

Exploring the role of the facilitator in learning communities supporting team learning and reflexivity

Madée Wiggers

Faculty of Behavioural, Management and Social Science, University of Twente

Master Thesis Educational Science and Technology

First supervisor: Dr. S.M. Dennerlein

Second supervisor: prof. dr. M.D. Endedijk

Consultation: A. Kornet, MSc

August 19th, 2024

Acknowledgment

I am grateful for the opportunity to contribute to this research and the help I received. For me, the process of writing this thesis was challenging but also a valuable experience. The biggest lesson for me is that not everything can be right at once and not to always doubt myself.

I would like to thank Amber Kornet for her valuable guidance. You have been very important to me during the journey of my thesis because of all the time you took for me, quick response, feedback, and the nice cooperation. I wish you lots of success in the future and in completing your PhD! I would like to thank Sebastian Dennerlein for the great guidance and comprehensive feedback. I wish you good luck in your work and research. I would also like to thank Maaïke Endedijk for your valuable insights and feedback for structuring my thesis. I wish you all the best as a teacher and professor in PLT.

Finally, I would like to thank my family and friends for their support, especially my boyfriend and my classmates Jeske Roerink and Floor Franssen. You all have been an important part of this process by helping, motivating, and believing in me.

With the completion of my thesis, my academic journey has also come to an end and my career as an educationalist is about to start. Possibly my knowledge about learning communities and facilitating them will become useful. I look forward to learning more at the workplace!

Madée Wiggers,

August 19th, 2024

Abstract

The installation sector faces challenges due to the energy transition, necessitating innovative learning-working environments. To address these challenges, some Dutch companies make use of learning communities (LCs). Within these LCs, facilitators play a crucial role in guiding team learning and reflexivity. However, there is a gap in understanding facilitators' behaviour and engagement in these activities. Therefore, this research aims to explore the role of the facilitator through investigating the position and the interactional behaviour of the facilitator relative to the team members. This study used an exploratory multiple case study design by analysing five Learning Communities. Based on two codebooks, the transcriptions of the meetings were coded. Additionally, the codes were analysed using the statistic software R. In R, a social network analysis is performed to define the position of the facilitator relative to the team members. In addition, a sequential analysis is performed in R to define how the facilitator supports team learning and team reflexivity, by looking at characterising sequences from which interactional behaviour can be derived from.

Firstly, the results indicate the facilitator plays a central role in both team learning and team reflexivity. While the facilitator's influence is strong in team reflexivity due to leading these activities, it is slightly reduced in team learning as team members take on more active roles in problem-solving. Secondly, there is a difference in team learning and team reflexivity interaction patterns. Interactions within team learning are more extensive and involves interactive and constructive feedback, supported by the facilitator, while reflexivity is more critical and requires facilitator intervention to trigger reflection. These results could be expanded in future research, considering the limitations for a better understanding how the facilitator guides and support teams in LCs and adapt facilitators' training accordingly.

Keywords: learning communities, facilitator, cross-functional teams, team learning and reflexivity, position, dialogic moves

Table of content

| | |
|--|-----------|
| <i>Acknowledgment</i> | 1 |
| <i>Introduction</i> | 4 |
| <i>Theoretical framework</i> | 6 |
| Learning Communities | 6 |
| Team learning and reflexivity activities..... | 7 |
| The role of the facilitator..... | 8 |
| Dialogic moves..... | 11 |
| <i>Present study & research questions</i> | 13 |
| <i>Method</i> | 15 |
| Research design..... | 15 |
| Data collection..... | 17 |
| <i>Procedure</i> | 17 |
| Data analysis..... | 18 |
| <i>Results</i> | 26 |
| Descriptives | 26 |
| SQ 1: Which position does the facilitator take during interactions with cross-functional team members of learning communities in team learning and team reflexivity activities?..... | 28 |
| SQ2: How does the facilitator support team learning and team reflexivity during interactions with cross-functional team members of learning communities? | 36 |
| <i>Discussion</i> | 55 |
| Insights into the positioning of the facilitator in team learning and reflexivity activities..... | 55 |
| Insights into the support of team learning and reflexivity by the facilitator | 58 |
| Limitations and directions for future research | 61 |
| Practical implications | 63 |
| <i>Conclusion</i> | 65 |
| <i>References</i> | 66 |
| <i>Appendix A</i> | 79 |
| <i>Appendix B</i> | 81 |
| <i>Appendix C</i> | 84 |
| <i>Appendix D</i> | 87 |
| <i>Appendix E</i> | 89 |

Introduction

In the installation sector, the energy transition, and the related demand for changing and updating installation workers' skills call for innovations in learning-working environments. It is necessary to accelerate the development of new approaches to expedite learning and innovation in the installation sector (Corporaal et al., 2021). In response to the effects of the energy transition on employee skill requirements, some Dutch installation companies use learning communities (LCs). LCs are well suited to address the challenges and opportunities involving energy transition since they promote innovative learning and work environments (Topsectoren, 2019). The varied perspectives provided by different members of LCs contribute to innovative problem-solving related to the energy transition and promote interprofessional learning within a group. However, it seems challenging to collaboratively approach tasks because team members need to cross knowledge barriers (Edmondson & Harvey, 2018).

To foster an interprofessional learning environment guidance is needed by a facilitator (Corporaal et al., 2021; Topsectoren, 2019). The facilitator can create an interprofessional learning environment to help team members navigate across knowledge barriers, by letting them discuss and evaluate possible solutions in their work practice (Van Rees et al., 2022). The development of innovative solutions requires teams to learn (Widmann & Mulder, 2018). Therefore, team members need to engage in team learning processes (Edmondson & Harvey, 2018).

Van Weeghel (2022) and Schinkel (2023) examined the behaviors of facilitators in guiding team learning and reflexivity within interprofessional learning communities (LCs). Schinkel (2023) expanded upon previous research by offering a more detailed understanding of facilitator behaviors. These findings highlight the aggregated behavior of facilitators across team learning and reflexivity activities, noting that facilitators play a central role in initiating

and guiding these activities. In line to the outcome of Schinkel (2023), the study of Schippers et al. (2008) suggests that team members primarily do not engage spontaneously in reflexivity activities and, therefore, require support from a facilitator. Hence, the theory of Schippers et al. (2008) and the outcome of Schinkel (2023) suggest that facilitators would engage more during reflexivity activities than team learning activities. However, there is no empirical evidence that this is true.

This study intends to further explore the facilitators' role in supporting team learning and reflexivity activities during verbal interaction with cross-functional team members in LCs, as there is currently a gap in knowledge about this. Firstly, this study will elaborate on the study of Schinkel (2023) by investigating the position that the facilitator takes in team learning and team reflexivity. In this context, no connection has been made between the facilitator's position during different team learning and team reflexivity activities. Secondly, this study will partly replicate Schinkel's (2023) sequential analysis of dialogic moves that are used by the facilitator during team learning and team reflexivity activities by using a more extensive dataset.

Theoretical framework

Learning Communities

The teams examined in this study are practical teams and are designed based on learning community concepts, like Professional Learning Communities (PLC) and Communities of Practice (CoP) (Hubers et al., 2021; Van Rees et al., 2022). These concepts have similar goals of collective learning and problem-solving (Wenger & Snyder, 2000, Stoll et al., 2006) and combine specific features for collaborative learning (Hubers et al., 2021). Topsectoren, (2019) used these characteristics when developing the LCs because they felt they could work for addressing challenges in the installation sector. However, there are also some differences between the LCs and the concepts they are derived from. PLCs are mainly formed in educational settings consisting of participants from similar organisations, while LCs consist of cross-functional teams with participants from various types of organisations (Hubers et al., 2021). CoPs may exhibit hierarchical knowledge sharing based on seniority (Lave & Wenger, 1991, as cited in Dochy et al., 2012), while LCs emphasise collective responsibility and complementary expertise (Van Rees et al., 2022). Additionally, CoPs can vary widely in size, while our LCs have a small number of participants (Van Rees et al., 2022; Wenger & Snyder, 2000). Moreover, CoPs are continuous, while our LCs concern a predetermined period (Van Rees et al., 2022; Wenger & Snyder, 2000).

The new approach of LCs promotes professional development and innovation in the installation sector and supports learning and knowledge sharing, which are crucial aspects of successful team performance (Barrett et al., 2004). Therefore, LCs are well suited to address the challenges and opportunities involving energy transition (Hubers et al. 2021). The LCs in this study are time-bound, cross-functional innovation teams consisting of about ten members, including teachers and professionals, bringing different functional backgrounds and expertise

(Hubers et al., 2021; Topsectoren., 2019). During the time-bound period, they meet to collaboratively learn work on a specific challenge, guided by an external facilitator (Topsectoren, 2019).

Team learning and reflexivity activities

From a process perspective, team learning encompasses the interpersonal behaviours exhibited by team members (Decuyper et al., 2010). Team learning takes place when team members are connected through work-related activities and build on each other's knowledge to develop new insights and information (Vashdi et al., 2013). Throughout this ongoing action cycle of action and reflection, team members collaborate while completing shared tasks. (Decuyper et al., 2010). Within team interaction, team members share their knowledge and exchanging ideas and perspectives (Decuyper et al., 2010), discuss problems and mistakes (Carmeli et al. 2013), and reflecting upon the process (Schippers et al., 2014). Edmondson (1999) conceptualised this as asking questions, receiving feedback, experimenting, reflecting on outcomes, and discussing mistakes and unexpected outcomes. Koekkoek (2022) replaced asking questions with collaborative idea generation (Messmann & Mulder, 2020) since this is essential in the context of learning communities. Sharing ideas within teams stimulates further idea generation, enabling members to build on each other's contributions (Kohn et al., 2011, as cited in Paulus et al., 2018) that meet the team's needs and are applicable in the work context (Messmann & Mulder, 2020).

The importance of the continuous action and reflection cycle highlighted by Edmondson (1999), is called "team reflexivity" by Decuyper et al. (2010). Team reflexivity refers to the degree to which team members consciously communicate and reflect on their goals, methods, and processes and adjust as necessary (West, 2000, as cited in Schippers et al., 2012). Therefore, team members assess their current state and sets goals to

achieve (i.e. monitoring), discuss strategies to reach them (i.e. planning), and evaluate the results (i.e. evaluating) (Decuyper et al., 2010). Monitoring entails measuring progress and identifying gaps between the present and intended states; planning entails establishing goals and developing strategies; and evaluation entails discussing outcomes and analysing goal achievement (Schipper et al., 2018; Wijga et al., 2023).

Team learning and reflexivity activities are important for teams that want to find innovative solutions (Edmondson & Harvey, 2018). This is because team learning and reflexivity have a positive impact on collaboration, leading to better team performance and innovation (Konradt et al., 2016). When teams engage in team learning and reflexivity activities that motivate them to explore information, ask questions, seek feedback and test their assumptions, they will learn (Bresman, 2013). Effective facilitation of team learning and reflexivity in meetings can significantly improve group problem-solving and decision-making (McFadzean, 2002). Therefore, this study dives into the activities of team learning and team reflexivity to investigate the interpersonal behaviours of the team members during the meetings in LCs and how the facilitator supports this process.

The role of the facilitator

The role of the facilitator refers to the skills and behaviour of the facilitator in groups (Viller, 1991). Research into the role of the facilitator, shows that the facilitator is positioned as an individual who is staying neutral in the decisions making of the group (Kolb et al., 2008). In their neutral role, a facilitator guides the process of a team, keeping the group focused (Margalef, 2016) and encourages team members to achieve their set goals through collaborative and constructive interactions (Kolb et al., 2008). In addition, the facilitator makes sure that all team members get the opportunity to participate and ease the participants into a new and unnatural work setting by creating a work climate of mutual respect and trust among the team

members (Ortquist-Ahrens & Torosyan, 2009; Petrone & Ortquist-Ahrens, 2004). Therefore, the facilitator is not a leader responsible for outcomes but adaptively supports where needed (Shaw et al., 2010). However, a facilitator can apply effective leadership strategies to maintain balance and fostering a conducive environment for group learning and development (London & Sessa, 2007).

In the LCs in this study, team members need to build upon each other and not only having a question and answering of the facilitator and the members (Hubers et al., 2021). Since a facilitator guides the process of the team (Margalef, 2016) and encourages team members to meet their desired goals through collaborative and constructive interactions (Kolb et al., 2008), the facilitator can play an important role to support this. Especially in team reflexivity, team members need support from a facilitator to participate effectively since this not arise spontaneously within teams (Koeslag-Kreunen et al., 2018; Raes et al., 2013; Schippers et al., 2008).

The position of the facilitator in group interactions

Positioning in group interactions is about how persons are ‘placed’ in a conversation, continuously occurring through interaction (Harré et al., 2009). Through the position that a person assumes in a conversation, one or more participants can take the lead in performing tasks associated with leadership behaviour (Meschitti, 2018). Van der Want and Meirink (2020) researched the position in the context of teacher team meetings, where also a facilitator is present. The results showed that facilitators navigated through the meeting, varying from passive-absent and passive-waiting to active-leading and proactive actions (Van der Want and Meirink, 2020). Therefore, the facilitator's position is seen as flexible, with the ability for facilitators to adapt their role to better support the group's interactions and learning (Shaw et al., 2010; Van Der Want and Meirink., 2020). Additionally, De Haan., (2005) states that a

facilitator may do the same things as the other group members (asking questions, broadening the issue through reflection, giving feedback, evaluating and so forth) only this will be less frequent because of extra responsibility for the course of the session. Therefore, the facilitator is also more conscious than the other participants about his or her behaviour in the session (De Haan, 2005).

Given that the facilitator has no decision-making authority (Kolb, 2008) and the absence of hierarchy in LCs (Van Rees et al., 2022), the position of the facilitator has so far been seen as outside the conversation and alongside the team members (Kolb, 2008). However, we know little about how this position is in interactions with team members in meetings. Since engaging in team learning behaviour needs to be encouraged through leadership behaviour (Van Der Haar et al., 2017), defining the position of the facilitator within interactions is important since could provide information about what the facilitator does during these interactions.

To define the position within interactions, Sauer & Kauffeld (2013) analysed team interactions through a Social Network Analysis. They calculated the extent of group interactions revolving around one dominant group member by using centralisation as a measure. Centralisation provides information about which group member occupies the most central position and thereby the most influence in a group (Wasserman & Faust, 1994, as cited in Sauer and Kauffeld, 2013). Additionally, Zaki (2016) used the PageRank metric for a Social Network Analysis to identify the most influential student. The most influential team members can be considered as the members who having a central position in the team (Zaki, 2016). Through the PageRank outcomes, Zaki (2016) could identify two peer leaders who ranked highest and were marked as the most influential students. Given that it appears that PageRank can be used well in small and vital communities to determine the influence and

position of participants (Zaki, 2016), this study is also going to use PageRank to determine the position of the facilitator in interactions with the team, considering the position emerges through interaction (Harré et al., 2009).

Dialogic moves

Dialogic moves are interesting to fill the gap in the literature of limited insights into the role of a facilitator during verbal interactions. Although Van Der Want & Meirink (2020) has researched the behaviour of the facilitator, they did not investigate which moves in interaction stimulate participants' reactions. Therefore, it is interesting to examine both his moves and the subsequent actions he takes in relation to those moves.

Warwick et al. (2016) defined the interactional characteristics that support learning during dialogues within Lesson Study groups. Warwick et al. (2016) revealed that certain dialogic moves foster a stimulating learning environment and productive professional dialogue to facilitate the learning process. These dialogic moves are asking questions (including negotiating meaning), providing evidence or reasoning building upon each other's ideas, reaching agreements and challenging ideas. Out of these findings, Warwick et al. (2016) created a protocol encompassing five dialogic moves which are explained in Appendix B.

Bjuland and Helgevold (2018) were the first to use these dialogic moves in conversations where a facilitator was present as a mentor for students in a Lesson Study group. According to Bjuland and Helgevold (2018), a facilitator's dialogic moves are vital during team interaction because the facilitator can build a dialogic space to move interactions towards a collaborative learning experience. Additionally, Schinkel (2023) adjusted four of the five dialogic moves of Warwick et al. (2016) to make it more suitable for the context of the LCs by specifying it more for the facilitator, as shown in Appendix B. This study builds further on this by using the dialogic moves of Warwick et al. (2016) adjusted by Schinkel (2023) to investigate

the interactive behaviours of facilitators and team members. It is important to understand which interactional sequences exist between the team members and the facilitator and it builds upon the position the facilitator takes within the interactions by adding their interactive behaviour.

Present study & research questions

Currently, the literature offers limited insights into the role of a facilitator during verbal interactions aimed at supporting team learning and reflexivity activities within cross-functional innovative teams. It is important to get a more thorough understanding of this role, since team learning and reflexivity emerge through interaction among team members (Raes et al., 2015) and can be encouraged by the facilitator (Kolb, 2008). Therefore, understanding the interactional behaviour of the facilitator is essential for a better understanding of the facilitation process to promote team learning and reflexivity. Since current knowledge on the facilitation process in LCs does not yet provide insight into the facilitators' position in interactions and the associated dynamics between cross-functional team members during discussions, investigating this is crucial.

The present study aims to build upon Schinkel's (2023) research by expanding and partially replicating findings regarding the facilitator's behaviour. To expand on previous outcomes, this research will dive into the positioning of the facilitator during verbal interaction relative to the cross-functional team members within team learning and reflexivity activities. To investigate the interactive behaviours, following Schinkel (2023), the dialogic moves of Warwick et al. (2016) will be used. Additionally, the sequential analysis of dialogic moves will be partially replicated. It differs from Schinkel (2023) since this study added data to the already existing dataset of Schinkel (2023). In doing so, the additional data is coded in this study. Furthermore, activity changes will not be considered in this study. Activity changes are interesting when investigating moves that initiate new activities. However, this study focusses on action and reaction among the team members during the activities, and how the dialogues be maintained. Therefore, activity change does not apply. Finally, where Schinkel (2023) did not analyse the negative significant residuals, this study does take these into account to

investigate why certain moves are less supported by the facilitator or triggered by the team members than expected. The objective of the replication is firstly to validate previous claims (Nosek & Errington, 2020). Furthermore, the extensive dataset makes it possible to investigate if new characteristic sequences from the sequential analysis arise. This will provide this study with a more thorough understanding into the interactional behaviour within team learning and team reflexivity activities.

In conclusion, this results in the following research question: *What is the role of the facilitator in supporting team learning and team reflexivity activities in guided learning communities?*

To answer this primary question two sub questions were formulated to investigate the facilitators position and the interactional behaviour of the facilitator and team members. Firstly, the position of the facilitator relative to team members during team learning and team reflexivity activities will be investigated by looking at how central the position of the facilitator is during verbal interaction. Therefore, different episodes within certain team learning and team reflexivity activities will be investigated. Next, dialogic moves will be analysed to better understand how the facilitator and members build on each other's contributions and identify which moves trigger responses during the team learning and team reflexivity activities. Through the interactional sequences, insight can be gained into how the facilitator supports team learning and team reflexivity in meetings and which dialogic moves are characteristic for team learning and team reflexivity activities. Consequently, the following sub-questions will be:

SQ 1: Which position does the facilitator take during interactions with cross-functional team members of learning communities in team learning and team reflexivity activities?

SQ2: How does the facilitator support team learning and team reflexivity during interactions with cross-functional team members of learning communities?

Method

Research design

This study investigates the role of the facilitator during verbal interactions with cross-functional team members while supporting team learning and reflexivity activities. For this research, it is beneficial to use observational data rather than interviews and questionnaires since this phenomenon is undertaken in real life (Cotton et al., 2010). This is evidenced by the fact that when observing the LC meetings, team learning and reflexivity activities come forward from spoken communication and can best be identified through observational data (Raes et al., 2015). This study uses data from five learning communities from the project '*Hit the Gas!*' and will be analysed qualitatively and quantitatively, applying an exploratory multiple case study design.

Sample

Within the LCs, the teams are composed of participants from one organisation, with a combination of individuals with the same profession and team and those from a different team, department, or organisation. The participants were selected based on the extent to which their daily work relates to the challenge the LC is working on. This concerns a purposeful sample (Palinkas et al., 2013). The composition of the LCs is shown in Table 1.

Since this study is exploratory, a sample of 23 meetings from the five LCs will be enough to provide this study with preliminary insights. Firstly, taking a sample of 23 meetings is based on expanding on the 15 meetings analysed by Schinkel's study (2023). Expanding on these builds on an already established foundation. Secondly, the eight additional meetings that were added were chosen because they both included meetings in which externals were present to give external input and meetings in which monitoring activities were expected because they were at the beginning or final phase of the LCs. This serves the goal of this study to understand the facilitator's role, by providing a broader range of team learning and team reflexivity activities. In addition, with a larger and more diverse sample, the results become more valid

and reliable (Andrade, 2020). Table 1 provides information about the profession of the members, team size, the total amount of meetings and which meetings are used.

Table 1

Descriptive information team members and meetings

| Learning community | Professions | Team sample | Meetings (total) | Meetings (used) |
|--------------------|--|-------------|------------------|-----------------|
| LC A | Project leaders, project modellers/engineers ICT workers, mechanics, structural engineering teacher. | 11* | 8 | 1, 4, 5, 7, 8 |
| LC B | Project leaders, project modellers/engineers, mechanics, structural engineering teacher, workshop supervisor. | 13*** | 10 | 1, 5, 6, 9, 10 |
| LC C | Training coordinator, work planner/draughtsman, leading mechanics, assembly leader, assembly leader in Mechanical Engineering, assembly leader in Electrical Engineering, leading electrician. | 13 | 7 | 2, 5, 6, 7 |
| LC D | Work planner/draughtsman, warehouse manager, service contract manager, head of administration, service mechanic, teacher. | 7** | 10 | 1, 5, 7, 8, 10 |
| LC E | Project leader, work planner, calculator, first mechanic in electrical engineering, teacher service and maintenance student, study coach/BPV supervisor/internship supervisor. | 6 | 6 | 1, 5, 6 |

Note. The facilitator and either one (*), two (**) or three (***) external persons are included in the team size.

Note. Meetings (used) where the external persons were present is marked **bold**.

Data collection

Procedure

The collected data for project '*Hit the Gas!*' is approved by the ethics committee of the BMS faculty at the University of Twente. The number for ethical approval is 201093. All the members that participate in the learning community from the project '*Hit the Gas!*' have signed an informed consent form to admit that they take part in the research of the project '*Hit the Gas!*' of their own free will. This includes the consent that they were recorded and that this data will be exploited for research purposes. The researcher of this study also signed an agreement to use the data anonymously, confidentially, and carefully.

Participation in this study entailed attending seven to ten meetings, lasting roughly one hour. Therefore, the total time of all meetings within an LC lies between seven and eleven hours. Member participation varied across meetings, as not all team members could attend every meeting. Occasionally, external professionals were invited to specific meetings. All LC meetings held in person at the company, except for those of LC A. Due to COVID-19 measures at the time, these meetings were held online via Microsoft Teams.

Within the project '*Hit the Gas!*', researchers recorded all the LC meetings with a 360-degree video camera. Subsequently, the recordings were transcribed through Amberscript. ATLAS.ti was used to code the data from the meeting transcriptions.

Qualitative data analysis

To guarantee the study's reliability and validity, two coders compared their results after coding 10%. The inter-coder agreement was determined by computing Krippendorff's alpha coefficients. Krippendorff's alpha ranges from 0 to 1, where 1 indicates perfect agreement, and 0 indicates no agreement better than chance. After coding 10%, the inter-coder agreement

reached a sufficient overall alpha coefficient ($\alpha = 0.915$). This indicates a high level of agreement (Hayes & Krippendorff, 2007).

Based on the transcriptions of the meetings, coding is performed at three levels. These levels are episode level, TL- and TR activity level, and moves level. For this purpose, two codebooks are used to code the transcriptions. Below, a further description of the segmentation and coding process at the *TL and TR activity* level (episodes) and the level of the *moves* will be provided.

Coding protocol for TL and TR activities.

The coding scheme that is used for coding the episodes of TL or TR activities is provided in Appendix A. This coding scheme comprises seven elements derived from Koekkoek's (2023) research and subsequently applied in the study of Schinkel's (2023). An episode refers to a segment of the conversation where all team members discuss the same topic. A new episode starts when the conversation shifts to a different topic (Bjuland & Helgevold, 2018). Subsequently, this episode can be characterised by coding whether it is a team learning or team reflexivity activity.

Coding protocol for dialogic moves

The second coding scheme comprises dialogic moves retrieved from Warwick et al. (2016) and adapted by Schinkel (2023). This coding scheme is used to code the moves of the facilitator and team members, during interaction within team learning and team reflexivity activities. The coding scheme is shown in Appendix B.

Data analysis

The transcribed and coded data described in the previous chapter are used for the data analysis. For the sub-questions, two sorts of analysis were applied. Firstly, for sub-question one, the Social Network Analysis is applied. This analysis is chosen because it allows this study

to investigate the position of the facilitator in team learning and team reflexivity activities. Secondly, a sequential analysis is applied for sub-questions two. This analysis is chosen because it allows this study to investigate which sequences of dialogic moves between the facilitator and the members are characteristic for team learning, team reflexivity and collaborative idea generation. How this is analysed is described below.

Social Network Analysis

To answer the first sub-research question, a social network analysis (SNA) is performed. A SNA is relevant because this analysis makes it possible to study important individuals and understand communication dynamics (Sauer & Kauffeld, 2013; Zaki, 2016). Several SNA metrics are used to measure different aspects of network structures and the position of individuals within those networks. Usually, the structure of networks is analysed using nodes and edges. Standard graph-level metrics, such as density, assess the overall connectivity of the network, whereas node-level metrics, such as Closeness Centrality and Betweenness Centrality, assess the importance of individual nodes in the network (Sauer & Kauffeld, 2013). In addition, the PageRank can also be used as a more specific metric. Originally, the PageRank is designed as an algorithm for ranking in search engines, such as Google. For the analysis of Social Networks, the PageRank is also suitable to analyse individual nodes (i.e. persons) and their role in the network (Sauer & Kauffeld, 2013).

Various metrics can be computed to conduct this type of analysis. The PageRank metric is chosen in this study because it is a powerful way to look at small and vital communities (Zaki, 2016). Waş and Skibski (2023) suggest that PageRank is the most suitable centrality measure for identifying important network nodes (i.e. persons). The PageRank considers the number of incoming connections (i.e. how many others refer to this person) and the quality of these connections (i.e. the importance of the referrers). Although outgoing connections do not

directly affect a node's PageRank, they forward the PageRank to the nodes they point to. This affects the network's link structure. For example, if a person frequently interacts with team members and often gets responses from other influential persons, that person will have a high PageRank due to the quality of their inbound links. At the same time, their outgoing links spread their influence across the network.

By evaluating the number of interactions and the quality of these interactions, PageRank can help identify individuals who consistently make valuable contributions to team learning and reflexivity activities. Individuals with many interactions and interactions with other influential team members can be considered more influential (Csardi & Nepusz, 2006). These features connect to the goal of this study to provide insights into the influence of the facilitator relative to the team members in LC meetings. Based on the influence, it becomes possible to infer the position of the facilitator.

The statistical data that emerged from coding each turn linked to a person in team learning and reflexivity activity episodes is used to compute the PageRank. The PageRank values are iteratively updated based on the connections between nodes until the results are stabilised. The formula for updating the PageRank (PR) value of a participant (x) can be displayed as follows:

$$PR(x) = \frac{1-d}{N} + d \sum_{v \in Bx} \frac{PR(v)}{L(v)}$$

The PageRank is calculated as the summation (\sum) of all PageRank values of other participants (v) connected to x , divided by their respective number of outgoing edges $L(v)$, in a subset set containing all participants linking to participant x ($v \in Bx$). It also includes a

damping factor (d , typically set to 0,85) that can be adapted to the chance of each random person linking within the network instead of not out of it. This computation is calculated using the *igraph* package in R (Csardi & Nepusz, 2006). The PageRank was calculated for each episode, i.e. TL- or TR activity. For each LC, several steps are taken in R to calculate the PageRank scores for each episode.

Step one. First, from Atlas.ti, the files of the meetings in which the turns (i.e. the utterance corresponding to a person) are linked to a person are coded and transported per LC to Excel as statistical data. The rows in the Excel files contain the corresponding LC and meeting. The columns in the Excel files contain the quote start, quote end, activities, the facilitator and the persons. Within these columns, 0 or 1 is used to indicate the absence or presence of the categories (i.e. activity and persons). A simplified example of how this looks like in Excel is provided in Table 2.

Since the data is coded chronologically in ATLAS.ti, adjustments are not needed in Excel. These Excel files can then be uploaded into R. In R, the custom statistical data runs through a PageRank script. This script includes codes and formulas to calculate the PageRank scores for each participant in each episode. The packages used for this are the *igraph* and *dyplr* packages. The output that R provides will show a table with the episode, related activity, and PageRank score for each speaker in this episode. An example of this is provided in Appendix C.

Table 2

Output statistical data from ATLAS.ti

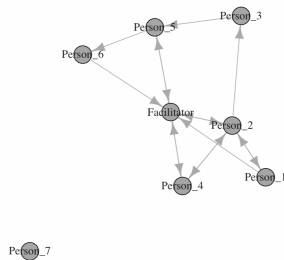
| Document Name | Quote start | Quote end | BC | CIG | DR | EV | MO | PL | SNAFAC | SNAP01 | SNAP02 | SNAP03 |
|---------------|-------------|-----------|----|-----|----|----|----|----|--------|--------|--------|--------|
| LCA M1 | 151 | 190 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| LCA M1 | 151 | 170 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| LCA M1 | 171 | 190 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |

Step two. In addition, directed graphs are used to understand the results better and make what is happening more tangible. Figure 1 shows an example of such a directed graph.

Step three. Eventually, by calculating the PageRank for each person in all consecutive episodes with corresponding activity, information about the facilitators' role within the team learning and team reflexivity activities is provided (Zaki, 2016). The calculated PageRank scores for each LC with corresponding directed graphs will be used to compare the PageRank scores of the facilitator and the team members to see any differences between the team learning and team reflexivity activities. This makes it possible to conclude the role of the facilitator and interaction patterns in team learning and reflexivity activities.

Figure 1

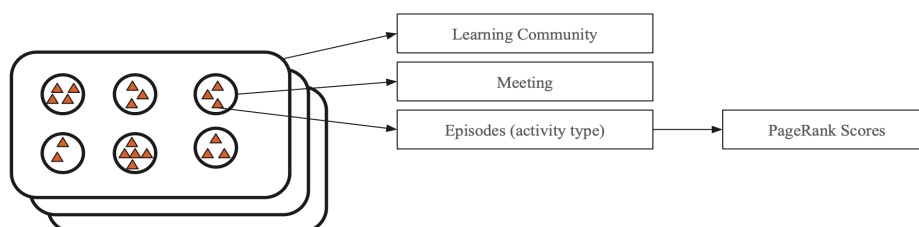
Example of a directed graph showing the direction of interactions in a certain episode



Step four. Given varying participation in episodes, the fourth step is calculating the average PageRank per person and activity for each LC. Within the meetings, there are different numbers of actively participating members. Therefore, standardisation will help compare individuals within and across activities. Figure 2 illustrates how the PageRank is computed from the five LCs.

Figure 2

Illustration of computing the PageRank from learning communities



Influence patterns can be identified and determined by which individuals generally influence team learning and reflexivity activities most. For example, a high (average) PageRank score for the facilitator in a certain activity could suggest that the facilitator plays a crucial role in the network of interactions of that activity.

From the PageRank scores, a division of the ranking of the scores into categories can be made. Across all learning communities, the lowest PR is 0,0000, the average PR is 0.2448 and the highest PageRank is 0,3392. An explanation for the PR score of 0,0000 may arise from the fact that the episodes in the meetings are often short ($mean = 32, SD = 51$). Therefore, not everyone gets the chance to participate in an episode. Based on this, a distinction is made into 'ranking' categories. For the interpretation in the result section, this study will use the following rule of thumb for interpreting these outcomes:

Maximal influence: 0.2700 - 0.3392

Major influence: 0.1700 - 0.2699

Moderate influence: 0.0900 - 0.1699

Minor influence: 0.0200 - 0.0899

Minimal influence: 0.0000 - 0.0199

These scores are similar regardless of the number of participants in a conversation so the SNA will assist this study to understand how the facilitator relates to other team members regarding positioning in the conversation (Zaki, 2016). The results of the SNA PageRank will be presented and explained in the following chapter.

Sequential analysis

To answer the second sub-research question, the coded data of the dialogic moves is used to perform a sequential analysis in R. This study will partially replicate the sequential analysis of Schinkel (2023) and will follow Bron's (2022) method, as this study also seeks to

enhance the understanding of interactional behaviour sequences in workplace team learning. The sequential analysis will be carried out in six steps to study the interactional sequences of dialogic moves that characterise team learning and reflexivity activities.

Step one. The interactional sequences of dialogic moves will be listed below one another and placed in the first column. To do a 1-lag sequential analysis, the first dialogic move will be eliminated while copying the interactional sequences in the second column. This process will be continued until for each activity, all sequences of interaction are represented in both columns.

Step two. Subsequently, three contingency tables (6 x 6) will be created for team learning activities and team reflexivity activities. This results in six tables overall. For each set of tables (team learning and team reflexivity) applies that the rows represent the preceding dialogic moves (of either the members or the facilitator) and the columns representing following dialogic moves (of either the members or the facilitator). Each cell will include the frequency of transitions between the two moves.

Step three. To determine if the chi-square test is appropriate, this study used the rule of thumb that fewer than 20% of the expected values within the contingency tables are less than 5, and the minimum expected count is of at least 1 (Yates et al., 1999, p. 734 as cited in Jeong, 2017).

Step four. If it emerges that it is acceptable to apply the chi-square test, the test will be performed to determine whether the preceding and following dialogic moves are connected.

Step five. Adjusted residuals are calculated as part of the chi-square analysis. As a form of post hoc, these residuals that are calculated for the aggregated level of team learning and

team reflexivity are analysed. This makes it possible to state which deviate significantly from the expected frequencies (Ebbert, 2019).

Step six. During the last step, to determine the significance deviation, this study uses $p < .05$ with 1.96 or less than -1.96 as critical values (Pineda & Sirota, 2018). The adjusted residuals with values exceeding the critical value will be examined to evaluate whether a specific transition occurred significantly more or less frequently than expected by chance. The findings from the data analysis will be reported in the following chapter.

Results

Descriptives

The first part of the data analysis is the episode level of team learning and team reflexivity activities. Across the 23 meetings, 548 activities took place. Each meeting consisted of an average of 25 activities ($SD = 12$, $min = 12$, $max = 52$). Team learning activities occurred the most, with 395 activities. On average, 18 team learning activities occurred at each team learning meeting ($SD = 10.56$, $min = 5$, $max = 42$). In addition, collaborative idea generation is the most frequent activity occurring in TL, with an average of 12 activities ($SD = 8.31$, $min = 1$, $max = 28$). The team reflexivity activities have a total of 153 activities. On average, 7 activities occurred at each team reflexivity meeting ($SD = 3.7$, $min = 2$, $max = 17$). Here, planning occurred the most, with an average of 4 activities ($SD = 1.63$, $min = 1$, $max = 7$). The total number of each team learning, and team reflexivity activity is provided in Table 3. Experimenting is excluded to answer the research questions and therefore from this table since it did not occur during the meetings. This table shows that, overall, team learning activities occurred more frequently than team reflexivity activities, where collaborative idea generation has by far the largest amount.

Subsequently, the dialogic moves were investigated at the level of sequences of utterances. 9809 dialogic moves occurred during all team learning and team reflexivity activities. Firstly, team learning, or team reflexivity episodes consisted of 32 dialogic moves on average ($SD = 51$, $min = 1$, $max = 395$). Secondly, team learning episodes consisted of 42 dialogic moves on average ($SD = 62.48$, $min = 2$, $max = 395$). Finally, team reflexivity episodes consisted of 16 dialogic moves on average ($SD = 17$, $min = 1$, $max = 118$). The total number of dialogic moves of the facilitator and members is provided in Figure 3. This figure shows that, the team members have the highest number of each dialogic move, except for requesting information, opinion, or clarification. Additionally, the most common move used by members

is providing evidence and reasoning, while challenging ideas or refocusing the discussion is the least common. For the facilitator, requesting information, opinion or clarification is most common move, while expressing shared ideas and agreement is the least common move.

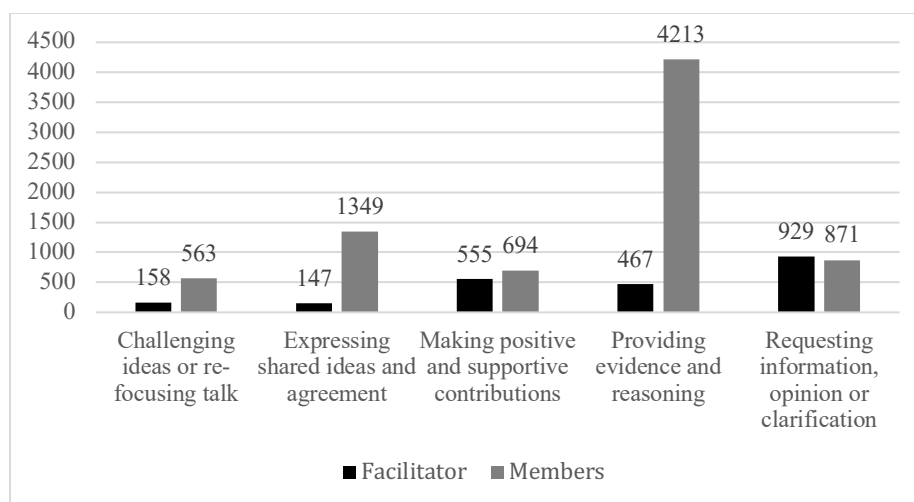
Table 3

Total number of each TL and TR activity (except for experimenting)

| TL activities | | | TR activities | | |
|-------------------------------|--------------------|--|---------------|------------|------------|
| Collaborative idea generation | Discussing results | Seeking or receiving external feedback | Planning | Monitoring | Evaluating |
| <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| 242 | 86 | 67 | 53 | 63 | 37 |

Figure 3

Total number of dialogic moves of the facilitators and members



SQ 1: Which position does the facilitator take during interactions with cross-functional team members of learning communities in team learning and team reflexivity activities?

Table 4 provides all the variables that are used to calculate the PageRank. The external persons are counted for each activity because all meetings have been taken together given that this study looks at activity level. In addition, an external person who is present can participate in any activity. External persons are only a small part of the team in the meetings, also where several externals participated, because they were never present in the meetings at the same time. Therefore, this will not make any difference to the outcome because they are contrasted with the facilitator and the other team members.

Table 5 provides an overview of the overall picture of the average PageRank scores for the facilitator and team members for team learning, team reflexivity and in total per team. This table is based on the PageRank of the activities of team learning and reflexivity per LC. These tables are shown in Appendix D. In the next paragraph, the results are discussed, using table 6.

Table 4

Total number of team members, episodes, number of utterances of members, members with highest PR and facilitator

| Team learning / reflexivity activity | Team | Number of team members | Number of episodes | Number of utterances team members (on average) | Number of utterances of team members with highest PR (on average) | Number of utterances facilitator (on average) |
|--|------|------------------------|--------------------|--|---|---|
| Seeking or receiving external feedback | A | 11 | 1 | 3 | 2 | 1 |
| | B | 13 | 13 | 19 | 4 | 4 |
| | C | 13 | 0 | - | - | - |
| | D | 7 | 5 | 12 | 4 | 5 |
| | E | 6 | 0 | - | - | - |
| Collaborative idea generation | A | 11 | 20 | 10 | 3 | 4 |
| | B | 13 | 28 | 25 | 7 | 3 |
| | C | 13 | 76 | 20 | 4 | 4 |
| | D | 7 | 19 | 13 | 2 | 4 |
| | E | 6 | 20 | 11 | 3 | 3 |
| Discussing results | A | 11 | 18 | 10 | 3 | 4 |
| | B | 13 | 7 | 13 | 3 | 5 |
| | C | 13 | 14 | 18 | 5 | 5 |
| | D | 7 | 8 | 21 | 5 | 8 |
| | E | 6 | 8 | 15 | 6 | 6 |
| Evaluating | A | 11 | 9 | 8 | 2 | 4 |
| | B | 13 | 6 | 14 | 4 | 3 |
| | C | 13 | 4 | 24 | 7 | 6 |
| | D | 7 | 5 | 32 | 5 | 14 |
| | E | 6 | 5 | 12 | 4 | 5 |

| | | | | | | |
|------------|----------|----|----|----|---|---|
| Monitoring | A | 11 | 12 | 9 | 3 | 4 |
| | B | 13 | 2 | 9 | 3 | 3 |
| | C | 13 | 4 | 13 | 5 | 4 |
| | D | 7 | 6 | 22 | 6 | 7 |
| | E | 6 | 3 | 18 | 6 | 8 |
| Planning | A | 11 | 15 | 7 | 2 | 3 |
| | B | 13 | 14 | 12 | 2 | 5 |
| | C | 13 | 5 | 11 | 3 | 4 |
| | D | 7 | 7 | 10 | 1 | 4 |
| | E | 6 | 13 | 10 | 3 | 4 |

Note. Variables to compute the PageRank metric.

Table 5

Overview PageRank scores facilitator and team members in TL and TR

| Team | Number of participants | Team learning | | Team reflexivity | | Overall Facilitator | Overall team members | Overall Total |
|--------------|------------------------|------------------------|--------------------|------------------------|--------------------|---------------------|----------------------|---------------|
| | | Average PR Facilitator | Average PR members | Average PR Facilitator | Average PR members | | | |
| LC A | 11 | 0.2492 | 0.0390 | 0.2601 | 0.0130 | 0.2655 | 0.0260 | 0.1457 |
| LC B | 13 | 0.1207 | 0.0529 | 0.2079 | 0.0391 | 0.1811 | 0.0439 | 0.2250 |
| LC C | 13 | 0.1549 | 0.0476 | 0.1490 | 0.0426 | 0.1266 | 0.0394 | 0.1660 |
| LC D | 7 | 0.2254 | 0.0859 | 0.2830 | 0.0807 | 0.2418 | 0.0922 | 0.3340 |
| LC E | 6 | 0.2412 | 0.1139 | 0.2900 | 0.1035 | 0.2778 | 0.0756 | 0.3534 |
| Total | | 0.1983 | 0.0678 | 0.2380 | 0.0557 | 0.2186 | 0.0554 | 0.2448 |

Note. The overall picture of the average PageRank scores for the facilitator and all team members in team learning, team reflexivity per team and in total for the facilitator and team members.

Table 6

| Team | Team learning | | Team reflexivity | | Overall Facilitator | Overall team members | Overall Total |
|--------------|------------------------|---|------------------------|---|---------------------|----------------------|---------------|
| | Average PR Facilitator | Average PR of members with highest PR score | Average PR Facilitator | Average PR of members with highest PR score | | | |
| LC A | 0.2492 | 0.1741 | 0.2601 | 0.1670 | 0.2655 | 0.1706 | 0.2180 |
| LC B | 0.1207 | 0.1760 | 0.2079 | 0.1333 | 0.1811 | 0.1547 | 0.1679 |
| LC C | 0.1549 | 0.1392 | 0.1490 | 0.1648 | 0.1266 | 0.1520 | 0.1393 |
| LC D | 0.2254 | 0.1646 | 0.2830 | 0.1435 | 0.2418 | 0.1541 | 0.1979 |
| LC E | 0.2412 | 0.1882 | 0.2900 | 0.2462 | 0.2778 | 0.2172 | 0.2475 |
| Total | 0.1983 | 0.1684 | 0.2380 | 0.1709 | 0.2186 | 0.1696 | 0.1941 |

Note. The overall picture of the average PageRank scores for the facilitator and the team members with the highest PageRank in team learning, team reflexivity per team and in total for the facilitator and team member.

Table 5 contains the average overall PageRank score in which a comparison can be made between the facilitator compared to all team members. However, there may be a distortion because the facilitator is a single person and the team members involve a group, of which not everyone always participates. For a more nuanced picture, we therefore compare the facilitator and the member who has the highest PageRank score. The person with the highest PageRank has certainly participated and may be the most influential person besides the facilitator.

By now comparing the facilitator and the team members with the highest PageRank score, as shown in Table 6, we see that the difference between the scores is much smaller, but the pattern remains. The pattern implies that, overall, the facilitator seems the most influential. In addition, the overall average of the team member with the highest PageRank at team learning and team reflexivity does not differ much anymore, while it does differ across the group of team members. This could be an indication that mainly in team reflexivity episodes more often only a limited group of people is talking. Especially in team reflexivity activities, compared to both the group and the person with the highest PageRank scores, the facilitator has a higher PageRank score compared to team learning activities.

Example of learning community D where the facilitator is the most influential person in most activities

LC D is a proper example of the facilitator being the most influential person in most of the episodes, as provided in Table 7. Here, the facilitator has the most influence and therefore is the person through which the most interaction takes place as shown in Figure 4. In all team reflexivity activities, the facilitator has the highest PageRank. In the presence of an external person (seeking and receiving external feedback), the facilitator is leading the discussion. Also, during collaborative idea generation, the facilitator plays a central role in collecting all ideas.

However, when discussing results of experiments that have taken place between meetings, the facilitator is no longer prominent. Here, mainly person 7 is in the lead. Regarding the reflexivity activities, the facilitator has the highest PageRank in planning, probably ensuring here that the team pays attention to the overall goal and planning all intermediate activities. The example of LC D, in Table 7 shows how in the team learning activities, the role of the facilitator differs as compared to team reflexivity. The range of the highest and lowest average PageRank (.1846 and .2852) in team learning is quite big, while in reflexivity the difference between PageRanks is much smaller (.2317 and .2704). Here the influence is carried out by the facilitator during monitoring and evaluating, being almost equal.

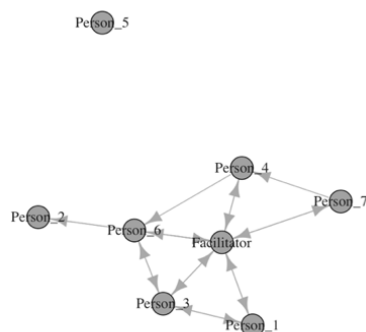
Table 7

Average PageRank scores per person and activity in LC D

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 |
|--|---------------|----------|----------|----------|---------------|---------------|----------|---------------|
| Seeking or receiving external feedback | 0.2852 | 0.0092 | 0.1181 | 0.1373 | 0.0597 | 0.0000 | 0.0000 | 0.1923 |
| Collaborative idea generation | 0.2418 | 0.1654 | 0.1658 | 0.0640 | 0.1517 | 0.0807 | 0.0731 | 0.0000 |
| Discussing results | 0.1846 | 0.1022 | 0.0858 | 0.0395 | 0.0284 | 0.0699 | 0.0984 | 0.2603 |
| Evaluating | 0.2371 | 0.0000 | 0.1664 | 0.1132 | 0.2017 | 0.1989 | 0.0000 | 0.0000 |
| Monitoring | 0.2317 | 0.1194 | 0.1736 | 0.0866 | 0.2031 | 0.0000 | 0.0950 | 0.0447 |
| Planning | 0.2704 | 0.1103 | 0.1421 | 0.1559 | 0.0800 | 0.0446 | 0.0343 | 0.0000 |

Figure 4

Illustrating directed graph for the facilitator having a central position



Example of learning community B where a member has the most influence in certain TL activities

Although the facilitator positions as the person with the most influence on average, some exceptions emerge when looking at the PageRank scores per LC that are provided in Appendix D. Besides the facilitator having a prominent position across all cases, other participants also have a significant influence in specific activities. Some team members have higher influence in seeking and receiving feedback, generating collaborative ideas, and discussing results. A proper example of this phenomenon is LC B, where person two has the most influence in seeking and receiving external feedback and collaborative idea generation, as shown in in Table 8. Here, person two has the most influence in these activities and therefore is the person through which the most interaction takes place, as shown by the incoming lines in Figure 5. Person 2 is the only one who is strongly invested in the meetings because he is frustrated that he has not been supported in the workplace so far. In addition, he has the most experience on the work floor, so he often has just another perspective on prefabrication as a solution to the staff shortage they are working. In the PageRank scores this is reflected when an external person is present (person 10), person 2 leads the discussion. Also, during collaborative idea generation, person 2 plays a central role in discussing the problem and generating ideas. During evaluating and monitoring, the PageRank scores of person 2 and the facilitator do not differ much. When discussing results of experiments that have taken place between the meetings and planning, the facilitator takes the lead. Here, he probably ensures that the team pays attention to planning and discussing all interim activities. The example of LC B in Table 8 shows how in the team learning activities, the role of the facilitator differs as compared to team reflexivity. The range of the highest and lowest average PageRank (.0913 and .2272) in team learning is big, but compared to reflexivity the difference between

PageRank is smaller (.1556 and .2644). Here the most influence is carried out by the facilitator during monitoring and evaluating.

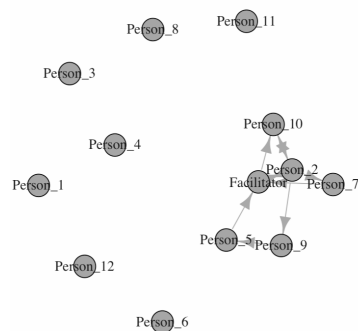
Table 8

Average PageRank scores per person and activity in LC B

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 | Person 8 | Person 9 | Person 10 | Person 11 | Person 12 | Person 13 |
|--|---------------|----------|---------------|----------|----------|----------|----------|----------|----------|---------------|-----------|-----------|-----------|-----------|
| Seeking or receiving external feedback | 0,1263 | 0,0897 | 0,1847 | 0,0000 | 0,0359 | 0,0516 | 0,0110 | 0,0599 | 0,0233 | 0,0889 | 0,1311 | 0,0034 | 0,0537 | 0,0000 |
| Collaborative idea generation | 0,0913 | 0,0589 | 0,1793 | 0,0000 | 0,0943 | 0,0812 | 0,0435 | 0,0839 | 0,0316 | 0,0501 | 0,0562 | 0,0000 | 0,0317 | 0,0000 |
| Discussing results | 0,2272 | 0,0775 | 0,1465 | 0,0000 | 0,0247 | 0,088 | 0,0000 | 0,0197 | 0,0201 | 0,0751 | 0,0623 | 0,0000 | 0,0000 | 0,0000 |
| Evaluating | 0,1556 | 0,1160 | 0,1416 | 0,0000 | 0,0815 | 0,0000 | 0,0000 | 0,0000 | 0,0514 | 0,1016 | 0,1161 | 0,0000 | 0,0000 | 0,0000 |
| Monitoring | 0,2644 | 0,1903 | 0,1903 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 |
| Planning | 0,2222 | 0,0687 | 0,1216 | 0,0379 | 0,0333 | 0,0324 | 0,0367 | 0,0567 | 0,0048 | 0,02273 | 0,0351 | 0,0000 | 0,0000 | 0,0342 |

Figure 5

Illustrating directed graph for person 2 having a central position in a certain TL episode



Example of learning community C where members having the most influence in certain TR activities

For team reflexivity, also some exceptions emerge when looking at the PageRank scores, as shown in in Table 9. Besides the facilitator having a high PageRank score across the activities, also other team members have a significant influence in specific activities. A proper example of this phenomenon is LC C, where person 9 and 10 often have a higher influence in team reflexivity activities. Person 9 here is the project's work planner and has

contacts with the client. Therefore, he knows a lot about the planning of the project, which he shares with the LC during planning and monitoring activities. The information of person 9 in the group is crucial because it helps the LC to apply it in practice. Person 10 is responsible for the process from within the company and knows everything about it. This person joined the LC to help the group oversee the process. Person 10 has a lot of knowledge that other participants need to be able to think along in improving the process. In addition, the facilitator who supervised this LC is known for letting participants speak a lot, and he also asks many substantive questions about how things are going within the company. His background is in technical business administration, and therefore, he is very interested in how those business processes run. This reflected by Person 9 having the most influence in evaluating and Person 10 in monitoring. The PageRank scores compared to the facilitator in evaluating (.2027 and 0.1449) and monitoring (.2241 and .1367) differ much in range in these activities.

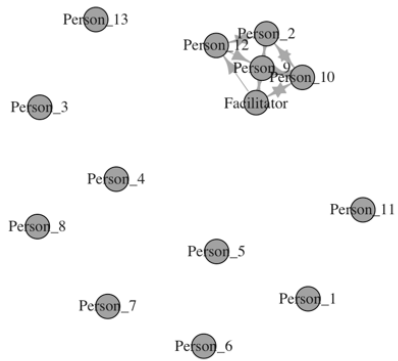
Table 9

Average PageRank scores per person 9 and 10 and activity LC C

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 | Person 8 | Person 9 | Person 10 | Person 11 | Person 12 | Person 13 |
|--|---------------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|---------------|-----------|-----------|-----------|
| Seeking or receiving external feedback | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Collaborative idea generation | 0.1537 | 0.0764 | 0.0937 | 0.0546 | 0.0215 | 0.0143 | 0.0150 | 0.0082 | 0.0108 | 0.1373 | 0.1015 | 0.0283 | 0.0529 | 0.0000 |
| Discussing results | 0.1618 | 0.1029 | 0.0357 | 0.0448 | 0.0000 | 0.0052 | 0.0127 | 0.0000 | 0.0041 | 0.1490 | 0.1796 | 0.0247 | 0.085 | 0.0045 |
| Evaluating | 0.1449 | 0.0474 | 0.0469 | 0.0784 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2027 | 0.1162 | 0.0217 | 0.1174 | 0.0580 |
| Monitoring | 0.1367 | 0.0658 | 0.0779 | 0.0350 | 0.0000 | 0.0052 | 0.0000 | 0.0166 | 0.0134 | 0.1469 | 0.2241 | 0.0000 | 0.0626 | 0.0000 |
| Planning | 0.1622 | 0.0237 | 0.0356 | 0.1439 | 0.0000 | 0.0000 | 0.0000 | 0.0156 | 0.0000 | 0.1488 | 0.0318 | 0.0000 | 0.0183 | 0.0569 |

Figure 5

Illustrating directed graph for person 9 and 10 having a central position in a certain TR episode



SQ2: How does the facilitator support team learning and team reflexivity during interactions with cross-functional team members of learning communities?

Across all team learning activities, 7831 between-person sequences have been counted. Of these, 1532 interactions go from the facilitator to team members, 1549 interactions go from team members to the facilitator and 4750 go from members to members. Across all team reflexivity activities, 1978 between-person sequences have been counted. Out of these, 637 go from the facilitator to the members, 598 go from the members to the facilitator, and 743 go from members to members. Appendix E provides all the contingency tables of the preceding and following moves of the facilitator and the team members in team learning and reflexivity activities.

Table 10 shows the significant interactional sequences between the facilitator and the members, which are higher than expected. Table 11 shows the significant interactional sequences between the facilitator and the members, which are lower than expected. These are the dialogic moves that occur significantly less or more, only appearing in team learning or in team reflexivity activities and are therefore characteristic for these activities.

Table 10

Numbers expected count and positive adjusted residuals of significant interactional sequences between the facilitator and members' dialogic moves underlying the TL activities or TR activities.

| Transition | TL activities | | TR activities | |
|---|---------------|----------|---------------|----------|
| | <i>n</i> | <i>z</i> | <i>n</i> | <i>z</i> |
| DMF – Challenging ideas and refocusing talk → DMP – Making positive and supportive contributions | 18 [6] | 4.6 | 7 [4] | 1.58 |
| DMF – Challenging ideas and refocusing talk → DMP – Requesting information, opinion, or clarifications | 13 [8] | 1.96 | 7 [4] | 1.32 |

| | | | | |
|---|-----------|------|-----------|-------|
| DMF – Expressing shared ideas and agreement → DMP – Expressing shared ideas and agreement | 25 [16] | 2.25 | 8 [8] | -0.09 |
| DMF – Making positive and supportive contributions → DMP – Challenging ideas or refocusing talk | 22 [14] | 2.01 | 3 [5] | -0.92 |
| DMF – Providing evidence and reasoning → DMP – Making positive and supportive contributions | 31 [17] | 3.26 | 15 [12] | 0.77 |
| DMF – Requesting information, opinion or clarification → DMP – Providing evidence and reasoning | 484 [431] | 2.56 | 168 [152] | 1.34 |
| DMP – Challenging ideas and refocusing talk → DMF – Expressing shared ideas and agreement | 13 [5] | 3.63 | 3 [3] | 0.29 |
| DMP – Requesting information, opinion or clarification → DMF – Expressing shared ideas and agreement | 9 [4] | 2.36 | 6 [3] | 1.77 |
| DMP – Expressing shared ideas and agreement → DMF – Providing evidence and reasoning | 80 [53] | 3.75 | 46 [36] | 1.74 |
| DMP – Making positive and supportive contributions → DMF – Providing evidence and reasoning | 39 [24] | 3.05 | 15 [11] | 1.08 |
| DMP – Providing evidence and reasoning → DMP – Challenging ideas and refocusing talk | 281 [217] | 4.33 | 37 [32] | 0.83 |
| DMP – Providing evidence and reasoning → DMP – Making positive and supportive contributions | 327 [260] | 4.27 | 30 [24] | 1.2 |
| DMP – Providing evidence and reasoning → DMP – Requesting information, opinion or clarification | 355 [315] | 2.28 | 51 [47] | 0.56 |

Transition

| | | | | |
|---|---------|-----|--------|------|
| DMF – Providing evidence and reasoning → DMP – Challenging ideas and refocusing talk | 14 [10] | 1.2 | 15 [6] | 3.57 |
|---|---------|-----|--------|------|

Note. Formatted as Observed [Expected] and Adjusted residuals, $p < .05$.

Note. DMP stands for member, DMF stands for facilitator.

Table 11

Numbers expected count and negative adjusted residuals of significant interactional sequences between the facilitator and members' dialogic moves underlying the TL activities or TR activities.

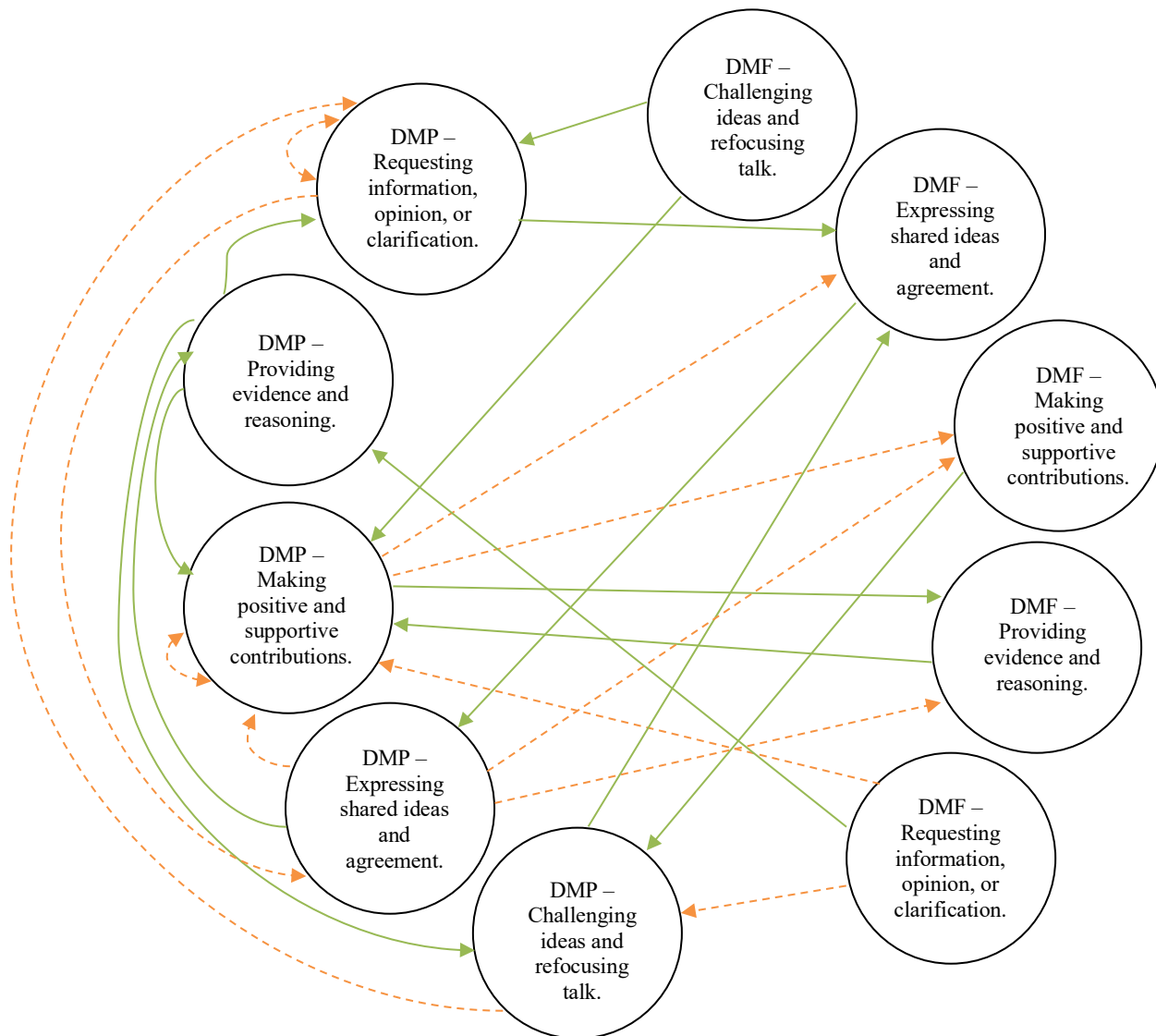
| Transition | TL activities | | TR activities | |
|--|---------------|--------------|---------------|--------------|
| | <i>n</i> | <i>z</i> | <i>n</i> | <i>z</i> |
| DMF – Requesting information, opinion or clarification → DMP – Making positive and supportive contributions | 24 [40] | -2.49 | 16 [20] | -0.99 |
| DMF – Requesting information, opinion or clarification → DMP – Challenging ideas or refocusing talk | 9 [23] | -2.95 | 5 [10] | -1.64 |
| DMP – Making positive and supportive contributions → DMF – Expressing shared ideas and agreement | 0 [8] | -2.84 | 3 [3] | -0.05 |
| DMP – Making positive and supportive contributions → DMF – Making positive and supportive contributions | 18 [34] | -2.7 | 4 [10] | -1.89 |
| DMP – Expressing shared ideas and agreement → DMF – Making positive and supportive contributions | 52 [74] | -2.55 | 21 [31] | -1.83 |
| DMP – Requesting information, opinion or clarification → DMP – Expressing shared ideas and agreement | 75 [109] | -3.25 | 37 [32] | 0.83 |
| DMP – Expressing shared ideas and agreement → DMP – Making positive and supportive contributions | 41 [80] | -4.36 | 10 [10] | -0.14 |
| DMP – Making positive and supportive contributions → DMP – Making positive and supportive contributions | 34 [49] | -2.18 | 2 [3] | -0.74 |
| DMP – Challenging ideas and refocusing talk → DMP – Requesting information, opinion or clarification | 37 [52] | -2.02 | 4 [6] | -0.67 |
| DMP – Requesting information, opinion or clarification → DMP – Requesting information, opinion or clarification | 57 [84] | -2.97 | 8 [12] | -1.22 |
| Transition | | | | |
| DMP – Expressing shared ideas and agreement → DMF – Expressing shared ideas and agreement | 14 [18] | -0.89 | 2 [10] | -2.47 |
| DMP – Expressing shared ideas and agreement → DMP – Expressing shared ideas and agreement | 126 [125] | 0.06 | 23 [39] | -2.54 |

Note. Formatted as Observed [Expected] and Adjusted residuals, $p < .05$.

Note. DMP stands for member, DMF stands for facilitator.

TL activities

Since we are interested in which moves of the facilitator trigger the moves of the team members while supporting team learning activities, and how the facilitator responds to the moves of the cross-functional team members, the positive and negative significant sequences of interactions that are characteristic for the team learning activities will be explained. Results of the chi-square indicated that there are significant sequences of dialogic moves that characterise team learning. Additionally, the residuals indicate which sequences are more or less present than expected by chance. From this, eight characteristic sequences between the facilitator and the members emerged in the team learning activities that were not present in team reflexivity. Of these, there are six more than expected and two less than expected. In addition, six characteristic sequences between the members and facilitator occurred in the team learning activities that were absent in team reflexivity. Of these, there are three more than expected and three less than expected. A visualisation of the characteristic sequences is shown in Figure 6.

Figure 6*Characteristic interactional sequences underlying TL activities*

Note. Positive residuals; solid green lines, Negative residuals; dashed orange lines.

Note. DMP stands for member, DMF stands for facilitator.

To interpret the results for team learning, each characteristic sequence will be discussed between the team members and the facilitator and the team members among themselves. Moves that are higher or lower than expected are both explained. Examples from the data are shown through excerpts. Excerpts are used because the 1-lag sequence shows

action and reaction, but this has to be placed in the context. Therefore, for comprehension reasons excerpts are more extensive than the actual sequence it exemplifies. This sequence is highlighted in blue. In addition, except for members towards members with moves that were less than expected excerpts have been left out because this study is largely about how the facilitator and team members interact with each other. It is interesting however to compare this to what happens more than expected between members but less than expected does not say enough about how the conversations unfold.

Significant sequences from the facilitator to a team member

First, when the facilitator is challenging ideas or refocusing talk, a member reacts positively with supportive contributions ($z = 4.61, p < .05$) and requests information, opinion, or clarification ($z = 1.96, p < .05$) more than expected. Positive and supportive contributions mainly occurred when the facilitator draws back the members' attention from a previous topic and starts or ends a discussion, as shown in Excerpt 1. Requesting information, opinion, or clarification also happened more than expected and mainly occurs when the facilitator refocuses talk by summarising what it discusses or drawing back attention, as shown in Excerpt 2.

Excerpt 1 - Discussing results

Facilitator: We still need to finish the series of meetings (member) - *Challenging ideas or refocusing talk*

Member 1: Yes you - *Making positive and supportive contributions*

Facilitator: Yes, we, but you too. Yes, we have to look back, because we started 10 weeks ago with mostly some personal learning objectives. (Person) and I picked up some learning objectives from you guys, we set some collective learning objectives. We talked about what we can learn from history, (Person) and you prepared that. We talked about the role of a work planner in the workshop. (Person) took us through what about the impossibilities of prefab. We had another session last week on the health and safety. – *Providing evidence and reasoning*

Member 2: That was also a very interesting one - *Making positive and supportive contributions*

Note. Excerpt occurred in the tenth meeting of LC4, lines 475 - 481.

Excerpt 2 - Collaborative idea generation

Member 1: Often when those thermostats are broken, you can't do much with them. – *Providing evidence and reasoning*

Member 2: No. – *Expressing shared ideas and agreement.*

Facilitator: Okay, well, so that's what we have - *Challenging ideas and refocusing talk*

Member 3: So, a heat exchanger, you exchange that quite little now? - *Requesting information, opinion or clarification*

Member 2: No, that's rare, then the life of the boiler is already so far, that the efficiency becomes so low, then we must start saying of... Well Atag does have the stainless-steel exchangers. – *Providing evidence and reasoning*

Note. Excerpt occurred in meeting one of LC D, lines 111-115.

Second, when the facilitator expresses shared ideas and agreement, members responded by expresses shared ideas or agreement more than expected ($z = 2.25, p < .05$). This mainly occurred when the facilitator summarised what was said or suggested an idea from there, to which the members agreed, as shown in Excerpt 3.

Excerpt 3 - Collaborative idea generation

Member 1: Doesn't the hometown buy that itself then? Or do you buy that for them? – *Requesting information, opinion or clarification*

Member 2: No, we buy that, a bit in consultation of now we have this and now that... – *Providing evidence and reasoning*

Member 3: Yes, to avoid being dependent on one supplier. Is there a certain ratio so to speak, so much from (Company) and so much from another. – *Providing evidence and reasoning*

Facilitator: Okay, yes, so when you have taken "this much" you stop and then you go to another supplier - *Expressing shared ideas and agreement*

Member 2: Yes, we go to another one. - *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting one of LC D, lines 238-243.

Third, when the facilitator makes positive and supportive contributions, a member mainly reacts with challenging ideas or refocusing talk ($z = 2.01, p < .05$). This is more than expected. This mainly happens when a facilitator responds positively to what a member has

said. To this, another team member responds by questioning what the other member has said and adds his or her opinion. This is shown in Excerpt 4.

Excerpt 4 - Collaborative idea generation

Facilitator: Because those agreements, you can tackle them that way. But of course, they also run within the line of mechanic work planner project leader, don't they? Because you have agreements to make there too. About the way of working, out of the lines, right? - *Requesting information, opinion or clarification*

Member: Yes, eventually you have to bring it together, but indeed you have to look individually first. You have to collect data first. And then you make chocolate out of that - *Providing evidence or reasoning*

Facilitator: Yes- *Making positive and supportive contributions*

Member: But you have to know first what people's requirements are. We did the same here with that structure, that overall structure. We looked at that and made adjustments. And then it is presented to everyone again. And then it is implemented again if necessary. I think you have to work on that same line. - *Challenging ideas or refocusing talk*

Note. Excerpt occurred in meeting four of LC A, lines 700-706.

Fourth, when the facilitator provides evidence or reasoning, a member reacts by making positive and supportive contributions more than expected ($z = 3.26, p < .05$). This mainly occurs when the facilitator gives input to the discussion or builds upon a member, to which another member reacts with a small contribution. This is shown in Excerpt.

Excerpt 5 - Discussing results

Facilitator: Please help me (Person) - *Requesting information, opinion or clarification*

Member 1: It was about putting the library in a central place and of how do you keep managing well, how do you keep your drawing well, how do you keep source files, in a unified position. - *Providing evidence of reasoning*

Facilitator: G also mentioned that it would be nice if everyone can draw 3D - *Providing evidence of reasoning*

Member 2: Yes - *Making positive and supportive contributions*

Member 1: Something has been said about that yes – *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting ten of LC B, lines 576-584.

Fifth, when the facilitator requests information, opinion or clarification, a member reacts by providing evidence or reasoning ($z = 2.56, p < .05$). This occurred more than expected. This often occurred when the facilitator asked questions that invited the opinion or reasoning of a member, as shown in Excerpt 6.

Excerpt 6 - Collaborative idea generation

Facilitator: Clear, and if you look at your organisation now, where would you be right now? If you had to give that a grade? - *Requesting information, opinion, or clarification*

Member: If I had to give myself a grade, I would give myself a six, so that is to say: we have all the things in place and we know quite a lot about it as well. But I think we don't get enough out of it, and we often put wrong energy into it, because you must fix things, because afterwards you suddenly have to adhoc put a pupil somewhere else for three weeks because the exam is coming up or a test is coming up and he hasn't experienced it all on the work floor yet. And he does need that. - *Providing evidence and reasoning*

Facilitator: And when are you happy? What grade goes with that? - *Requesting information, opinion, or clarification*

Member: Well, an eight, at least an eight. But yes you give yourself the grade, but actually I just want a ten, for all sorts of reasons. I don't want to make any more mistakes, and just use the right energy. That does mean that the student enjoys learning a lot more and the material lands a lot better, so you get better school results. So basically it just has to go to a ten. - *Providing evidence and reasoning*

Note. Excerpt occurred in meeting one of LC E, lines 22-25.

Sixth, when the facilitator is requesting information, opinion, or clarification, the members are making less positive or supportive contributions than expected ($z = -2.49, p < .05$). Investigating the data shows that this only happens when the facilitator searches for information or clarification, and a member responds to this 'aha' or 'hmh' to keep the conversation going. This is shown in Excerpt 7.

In addition, members responding by challenging ideas or refocusing talk also less than expected ($z = -2.95, p < .05$). This sometimes happens when the facilitator asks questions for clarifications, to which the member responds by giving alternative ideas or suggestions, as shown in Excerpt 8.

Excerpt 7 - Collaborative idea generation

Member 1: Would it be good for your image to maybe just have a whole kettle like that here next time? - *Requesting information, opinion, or clarifications*

Facilitator: Yes, well, maybe not just for me, I don't know, I have one hanging at home. But I'm curious, yes, what that looks like. - *Requesting information, opinion, or clarifications*

Member: Aha. - *Making positive and supportive contributions*

Facilitator: Well, and there are some things I think we need to do. How we check that whether that is indeed these five it or not. Is that how we check? - *Requesting information, opinion, or clarifications*

Note. Excerpt occurred in meeting one of LC D, lines 251-254.

Excerpt 8 - Collaborative idea generation

Facilitator: What do they need though? I mean, we all know this, but what do they need? - *Requesting information, opinion or clarifications*

Member: Yes but look, maybe those four times don't need either. A start interview and a progress interview and that four times in two years. When I talk to the companies, they all say, that's just not necessary at all. If they know it's going well, just do it all at once. Then just do it at the beginning and take an hour for that instead of 15 minutes. And put the whole package on the table. And we will discuss how to go about it. - *Challenging ideas or refocusing talk*

Note. Excerpt occurred in meeting one of LC E, lines 91-93.

Significant sequences from the members to the facilitator

First, when a member is challenging ideas or refocusing talk, the facilitator responds by expressing shared ideas and agreement ($z = 3.63, p < .05$). This occurred more than expected. This mainly happens when the member contradicts the arguments of a predecessor, to which the facilitator responds as a sort of closing agreement, as shown in Excerpt 9.

Excerpt 9 - Seeking or receiving external feedback or information

Member 1: You're going to take out two at a time? - *Requesting information, opinion, or clarifications*

Member 2: Well I don't think that's very wise. - *Challenging ideas and refocusing talk*

Facilitator: No exactly - *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting five of LC D, lines 522-524.

Second, when a member requests information, opinion or clarifications, the facilitator responds by expressing shared ideas and agreement more than expected ($z = 2.36, p < .05$).

This mainly happens when the member is asking a question for clarification and opinion to which the facilitator responds with agreement as shown in Excerpt 10.

Excerpt 10 - Collaborative idea generation

Facilitator: So we would next week, then I think it's nice to know exactly which ones they are. And then it's also, because that's all for you to know, so that you know what parts we then and are going to look at in the warehouse. And we may then go into the all of yours in the warehouse. - *Providing evidence of reasoning*

Member 1: Good. - *Expressing shared ideas and agreement*

Member: Then we all get a special pass or something? - *Requesting information, opinion or clarifications*

Facilitator: Also yes already. - *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting one of LC6 D lines 277-280.

Third, when a member is expressing shared ideas and agreement, the facilitator reacts by providing evidence and reasoning more than expected ($z = 3.75, p < .05$). This mainly happens when the member expresses shared ideas and agreement to what is said or asked before and the facilitator builds further on this by providing evidence and reasoning, as shown in Excerpt 11.

Excerpt 11 - Collaborative idea generation

Facilitator: Yes, other points for now? For this kick-off meeting? – *Requesting information, opinion or clarification*

Member 1: No, I think it's very clear. I think you also have a lot on paper, but kind of the same thing, but well, as we said it is indeed expectations that we have, yes, that we have now noted down, say, that we are out of together. But the question now is, how can you implement that? How can you improve that? – *Expressing shared ideas or agreement*

Facilitator: And in that, you are crucial. I'm talking about myself as facilitator, but these gentlemen are teachers and look at things from that perspective, and when we start working things out later, you are there to put the brakes on and say 'that's rubbish what's written here, that's too educational or is all big people's language and I don't understand any of that at all... - Providing evidence and reasoning - *Providing evidence and reasoning*

Member 2: No, but you are part of that.... - *Expressing shared ideas and agreement.*

Note. Excerpt occurred in meeting one of LC E, lines 310-313.

Fourth, when a member makes positive and supportive contributions, the facilitator responds by providing evidence or reasoning more than expected ($z = 3.05, p < .05$). This is mainly happening when the member is making a supportive move that is not an expression of agreement, to which the facilitator responds by speaking on behalf of the participants, and giving input to the discussion, as shown in Excerpt 12.

Excerpt 12 - Seeking or receiving external feedback

Member: Yes just do it - *Making positive and supportive contribution*

Member: Yes - *Making positive and supportive contribution*

Facilitator: It's an important issue, of course, though. Last week a number of questions came up of actually we should invite (Person) and you're invited right away. Glad you can attend. - *Providing evidence and reasoning*

Note. Excerpt occurred in meeting five of LC D, lines 37-39.

Fifth, when a member makes positive and supportive contributions, the facilitator is responding by expressing shared ideas and agreement ($z = -2.84, p < .05$) or making positive or supportive contributions ($z = -2.7, p < .05$) less than expected. This only happens when the facilitator gives a sign for the member to move on by expressing shared agreement or say

words like ‘yes’ to keep the conversation going. The facilitator responds with expressing idea is shown in Excerpt 13 and making positive or supportive contributions in Excerpt 14.

Excerpt 13 – Discussing results

Member 1: For the youth, that's the future actually. They have to pick it all up later. So... yes... I had already talked to him about that. Other than that, I didn't really do much with it this week... - *Providing evidence and reasoning*

Facilitator: Do you also notice that they ... euhh....? – *Requesting information, opinion or clarification*

Member 1: Yes they want there too... Definitely! - *Providing evidence and reasoning*

Member 2: Yeah - *Making positive and supportive contributions*

Member 1: Those are also there for - *Provide evidence of reasoning.*

Member 2: Yes - *Making positive and supportive contributions*

F: Nice! Good - *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting five of LC D lines 44-51.

Excerpt 14 – Collaborative idea generation

Member 1: If he can take care of these aspects at an early stage, if they are known within the company, and there is a job coming up that involves certain aspects that the trainee will have to deal with, they say "guys, take this into account" at an early stage. And then we better just send that student over there. But then not only with jobs, but also with scholarships. With anything related to the learning process. That you say of catching on to that early and that you say of, we are indeed steering more in that direction, so that your education does go more smoothly, so to speak. - *Providing evidence and reasoning*

Member 2: Yes. - *Making positive and supportive contributions*

Member 1: Yes, and then you're talking mainly about the insight as well so.... - *Providing evidence and reasoning*

Member 2: Yes, those content expectations, the insight indeed. - *Making positive and supportive contributions*

Member 1: That's no, but that they also know from each other what they are doing. What does the student do? But I also understand him that because of that whole digitisation process and the lack of books - *Making positive and supportive contributions*

Facilitator: Yes. - *Making positive and supportive contributions*

Note. Excerpt occurred in meeting one of LC E, lines 160-165.

Sixth, when a member expresses shared ideas or agreement, the facilitator reacts to this by making positive and supportive contributions less than expected ($z = -2.55, p < .05$). This is only happening when a member agrees with what was said before, mostly by another

member. The facilitator responds with 'Yes' when it is between the participants' contributions and to support participants in moving on.

Excerpt 15 – Collaborative idea generation

Facilitator: Whole kettles go there? - *Requesting information, opinion or clarifications*

Member 1: So we are going to do that? - *Requesting information, opinion or clarifications*

Member 2: Now you are even going to take the parts out of the cauldron. At (company) it's like, 'Well, there comes an old boiler'. And they say of that: well, oh yes, that's good, that's not good, that goes in the scrap bin.... - *Providing evidence and reasoning*

Member 1: Yes - *Making positive and supportive contributions*

Member 2: Who can re-fabricate. - *Providing evidence and reasoning*

Member 1: Yes... exactly. So that's what's new about it. Then just a question of whether that can then still go to (Company) or not. Then we have to look at (Company) and (Company) I think right? - *Requesting information, opinion or clarifications*

Member 2: Yes, (Company) and (Company) actually do the same thing. – *Expressing shared ideas and agreement*

Facilitator: Yes – *Making positive and supportive contributions*

Note. Excerpt occurred in meeting five of LC D, lines 394-401.

Significant sequences from members to members

Four sequences from members to members occurred more than expected within team learning activities. When a member is expressing shared ideas and agreement it is followed by providing evidence or reasoning by another member ($z = 2.24, p < .05$). When a member is providing evidence or reasoning it is followed by challenging ideas or refocusing talk ($z = 4.33$). In addition, providing evidence or reasoning is followed by making positive and supportive contributions ($z = 4.27, p < .05$), or requesting information, opinion, or clarification ($z = 2.28, p < .05$) by another member. Examples of a pattern like these sequences is provided in Excerpt 16 and Excerpt 17.

Excerpt 16 – Collaborative idea generation

Member 1: Yes and warranty...especially of course if it's a refurbished part.... -*Providing evidence and reasoning*

Member 2: Look, if (company) is going to do it themselves, then...then it's not such a problem - *Providing evidence and reasoning*

Member 1: It is -*Expressing shared ideas and agreement*

Member 2: Either ..or go through (company)...then then...it becomes a lot easier. But you have now through (company), there are things that happen. Maybe through (company), maybe... there are more companies. - *Providing evidence and reasoning*

Member 3: But then, of course, you need to know from who is doing what, so you have some visibility into it. - *Challenging ideas and refocusing talk*

Facilitator: Humm... Okay... well, that will be continued.... - *Challenging ideas and refocusing talk*

Member 3: Yes - *Making positive and supportive contributions*

Note. Excerpt occurred in meeting five of LC D, lines 160-167

Excerpt 17 – Seeking or receiving external feedback

Member 1: What exactly did you say about that? – *Requesting information, opinion or clarification*

Member 2: They give a guarantee ... as a supplier, but that's not a manufacturer's warranty. - *Providing evidence and reasoning*

Member 1: Yes but.... but in conjunction with (Company)? - *Requesting information, opinion or clarification*

Member 2: No, they give warranty, like they say of, we think we can re-manufacture well and we give warranty on that. If something breaks, then we give warranty on it. - *Providing evidence and reasoning*

Member 3: (Company) says that? - *Requesting information, opinion or clarification*

Member 1: No.... - *Providing evidence and reasoning*

Facilitator: Yes... okay ... and (Brand).... - *Providing evidence and reasoning*

Member 1: Yes but because he called something about (Company).... - *Requesting information, opinion or clarification*

Member 2: Yes, that's right, but the quality control of those parties is perhaps even different as the quality control of (Company). - *Providing evidence and reasoning*

Member 3: Yes – *Making positive and supportive contributions*

Member 2: Yes – *Making positive and supportive contributions*

Note. Excerpt occurred in meeting five of LC D, lines 337-347

On the other hand, there are six sequences from members to members that occurred less than expected within team learning. When a member is requesting information, opinion or clarification, it is followed by expressing shared ideas and agreement by another member less than expected ($z = -3.25, p < .05$). Expressing ideas is followed by making positive and supportive contributions occurred less than expected ($z = -4.36, p < .05$). Making positive and supportive contributions followed by making positive and supportive contributions by team members among each other occurred less than expected ($z = -2.18, p < .05$). When a member is challenging ideas and refocuses the talk, followed by another member who is responding with requesting information, opinion or clarification occurred less than expected ($z = -2.02, p < .05$). Requesting information, opinion or clarification followed by requesting information, opinion or clarification by team members among each other occurred less than expected ($z = -2.97, p < .05$).

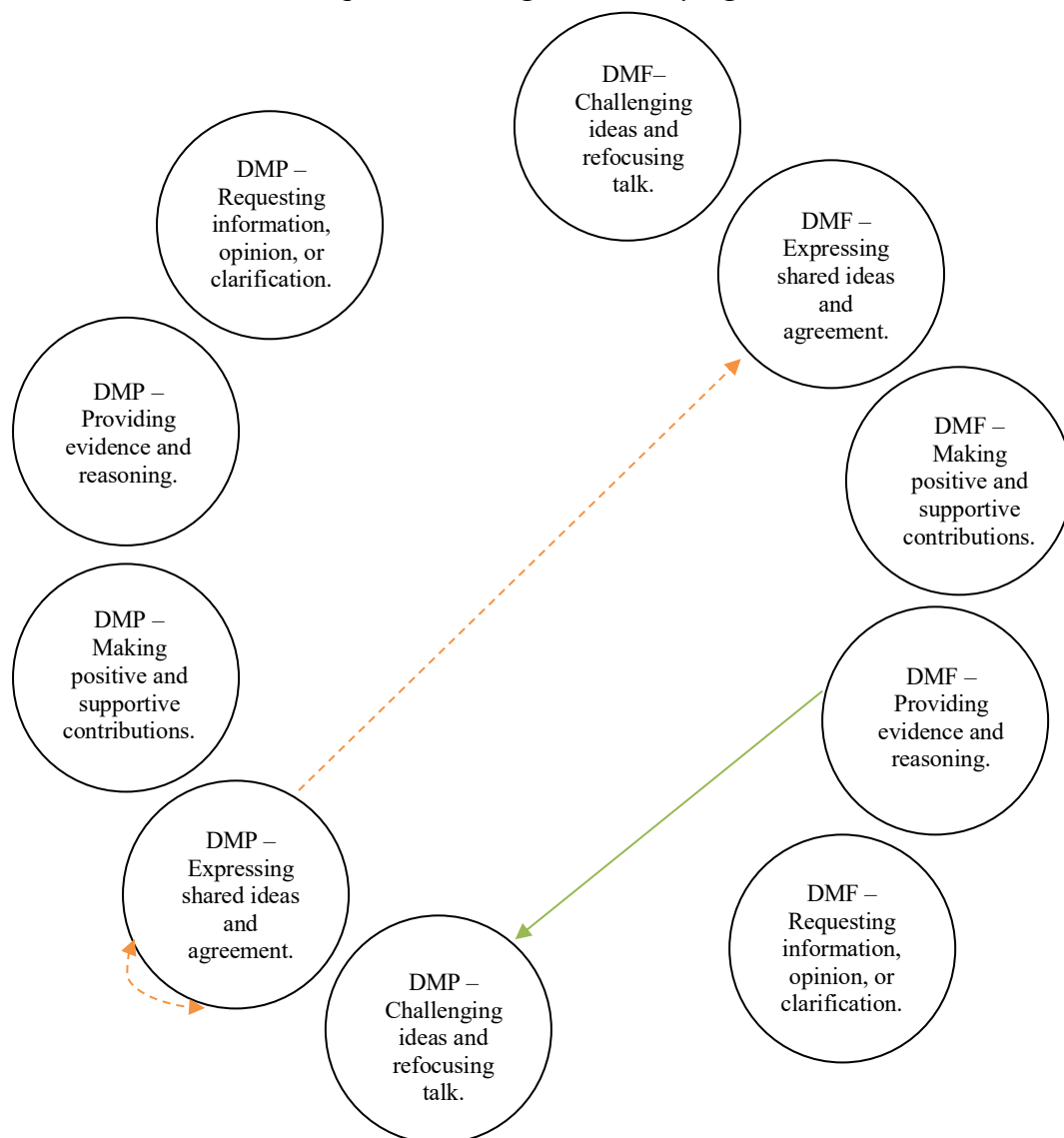
Team reflexivity

In addition to the characterising interactional sequences underlying team learning activities, this study is also interested in which moves of the facilitator trigger the moves of the cross-functional team members and how the facilitator responds to the moves of the cross-functional team members while supporting team reflexivity activities. Therefore, the positive and negative significant sequences of interactions that are characteristic for team reflexivity will be explained. Results of the chi-square indicated that there were significant sequences of dialogic moves that characterise team reflexivity. Additionally, the residuals indicate which sequences are more or less present than expected by chance. From this, one characteristic sequence between the facilitator and the members that is higher than expected emerged in the team reflexivity activities that were absent in the team learning activities. In addition, one characteristic sequence occurred between the members and the facilitator that

are lower than expected in the team reflexivity activities that was not present in the team learning activities. A visualisation of these characteristic sequences is shown in Figure 7.

Figure 7

Characteristic interactional sequences among and underlying TR activities



Note. Positive residuals; solid green lines, Negative residuals; dashed orange lines.

Note. DMP stands for member, DMF stands for facilitator.

To interpret the results for team reflexivity, each characteristic sequence will be discussed between the team members and the facilitator and the team members among

themselves. Moves that are higher or lower than expected are both explained. Examples from the data are shown through excerpts.

Significant sequences from the facilitator towards the members

First, when the facilitator provides evidence and reasoning, a member reacts by challenging ideas and refocusing on the talk ($z = 3.57, p < .05$). This mainly happens when the facilitator is giving arguments or input to the discussion, where the member reacts by signs of disagreement like “but”. An example of this occurring is shown in Excerpt 16.

Excerpt 16 - Monitoring

Facilitator: Yes, I want to go back very briefly, because the question under that is, we are sitting here together...- *Challenging ideas or refocusing talk*

Member 1: For (Company) *Providing evidence or reasoning*

Facilitator: With two representatives from (Business) - *Providing evidence or reasoning*

Member 2: Yes but that I understand... but...- *Challenging ideas or refocusing talk*

Note. Excerpt occurred in meeting five of LC E, lines 521-523.

Significant sequences from the members to the facilitator

Second, when a member expresses shared ideas or agreement, the facilitator responds to this by also expressing shared ideas or agreement ($z = -2.47, p < .05$). This is mainly happening when a member agrees with what the preceding person has said and the facilitator is summarising and coming to a closing agreement, as shown in Excerpt 17.

Excerpt 17- Planning

Member: Then you can get together, but then you can't really make... an appointment with a supplier. – *Challenging ideas or refocusing talk*

Facilitator: No, no, no, but then we can say, then we will continue the seventh with the process of (member) Surely then everyone has two weeks to look at that. - *Providing evidence or reasoning*

Member: Yes - *Expressing shared ideas and agreement*

Note. Excerpt occurred in meeting five of LC D, lines 772-775.

Significant sequences from members to members

It appears that when a member is expressing ideas or agreement and another member is responding to this by also expressing shared ideas and agreement, occurs less than expected ($z = -2.54, p < .05$).

Team learning and team reflexivity

Despite focusing on the characteristic sequences for team learning or team reflexivity, there are also significant sequences that occur in both team learning and team reflexivity. The sequences that occurred in both team learning and team reflexivity will provide a more complete understanding of how the facilitator supports team learning and team reflexivity. Appendix B contains all the contingency tables that provide information about which sequences occurred more and less than expected in both team learning and reflexivity.

Discussion

The present study intends gain a better understanding of the facilitators' role when supporting team learning and reflexivity. While previous research has mostly focused on the initiating behaviour of the facilitator, this study took a step further by looking at the positioning of the facilitator, using the PageRank metric (i.e. elaboration). In addition, through the sequential analysis, characteristic interactional sequences of dialogic moves have emerged (i.e. partial replication).

Insights into the positioning of the facilitator in team learning and reflexivity activities

To determine the position of the facilitator in team learning and reflexivity activities, it emerged that the PageRank is well suited to explore the position and what influence the facilitator has within team learning and team reflexivity. From the results of the PageRank scores, three main findings are outlined.

Firstly, from the results of the PageRank scores, we conclude that the facilitator often has the most influence in all team learning and reflexivity activities. This is concluded from the fact that the facilitator has the highest PageRank score in most of the LCs. Therefore, the facilitator has a central position within these activities (Sauer & Kauffeld, 2013). The central position of the facilitator in team learning and reflexivity can be explained by Goodyear and Casey (2015), who already suggested that an assigned external facilitator encourages reflection and team learning. This encouragement could particularly arise when the facilitator assesses that the team needs more guidance, as the team members in the LCs in this context are working together in this composition for the first time (Hubers et al., 2021; Van Rees et al., 2022). In the initial phase of the LCs team members are getting to know each other and start to understand what the task is about, what the limits are, and which information they need to complete it (Miller, 2003; Tuckman & Jensen, 1977). By applying transformational leadership styles, the facilitator seeks to understand and assess the needs of the team (London

& Sherman, 2021) and adapts accordingly (Shaw et al., 2010). Moreover, since no chairperson is present in the LCs, team members might look to the facilitator as chairperson because he is responsible for the process (Hirvonen, 2016). This is line with the study of Gorse et al. (2006) who suggested that when members have established their position in the team, some member such as chairs and leaders significantly influence the norms of the group. Conversely, appointed leaders, or in this case the facilitator, have considerable influence on the group interaction and the making of decisions (Enayati, 2002 as cited in Gorse et al., 2006). This is contrary to this study, given here the process is supported by the facilitator, but the content and decisions must be made by the group as the facilitator has no decision-making authority (Kaner et al., 2014; Kolb, 2008).

Secondly, some nuances have been found that conclude that the facilitator is having a less prominent role by having fewer influence within team learning compared to team reflexivity. The results showed that the PageRank of the facilitator is lower in team learning compared to team reflexivity. In addition, some team members take a more prominent role compared to the facilitator in team learning, could indicate that these team members contributed more during team learning (Meslec & Curşeu, 2015). An explanation for the overall contribution of the team members in team learning could be that within the collaborative interaction in team learning, groups must generate new ideas for solving problems (Widmann & Mulder, 2018). This requires groups to be creative and develop new ideas to solve complex challenges (Paulus et al., 2012). By actively participating, groups can accomplish this (Edmondson, 1999). Moreover, unlike the team members, the facilitator is unaware of the specific content of the tasks (Van Rees et al., 2022). This can also clarify why the facilitator does not always have the most influence in team learning. Additionally, this study showed that the members playing a more prominent role, are usually not more than one or two persons having a high PageRank score and the other team members having a much

lower score. This is in line with the study of Gorse et al, (2006), where it emerged that interaction was dominated by one or two team members, while other team members had a reduced role. Furthermore, others playing a key role may arise because someone is used to taking the lead at work or has more expertise in the subject (Alblooshi et al., 2020; Van Rees et al., 2022). In addition, team members feel the urge to share their expertise based on their specific areas of complementary knowledge (Van Rees et al., 2022). Therefore, if a team member has unique experiences or information from their function that other team members do not have, this could also play a role. Especially if this is information that the team really needs to come up with solutions for the challenges. This could be explained by the fact that the composition and cross-functionality is an important factor (Grover & Malhotra, 1997, as cited in Malhotra et al., 2016) but also to what extent that unique information is relevant to the challenge (Yeo, 2020). Research into cross-functional teams showed that to improve the efficiency of existing systems in the construction industry, the team relied on the expertise of functional members that provide a reliable source of information and knowledge (Hirunyawipada et al., 2010; Olopade & Franz, 2018). This may explain why some team members have more influence in team learning or reflexivity activities.

Lastly, the facilitator has the most prominent role in team reflexivity. The results showed that the facilitator continuously leads planning, evaluation, and monitoring. Given that the facilitator is appointed for the process and fosters members to reflect on the content of the task, it can be explained that he takes a more prominent role in reflexivity (Lessard et al., 2015; Miranda & Bostrom, 1999). This is in line with (Nelson & McFadzean, 1998), who states that the facilitator is responsible to focus on reflection, since they need to guide the team members in the right direction. Furthermore, team members do not spontaneously engage in the process of team reflexivity and therefore require more support from a facilitator (Koeslag-Kreunen et al., 2018; Schippers et al., 2008). Additionally, it corresponds with the

study of Schinkel (2023) who stated that the facilitator is initiating planning, monitoring and evaluating more than expected.

Insights into the support of team learning and reflexivity by the facilitator

The results of the sequential analysis appeared to be an added value to distinguishing characterising dialogic moves of team learning and team reflexivity. Generally, this study arrived at the same insights compared to Schinkel (2023). Based on the similar characteristic sequences as Schinkel (2023), the facilitator fosters recognition by team members through expressing shared ideas and agreement and creates an environment where members share and discuss information (Bjuland & Helgevold, 2018; Kolb et al., 2008). Additionally, when team members feel psychological safety, they dare to be critical and honest when interacting with the facilitator and the other team members (Edmondson, 2003b) and therefore express challenging ideas. However, because a more extensive dataset was used in this study, new characteristic sequences have also emerged. From these results, we outline three main findings.

Firstly, there is a clear difference in sequences between team learning and team reflexivity. This clear difference may appear because in team learning, the sequences tend to focus more on constructive feedback, encouraging team members to expand their ideas and promote mutual understanding (Edmondson, 1999). In the excerpts, this can be seen particularly in many episodes of collaborative idea generation, where multiple team members interact, build on each other, and being critical, where the facilitator is more likely to complement the conversation or ask questions when topics are unclear and need more explanation. Reflexivity, on the other hand, seems to be more focused on critically evaluating existing ideas and identifying areas for improvement (Bjuland & Helgevold, 2018). In the excerpts, this can be seen in short conversations with few members. Here, the excerpts show that the facilitator brings up topics for discussion and makes members think critically about them. An explanation for the difference in the richness of interactional patterns in team learning

compared to team reflexivity could be that team members rarely engage spontaneous reflection, since this behaviour is not a habit for them (Schippers et al., 2008). Moreover, team members may feel that team reflexivity takes too much time and would rather concentrate on using team learning to solve the problem. (Schippers et al., 2012; Schmutz et al., 2018).

Secondly, within team learning, there is much more interacting and building on each other. From the facilitators' perspective, by asking questions and making supportive contributions, the facilitator seeks to keep conversations going in team learning (Warwick et al., 2016). By expressing agreement or shared ideas, the facilitator encourages to keep on sharing and discuss information (Bjuland & Helgevold, 2018; Kolb et al., 2008). The excerpts indicate that the facilitator encourages team members to counter arguments to assist overcome knowledge barriers by often making positive and supportive contributions to keep the conversation going and expressing agreement to what the members said. This results in members responding with challenging the ideas. This support may arise since the facilitator plays an important role in generating a dialogic space between team members and to let them experience a collaborative learning environment (Bjuland & Helgevold, 2018). The sequences of sharing and asking for information and feedback to individuals that are from outside the team, results in team taking the initiative to cross the knowledge boundaries (Kasl et al., 1997, as cited in Raes et al., 2015). This serves the purpose of the facilitator, who wants members to engage with each other (Berta et al., 2015). Another explanation for the many interactions between the team members themselves could be that team interaction during team learning often reflect a team's daily collaborative actions outside the context of the meeting (Kauffeld & Lehmann-Willenbrock, 2011). This provides these activities with content to discuss to solve the problem and is in line with (David et al., 2022) who states that the phenomenon of team learning through interaction is interpreted as the exchange information by sharing knowledge to collaborate and solve problems together.

Lastly, for team reflexivity it seems like not much is happening compared to team learning, because of only two characteristic sequences of dialogic moves. However, there are certainly other significant moves in team reflexivity, only they also occur in team learning. Therefore, they are not characteristic for team reflexivity. Even though requesting information or challenging ideas or refocusing talk is not a characteristic preceding move, it is found in that starting a team reflexivity activity is mainly typified by a person expressing the need for reflection or asking questions that trigger reflection in the form of sharing (Raes et al., 2015). However, when team members are not triggered by certain questions, reflexivity does not emerge (Raes et al., 2015). This must be supported by the facilitator by directing focus during team reflexivity (Kolb & Rothwell, 2002). Out of the results it emerged that is characterising for the facilitator to support reflexivity by starting an activity through refocusing the talk and after that providing evidence and reasoning for this. It appears that this results in members challenging ideas. This is reflected in the excerpts, where the facilitator wants to look back at something said earlier and elaborate on it by providing evidence about what to discuss, to which a member responds critically. This may arise because members being more critical when they have more knowledge about the content of the task or based on their expertise and experience compared to the facilitator (Edmondson, 2003). This is in line with, (Dussart et al., 2021), who stated that organisational subgroups, such as IT-oriented versus business-oriented professionals, may have different attitudes towards knowledge integration. This difference may lead some members to be more critical, especially if they have more knowledge or experience regarding the content being discussed (Dussart et al., 2021). Accordingly, they will feel more confidence to challenge the ideas when the content of the task is discussed (Edmondson, 2003).

In addition to the sequences that were more prevalent than expected, the results also show that there are sequences that occurred less frequently than expected. An initial

explanation for the sequences being less prevalent than expected has to do with the chi-square test, which assumes that all combinations of interactional sequences in the contingency tables are possible (McHugh, 2013). It is logical that requesting information is followed by a clarifying move such as providing information and clarification (Warwick et al., 2016). However, a move like making positive or supportive contributions triggering the move expressing shared ideas and agreement is not so logic. This is because a person is not agreeing on someone who is making a supportive contribution but agrees on what another person said before. The excerpts are also showing that these sequences only arise by how conversations run in time but are not typical contribution to the discussion among team members and the facilitator. More logical sequences that occurred less than expected, such as expressing shared ideas by team members, followed by making supportive contributions by the facilitator may arise because members are building on each other in collaborative idea generation by reaching an agreement (Vrikki et al., 2017). Since the facilitator needs to stay neutral in conversations (Kolb & Rothwell, 2002) could be a reason that facilitator will not often make positive or supportive contributions on an agreement between team members. As the data reveals, the facilitator makes the supportive contributions at the end of a conversation to make clear that he understands what the team members are talking about.

Limitations and directions for future research

Logical implications of transcribing spoken text in team meetings

In the transcripts of spoken text from the team meetings, the utterances were written down one after the other in order of time. However, the utterances that occurred at the same time will be sequential. This is not considered for the 1-lag sequential analysis. One limitation of 1-lag sequential analysis is that it can only analyse direct, sequential pairs of dialogic moves between persons (Solomon et al., 2022). Transitions from A to B are recorded, while the influence of C on the dynamics and sequence of the discussion is not

included. This means that it is limited to observing direct transitions such as from a team member to the facilitator (e.g. question from a team member followed by a response from the facilitator), while interaction patterns may extend over several steps (Schneider et al., 2018). This is clearly reflected in the excerpts where it seems like one move follows another but looking at the rest of the moves in the excerpt, we see that the moves are a reaction to what was said even before. Therefore, it could be useful in future research to perform a 2-lag sequential analysis. This type of sequential analysis can identify patterns by looking at transitions between three consecutive sequences (Bakeman & Gottman, 1997). As a result, contextually richer interactions can be studied.

Proper support of facilitator

This study only explores the behaviour and the centrality of the facilitator, in conversations within certain learning or reflexivity activities. In future research, it could be interesting to dive into what is good or bad in this respect. This could be particularly interesting for team reflexivity. Again, this appears to be the activity in which not everyone actively participates despite the facilitator being central here. For proper training guidelines, it would be interesting if the outcomes of the facilitation process of the team meetings were further investigated for more extensive guidelines. As it turns out, the training of facilitators is essential for enhancing group effectiveness. When a facilitator is well-trained, they can apply support techniques adaptively and flexibly during team meetings (McFadzean, 2002).

Analysis role of the facilitator over time is not included

Previous research indicated that teams go through different development phases and therefore their team learning and reflexivity behaviour changes over time. However, this research did not take the change over time into account when computing the PageRank. The

outcomes of the PageRank in this study indicated how the facilitator influences team learning and reflexivity overall but could not state if this differs over time. Future research could study this change over time by computing the PageRank for each developmental phase to investigate how the influence of the facilitator unfolds over time. Additionally, it could be interesting to compute the PageRank in dependence of events, like conflict, to provide a more thorough understanding of the influence of the facilitator.

Analysation of rankings for cross-case analysis

This study introduced a rule of thumb for ranking the PageRank scores. These rankings are used to state if a person has a high or low PageRank score and thereby a higher or lower influence. However, these rankings are not specified when analysing across cases. In future research, it could be interesting to state across cases what the degree (i.e. minimal, minor moderate, major and maximal) of influence is from a person, based on the rankings.

Practical implications

Given that a learning community must solve workplace challenges and problems in a short period of time, the main goal of the facilitator is to support the teams towards this goal. Therefore, the facilitator must know how to cope with this and understand their role in it. In this study, the facilitator takes a very central position beyond our expectations. It is, therefore, important to take this into account within the training of facilitators by discussing how the facilitator perceives their role. Therefore, it could be a good implication to adapt the training to talk to the facilitator about his positioning within discussions and the use of moves to trigger certain behaviour in team members. The design of such training can consider the findings from this study. Specific elements include which questions should be asked to trigger members to participate actively in team learning and team reflexivity activities. Hereby, a distinction should be made between team learning and team reflexivity activities.

In addition, training could also give the facilitator insights into variation in (active) participation.

Besides the facilitator needing proper training, more attention could be paid to a proper introduction among the members in LCs. The meetings show that the moment team members get to know each other in the first meeting, after which the challenge is immediately discussed. This could also be split by first organising a meeting to get to know each other. Aspects of a learning community could also be further explained. For instance, creating awareness of the importance of reflexivity. Even though members may feel they must move on quickly, reflexivity can contribute to solving the challenge effectively. By mentioning this in the introduction, the importance of using certain activities can also be brought to participants' attention. This may result in them coming up with this themselves or recognising it more when the facilitator drives and initiates these activities.

Conclusion

This study explored the role of the facilitator in supporting team learning and team reflexivity activities within Learning Communities. The results of this study show the added value of investigating the position of the facilitator in team learning and reflexivity through exploring PageRank as a new innovative measure. This metric is well suited to explore what influence the facilitator has within team learning and team reflexivity. The findings from indicate that facilitators often have the most central position in cross-functional team meetings due to their responsibility for guiding the learning process and encouraging team reflexivity. Facilitators play a more prominent role in team reflexivity activities, where members need more engagement support. In contrast, other team members may take on key roles during team learning activities, particularly in generating collaborative ideas. Here, the facilitator is a connector to ensure the conversation flows smoothly. The study also highlights how the facilitator supports team learning and reflexivity by investigating the dynamic nature of facilitator interactions. In team learning activities, facilitators create an open dialogic space, fostering comfort and confidence among members to contribute. In team reflexivity, facilitators provide input that triggers members to rethink and share ideas. These findings contribute to a better understanding of the facilitators' role and behaviour in learning communities and could serve to adapt trainings for facilitators to guide cross-functional teams in learning communities. In addition, it could serve to expand the meetings with an additional introduction for the cross-functional team members. Future research into the role of the facilitator in LCs may further extend, improve, and validate these findings and implications.

References

- Alblooshi, M., Shamsuzzaman, M., & Haridy, S. (2020). The relationship between leadership styles and organisational innovation. *European Journal Of Innovation Management*, 24(2), 338–370. <https://doi.org/10.1108/ejim-11-2019-0339>
- Andrade, C. (2020). Sample Size and its Importance in Research. *Indian Journal Of Psychological Medicine*, 42(1), 102–103. https://doi.org/10.4103/ijpsym.ijpsym_504_19
- Bakeman, R., & Gottman, J. M. (1997). *Observing interaction: An introduction to sequence analysis*. Cambridge University Press. <https://doi.org/10.1017/cbo9780511527685>
- Bakkenes, I., Vermunt, J. D., & Wubbels, T. (2010). Teacher learning in the context of educational innovation: Learning activities and learning outcomes of experienced teachers. *Learning And Instruction*, 20(6), 533–548. <https://doi.org/10.1016/j.learninstruc.2009.09.001>
- Barrett, M., Cappleman, S., Shoib, G., & Walsham, G. (2004). Learning in Knowledge Communities: Managing Technology and Context. *European Management Journal*, 22, 1-11. <https://doi.org/10.1016/J.EMJ.2003.11.019>.
- Beranek, P., Beise, C., & Niederman, F. (2002). Facilitation and group support systems. *IEEE Xplore*. <https://doi.org/10.1109/hicss.1993.284182>
- Berta, W., Cranley, L., Dearing, J. W., Dogherty, E. J., Squires, J. E., & Estabrooks, C. A. (2015b). Why (we think) facilitation works: insights from organizational learning theory. *Implementation Science*, 10(1). <https://doi.org/10.1186/s13012-015-0323-0>
- Bjuland, R., & Helgevold, N. (2018). Dialogic processes that enable student teachers' learning about pupil learning in mentoring conversations in a Lesson Study field practice. *Teaching and Teacher Education*, 70, 246-254. <https://doi.org/10.1016/j.tate.2017.11.026>

- Bresman, H. (2013). Changing Routines: A Process Model of Vicarious Group Learning in Pharmaceutical R&D. *Academy Of Management Journal*, 56(1), 35–61.
<https://doi.org/10.5465/amj.2010.0725>
- Bron, R. (2022). *Collaborative course design in higher education: a team learning perspective*. <https://doi.org/10.3990/1.9789036554657>
- Carmeli, A., Sheaffer, Z., Binyamin, G., Reiter-Palmon, R., & Shimoni, T. (2013). Transformational Leadership and Creative Problem-Solving: The Mediating Role of Psychological Safety and Reflexivity. *Journal Of Creative Behavior/The Journal Of Creative Behavior*, 48(2), 115–135. <https://doi.org/10.1002/jocb.43>
- Corporaal, S., Disberg – Van Geloven, M., Endedijk, M., & Hubers, M. (2021, May). Gas erop! Ontwerpprincipes van learning communities als aanjager voor de energietransitie. <http://www.techyourfuture.nl/>. Retrieved November 22, 2023, from <https://www.utwente.nl/nl/bms/gas-erop/onderzoek/2021-05-04-praktijkpublicatie-lcs-in-de-installatiebranche-def-tekst.pdf>
- Csardi, G., & Nepusz, T. (2005). The iGraph software package for complex network research. *ResearchGate*.
https://www.researchgate.net/publication/221995787_The_Igraph_Software_Package_for_Complex_Network_Research
- David, L. Z., Endedijk, M. D., Van Den Bossche, P., & The Author(s), under exclusive license to Springer Nature Switzerland AG. (2022b). Investigating Interaction Dynamics: A Temporal Approach to Team Learning. In M. Goller et al. (Red.), *Methods For Researching Professional Learning And Development* (pp. 187–202) [Book-chapter]. Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-031-08518-5_9
- Decuyper, S., Dochy, F., & Van Den Bossche, P. (2010). Grasping the dynamic complexity

- of team learning: An integrative model for effective team learning in organisations. *Educational Research Review (Print)*, 5(2), 111–133.
<https://doi.org/10.1016/j.edurev.2010.02.002>
- De Haan, E. (2005). The role of the facilitator. In *Palgrave Macmillan UK eBooks* (pp. 58–61). https://doi.org/10.1057/9780230509429_7
- Dochy, F., Gijbels, D., Segers, M., & Van den Bossche, P. (2012). Theories of learning for the workplace: Building blocks for training and professional development programs. Routledge. <https://doi.org/10.4324/9780203817995>
- Dussart, P., Van Oortmerssen, L. A., & Albronda, B. (2021). Perspectives on knowledge integration in cross-functional teams in information systems development. *Team Performance Management*, 27(3/4), 316–331. <https://doi.org/10.1108/tpm-11-2020-0096>
- Ebbert, D. (2019, 21 oktober). *A Post Hoc Analysis for Pearson's Chi-Squared Test for Count Data*. https://cran.r-project.org/web/packages/chisq.posthoc.test/vignettes/chisq_posthoc_test.html
- Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44(2), 350–383. <https://doi.org/10.2307/2666999>
- Edmondson, A. C. (2003). Managing the Risk of Learning: Psychological Safety in Work Teams. *International Handbook Of Organizational Teamwork And Cooperative Working*, 255–275. <https://doi.org/10.1002/9780470696712.ch13>
- Edmondson, A. C. (2003). Speaking up in the operating room: How team leaders promote learning in interdisciplinary action teams. *Journal of Management Studies*, 40(6), 1419–1452. <https://doi.org/10.1111/1467-6486.00386>
- Edmondson, A. C., & Harvey, J. F. (2018). Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organisations. *Human Resource*

- Management Review, 28(4), 347– 360. <https://doi.org/10.1016/j.hrmr.2017.03.002>
- Gander, F., Gaitzsch, I., & Ruch, W. (2020). The Relationships of Team Role- and Character Strengths-Balance With Individual and Team-Level Satisfaction and Performance. *Frontiers in Psychology, 11*. <https://doi.org/10.3389/fpsyg.2020.566222>
- Goodyear, V. A., & Casey, A. (2013). Innovation with change: developing a community of practice to help teachers move beyond the ‘honeymoon’ of pedagogical renovation. *Physical Education And Sport Pedagogy, 20*(2), 186–203. <https://doi.org/10.1080/17408989.2013.817012>
- Gorse, C., McKinney, I., Shepherd, A., & Whitehead, P. (2006). Meetings: Factors that affect group interaction and performance. Association of Researchers in Construction Management, ARCOM 2006 - Procs 22nd Annual ARCOM Conference. 2. 915-923 https://www.arcom.ac.uk/-docs/proceedings/ar2006-0915-0923_Gorse_et_al.pdf
- Harré, R., Moghaddam, F. M., Cairnie, T. P., Rothbart, D., & Sabat, S. R. (2009). Recent advances in positioning theory. *Theory & Psychology, 19*(1), 5–31. <https://doi.org/10.1177/0959354308101417>
- Hayes, A. F., & Krippendorff, K. (2007). Answering the Call for a Standard Reliability Measure for Coding Data. *Communication Methods And Measures, 1*(1), 77–89. <https://doi.org/10.1080/19312450709336664>
- Hirunyawipada, T., Beyerlein, M., & Blankson, C. (2010). Cross-functional integration as a knowledge transformation mechanism: Implications for new product development. *Industrial Marketing Management, 39*(4), 650–660. <https://doi.org/10.1016/j.indmarman.2009.06.003>
- Hubers, M. D., Endedijk, M. D., Schipper, T. M., De Jong, L., & Corporaal, S. (2021). Learning Communities: Het vormgeven en evalueren van een kansrijke vorm voor

een leven lang ontwikkelen. In J. Kessels & R. Poell, *Handboek Human Resource Development: Organiseren van het leren* (pp. 333–347). LannooCampus.

Hoegl, M., & Gemuenden, H. G. (2001). Teamwork Quality and the Success of Innovative Projects: A Theoretical Concept and Empirical Evidence. *Organization Science*, *12*(4), 435–449. <https://doi.org/10.1287/orsc.12.4.435.10635>

Jeong, H. J. (2017). Rethinking the Assumptions of Chi-squared and Fisher's Exact Tests. *Biometrics & Biostatistics International Journal*, *6*(1). <https://doi.org/10.15406/bbij.2017.06.00159>

Kaner, S., Doyle, M., Kerney, K., Berger, D., & Lind, L. (2014). *Facilitator's guide to participatory decision-making* (Third edition). Jossey-Bass. <http://site.ebrary.com/id/10862685>

Kauffeld, S., & Lehmann-Willenbrock, N. (2011b). Meetings matter. *Small Group Research*, *43*(2), 130–158. <https://doi.org/10.1177/1046496411429599>

Koeslag-Kreunen, M., Van den Bossche, P., Hoven, M., Van der Klink, M., & Gijselaers, W. (2018). When leadership powers team learning: A Meta-Analysis. *Small Group Research*, *49*(4), 475 - 513. <https://doi.org/10.1177/1046496418764824>

Kolb, J. A., Jin, S., & Hoon Song, J. (2008). A model of small group facilitator competencies. *Performance improvement quarterly*, *21*(2), 119-133. <https://doi.org/10.1177/0149206308316061>

Kolb, J. A., & Rothwell, W. J. (2002). Competencies of small group facilitators: what practitioners view as important. *Journal Of European Industrial Training*, *26*(2/3/4), 200–203. <https://doi.org/10.1108/03090590210422085>

Konradt, U., Otte, K. P., Schippers, M. C., & Steenfatt, C. (2016). Reflexivity in teams: A review and new perspectives. *The Journal of Psychology*, *150*(2), 153-174. <https://doi.org/10.1080/00223980.2015.1050977>

- Kyndt, E., Gijbels, D., Grosemans, I., & Donche, V. (2016). Teachers' everyday professional development. *Review Of Educational Research*, 86(4), 1111–1150.
<https://doi.org/10.3102/0034654315627864>
- Lessard, S., Bareil, C., Lalonde, L., Duhamel, F., Hudon, E., Goudreau, J., & Lévesque, L. (2015). External facilitators and interprofessional facilitation teams: a qualitative study of their roles in supporting practice change. *Implementation Science*, 11(1).
<https://doi.org/10.1186/s13012-016-0458-7>
- London, M., & Sessa, V. I. (2007). The Development of Group Interaction Patterns: How Groups Become Adaptive, Generative, and Transformative Learners. *Human Resource Development Review*, 6(4), 353–376.
<https://doi.org/10.1177/1534484307307549>
- London, M., & Sherman, G. D. (2021). Becoming a Leader: Emergence of Leadership Style and Identity. *Human Resource Development Review*, 20(3), 322–344.
<https://doi.org/10.1177/15344843211009632>
- Malhotra, M. K., Ahire, S., & Shang, G. (2016). Mitigating the impact of functional dominance in Cross-Functional process improvement teams. *Decision Sciences*, 48(1), 39–70. <https://doi.org/10.1111/dec.12217>
- Margalef, L., & Roblin, N. P. (2016). Unpacking the roles of the facilitator in higher education professional learning communities. *Educational Research And Evaluation*, 22(3–4), 155–172. <https://doi.org/10.1080/13803611.2016.1247722>
- McFadzean, E. (2002). Developing and supporting creative problem solving teams: part 2 – facilitator competencies. *Management Decision*, 40(6), 537–551.
<https://doi.org/10.1108/00251740210433936>
- McHugh, M. L. (2013). The Chi-square test of independence. *Biochemia Medica*, 143–149.
<https://doi.org/10.11613/bm.2013.018>

- Meirink, J. A., Meijer, P. C., & Verloop, N. (2007). A closer look at teachers' individual learning in collaborative settings. *Teachers And Teaching*, *13*(2), 145–164.
<https://doi.org/10.1080/13540600601152496>
- Meschitti, V. (2018). The power of positioning: How leadership work unfolds in team interactions. *Leadership*, *15*(5), 621–643. <https://doi.org/10.1177/1742715018808905>
- Meslec, N., & Curşeu, P. L. (2015). Are balanced groups better? Belbin roles in collaborative learning groups. *Learning And Individual Differences*, *39*, 81–88.
<https://doi.org/10.1016/j.lindif.2015.03.020>
- Messmann, G., & Mulder, R. H. (2020). A short measure of innovative work behaviour as a dynamic, context-bound construct. *International Journal of Manpower*, *41*(8), 1251-1267. <https://doi.org/10.1108/IJM-01-2019-0029>
- Miller, D. L. (2003). The Stages of Group Development: A Retrospective Study of Dynamic Team Processes. *Canadian Journal Of Administrative Sciences / Revue Canadienne Des Sciences de L Administration*, *20*(2), 121–134. <https://doi.org/10.1111/j.1936-4490.2003.tb00698.x>
- Miranda, S. M., & Bostrom, R. P. (1999). Meeting Facilitation: process versus content Interventions. *Journal Of Management Information Systems*, *15*(4), 89–114.
<https://doi.org/10.1080/07421222.1999.11518223>
- Nelson, T., & McFadzean, E. (1998). Facilitating problem-solving groups: facilitator competences. *Leadership & Organization Development Journal*, *19*(2), 72–82.
<https://doi.org/10.1108/01437739810208647>
- Nosek, B. A., & Errington, T. M. (2020). What is replication?. *PLOS biology*, *18*(3), 1-8.
<https://doi.org/10.1371/journal.pbio.3000691>
- Olopade, J., & Franz, B. (2018). Success factors for cross-functional teams in the construction industry: a literature review [Working Paper Proceedings]. In Bryan Franz & Iva

Kovacic (Eds.), *16th Engineering Project Organization Conference* (p. 512).

<https://cpdlab.dcp.ufl.edu/wp-content/uploads/2020/08/Critical-Success-Factors-for-CFTs.pdf>

Ortquist-Ahrens, L., & Torosyan, R. (2009). The role of the facilitator in faculty learning communities: Paving the way for growth, productivity, and collegiality. *Learning Communities Journal*, 1(1).

<http://digitalcommons.fairfield.edu/cgi/viewcontent.cgi?article=1002&context=cae-facultypubs>

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2013). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration And Policy in Mental Health*, 42(5), 533–544. <https://doi.org/10.1007/s10488-013-0528-y>

Paulus, P. B., Baruah, J., & Kenworthy, J. B. (2018). Enhancing collaborative ideation in organizations. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.02024>

Paulus, P. B., Dzindolet, M., & Kohn, N. W. (2012). Collaborative Creativity—Group Creativity and Team Innovation. In *Elsevier eBooks* (pp. 327–357). <https://doi.org/10.1016/b978-0-12-374714-3.00014-8>

Perezgonzalez, J. D. (2015). The meaning of significance in data testing. *Frontiers in Psychology*, 6. <https://doi.org/10.3389/fpsyg.2015.01293>

Petrone, M. C., & Ortquist-Ahrens, L. (2004). Facilitating faculty learning communities: A compact guide to creating change and inspiring community. *New Directions For Teaching And Learning*, 2004(97), 63–69. <https://doi.org/10.1002/tl.133>

Pineda, S., & Sirota, M. (2018). Determining Significance in the New Era for P Values. *Journal Of Pediatric Gastroenterology And Nutrition*, 67(5), 547–548. <https://doi.org/10.1097/mpg.0000000000002120>

- Pinheiro, M. M., Rebelo, T., Lourenço, P. R., De Sousa, B., & Dimas, I. D. (2022). Dynamics of Team Learning Behaviours: The Effect of Time and Team Culture. *Behavioral Sciences, 12*(11), 449. <https://doi.org/10.3390/bs12110449>
- Raes, E., Decuyper, S., Lismont, B., Van den Bossche, P., Kyndt, E., Demeyere, S., & Dochy, F. (2013). Facilitating team learning through transformational leadership. *Instructional Science, 41*(2), 287-305. <https://doi.org/10.1007/s11251-012-9228-3>
- Raes, E., Boon, A., Kyndt, E., & Dochy, F. (2015). Measuring team learning behaviours through observing verbal team interaction. *Journal Of Workplace Learning, 27*(7), 476–500. <https://doi.org/10.1108/jwl-01-2015-0006>
- Raes, E., Boon, A., Kyndt, E., & Dochy, F. (2016). Exploring the occurrence of team learning behaviours in project teams over time. *Research Papers in Education, 32*(3), 376–401. <https://doi.org/10.1080/02671522.2016.1225793>
- Sauer, N. C., & Kauffeld, S. (2013). Meetings as Networks: Applying Social Network Analysis to Team Interaction. *Communication Methods And Measures, 7*(1), 26–47. <https://doi.org/10.1080/19312458.2012.760729>
- Schinkel, J. (2023). *Exploring the facilitators' behaviour supporting interprofessional learning*. [Master's thesis, University of Twente]. University of Twente Student Theses. <https://essay.utwente.nl/97811/>.
- Schippers, M. C., Den Hartog, D. N., Koopman, P. L., & Van Knippenberg, D. (2008). The role of transformational leadership in enhancing team reflexivity. *Human Relations, 61*(11), 1593- 1616. <https://doi.org/10.1177/0018726708096639>
- Schippers, M. C., West, M. A., & Dawson, J. F. (2012). Team Reflexivity and Innovation. *Journal Of Management, 41*(3), 769–788. <https://doi.org/10.1177/0149206312441210>
- Schippers, M. C., Edmondson, A. C., & West, M. A. (2014). Team reflexivity as an antidote to team information-processing failures. *Small Group Research, 45*(6), 731–769.

<https://doi.org/10.1177/1046496414553473>

Schippers, M. C., Edmondson, A. C., & West, M. A. (2018). Team reflexivity. In L. Argot & J.M. Levine (Eds.), *The Oxford Handbook of group and organizational learning*, (pp. 175–194). Oxford University Press.

Schmutz, J. B., Lei, Z., Eppich, W. J., & Manser, T. (2018b). Reflection in the heat of the moment: The role of in-action team reflexivity in health care emergency teams. *Journal Of Organizational Behavior*, 39(6), 749–765.

<https://doi.org/10.1002/job.2299>

Schneider, K., Klünder, J., Kortum, F., Handke, L., Straube, J., & Kauffeld, S. (2018). Positive affect through interactions in meetings: The role of proactive and supportive statements. *Journal Of Systems And Software*.143, 59–70.

<https://doi.org/10.1016/j.jss.2018.05.001>

Shaw, E., Looney, A., Chase, S., Navalekar, R., Stello, B., Lontok, O., & Crabtree, B. (2010). ‘In the moment’: An analysis of facilitator impact during a quality improvement process. *Group facilitation: a research & applications journal*, 10, 4–16.

Solomon, D. H., Jones, S., Brinberg, M., Bodie, G. D., & Ram, N. (2022). Using Sequence Analysis to Identify Conversational Motifs in Supportive Interactions. *Journal Of Social And Personal Relationships*, 39(10), 3155–3179.

<https://doi.org/10.1177/02654075211066618>

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of educational change*, 7(4), 221–258. <https://doi.org/10.1007/s10833-006-0001-8>

Tan, B., Wei, K., & Lee-Partridge, J. (1999). Effects of facilitation and leadership on meeting

- outcomes in a group support system environment. *European Journal of Information Systems*, 8, 233-246. <https://doi.org/10.1057/PALGRAVE.EJIS.3000335>.
- Topsectoren. (2019). Advies meerjarig onderzoeksprogramma learning communities. <https://www.topsectorenergie.nl/sites/default/files/uploads/Algemeen/Advies%20meerjarig%20onderzoeksprogramma%20Learning%20Communities.pdf>
- Tuckman, B. W., & Jensen, M. A. C. (1977). Stages of Small-Group Development Revisited. *Group & Organization Studies*, 2(4), 419–427. <https://doi.org/10.1177/105960117700200404>
- Van Der Haar, S., Koeslag-Kreunen, M., Euwe, E., & Segers, M. (2017). Team Leader Structuring for Team Effectiveness and Team Learning in Command-and-Control Teams. *Small Group Research*, 48(2), 215–248. <https://doi.org/10.1177/1046496417689897>
- Van Der Want, A. C., & Meirink, J. A. (2020). Facilitator actions in teacher teams. *Professional Development in Education*, 49(2), 257–272. <https://doi.org/10.1080/19415257.2020.1827008>
- Van Maurik, J. (1994). Facilitating Excellence: Styles and Processes of Facilitation. *Leadership & Organization Development Journal*, 15(8), 30–34. <https://doi.org/10.1108/01437739410073083>
- Van Rees, M., Disberg-van Geloven, M., Kornet, A., Corporaal, S., & Endedijk, M. (2022). A first attempt in shaping learning communities for the energy transition. CLIMA, REHVA 14th HVAC World Congress, Rotterdam. <https://doi.org/10.34641/clima.2022.231>
- Van Weeghel, S. (2022). Exploring the role of the facilitator in initiating team learning in learning communities [Master's thesis, University of Twente]. University of Twente Student Theses. <https://essay.utwente.nl/90822/>

- Vashdi, D. R., Bamberger, P. A., & Erez, M. (2013). Can Surgical Teams Ever Learn? The Role of Coordination, Complexity, and Transitivity in Action Team Learning. *Academy Of Management Journal*, 56(4), 945–971.
<https://doi.org/10.5465/amj.2010.0501>
- Viller, S. (1991). The Group Facilitator: A CSCW perspective. In *Springer eBooks* (pp. 81–95). https://doi.org/10.1007/978-94-011-3506-1_6
- Vrikki, M., Warwick, P., Vermunt, J. D., Mercer, N., & Van Halem, N. (2017). Teacher learning in the context of Lesson Study: A video-based analysis of teacher discussions. *Teaching and Teacher Education*, 61, 211-224.
<https://doi.org/10.1016/j.tate.2016.10.014>
- Waş, T., & Skibski, O. (2023). Axiomatic characterization of PageRank. *Artificial Intelligence*, 318, 103900. <https://doi.org/10.1016/j.artint.2023.103900>
- Wenger, E. C., & Snyder, W. M. (2000). Communities of practice: The organizational frontier. *Harvard Business Review*, 78(1), 139–146
- West, M. A. (2000). Reflexivity, revolution and innovation in work teams. *Advances in interdisciplinary studies of work teams*, 5, 1-29.
- Widmann, A., & Mulder, R. H. (2018). Team learning behaviours and innovative work behaviour in work teams. *European Journal Of Innovation Management*, 21(3), 501–520. <https://doi.org/10.1108/ejim-12-2017-0194>
- Wijga, M., Endedijk, M. D., & Veldkamp, B. P. (2023). A social Regulation perspective on team reflexivity: the development of an analytical framework. *Vocations and Learning*.
https://ris.utwente.nl/ws/portalfiles/portal/306189965/s12186_023_09315_0.pdf

Yeo, R. K. (2020). Crossing Knowledge Boundaries: From Team Learning to Knowledge Teams. *Small Group Research*, 51(6), 700–737.

<https://doi.org/10.1177/1046496420919929>

Zaki, N. (2016). PageRank Algorithm to Improve the Peer-Led Team Learning Pedagogical Approach. In *Smart innovation, systems and technologies* (pp. 225–234).

https://doi.org/10.1007/978-3-319-39690-3_20

Appendix A

The coding scheme of the TL-activities and TR-activities (Koekkoek, 2022; Schinkel, 2023).

| Code | Description | Protocol | Example |
|---|--|---|---|
| TL- Collaborative idea generation | Collaborative idea generation is described as creating ideas that effectively address existing needs and challenges in a way that is new and valuable for the work context (Widmann & Mulder, 2018). | Coding within TL will be started when team members discuss the current status of the problem on the work floor, share their thoughts and ideas and approach it from different angles, taking into account the different perspectives of the other participants. Coding will be stopped when this is no longer the case. | F: What do they need though? I mean, we all know this, but what do they need? M: Yes, and yes. Look, maybe those four times don't need either. A start interview and a progress interview and that four times in two years. When I talk to the companies, they all say, that's just not necessary at all. If they know it's going well, just do it all at once. Then just do it at the beginning and take an hour for that instead of 15 minutes. And put the whole pack on the table. And we will discuss how to go about it. M: Yes. F: Yes, and then you have something to monitor, and I have something to ask. M: Yes. |
| TL- Seeking or receiving external feedback or information | Seeking or receiving external feedback or information is described as intentional searching or exchanging for ideas/information/opinions/ with or from external parties outside the team (Edmondson, 1999). These external individuals from outside the team are invited by team members to provide information or engage in discussion with them (Raes et al., 2016). | Coding within TL will be started when individuals from outside the team are joining to explain certain aspects of the subject and when team members discuss to seek external input or feedback. | F: (M) we are very curious to know who you are. M: Yes, I am (M). I have been working at [company] since mid-April, with the title of marketing and communications consultant. I did hear about the learning community, but yes actually it has remained there until now. (M2) had dropped it once of maybe you can still join that so that is the case with this. F: Yes M: And I am very curious, what questions you have and what things are going on that I can join and help with. |
| TL- Experimenting | Experimenting is defined as practicing new behaviour, trying out a new approaches, and engaging in working activities without an intention to learn but still leading to learning (Decuyper et al., 2010; Raes et al., 2016; Bakkenes et al., 2010; Kyndt et al., 2016; Meirink et al., 2007). | Coding within TL will be started when a team member proposes to other members of the team to try out new approaches, and this is implemented during the meeting. | M1: Shall we see what happens if I follow these steps in the system? M2: Yeah, let's try it out. |
| TL- Discussing results | Discussing results is defined as reflecting on the results of experiments and discussing errors and unexpected outcomes of experiments, challenges and errors made on the work floor or where things did not go as planned (Edmondson, 1999). | Coding within TL will be started when a team member reports on actions completed outside of the meetings and share their findings and experiences. In addition, when team members report on errors in the | F: We still have to conclude the series of meetings. M: Well, you guys. F: Yes we, but you too. Yes, we still have to look back, because we started 10 weeks ago with mostly some personal learning objectives. M2 and I collected some learning goals from you guys, we set some collective learning goals. We talked about what we can learn from history, M2 and you prepared that. We talked about the role of a work planner in the |

| | | | |
|-----------------|--|---|--|
| | | activities outside the meetings or when the action delivered unexpected outcomes. | workshop. M3 took us through the impossibilities of prefab. We had another session last week on health and safety. M: That was also a very interesting. |
| TR- Planning | Planning is described as talking about goal setting, how to solve problems, collaboratively discussing the directions of the tasks, converting task directions into a clear plan with scheduling, and assignin task responsibilities (Wijga et al., 2023). | Coding within TR will be started when team members are planning activities or tasks before, during or between meetings or when goals are established for the current meeting, the next meetings or for the entire collaboration. | F: Yeah, I was just wondering, because if we're going to do that for next week, will an hour be enough for us to look at that? M: If you take it apart? M2: If I have to put it together, then no. M3: Well, there are actually two steps. The first is that we just need to be sure which parts it is, and of course it's good that we know something before we start looking, because then we're sitting. |
| TR - Monitoring | Monitoring is described as keeping track on content comprehension, comparing the current state to the planned state (target standard), assessing progress, recognising the tasks still to be completed, and assess the pace and time remaining (Wijga et al., 2023). | Coding within TR will be started when team members discuss or ask questions about the planning and how far they are in the process, wondering what further needs to be completed and assessing if there is enough time to meet the goals that were set. | F: We still had a point open from M. Because you would also try out things within bim360 docs, right? M: That's right, I did that at the time. I put in the closures, but M2 couldn't see that then. But if all goes well, it's possible now. I did just get another notification from M: So maybe he did something too. Is that right R? R: Yes, that's right but I don't know if you can see what I put in, on that pdf. |
| TR - Evaluating | Evaluating is about determine whether a goal was achieved and discussing what could be improved next time (Wijga et al., 2023) | Coding within TR will be started when a team member provides comments regarding achieving the personal or collective goal and statements about what should be done otherwise in the process to reach the common goal more effectively. | F: So, if I kind of summarise it at this point. Then the advantage of this approach is; it's just on the agenda on a weekly basis. So, it gives a kind of pressure. We have to keep going. It comes back every time. So, it doesn't wear out, so to speak. The lines of communication are short, so you hear from each other right away how this is, how that is, what works, what doesn't work. So, you also know what to do. But a lot also comes down to [M]. I also hear that in this project, the preconditions or the ICT preconditions were decisive and if they don't work properly, that also leads to frustration, because you can't actually do what you want to do. And that it also helps if you know as soon as possible what is expected of you, in your work around that issue. So that you also know, can I do this, do I want this, how does it work for me? M: Right. F: So, do you have any tips at this point? If you were to reshape this, maybe continue in a similar way in a sequel, or whatever, what would you definitely want or do differently? |

Appendix B

The coding scheme of the dialogic moves based on the theory of Warwick et al. (2016) and adjustments of Schinkel. (2023).

| Code | Description | Protocol | Example |
|---|---|--|--|
| DM1: Requesting information, opinion or clarifications. | This dialogic move code refers to when facilitators or members asking for clarification, request for opinions or reasoning, and negotiated meaning (Vrikki et al., 2017). This behaviour could entail negotiating meaning and questioning (Warwick et al., 2016). | Similar for <u>facilitator</u> and <u>members</u> | M: Would it be good for your image to maybe just have a whole kettle like that here next time, so you can see how that looks like? |
| DM2: Making positive and supportive contributions | This dialogic move code refers to supportive moves that are not an expression of agreement (Warwick et al., 2016). These supportive contributions could be found verbally (e.g. minimal responses), in the facilitator or member being uncontested and in creating a friendly and relaxing environment (Warwick et al., 2016). | <u>Facilitator and members:</u> "Yes" that is not an expression of agreement. All expression not having any content, but to keep the conversation running or to fill in silences. <u>Members:</u> A "Yes" that does not express agreement. <u>Facilitator:</u> A "Yes" when it falls between the contributions of the team members. Expressions that encourage team members to move on, explaining further, and elaborate on their responses. Expressions that make team members feel supported, such as "I hope you will manage." | M: In any case, what I have already understood from (person) is that he has made an appointment with the boiler contractors who are going to think along in a piece of circularity. F: Yes. M: Because it's important that, as a company, you can want something, but you always have to have sales in line and you have to be able to bring that back somewhere. Where it is made well. |

| | | | |
|--|--|--|---|
| DM3: Expressing shared ideas and agreement | <p>This dialogic move code refers to the expression of shared ideas and agreement, building on each other's ideas and reaching an agreement (Warwick et al., 2016)</p> <p>Building on ideas: Refers to when facilitators or team members build on ideas and when reached an agreement after a difference in opinion (Vrikki et al., 2017).</p> | <p><u>Members:</u> Expressing shared ideas: involves speaking on behalf of the entire group and repeating what a previous member said. Agreement: Responding to questions by agreeing and not providing any arguments. Could also be simply answering "no" to a question when it agrees with what the preceding team member is saying or asking</p> <p><u>Facilitator:</u> Facilitators summaries what team members say as means of closing/ coming to an agreement, but they do not really express shared ideas and agreement.</p> <p>Agreement: when a team member offers a process recommendation (e.g. should we discuss this topic now or later) and the facilitator agrees and guides the discussion that direction.</p> | <p><u>F:</u> Would you want to be able to do that, or is that asking too much of you? <u>M:</u> No, I don't think so, because that is also project related. Some guys have taken cuttings from us. And they've never used that. In projects we outsource that or someone else is going to do that. So, he may have that knowledge, but at that moment it's of no use to him. A lot of our guys in the technical engineering department weld or have the papers to weld, but not all of us can weld. Those are really selective guys, and selective projects, who can weld. <u>F:</u> I think that's the biggest difficulty. What do you point out, who do we put on which projects.</p> |
| DM4: Providing evidence of reasoning | <p>This dialogic move code refers to facilitators or members explaining their reasoning or when they illustrated their opinions (Vrikki et al., 2017) and is used whenever team members or the facilitator explain their arguments (Warwick et al., 2016).</p> | <p><u>Members:</u> Members who provide evidence of reasoning answer questions more elaborate. They provide arguments on the content of the task or when the answer to an informative question is "no", it provides evidence to the group that the team member did not do or knew something.</p> <p><u>Facilitator:</u> The facilitator provides evidence and reasoning arguments at the process level (why do something now or later, explaining the process to the team), or speaking for or on behalf of a team member who is contributing arguments/ input to the discussion and building on each other</p> | <p><u>F:</u> What could you name that you say: looking at the culture, within (Company) and looking at the way how they have been working for years: what would be a challenge? <u>M:</u> Well, turning lack of time into use of time. It's often busy busy busy, but when you see how important the education of those young guys is, more like education alone. So, you just have to prioritise.</p> |

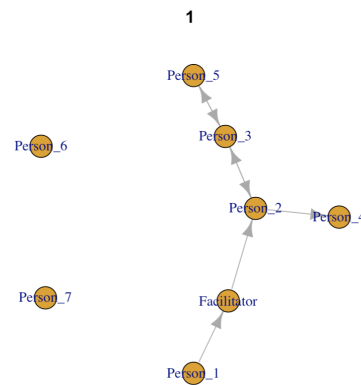
| | | | |
|--|---|--|--|
| DM5: Challenging ideas or re-focusing talk | This dialogic move code refers to challenging ideas or re-focusing talk through positive professional criticism (Warwick et al., 2016). | <u>Members:</u> A member shows challenging ideas or re-focusing talk by giving signs of disagreement like “but”, “in my opinion”, “however”, “on the contrary” and then offer alternative ideas or suggestions etc. | M: Yes, because the students all have to learn the same thing. Whether they go to company A, B or C, it remains the same in that sense M2: Yes, no, but there is a difference there in my part. Then you do talk about a different course where Mechatronics students do different things. M: Well yes, they do, but per course it's the same.... M2: But we can, so to speak, let the company know right away that they have to do this. This is what they are all going to learn with us. |
| | | <u>Facilitator:</u> Refocusing talk: because a facilitator lacks content knowledge, there is little challenging on the topic. Instead they refocusing on another topic or returning to the previous one. | |
| | | Not expanding upon previous ones but rather introducing new ideas, opposing viewpoints, or challenging the latter opinion. | |

Appendix C

Examples of PageRank scores per person and per activity from LC D, with corresponding directed graphs

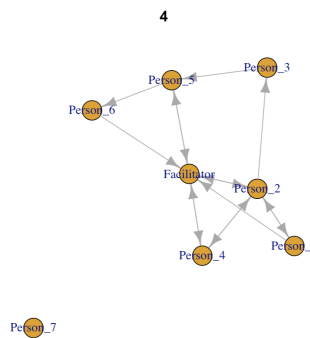
Episode: 1 PL

| | Person | PageRank |
|-------------|-------------|------------|
| Person_1 | Person_1 | 0.04244130 |
| Facilitator | Facilitator | 0.07851641 |
| Person_2 | Person_2 | 0.22506598 |
| Person_3 | Person_3 | 0.27267233 |
| Person_5 | Person_5 | 0.15832704 |
| Person_4 | Person_4 | 0.13809434 |



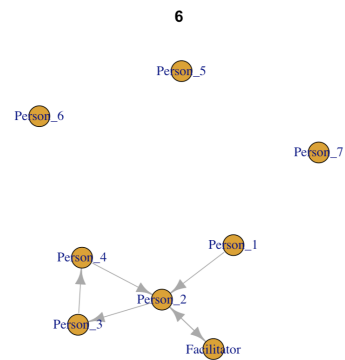
Episode: 4 CIG

| | Person | PageRank |
|-------------|-------------|------------|
| Person_1 | Person_1 | 0.06101139 |
| Facilitator | Facilitator | 0.28618922 |
| Person_2 | Person_2 | 0.18838760 |
| Person_4 | Person_4 | 0.14209833 |
| Person_5 | Person_5 | 0.15392564 |
| Person_3 | Person_3 | 0.06101139 |
| Person_6 | Person_6 | 0.08639742 |



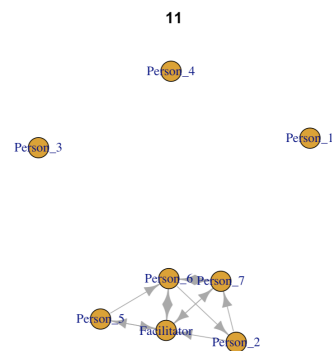
Episode: 6 SREF

| | Person | PageRank |
|-------------|-------------|------------|
| Person_1 | Person_1 | 0.02752294 |
| Person_2 | Person_2 | 0.35452570 |
| Facilitator | Facilitator | 0.17819636 |
| Person_3 | Person_3 | 0.17819636 |
| Person_4 | Person_4 | 0.17898984 |



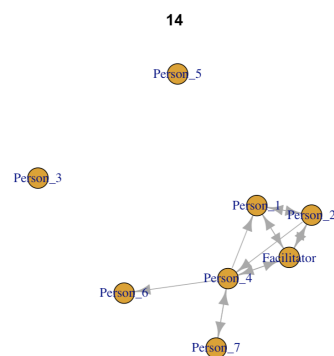
Episode: 11 DR

| | Person | PageRank |
|-------------|-------------|------------|
| Facilitator | Facilitator | 0.26928778 |
| Person_6 | Person_6 | 0.23785485 |
| Person_7 | Person_7 | 0.21155228 |
| Person_2 | Person_2 | 0.09491514 |
| Person_5 | Person_5 | 0.10382114 |



Episode: 14 MO

| | Person | PageRank |
|-------------|-------------|------------|
| Facilitator | Facilitator | 0.20663974 |
| Person_2 | Person_2 | 0.17207929 |
| Person_1 | Person_1 | 0.18609661 |
| Person_4 | Person_4 | 0.20871798 |
| Person_7 | Person_7 | 0.07879288 |
| Person_6 | Person_6 | 0.07879288 |



Episode: 20 EV

Person PageRank

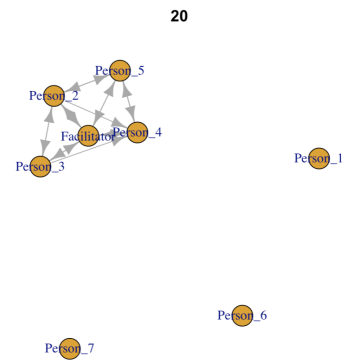
Facilitator Facilitator 0.2370819

Person_2 Person_2 0.1663732

Person_4 Person_4 0.2017276

Person_5 Person_5 0.1989914

Person_3 Person_3 0.113257



Appendix D

Table D1

Average PageRank scores per person and activity LC A

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 | Person 8 | Person 9 | Person 10 | Person 11 |
|--|---------------|----------|----------|----------|---------------|---------------|----------|----------|---------------|----------|-----------|-----------|
| Seeking or receiving external feedback | 0.2857 | 0.0000 | 0.0000 | 0.0000 | 0.2857 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Collaborative idea generation | 0.2344 | 0.0237 | 0.0000 | 0.0402 | 0.1587 | 0.1071 | 0.0453 | 0.0215 | 0.0478 | 0.0065 | 0.0237 | 0.0000 |
| Discussing results | 0.1958 | 0.0823 | 0.0000 | 0.0000 | 0.1844 | 0.0466 | 0.0132 | 0.0424 | 0.0251 | 0.0071 | 0.1077 | 0.0195 |
| Evaluating | 0.2173 | 0.1041 | 0.0000 | 0.0000 | 0.1536 | 0.0000 | 0.0000 | 0.0251 | 0.0783 | 0.0000 | 0.0770 | 0.0966 |
| Monitoring | 0.2062 | 0.1057 | 0.0000 | 0.0000 | 0.1710 | 0.0413 | 0.0117 | 0.0783 | 0.0084 | 0.0228 | 0.1057 | 0.0000 |
| Planning | 0.2338 | 0.0840 | 0.0118 | 0.0376 | 0.1719 | 0.0499 | 0.0346 | 0.0098 | 0.0137 | 0.0067 | 0.0757 | 0.0000 |

Table D2

Average PageRank scores per person and per activity LC B

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 | Person 8 | Person 9 | Person 10 | Person 11 | Person 12 | Person 13 |
|--|---------------|----------|---------------|----------|----------|----------|----------|----------|----------|---------------|-----------|-----------|-----------|-----------|
| Seeking or receiving external feedback | 0.1263 | 0.0897 | 0.1847 | 0.0000 | 0.0359 | 0.0516 | 0.0110 | 0.0599 | 0.0233 | 0.0889 | 0.1311 | 0.0034 | 0.0537 | 0.0000 |
| Collaborative idea generation | 0.0913 | 0.0589 | 0.1793 | 0.0000 | 0.0943 | 0.0812 | 0.0435 | 0.0839 | 0.0316 | 0.0501 | 0.0562 | 0.0000 | 0.0317 | 0.0000 |
| Discussing results | 0.2272 | 0.0775 | 0.1465 | 0.0000 | 0.0247 | 0.0880 | 0.0000 | 0.0197 | 0.0201 | 0.0751 | 0.0623 | 0.0000 | 0.0000 | 0.0000 |
| Evaluating | 0.1556 | 0.1160 | 0.1416 | 0.0000 | 0.0815 | 0.0000 | 0.0000 | 0.0000 | 0.0514 | 0.1016 | 0.1161 | 0.0000 | 0.0000 | 0.0000 |
| Monitoring | 0.2644 | 0.1903 | 0.1903 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Planning | 0.2222 | 0.0687 | 0.1216 | 0.0379 | 0.0333 | 0.0324 | 0.0367 | 0.0567 | 0.0048 | 0.0227 | 0.0351 | 0.0000 | 0.0000 | 0.0342 |

Table D3*Average PageRank scores per person and activity LC C*

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 | Person 8 | Person 9 | Person 10 | Person 11 | Person 12 | Person 13 |
|--|---------------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|---------------|-----------|-----------|-----------|
| Seeking or receiving external feedback | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Collaborative idea generation | 0.1537 | 0.0764 | 0.0937 | 0.0546 | 0.0215 | 0.0143 | 0.0150 | 0.0082 | 0.0108 | 0.1373 | 0.1015 | 0.0283 | 0.0529 | 0.0000 |
| Discussing results | 0.1618 | 0.1029 | 0.0357 | 0.0448 | 0.0000 | 0.0052 | 0.0127 | 0.0000 | 0.0041 | 0.1490 | 0.1796 | 0.0247 | 0.085 | 0.0045 |
| Evaluating | 0.1449 | 0.0474 | 0.0469 | 0.0784 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2027 | 0.1162 | 0.0217 | 0.1174 | 0.058 |
| Monitoring | 0.1367 | 0.0658 | 0.0779 | 0.0350 | 0.0000 | 0.0052 | 0.0000 | 0.0166 | 0.0134 | 0.1469 | 0.2241 | 0.0000 | 0.0626 | 0.0000 |
| Planning | 0.1622 | 0.0237 | 0.0356 | 0.1439 | 0.0000 | 0.0000 | 0.0000 | 0.0156 | 0.0000 | 0.1488 | 0.0318 | 0.0000 | 0.0183 | 0.0569 |

Table D4*Average PageRank scores per person and activity LC D*

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 | Person 7 |
|--|---------------|----------|----------|----------|---------------|----------|----------|---------------|
| Seeking or receiving external feedback | 0.2852 | 0.0092 | 0.1181 | 0.1373 | 0.0597 | 0.0000 | 0.0000 | 0.1923 |
| Collaborative idea generation | 0.2418 | 0.1654 | 0.1658 | 0.0640 | 0.1517 | 0.0807 | 0.0731 | 0.0000 |
| Discussing results | 0.1846 | 0.1022 | 0.0858 | 0.0395 | 0.0284 | 0.0699 | 0.0984 | 0.2603 |
| Evaluating | 0.2371 | 0.0000 | 0.1664 | 0.1132 | 0.2017 | 0.1989 | 0.0000 | 0.0000 |
| Monitoring | 0.2317 | 0.1194 | 0.1736 | 0.0866 | 0.2031 | 0.0000 | 0.0950 | 0.0447 |
| Planning | 0.2704 | 0.1103 | 0.1421 | 0.1559 | 0.0800 | 0.0446 | 0.0343 | 0.0000 |

Table D5*Average PageRank scores per person and activity LC E*

| Activity | Facilitator | Person 1 | Person 2 | Person 3 | Person 4 | Person 5 | Person 6 |
|--|---------------|----------|---------------|----------|---------------|----------|----------|
| Seeking or receiving external feedback | - | - | - | - | - | - | - |
| Collaborative idea generation | 0.2216 | 0.0181 | 0.1538 | 0.1555 | 0.2094 | 0.0590 | 0.0066 |
| Discussing results | 0.2904 | 0.0000 | 0.2741 | 0.0247 | 0.1892 | 0.0000 | 0.0000 |
| Evaluating | 0.3392 | 0.0000 | 0.2638 | 0.0729 | 0.0339 | 0.0727 | 0.0000 |
| Monitoring | 0.3119 | 0.0259 | 0.2530 | 0.1967 | 0.1041 | 0.0000 | 0.0000 |
| Planning | 0.2260 | 0.0279 | 0.2378 | 0.0889 | 0.1167 | 0.0382 | 0.0224 |

Appendix E

Team learning activities

| | | Following dialogic moves member | | | | Total |
|--|--------------------------------------|---------------------------------------|--|----------------------------------|---|----------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | |
| Preceding dialogic moves facilitator | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Challenging ideas and refocusing talk | 3 [4] (-0.38) | 16 [17] (-0.28) | 18 [6] (4.61) | 54 [69] (-1.82) | 13 [8] (1.96) | 104 |
| Expressing shared ideas and agreement | 7 [4] (1.89) | 25 [16] (2.25) | 5 [6] (-0.39) | 52 [63] (-1.56) | 8 [7] (0.34) | 96 |
| Making positive and supportive contributions | 22 [14] (2.01) | 21 [66] (-5.55) | 16 [25] (-1.73) | 309 [266] (2.59) | 33 [29] (0.69) | 400 |
| Providing evidence and reasoning | 14 [10] (1.2) | 101 [47] (7.91) | 31 [17] (3.26) | 121 [189] (-4.94) | 17 [21] (-0.82) | 284 |
| Requesting information, opinion or clarification | 9 [23] (-2.95) | 90 [107] (-1.63) | 24 [40] (-2.49) | 484 [431] (2.56) | 41 [47] (-0.86) | 648 |
| Total | 55 | 253 | 94 | 1018 | 112 | 1532 |

Note. $\chi^2(16)=206, p<.05$

| | | Following dialogic moves facilitator | | | | Total |
|--|--------------------------------------|---------------------------------------|--|----------------------------------|---|----------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | |
| Preceding dialogic moves member | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Challenging ideas and refocusing talk | 8 [6] (0.95) | 13 [5] (3.63) | 15 [21] (-1.22) | 20 [15] (1.4) | 22 [32] (-1.79) | 79 |
| Expressing shared ideas and agreement | 25 [21] (0.96) | 14 [18] (-0.89) | 52 [74] (-2.55) | 80 [53] (3.75) | 110 [116] (-0.55) | 282 |
| Making positive and supportive contributions | 12 [9] (0.85) | 0 [8] (-2.84) | 18 [34] (-2.70) | 39 [24] (3.05) | 59 [53] (0.85) | 128 |
| Providing evidence and reasoning | 69 [74] (-0.62) | 63 [64] (-0.13) | 317 [267] (3.09) | 135 [190] (-4) | 429 [418] (0.54) | 996 |
| Requesting information, opinion or clarification | 1 [4] (-1.75) | 9 [4] (2.36) | 10 [17] (-1.77) | 20 [12] (2.16) | 26 [27] (-0.23) | 64 |
| Total | 97 | 99 | 413 | 294 | 646 | 1549 |

Note. $\chi^2(16)=114.7, p<.05$

| | Following dialogic moves member | | | | | |
|--|--|---------------------------------------|--|----------------------------------|---|-------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | Total |
| Preceding dialogic moves member | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | |
| Challenging ideas and refocusing talk | 25 [36] (-1.77) | 78 [67] (1.39) | 42 [43] (-0.08) | 221 [207] (0.99) | 37 [52] (-2.02) | 405 |
| Expressing shared ideas and agreement | 63 [67] (-0.48) | 126 [125] (0.06) | 41 [80] (-4.36) | 433 [389] (2.24) | 95 [97] (-0.2) | 758 |
| Making positive and supportive contributions | 35 [41] (-0.97) | 13 [77] (-7.31) | 34 [49] (-2.18) | 322 [240] (5.33) | 63 [60] (0.43) | 467 |
| Providing evidence and reasoning | 281 [217] (4.33) | 493 [407] (4.27) | 327 [260] (4.18) | 1004 [1262] (-7.26) | 355 [315] (2.28) | 2461 |
| Requesting information, opinion or clarification | 15 [58] (-5.66) | 75 [109] (-3.25) | 57 [70] (-1.5) | 455 [338] (6.36) | 57 [84] (-2.97) | 659 |
| Total | 419 | 785 | 502 | 2436 | 608 | 4750 |

Note. $\chi^2(16)= 328.7, p<.05$

Note. Formatted as observed [expected] and (Adjusted Residual).

Team reflexivity activities

| | Following dialogic moves member | | | | | |
|--|--|---------------------------------------|--|----------------------------------|---|----------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | Total |
| Preceding dialogic moves facilitator | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Challenging ideas and refocusing talk | 1 [2] (-0.68) | 13 [10] (0.91) | 7 [4] (1.58) | 21 [29] (-1.45) | 7 [4] (1.32) | 49 |
| Expressing shared ideas and agreement | 1 [2] (-0.47) | 8 [8] (-0.09) | 4 [3] (0.46) | 21 [23] (-0.51) | 6 [3] (1.34) | 42 |
| Making positive and supportive contributions | 3 [5] (-0.92) | 11 [26] (-3.01) | 8 [10] (-0.68) | 101 [75] (2.98) | 5 [11] (-1.85) | 127 |
| Providing evidence and reasoning | 15 [6] (3.57) | 47 [32] (2.66) | 15 [12] (0.77) | 59 [91] (-3.36) | 19 [14] (1.49) | 155 |
| Requesting information, opinion or clarification | 5 [10] (-1.64) | 51 [53] (-0.31) | 16 [21] (-0.99) | 168 [152] (1.34) | 18 [23] (-0.95) | 259 |
| Total | 25 | 132 | 50 | 370 | 55 | 632 |

Note. $\chi^2(16)= 73, p<.05$

| Following dialogic moves facilitator | | | | | | |
|--|--------------------------------------|---------------------------------------|--|----------------------------------|---|----------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | Total |
| Preceding dialogic moves member | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Challenging ideas and refocusing talk | 3 [2] (0.56) | 3 [3] (0.29) | 4 [8] (-1.45) | 15[9] (1.87) | 11 [14] (-0.77) | 36 |
| Expressing shared ideas and agreement | 9 [8] (0.24) | 2 [10] (-2.47) | 21 [31] (-1.83) | 46 [36] (1.74) | 60 [53] (0.94) | 138 |
| Making positive and supportive contributions | 3 [3] (0.21) | 3 [3] (-0.05) | 4 [10] (-1.89) | 15 [11] (1.08) | 19 [17] (0.5) | 44 |
| Providing evidence and reasoning | 21 [20] (0.15) | 28 [24] (0.88) | 102 [76] (2.95) | 57 [87] (-3.21) | 129 [130] (-0.07) | 337 |
| Requesting information, opinion or clarification | 0 [3] (-1.59) | 6 [3] (1.77) | 4 [10] (-1.78) | 21 [11] (3.09) | 11 [16] (-1.3) | 43 |
| Total | 36 | 43 | 135 | 154 | 230 | 598 |

Note. $\chi^2(16)= 65$, $p<.05$

| Following dialogic moves member | | | | | | |
|--|--------------------------------------|---------------------------------------|--|----------------------------------|---|----------|
| | Challenging ideas or refocusing talk | Expressing shared ideas and agreement | Making positive and supportive contributions | Providing evidence and reasoning | Requesting information, opinion or clarifications | Total |
| Preceding dialogic moves member | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> | <i>n</i> |
| Challenging ideas and refocusing talk | 4 [4] (0.09) | 10 [11] (-0.18) | 2 [3] (-0.5) | 25 [22] (0.6) | 4 [6] (-0.67) | 46 |
| Expressing shared ideas and agreement | 17 [14] (0.8) | 23 [39] (-2.54) | 10 [10] (-0.14) | 90 [81] (0.97) | 25 [20] (1.01) | 164 |
| Making positive and supportive contributions | 3 [5] (-0.7) | 2 [13] (-2.97) | 2 [3] (-0.74) | 42 [26] (3.11) | 4 [7] (-1) | 54 |
| Providing evidence and reasoning | 37 [32] (0.83) | 121 [90] (3.3) | 30 [24] (1.2) | 142 [188] (-3.33) | 51 [47] (0.56) | 381 |
| Requesting information, opinion or clarification | 2 [8] (-2.21) | 19 [23] (-0.89) | 3 [6] (-1.3) | 67 [49] (2.61) | 8 [12] (-1.22) | 98 |
| Total | 63 | 176 | 46 | 366 | 92 | 743 |

Note. $\chi^2(16)= 71$, $p<.05$

Note. Formatted as observed [expected] and (Adjusted Residual).