al., *Promoting and assessing value creation in communities and networks: a conceptual framework*. Open University of the Netherlands, Heerlen, The Netherlands, 2011). The usefulness of this adaptation for analysing sustainable knowledge creation was explored with a case study. Results show that the DSL-E Framework is helpful to

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identify indicators for sustainable knowledge creation. First, the use of the DSL-E Framework revealed the collective knowledge working identity as indicator. A gradual development of distributed leadership as well as an inquiry-based attitude appeared necessary ingredients in this matter. Second, institutional value creation was found an important indicator for sustainable knowledge creation. This indicator says that TLGs should involve all stakeholders when starting a joint enterprise and connect actions to institutional goals right from the start.

## Introduction

Research shows a growing interest in social learning in teacher-learning groups (TLGs) to stimulate teacher professional development (Boud & Hager, 2012; Hargreaves & Fullan, 2012; Vrieling, Van den Beemt, & De Laat, 2016). Dopperberg, Bakx, and Den Brok (2012) define social learning within a teacher-learning context as ‘undertaking (a series of) learning activities by teachers in collaboration with colleagues, resulting in a change in cognition and/or behaviour at the individual and/or group level’ (p. 548–549). This definition strongly relates to Wenger, Trayner, and De Laat’s (2011) view on social learning that features collaborative knowledge construction through dialogue and social interaction.

In contemporary education, teachers are often expected to anticipate on educational change, preferably with colleagues (Hargreaves et al., 2013). However, traditionally most teachers carry out their work individually, in their own classroom setting (Dopperberg et al., 2012). This isolated position can harm teachers’ continuous professional learning and development (Lieberman & Pointer Mace, 2010). In response to this situation, educational managers and researchers regard TLGs as a solution for facing change and solving problems too complex to be solved individually. The purpose of such groups is to increase teachers’ learning opportunities, because social learning enhances learning beyond the classroom walls (see also Chap. 9, Jaldemark, Håkansson Lindqvist, & Mozelius, this volume; Chap. 10, Pettersson & Olofsson, this volume; Chap. 11, Van Amersfoort, Korenhof, Nijland, De Laat, & Vermeulen, this volume; Chap. 13, Spante, Johansson, & Jaldemark, this volume; Vrieling, Bastiaens, & Stijnen, 2012). It is argued that a possible tension between individual learning and group- or school-benefits, and growing attention in educational practice for sustainable knowledge creation, posits a need to include these aspects in research on social learning.

### *Facilitation of Teacher-Learning Groups: The DSL Framework*

The traditional individual working mode of most teachers impedes the implementation of social learning in TLGs (Dopperberg et al., 2012; Vangrieken, Dochy, Raes, & Kyndt, 2014). For TLGs to function properly, it is crucial that educational institutions breach the prevailing ‘individual way of working’, and promote social learning so that professional development on both individual and group level can be induced

(Büchel & Raub, 2002). Social learning in TLGs can be explored with Vrieling et al.'s (2016) Dimensions of Social Learning Framework (DSL Framework). The dimensions of this framework constitute the social configuration (i.e., patterns of behaviour, group constellation, and thinking) of TLGs, and the framework itself can be used as a monitoring instrument to stimulate awareness of the importance of social learning for knowledge creation.

Research on teacher professional learning uses words such as ‘teacher teams’ (Knapp, 2010), ‘teacher communities’ (Little, 2003), or ‘teacher networks’ (Lieberman, 2000) to refer to social learning activities among teachers. These references suggest stable characteristics of TLGs. However, groups of learners are dynamic, and their structure changes over time depending on the needs of the participants. In some occasions, TLGs show aspects of communities, for instance in activities that support mutual engagement in learning, while, in activities focused on a common goal, the term networks or teams applies better (Mazereeuw, Wopereis, & McKenney, 2016; Vrieling et al., 2016). Therefore, the DSL Framework contains aspects of team, community, and network perspectives to help to view the group’s activities from an overarching social learning perspective. The framework identifies social learning processes in TLGs on commonalities (‘dimensions’, see Table 12.1, column 1) and associated characteristics (‘indicators’, see Table 12.1, column 2).

The DSL Framework includes four dimensions, each consisting of two to four indicators. These indicators help to identify and describe individual and group attitudes and behaviour. The dimensions and according indicators serve as a lens through which the current social configuration of TLGs can be observed. Moreover, based on this analysis, the group can reflect on how the social configuration fits their learning goals and/or adjust their configuration accordingly to improve their learning. Below, the framework is briefly outlined (see the first two columns of Table 12.1). For a full discussion see Vrieling et al. (2016).

The first dimension, *practice*, encompasses the need for a relationship between the knowledge created and shared in the group and teachers’ day-to-day activities. This dimension consists of two indicators: (1a) *integrated or non-integrated activities*, representing the extent to which group knowledge and activities are integrated in practice, and (1b) *temporary or permanent activities*, which describe the social learning attitude as reflected in the duration or sustainability of learning activities.

*Domain and value creation*, the second dimension, is defined as the sharing of experience and expertise among group members. Indicators are as follows: (2a) *Sharing or broadening/deepening knowledge and skills*, reflecting the extent to which the group develops collective knowledge and skills through dialogue, and (2b) *individual or collective value creation*, which describes the level to which the group develops shared value such as group ownership, mutual inspiration, or positive interdependence.

When group members work interdependently with a shared purpose and responsibility for collective success, the group can develop a *collective identity*. This third dimension can be characterised by (3a) *shared or unshared identity*, which is related to group history and social and cultural background; (3b) *strong or weak ties*, which reflect the sense and intensity of general contact among group members; and (3c)

**Table 12.1** Social learning dimensions, indicators, original interview questions, and extended perspectives

Dimension	Indicator	Example interview questions	Extended framework
1. Practice	1a. Integrated or non-integrated activities	In what way are the experiences in practice communicated within the group?	
	1b. Temporarily or permanent activities	In what way are the group activities connected?	Perspective of value creation: (1) What are the group’s goals based upon? (Strategic Value); (2) Which factors were conducive or obstructive to achieve the goals? (Enabling Value)
2. Domain and value creation	2a. Sharing or broadening/deepening knowledge and skills	In what way is improvement of the group work visible after the group activities?	Perspective of value creation: (1) How did you experience the group’s activities? (Immediate Value); (2) Which gains did the group’s activities bring you? (Potential Value); (3) What difference has it made to your practice? (Applied Value); (4) What difference has it made to your personal, students’, and school’s achievements? (Realised Value); (5) What difference has it made to your understanding and definition of what matters? (Reframed Value); (6) What difference have the group’s activities made to your board’s achievements? (Strategic Value)
	2b. Individual or collective value creation	In what way reflects the agenda of the meetings the group’s goals?	
3. Collective identity	3a. Shared or unshared identity	Which feelings characterise the members’ belongingness to the group?	
	3b. Weak or strong ties	Which group members are closely connected?	
	3c. Task executors or knowledge workers	In what way results the group’s discussion into future ideas?	Perspective of innovation: (1) In what way is innovation achieved in your group? (2) Can you provide examples of moments when you have learned something new? (3) Which factors were conducive or obstructive for learning in this matter?

(continued)

**Table 12.1** (continued)

Dimension	Indicator	Example interview questions	Extended framework
4. Organisation	4a. Directed or self-organised activities	In what way are the group activities organised?	
	4b. Local or global activities	What issues are discussed in the group?	
	4c. Hierarchic or equal relationships	In what way are the relationships between the group members characterised?	
	4d. Shared or non-shared interactional norms	In what way is agreement achieved about the procedure to develop upon the group's goals?	

the extent to which group members perceive each other as *task executors or knowledge workers*, which characterises the degree of group participants working on their tasks but also sharing knowledge within their group in the form of new rules, routines, strategies, best practices, and implementation.

The final dimension, *organisation*, represents how the group is organised. Teacher group organisation can be indicated by (4a) the extent to which the group shows *externally directed or self-organised learning*; (4b) the focus on *local or global activities*; (4c) the presence of *hierarchic or equal relationships*; and (4d) the extent to which the group shows a shared interactional repertoire, reflected in *shared or non-shared interactional norms*.

### ***Facilitating Sustainable Knowledge Creation in Teacher-Learning Groups***

TLGs are increasingly required to develop products, output, and gains and benefits, monitored through superiors, boards, or school inspectors that value the quality of the products (Ehlen, 2014). Besides this control for performance requirements (Vaessen, Van den Beemt, & De Laat, 2014), some organisations also aim for TLGs to develop a long-term perspective with a focus on continuous and sustainable development and innovation (Ehlen, Van der Klink, Roentgen, Curfs, & Boshuizen, 2014). In terms of 'structural or organisational embeddedness', Agterberg, Van den Hooff, Huysman, and Soekijad (2009) refer to the extent to which group knowledge is integrated into, and relevant to, organisations of which the groups are part. Groups

such as knowledge-creating TLGs that aim to create sustainable knowledge not only work on their tasks but also share knowledge within their group in the form of new rules, routines, strategies, or best practices (Vrieling et al., 2016).

Earlier findings (De Laat, Vrieling, & Van den Beemt, 2017) suggest that the DSL Framework suits the analysis of TLGs' processes and development. However, the DSL Framework could be adapted to shift attention to a possible tension between benefits for the individual learner and for the group, together with sustainable knowledge creation. Only one indicator, 'the extent to which group members perceive each other as task executors or knowledge workers' (see Table 12.1, column 2, indicator 3c), explicitly addresses sustainable knowledge creation of TLGs. Therefore, similar to the work of Pettersson and Olofsson (see Chap. 10 in this volume), this study searches for additional perspectives to enrich the original framework with the purpose to broaden the sustainable knowledge-creation perspective of TLGs. Sustainability in this context resembles the social learning attitude as reflected in the duration or sustainability of learning activities (Vrieling et al., 2016). When TLGs are proactively discussing work-related topics to broaden or deepen their knowledge and skills in cooperation with people who share the same questions or challenges, temporarily learning activities can develop towards a more permanent social learning attitude. Columns 3 and 4 in Table 12.1 show the extensions to the original framework, which will be discussed in detail below. These follow-up perspectives are integrated into the interview questions of the DSL Interview Method (Van den Beemt, Vrieling, & De Laat, 2015).

### **The Social Capital Model**

Our effort to bring sustainable knowledge creation of TLGs into focus in the DSL Framework asks for a theory that addresses the factors supporting the transformation of the workplace into a setting for learning and innovation. In many domains, social capital is the key concept to describe sustainable knowledge creation (Ehlen et al., 2014). Social capital represents 'the network of social relations, based on shared norms and goals, trust and good atmosphere, by which materials and knowledge resources become available that are useful for the actions of the members of the network' (Ehlen, 2014, p. 89). More specific, Ehlen's model is of interest for our study because it focuses on relations between organisational innovation, knowledge productivity, and social capital in the domain of professional education. The Social Capital Model of Ehlen (2014) distinguishes four (i.e., action, cognitive, relational, and structural) dimensions of social capital that influence knowledge productivity, each requiring a minimum quality to create a rich innovation environment for sustainable results.

Based on the Social Capital Model, supplements were added for dimension 3 (collective identity), indicator 3c (To what extent do the participants view one another as task executors or knowledge workers?). Accordingly, innovation was taken as a follow-up perspective in the DSL Interview Method adding three questions (see Table 12.1, column 4): (1) In what way is innovation achieved in your

group? (2) Can you provide examples of moments when you have learned something new? (3) Which factors were conducive or obstructive for learning in this matter?

### The Value Creation Framework

In line with the dimensions and indicators of the DSL Framework, understanding TLGs' processes could be deepened by analysing how TLGs' members describe the value of social learning activities resulting in sustainable knowledge. Creating this value is defined as 'the value of the learning enabled by community involvement and networking' (Wenger et al., 2011, p. 7). Wenger and colleagues' Value Creation Framework (see also, Chap. 11, Van Amersfoort, Korenhof, Nijland, De Laat, & Vermeulen, this volume) might offer a fruitful additional perspective towards the DSL Framework to gain insight into how sustainable knowledge creation in TLGs is valued by its' members.

The Value Creation Framework focuses on the value that (teacher) groups create when they are used for social learning activities. The Value Creation Framework originally distinguishes five cycles of value creation: (a) immediate value (i.e., social learning activities and interactions as having value in and of themselves), (b) potential value (i.e., knowledge capital whose value lies in its potential to be realised later), (c) applied value (i.e., changes in practice), (d) realised value (i.e., performance improvement), and (e) reframing value (i.e., redefining success). With respect to the DSL Framework (see Table 12.1), the value creation perspective matches the second dimension (domain and value creation), indicator 2a (To what extent does the group focus on sharing or broadening/deepening knowledge and skills?). As a result, the following questions were added to the DSL Interview Method (see Table 12.1, column 4): (1) How did you experience the group's activities? (Immediate Value); (2) Which gains did the group's activities bring you? (Potential Value); (3) What difference has it made to your practice? (Applied Value); (4) What difference has it made to your personal, students', and school's achievements? (Realised Value); and (5) What difference has it made to your understanding and definition of what matters? (Reframed Value).

In 2014, Trayner presented a new version of the Value Creation Framework that puts the framework in a broader context by adding two new cycles: (a) strategic value (i.e., the clarity of the strategic context in which the group is operating and the ability of the group to engage in strategic conversations about the value it creates) and (b) enabling value (i.e., the support processes that make the group's life possible).

The value creation insights added supplements to the DSL Framework (see Table 12.1), dimension 2 (domain and value creation), indicator 2a (To what extent does the group focus on sharing or broadening/deepening knowledge and skills?), adding a new value question to the DSL interview guidelines (see Table 12.1, column 4): What difference have the group's activities made to your board's achievements? (Strategic Value). Besides dimension 2, the value creation perspective was also taken as a follow-up perspective in the DSL Interview Method with regard to



dimension 1 (practice), indicator 1b (To what extent does the group exhibit temporary or permanent social activities?). The following questions were added towards the group's goals questions: (1) What are the group's goals based upon? (Strategic Value) and (2) Which factors were conducive or obstructive to achieve the goals? (Enabling Value).

## ***Problem Definition***

The study explores whether it is useful to integrate the social capital and value creation perspectives into the DSL Framework to get a grip on indicators for knowledge-creating TLGs. This brings us to the following research question: Which indicators for sustainable knowledge creation in TLGs are brought into view by using the extended version of the DSL Framework (abbreviated as DSL-E Framework; E, extended)? First, methodological issues of the study are described in the method section. Second, the DSL-E Framework is tested in a TLG with a focus on sustainable knowledge creation for curriculum development (the findings section). Finally, the conclusion and discussion section discusses our findings and elaborates upon recommendations for future research.

## **Method**

### ***Setting and Participants***

Gaining insight into social learning activities needs a qualitative research design that is exploratory in nature (Creswell, 2007). Therefore, an in-depth case study was conducted in a teacher training college for primary education in the Netherlands. This college is a small institution that educates approximately 400 students a year. Most students enter its program after graduating from the middle level of general secondary education and the highest level of secondary vocational education.

The college's TLG 'Curriculum Development' was studied which included senior teacher educators ( $n = 3$ ), junior teacher educators ( $n = 2$ ), and a manager. Three out of the six group members were female. All participants had indicated their interest in joining the group in arranged meetings before the research period where they could express their ideas about the new curriculum. The group was tasked with starting up developing a new educational curriculum. The group aimed at structuring the curriculum ideas into design principles representing the different perspectives of the organisation, but also putting these ideas into practise in the form of a first small pilot with aspirant primary school teachers. The meetings of the group were planned every four to 6 weeks during one academic year (September until June) with a total amount of seven meetings (see Table 12.2). Every meeting lasted 90 minutes.



**Table 12.2** Data collection

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
Interviews					x					x
Meetings (audio)	x		x		x		x	x	x	x
Debriefings					x					x

## *Instruments*

The DSL Interview Method (Van den Beemt et al., 2015) was used to structure the interviews. This method follows a biographical approach (Bornat, 2008) to let participants rethink the group's social processes from the start towards the present. Table 12.1, column 3, presents examples of questions for each indicator within the dimensions of the DSL Framework.

## *Data Collection*

Data were collected with semi-structured interviews, audio recordings of TLG meetings, and audio recordings of peer debriefings (see Table 12.2). The interviews followed the DSL Interview Method that took approximately 1 hour per interview. Its guidelines were used for two cycles of in-depth retrospective semi-structured interviews conducted in January (first cycle, 6 interviews) and June (second cycle, 5 interviews). Each interview was audio recorded and transcribed. In addition to the interviews, audio recordings of the seven group meetings were collected.

Besides the semi-structured interviews and the audio recordings of TLG meetings, an interim (face to face) and final (digital) peer debriefing were organised. These involved presentations and discussions of the results with TLG participants. For the interim debriefing, conducive and obstructing factors for sustainable knowledge creation were deduced from the data to give the TLG members feedback. For the final debriefing, the recommendations from the interim debriefing were compared with the final debriefing situation to demonstrate the professional growth. In this way, the group's social configuration development was analysed. The questions concerned the conducive and obstructive factors that respondents considered most important, the changes as observed, respondents' expectations and wishes, the factors that influenced the group's development, the necessary follow-up steps, and the enabling factors to realise future steps. Respondents were also asked what they considered the most valuable personal and group's benefits of the group activities.

## ***Data Analysis***

Collected empirical data from the transcribed interviews were analysed during (January) and after (June) the research period. The analysis was guided by the DSL-E Framework that acted as a coding scheme for elaborating the social configuration of TLGs in relation to the group's learning activities. For the analysis, all findings were structured in a matrix containing the four dimensions and the 11 indicators of the DSL-Framework (see Table 12.1, columns 1 and 2) also including the theoretical perspectives to bring sustainable knowledge creation of TLGs into focus into view (see Table 12.1, column 4).

To enhance the internal validity of the results per indicator, two researchers independently analysed the collected interview data with a content analytic summary matrix (Miles, Huberman, & Saldaña, 2014). In addition, the two researchers reciprocally checked the matrix and discussed similarities and differences in their views. Finally, one of the researchers analysed the audio recordings from the group meetings including the peer debriefings, triangulating for added information towards the matrix. This process resulted in a matrix holding the final data for analysis as well as codes and themes related directly to the DSL-E Framework.

## **Findings**

In answer to our research question, the findings of the case study are elaborated to test the usefulness of the DSL-E Framework for bringing indicators for knowledge creation into view. Grounded on the analysis, two important indicators for TLGs' knowledge creation are presented: (a) collective knowledge working identity and (b) institutional value creation. For both indicators, the synthesised findings are described including fragments from the data that illustrate the findings.

### ***Collective Knowledge Working Identity***

In the TLG, it was common to develop collective knowledge and skills through dialogue that included giving and accepting feedback. In this way, knowledge creation was demonstrated by sharing experience and expertise among group members: 'after introducing a theme, it is discussed from diverse perspectives'. The shared interest developed into a basis for a deep level similarity among group members despite their diversity in voices or language. The group members performed collaborative research towards a collective goal (i.e., shared agenda) and consequently generated shared knowledge.

In our TLG, four phases were distinguished (see also Katz & Earl, 2010). The first phase, 'Storytelling and scanning for ideas', was illustrated while participants gained information by exchanging stories in search for specific ideas. Phase two,

'Aids and assistance', occurred in the form of mutual assistance and feedback when group members asked for help. The final two phases also saw an open exchange of ideas and opinions ('Sharing') as well as a feeling of shared responsibility ('Joint work'). Upon the realisation of a shared agenda, two conditions were shown important: distributed leadership and an inquiry-based attitude. In addition it was found that the increase of group participants' skills towards spread leadership and an inquiry-based attitude needed a gradual development ('scaffolding') to enhance knowledge creation. The important role of the facilitator in this matter is described in Scaffolding section below.

### **Distributed Leadership**

A shared agenda for the TLG was demonstrated through the distribution of the leadership activities across multiple group members. Tasks and roles were divided to actively involve all members and stimulate feelings of responsibility for a proper outcome of the group. In the TLG several positions were present. The manager acted as group coordinator. The manager and the senior teacher educators were providers of inspiration and the junior teacher educators mainly acted as creators by translating the ideas into concrete design principles for the curriculum and trying out those principles. These learning positions are examples of how group members collaborate as knowledge workers, which stands in contrast to groups where members are focused on execution of given tasks (see also Haythornthwaite & De Laat, 2012; Wenger et al., 2011). In this way, in our TLG 'the diversity of roles kept the group in balance'.

### **Inquiry-Based Attitude**

TLGs' products often reflect the first four cycles of value creation (i.e., immediate value, potential value, applied value, and realised value) referring to more direct gains of the group activities. The transfer from a 'working' to a 'learning' attitude asks for a changing group mode. For TLGs to develop a longitudinal knowledge-creation perspective, it is therefore important to pay attention to both the inward and outward dimension of an inquiry-based attitude while working and learning (Meijer, Geijsel, Kuijpers, Boei, & Vrieling, 2016). Regarding the inward dimension, the positioning of critical questions and critical feedback appeared rewarding: 'the group members are critical in a positive manner and show real interest in each other's work. The work is thoroughly read and feedback is provided in detail'. To maintain this positive critical working procedure, the group members reflected their need for clear criteria to make judgements about the quality of the products that were developed. Through thinking and reflecting on actions and listening to the perspectives of others in dialogues, new views were examined to alter old views. These dialogues, often enforced by critical questions (Barak, Gidron, & Turniansky, 2010; Leh, Kouba, & Davis, 2005) resulted in reframing (i.e., reframed value). In this way,

the group integrated their views into a new mental construct that was collectively held: ‘working in this group resulted in really different thinking towards an innovative curriculum with a totally new approach’.

Upon the outward knowledge-sourcing dimension, the group performed a collaborative literature search and discussed the findings. As a result, their knowledge about curriculum development increased and they were kept up to date with what was happening in the educational field. The curriculum design as intended was also piloted, and data were collected, analysed, and evaluated in the group meetings.

### **Scaffolding**

Since the effects of learning in TLGs vary depending on self-regulation by the participants (Laferrrière, Lamon, & Chan, 2006), group members are required to possess sufficient metacognitive skills or knowledge. This team reflexivity (Knapp, 2010) can be viewed as a combination of collective metacognition and team reflection. Although in the group we followed the three overarching regulating roles (coordinator, creator, and provider of inspiration) were present, and tasks were divided, one of the group members (junior teacher educator) did not perform the tasks as intended resulting in a disappointment for both the group and the group member. This stresses the necessity for facilitators to gradually regulate the group activities amongst group members (Vrieling, Bastiaens, & Stijnen, 2010).

In an optimal learning situation, group facilitators gradually decrease assistance when the participants are able to perform more independently (i.e., scaffolding). To reach for this aim, the necessary regulation skills can be modelled to novices upon four regulatory skill levels as distinguished by Schunk and Zimmerman (2007): (1) observation: learners can induce the major features of the skill from watching a model learn or perform; (2) emulation: the learner imitates performances of a model’s skill with social assistance; (3) self-control: the learner independently shows a model’s skill under structured conditions; and (4) self-regulation: the learner shows an adaptive use of skills across changing personal and environmental conditions. In the TLG that was observed, the participants decided to work in pairs instead of individually.

### ***Institutional Value Creation***

When TLGs aim for institutional value creation, it is important to discuss the question what the group’s goals are based upon (i.e., strategic value). In our TLG, the overview of short- and long-term goals was lacking: ‘it is not clear how our choices regarding the new curriculum will continue on the longer term: what steps are we going to take?’. Therefore, it was difficult for the group to develop a working plan to achieve the goals. To hold on to the shared agenda, the group members stressed

the importance to explicate the group process ('Where are we now and where are we going?') on several moments. In this matter, the group asked for clear criteria for the in-between and final products.

To reflect upon the group's strategic and enabling value, it appeared crucial to engage all stakeholders from the start: 'our professional vision is shared with fellow teachers face to face. We also wrote newsletters to inform all colleagues. However, not everyone reads a newsletter, so we can use more information canals for a broader dissemination. Overall, innovation develops only if it is experienced by the people who work with it'.

## Conclusion and Discussion

This study elaborated on the usefulness of the DSL-E Framework to bring sustainable knowledge-creation indicators of TLGs into view. It was found that the perspectives concerning social capital and value creation deepen our dimension theory towards sustainable knowledge creation of TLGs. However, future research is necessary to search for added models and theories to deepen the framework.

The findings show that the DSL-E Framework (see Table 12.1) helps to reveal knowledge productivity of TLGs by identifying conducive and obstructing indicators. As such, the framework can function as instrument for professional development of knowledge-creating TLGs. The DSL-E Framework provided us with a picture of individual and collective value creation. For the benefit of sustainable knowledge creation for TLGs, this raised the question of how both perspectives (individual and collective) are beneficial in this matter, an interesting focus for future research.

Two indicators of the DSL-E Framework appeared important for sustainable knowledge creation in TLGs: (1) collective knowledge working identity and (2) institutional value creation. Collective knowledge working identity develops when TLGs aim for shared knowledge, using a shared agenda. In such group settings, distributed leadership appears an attractive concept to enhance professional development. Based on the expertise of the participants, all members can contribute to problems and challenges concerning school improvement and fulfil diverse positions within groups. A second condition for collective knowledge working identity is the development of an inquiry-based attitude. In line with the findings of Meijer et al. (2016) both the internal and external dimension of an inquiry-based attitude were proven important in this matter. For the internal dimension, a reflective learning environment is needed where providing feedback based on previously formulated criteria and asking positively formulated critical questions is a regular behaviour. In these circumstances, group participants will 'step out of their comfort zone to jump into something new' (i.e., transformative value).

Regarding the external dimension of an inquiry-based attitude, knowledge sourcing appeared an important skill for sustainable knowledge creation in TLGs. Through developing research skills, a strong inward focus for knowledge creation

can be enhanced. In addition, knowledge sourcing also expects an external view of the group because ‘weak ties’ (Granovetter, 1973) are necessary for an innovative focus of the group. In follow-up research, it is our aim to study multiple TLGs that learn to perform educational design research as a catalyst for professional development.

To enhance distributed leadership and an inquiry-based attitude for sustainable knowledge creation in TLGs, facilitators must give opportunities for novices to gradually move towards a full member of the group (i.e., scaffolding). These skills can be modelled by using the four phases of Schunk and Zimmerman (2007): observation, emulation, self-control, and self-regulation.

The second indicator of the DSL-E Framework that appeared important for TLGs’ knowledge development concerns institutional value creation because it puts the learning environment of TLGs in a long-term perspective. It stresses the importance for TLGs to interact with stakeholders and connect with the institutional goals from the beginning of the joint adventure to ensure embeddedness and change on the organisational level. Pettersson and Olofsson (see Chap. 10, this volume) also emphasise the importance to align the learning object with organisational goals and visions to be anchored in the overall school culture. Although the role of the ‘strategic communicator’ was present in our group, the adaption process appeared difficult. Therefore, how to facilitate the transition from knowledge creation towards adaption on several levels is interesting to analyse in future research.

One limitation of the study concerns the short period (1 year) in which the group was studied. This is a rather short period to analyse sustainable knowledge creation in TLGs. Second, only one TLG in one teacher education college was studied. Therefore, future research should investigate sustainable knowledge creation of multiple TLGs in different settings over a longer period and ‘test’ the proposed DSL-E Framework.

To conclude, the present study yielded fruitful perspectives to extend the original DSL Framework (Vrieling et al., 2016) towards the analysis of sustainable knowledge creation in TLGs. In this way, more insight is provided in the relationship between theories of DSL, social capital, and value creation for the benefit of facilitating TLGs. For knowledge-creating TLGs, it is recommended to give attention to collective knowledge working identity as well as institutional value creation. For this matter, the DSL-E Framework can be applied to bring the groups’ social configuration into view.

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