



Connectedness and diversity, drivers for collective learning in PLCs

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Abstract

This study examines how diversity and connectedness interact to foster collective learning within Professional Learning Communities (PLCs). Two PLCs, consisting of members from different educational organizations, were followed over three years, with annual interviews analyzed through the lens of value creation and collective learning, to answer the question: "Through what mechanisms does the interplay between connectedness and diversity contribute to collective learning in PLCs composed of members from two educational organizations?" The findings indicate two mechanisms: 1) Immediate value acts as a reciprocal motivator, strengthening connectedness and stimulating collective learning processes. 2) Collective ambition functions as a coordinating mechanism, aligning goals and facilitating learning within heterogeneous, formalized groups. Both value creation and collective ambition act as mutually reinforcing drivers of collective learning: as members experience value, their motivation and connectedness deepen, which in turn fosters further value creation. Likewise, collective attention amplifies these dynamics by continuously aligning members' engagement and learning efforts, creating a recursive system that sustains collective growth. These findings highlight the practical importance of deliberately balancing diversity and connectedness, and they demonstrate how shared ambition and experienced value, such as joy, can enhance collaboration and learning in PLCs, while a lack of both diminishes it.

Keywords: Collective learning, Connectedness, Diversity, PLC, Self-categorization, Value creation.

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Contribution of this paper to the literature

This study is original in its use of three-year, longitudinal interview data from two inter-organizational Professional Learning Communities (PLCs). It uncovers two mechanisms that facilitate the interplay between diversity and connectedness in PLC learning, making it productive and functioning as a self-reinforcing system over time: the creation of immediate value and the construction of collective ambition.

1. Introduction

Participation in Professional Learning Communities (PLCs) contributes to individual and collective learning (Fenwick, 2008) and is therefore often part of professional development programs for educational professionals. In PLCs, educational professionals have the opportunity to connect with colleagues, discuss experiences and challenges, and collaboratively construct knowledge. However, this *collective learning* is not only considered the most fruitful (Shteynberg, 2015) but also the most difficult to achieve (Van den Bossche, Gijselaers, Segers, & Kirschner, 2006). Collective learning is rooted in various scientific fields, including organizational theory, sociology, and psychology (Garavan & Carbery, 2012). It is a form of learning in which a group creates collective knowledge through an inherently social process in a social context (Wenger-Trayner & Wenger-Trayner, 2020). This social context can range from face-to-face interactions to contexts that are fully digitally mediated. Because collective learning is constituted in social interaction, it is essential to understand the dynamics involved in these various settings (Mercer, 2013). This enables individuals to access otherwise inaccessible events, knowledge, and perspectives (Fenwick, 2008). Consequently, more diverse relations provide access to more diverse resources, opening up opportunities for learning, complex problem solving, and collective innovation (Van Knippenberg & Schippers, 2007).

In these processes, the creation of a sense of commonality among diverse learners plays a crucial role. Such commonalities have been described in various ways, including the development of a shared language (Garavan & Carbery, 2012; Mercer, 2013) the emergence of collective attention (Shteynberg, 2015) the formation of a shared frame of reference or social equivalence (Nijland & Vermeulen, 2025) and the cultivation of collective cognition (Van Knippenberg & Schippers, 2007). Together, this sense of commonality constitutes connectedness, which underpins the processes of networking (Wenger, Trayner, & de Laat, 2011) and collective learning (Nijland & Vermeulen, 2025; Shteynberg, Hirsh, Bentley, & Garthoff, 2020).

However, the emergence of collective learning depends on a delicate balance between both connectedness and diversity. While a sense of connection among learners is essential, too much connectedness can stifle innovation and creativity through groupthink (Watson, 2014). Conversely, excessive diversity may lead to conflict and diminish group performance (Bell, Villado, Lukasik, Belau, & Briggs, 2010; Sjoer & Meirink, 2016). Although research on PLCs and collective learning in education has increased over the last decade, the way in which connectedness and diversity interact to support collective learning within educational PLCs remains unclear. The aim of this paper is to shed light on the interplay between connectedness and diversity and how this shapes collective learning.

2. Theory

2.1. Collective Learning and PLCs

A PLC can be defined as a community of learners in which educators collaboratively engage with a shared goal and foster a culture that enhances teaching and learning for all participants (Huffman et al., 2016). Research on PLCs has identified critical factors essential for their effective functioning, such as shared values and goals (Hairon, Goh, Chua, & Wang, 2017) (b) shared personal practices, responsibilities and a focus on student learning (Huffman et al., 2016) (c) shared power through egalitarian dialogue (Garcia-Carrion, Gomez, Molina, & Ionescu, 2017) (d) flexibility and open communication, and (e) a culture of trust and respect among members (Mittendorff, Geijsel, Hoeve, De Laat, & Nieuwenhuis, 2006). These characteristics lead to a sense of connectedness between diverse members (Nijland & Vermeulen, 2025).

In the field of educational sciences, a PLC is characterized by the interplay between individual and collective learning (Hairon et al., 2017; Schechter, 2013). Collective learning is a multifaceted concept, defined as a social learning process occurring within groups (Garavan & Carbery, 2012). Members share a collective ambition and collectively assume responsibility for both the learning process and its outcomes (Van den Bossche et al., 2006). Participation in PLCs stimulates collective learning because collaborative interaction promotes deeper understanding and shared growth (Wenger-Trayner & Wenger-Trayner, 2020).

Collective learning is defined from multiple fields of study (Garavan & Carbery, 2012; Hairon et al., 2017; Shteynberg et al., 2020). In the field of education, it is often characterized as joint participation, which emphasizes collaborative engagement among learners (Sewell, St George, & Cullen, 2013; Wenger-Trayner & Wenger-Trayner, 2020) and collective action, defined as shared efforts towards common goals (Van den Bossche et al., 2006; Van Zomeren, Postmes, & Spears, 2008). Additionally, members' sense of ownership and influence over collective outcomes are seen as vital elements in the collective learning process (Sewell et al., 2013).

In cognitive psychology, collective learning is defined as a process through which new knowledge emerges from the interactions of multiple individuals who focus, think, and learn together. Central to this perspective is the notion of collective attention, which reflects a shared cognitive capacity within a group to establish collective knowledge (Shteynberg et al., 2020). This shared understanding encompasses mutually recognized representations, emotions, and beliefs. The awareness of collective attention can arise through various forms of situational cues, such as communication and observation. According to Shteynberg et al. (2020), collective attention produces three main outcomes: it signals and reinforces common knowledge, it enhances connectedness and social coordination, and it facilitates cognitive collaboration through shared mental representations. Collective attention is considered a situationally influenced mental state, characterized by an individual's experience of jointly attending to a particular aspect of the world from a first-person plural perspective ("we") (Shteynberg, 2015). As such, collective attending can be understood as a situated process, aligning closely with the principles of situated learning theories (Lave & Wenger, 1991).

2.2. Connectedness

The relationship among members of a group can be described by a myriad of concepts, including cohesion, belonging, embeddedness, connectedness, bonds and ties, with the choice of terminology often depending on the scientific field or context (Casey-Campbell & Martens, 2009). In this article, we adopt the term "connectedness" as it specifically captures the reciprocal relationships among group members that emerge and evolve during the process of collective learning. Connectedness stems from the psychological need to belong to a social group (Ryan & Deci, 2017). Individuals are drawn to groups based on perceived similarities with themselves (Mannix & Neale, 2005; Van Knippenberg & Schippers, 2007), leading to self-categorization into certain groups while excluding others (Nijland, Firssova, Robbers, & Vermeulen, 2023; Nijland & Vermeulen, 2025; Reimer, Schmid, Hewstone, & Al Ramiah, 2020). Although individuals in groups follow their own unique paths by fulfilling their personal learning needs and making unique contributions to the community, thereby maintaining a sense of individuality (Ryan & Deci, 2017), this process is thoroughly intertwined with a collective process.

Through self-categorization, individuals undergo cognitive processes of depersonalization, aligning themselves with the in-group and integrating the group into their self-concept. This shared identification with the norms and values of the group is called *collective identity* (Brewer, 2001). The individual perceives themselves as 'we' and 'us' rather than 'I' and 'me'. A collective identity facilitates the coordination of group activities (Shteynberg et al., 2020). Members develop collective knowledge by accumulating shared resources, repertoires, tools, stories, concepts, and perspectives (Wenger et al., 2011). Identification and creation of collective knowledge unfold over time (Srikanth, Harvey, & Peterson, 2016).

Social identification processes consist of three interrelated components: evaluative, cognitive, and emotional connectedness. Evaluative connectedness involves positive or negative attitudes toward the group (Reimer et al., 2020). Cognitive connectedness emerges through collective attention to a subject within a specific context. Emotional connectedness encompasses shared feelings, such as fostering a pleasant atmosphere, mutual respect, a sense of safety and security within the group, and shared responsibility for the collective good, all of which contribute to the development of trust (Bolam, McMahon, Stoll, Thomas, & Wallace, 2005; Nahapiet, Gratton, & Rocha, 2005). Trust can be viewed as a collective emotional framework that influences the group's information processing, communication patterns, and actions. It helps align cognitive connectedness, including the group's frame of reference, goals, and collective behaviors (Wenger et al., 2011).

2.3. Diversity

Diversity can be defined as "any attribute that can identify differences between individuals that are observable by others" (Williams & O'Reilly, 1998). These attributes consist of observable differences, such as demographic characteristics or organizational distinctions, and hidden attributes, such as values, opinions, and expertise (Bell et al., 2010; Van Knippenberg & Schippers, 2007). Diversity is an asset that enhances group outcomes by fostering higher-quality solutions and promoting innovation (Bell et al., 2010; Sundaramurthy & Lewis, 2003). It serves as a significant source of learning, especially when open dialogue and constructive feedback from diverse perspectives are encouraged (Nahapiet & Ghoshal, 1998; Watson, 2014). Heterogeneous groups often outperform homogeneous ones because constructive conflict and debate, which may arise from diversity of expertise, lead to superior outcomes (Mannix & Neale, 2005). However, diversity can also hinder the functioning of PLCs due to the substantial effort required to bridge differences through coordination and communication, which may result in perceived inefficiencies (Marlow, Lacerenza, Paoletti, Burke, & Salas, 2018). Furthermore, diversity can create social divisions, which hinder social identification (Putnam, 2007; Reimer et al., 2020) and may ultimately lead to negative group outcomes (Srikanth et al., 2016). Conversely, a lack of diversity can impede collective learning in contexts where members share similar ideas and backgrounds (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Wenger et al., 2011). The positive effects of diversity appear to be non-linear, resembling an inverted U-shaped curve, in which diversity functions as an asset up to an optimal point (Gourlay et al., 2021).

2.4. Value Creation

Wenger et al. (2011) define learning in PLCs as a situated process of individual and collective value creation. To assess this learning process, they originally identified five cycles of value creation (Wenger et al., 2011).

Cycle 1, Immediate Value: Activities may have inherent value, such as enjoyment, inspiration, or recognition, fostering social relatedness and autonomy.

Cycle 2, Potential Value: Some activities generate "knowledge capital" with potential value, such as information, skills, relationships, or intangible assets like reputation, which may be realized later.

Cycle 3, Applied Value: Changes in practice, such as reusing resources or innovating new methods, constitute value in and of themselves.

Cycle 4, Realized Value: Changes in practice may lead to improved performance, with the value reflected in the achievement of stakeholders' objectives.

Cycle 5, Reframing Value: Social learning can lead to a redefinition of learning goals and success criteria, reframing the value.

These cycles are interconnected, but, as Wenger et al. (2011) state, learning is dynamic, and cycles may not follow a fixed order or cause-and-effect pattern. Value may also fail to be created or may even be negative, in which case learning may be hindered or not occur at all. Negative values can arise in situations involving an overabundance of learning resources (i.e., excessive diversity), which can lead to excessive noise and distractions, or in situations with bottlenecks in accessing these resources (Wenger et al., 2011). They may also stem from an extreme sense of connectedness, where individuals feel pressured to conform and hesitate to share deviating perspectives (Wenger-Trayner & Wenger-Trayner, 2020).

Maintaining a balance between diversity and connectedness in a heterogeneous PLC is a crucial process. When appropriately balanced, PLC members can act as valuable learning resources for one another (Wenger et al., 2011), creating value both individually and collectively. To achieve this balance, a deeper understanding of the factors that promote or obstruct collective learning processes is required, leading to the following research question: "Through

what mechanisms does the interplay between connectedness and diversity contribute to collective learning in professional learning communities composed of members from two educational organizations?"

3. Method

Two PLCs that each spanned three years were studied in depth based on an exploratory qualitative case study design (Strauss & Corbin, 1998). PLC members were interviewed annually about their experiences to gain a comprehensive understanding of diversity and connectedness within each case in relation to the value that was created, allowing for meaningful comparisons between the two PLCs (Maxwell, 2004).

3.1. Context

Two heterogeneous PLCs were constructed based on empirical evidence of key features and critical conditions derived from PLC research, such as organizational support, adequate time and opportunities for collaboration, diversity among members, equality, collective autonomy, respect, and trust (Huffman et al., 2016). The PLCs consisted of six members from two educational organizations: a Primary Teacher Education programme at a University of Applied Sciences (UAS) and an Educational Consultancy Organization (ECO). UAS focused on the education and professional development of primary education teachers at both undergraduate and master's levels. ECO was actively involved in generating and disseminating knowledge to educational institutions, including schools, universities, and colleges.

Three members from each organization were included in each PLC, resulting in six members per PLC, to ensure that the groups remained manageable for their respective organizations while also being large enough to avoid the risk of stagnation in case of member dropout. One individual participated in both PLCs (see Table 1). All members received 80 hours annually. One member in each PLC held the role of facilitator, receiving an additional 40 hours of support. According to Margalef and Roblin (2018) a facilitator is recommended to foster reflection and experimentation among members. The administrators of both organizations formulated focus areas, which served as a starting point for establishing a shared ambition for each PLC. The PLCs spanned three years, during which members collaborated on their distinct topics, Self-Regulation (SR) and Deep Learning (DL), to create both knowledge and tools aimed at improving educational outcomes. Monthly PLC meetings were held based on members' agendas; meetings took place both online via Teams and in person, alternating between UAS and ECO as locations. Part of the PLC process occurred during the COVID-19 pandemic, during which the mode of interaction varied depending on prevailing public health restrictions. The facilitators met with a PLC expert every two months for support.

3.2. Participants

The study included all twelve members of the two PLCs. Participants were both teacher trainers and educational consultants from both participating organizations, at both novice and expert levels. Membership in the PLCs varied somewhat over the three years during which the study was conducted due to personal circumstances, but both PLCs experienced the same degree of member turnover. Table 1 provides an overview of the members and their specifics.

Table 1. Overview of PLC members interviewed, their roles, interview rounds, professions, and home organizations.

Members	PLC	Role	Interview	Characteristics	Profession	Organization
A	1	Member	1	Quit, assigned to other tasks.	Teacher educator	UAS
B	1	Member	1,2,3		Educational consultant	ECO
C	1	Facilitator	1,2	Quit in year 3 due to health reasons.	Sr. educational consultant	ECO
D	1	Member	1,2,3		Teacher educator	UAS
E	1	Member	1,2	Quit in year 3 due to health reasons.	Teacher educator	UAS
F	1	Member	2,3	Joined in year 2 instead of A.	Teacher educator	UAS
G	1&2	Member	1,2,3		Educational consultant	ECO
H	2	Facilitator	1,2	No 3rd interview (Family circumstances).	Sr. lecturer	UAS
I	2	Member	1	Changed jobs in year 2.	Educational consultant	ECO
J	2	Member	1,2,3		Educational consultant	ECO
K	2	Member	1,2,3		Teacher educator	UAS
L	2	Member	1,2,3		Teacher educator	UAS

Note: Members were assigned pseudonyms A to L.

3.3. Procedure

Permission was obtained from the ethics committee of the Dutch Open University for research purposes and procedures, with the reference number U202009418. In three rounds of semi-structured interviews, members' perspectives on their PLC's collective learning process were gathered. The annual semi-structured interview method allowed members to share their experiences and feelings with the interviewer (Galletta, 2013). The interviews lasted approximately 60 minutes, were conducted and recorded online using Microsoft Teams, and were subsequently transcribed manually.

3.4. Measuring Instruments and Materials

A semi-structured interview protocol was used, focusing on individual and collective value creation based on Wenger et al. (2011), five cycles in relation to perceived connectedness and diversity were used (Nijland & Vermeulen, 2025). Table 2 shows the guiding questions, followed by questions focusing on experienced connectedness, concerning aspects of emotional, evaluative and cognitive connectedness, and diversity, concerning aspects such as other members' expertise and perspectives.

Table 2. Value creation cycles and guiding questions in interview format.

Value cycle	Guiding questions
Aspirational Value	What did you hope to achieve in the PLC, both individually and as a group?
Enabling Value	What do you need to achieve these goals, both individually and as a group?
Ground Narrative	What activities with PLC members did you employ, both individually and as a group?
Immediate Value	How did you experience these activities, individually and as a group?
Potential Value	What knowledge, instruments, or insights did they bring to you, individually and as a group?
Applied Value	How did this influence your daily practice as an educational professional, both individually and as part of a group?
Realized Value	How did this affect you, your peers, your pupils, or other stakeholders, individually and as a group?
Transformative Value	What fundamental changes in perspectives, if any, did the PLC bring to you, both individually and as a group?

3.5. Data Analysis

The 28 interviews were analyzed using both data- and theory-driven approaches. Following Creswell (2014) open, axial, and selective coding methods, transcripts were segmented by topic and analyzed. Two authors inductively developed over 100 codes in Atlas.ti 21, based on participants' phrasing (e.g., *giving meaning, shared ambitions, trust, need for collectivity*). Ambiguous data were clarified through microanalysis (Strauss & Corbin, 1998). Across three interview rounds, the code tree was iteratively refined in line with Wenger-Trayner and Wenger-Trayner (2020) latest insights.

During the axial phase, codes were consolidated into broader categories and discussed by all four authors, drawing on two additional interviews, using a consensus-coding approach (Gibbert & Ruigrok, 2010). The resulting categories were integrated and validated to identify overarching themes and their impact on PLC functioning (Kuckartz, 2019). Members were grouped by PLC to enable cross-case comparison. In the selective phase, these comparisons revealed patterns linking connectedness and diversity to value creation, collective learning processes, and collective outputs. Variations between cases were analyzed, with representative quotations illustrating members' perspectives. A full overview of excerpts is provided in Appendices A and B.

4. Results

Table 3 shows how often Members of the Professional Learning Communities (PLCs) reported on their experiences of connectedness and diversity over a three-year period, revealing a clear quantitative contrast between PLC 1 and PLC 2. In PLC 1, factors that stimulated connectedness decreased sharply over time. For example, the sense of "relationship with others" declined from a score of 6 to 1, and the perception of a "shared goal" decreased from 5 to 2. Conversely, hindering factors persisted or increased; "organizational differences" rose from 3 to 4. Trust also declined, with mentions of trust-building decreasing from 3 to 0, while hindering factors related to trust increased from 0 to 2. Additionally, positive immediate value diminished from 6 to 0, whereas negative value increased to 4 in the final year. In contrast, PLC 2 demonstrated consistently high levels of stimulating factors across all dimensions. For instance, the perception of a "relationship with others" remained relatively stable at scores of 5, 4, and 4 across the three years, and the sense of a "shared goal" remained strong with scores of 6, 5, and 4. Hindering factors nearly disappeared in PLC 2. Stimulating diversity indicators increased significantly, and positive value creation expanded across all cycles, culminating in realized and even transformative value by the third year. These figures illustrate a steady deterioration in PLC 1, contrasted with a progressive strengthening of collaboration and value creation in PLC 2, highlighting the divergent trajectories of these two communities over time.

Table 3. PLC members with statements about stimulating or hindering factors on connectedness, diversity and value creation over three years.

Factors	Year	PLC 1			PLC 2		
		1	2	3	1	2	3
Connectedness							
Relationship with others	Stimulating	6	1	1	5	4	4
	Hindering	2	2	2	2		
Trust	Stimulating	3			2	4	2
	Hindering	3		2	2		
Shared frame of reference	Stimulating	4	2	1	6	4	4
	Hindering	1	1		3		
Shared goal	Stimulating	5		2	6	5	4
	Hindering	3	4	3	3	1	
Diversity							
Expertise	Stimulating	2	1		3	5	4
	Hindering	1		2	5		
External frame of reference	Stimulating	3	1	1	3	6	4
	Hindering			2	1		
Organizational differences	Stimulating	2	1	1	2	3	4
	Hindering	3	3	4	3	1	
Value creation							
Immediate	Positive	6	1		6	6	4
	Negative		6	4	4		
Potential	Positive	4	1		4	6	4

Note: For the literal statements supporting this table, see Appendix A-B.

4.1. PLC 1

As shown in Table 3, PLC 1 initially demonstrated several stimulating factors for both connectedness and diversity. However, these diminished over time, while hindering factors and negative value creation steadily increased. Members reported strong immediate value and enthusiasm in the first year, but by the third year, the perceived value was predominantly negative.

From the outset, members described a strong sense of connectedness, largely grounded in pre-existing professional relationships. They emphasized an open, pleasant atmosphere in which "everyone felt invited to participate" (G, H, I, K) and described "experiencing a click" and "being one group" (J, L). As one member summarized: "From the beginning, it went very smoothly; we didn't even have to do introductions" (J). This familiarity created a sense of cohesion and motivation, generating both immediate and potential value. However, it also led to a premature assumption of mutual understanding, reducing curiosity about individual differences and organizational diversity. Because diversity was initially perceived as complementary, it was insufficiently explored by the group. Members rarely discussed their varying ambitions, expectations, or organizational perspectives. While some viewed the contrast between consultancy and education as enriching (G), others saw it as obstructive (J, K, L). Constructing a shared goal proved difficult, despite knowledge exchange and theory discussions (H, I, J, L).

In the second year, frustrations increased as both immediate and potential value declined. The desire for a shared direction grew stronger (J, K, L), but attempts to establish it were hindered by emerging distrust and differing working norms. One educator reflected on this friction: "The speed of consulting work [is problematic]. We [UAS] have an idea, and they immediately pursue it. That holds us back. It has to be more research-based or more substantiated." (J). These differences undermined trust, which in turn reduced emotional connectedness. As distrust spread, demotivation increased, resulting in unfulfilled agreements and withdrawal from joint activities. Members described this as a self-reinforcing cycle: "It frustrates people in the PLC that we are not making progress. Some lose motivation, which results in prioritizing other things, and that causes frustration among others." (G, 2nd round). Efforts to strengthen coordination, such as preparing readings and joint meeting agendas, did not succeed. Members reported a lack of continuity and "collective memory," describing a repetitive process: "Even if only two weeks have passed, we have to look back again; what did we actually do last time?" (H).

In the third year, external experts were invited to help overcome the impasse, but their input did not resolve the lack of direction. As one member explained, "And when we think we have found it... in that process, other perspectives emerge. Then we all feel like we've taken another step back." (G). Increasing distrust between organizations further deepened the divide: "There has been so much distrust from the very beginning... let's hope they [ECO] don't take over too soon." (L)

By this stage, members' language reflected an entrenched "us versus them" perspective. Organizational boundaries had hardened, and practical collaboration had deteriorated: "We [ECO] regularly try to reach out... but the ball just stayed in their court." (G). Members attributed the PLC's stagnation to fundamental differences in organizational culture. These hindrances were amplified by the COVID-19 pandemic and became increasingly difficult to overcome: "Because we work with two institutions with completely different visions, missions, and core businesses, the PLC has been difficult to manage. With COVID-19, it has become even more challenging." (L)

By the end of the third year, participation yielded little positive or developmental value. Connectedness had fragmented into subgroups divided along organizational lines, and diversity had become a source of tension rather than a source of learning. No collective product was realized. The PLC's loss of balance between connectedness and diversity led to a breakdown of trust, motivation, and value creation. Diminishing connectedness undermined learning and collaboration.

4.2. PLC 2

Compared with PLC 1, PLC 2 demonstrated a markedly more positive developmental trajectory. From the first to the third year, members reported an increasing number of stimulating factors for both connectedness and diversity (see Table 3). While initial interviews revealed mixed experiences, by the third year, nearly all participants described exclusively stimulating factors. Similarly, negative value creation disappeared entirely over time, and four of the five value cycles were consistently reported as positive by all members.

At the outset, PLC 2 members described limited familiarity with one another: "I find it quite difficult so far, also because we are different people, but that's okay; you learn a lot from that too" (B). Initially, this diversity produced some tension and immediate negative value. However, members gradually began to recognize these differences as a source of learning. As one member reflected, "We all have different backgrounds and specialties. That's also its value. On the one hand, you don't catch up quickly, but on the other hand, you're challenged to explore things more deeply" (E). Over time, this reframing of diversity as a resource rather than a barrier fostered both emotional and cognitive connectedness.

Members made a deliberate effort to establish a shared goal that could unify them. They planned joint activities, such as collectively reading a book and discussing its implications for educational practice, which played a key role in this process (B, C, D). The shared goal ultimately resulted in creating a strong sense of ownership and became a pivotal moment in the development of the Professional Learning Community (PLC). Members described it as a turning point that increased commitment, improved workflow, and fostered synergy: "Everyone was committed to it. This is our product, our project. That sense of ownership fostered a sense of collectivity, making it easier to coordinate efforts and identify individual contributions" (E).

In the second year, the facilitator intentionally invested in building interrelationships and trust (C). Members emphasized the value of informal, relational practices such as beginning meetings with "a round of news and gossip," which enhanced a sense of safety and authenticity: "It's also just interest, genuine, in the relationship. I think that's conditional for this group" (C). These interactions supported the emergence of a psychologically safe climate that deepened both emotional connectedness and collective attention.

By this stage, members reported virtually no hindrances related to connectedness or diversity. Cross-organizational collaboration was described as fluid, stimulating, and productive: "Working with the other organization is both fascinating and seamless" (B, G). Members valued the diversity of perspectives for keeping discussions sharp and maintaining quality (D). Working in mixed pairs was considered particularly beneficial,

offering greater depth and encouraging critical reflection (F, D). The PLC also invited an external expert on inter-organizational collaboration, which members described as a major step forward: "It really led to scientific underpinning for our product" (C).

In the third year, members intentionally leveraged individual strengths and organizational diversity. As one member explained, "C is really very theoretically inclined... and I find it very interesting to translate that theory into practice. We began to consider what suits whom and how to structure it accordingly" (B). This deliberate alignment of tasks to personal and professional strengths reinforced both motivation and mutual respect.

The group tested the prototype of their co-created product on themselves. This process required vulnerability but was described as both valuable and enjoyable. Members recognized the potential value of the tool for both organizations: "ECO can use it in training courses... We (UAS) need to tweak it a bit, but we'll use another meeting for that" (F). Iterative testing and reflection led to further refinement, and the final product was presented at the closing project meeting.

As PLC 2 concluded, members expressed mutual appreciation through informal gestures and humor. One member recalled, "We had crafted a box with our own cues as a joke to say thank you... It was really nice because you also know the other person worked very hard and kept their commitments" (F). These expressions of mutual recognition reflected the depth of emotional and cognitive connectedness achieved by the group. Members also reported increased immediate and potential value through ongoing collaboration and learning: "We went to lunch together, and afterwards it was like: Oh yeah, we've got this now... there's actually quite nice contact within our PLC" (B). Aside from the collective product they created, members described individually realized value, such as the integration of new knowledge into their teaching (D), new training practices (G), and different professional presentations (F).

4.3. Patterns

The development of a collective ambition emerged as a critical coordination mechanism. PLC 2 illustrated that initial connectedness can be leveraged to co-construct a collective ambition, which in turn strengthens both emotional and cognitive connectedness in a self-reinforcing cycle. The emergence of a collective ambition marked a turning point: once members saw the product as "our project," motivation increased, and cooperation became self-sustaining. In PLC 1, the absence of such a collective ambition reinforced fragmentation. PLC 1, lacking a collective ambition, failed to align efforts or achieve meaningful collaboration. The data thus suggest that collective ambition does not merely result from connectedness but also reinforces it in a recursive cycle.

PLC 1 produced little to no positive value after the first year; its immediate value dropped from six to zero. In contrast, PLC 2 maintained consistently positive immediate and potential values, culminating in applied, realized, and even transformative value by year three. This indicates that both immediate and potential values can serve as outcomes and drivers of collective learning. The interaction between connectedness and diversity creates conditions conducive to value emergence. Once members begin to experience positive immediate and potential value, it reinforces motivation, trust, and engagement. Connectedness fosters psychological safety and shared commitment, while diversity enhances learning through contrasting perspectives. When value is perceived as meaningful and shared, it strengthens both connectedness and motivation, sustaining the "vital space" where learning and innovation can continue to grow. Conversely, when this positive feedback loop breaks down as observed in PLC 1 motivation declines, collaboration becomes fragmented, and learning stagnates.

5. Conclusion and Discussion

This study examined the roles of diversity and connectedness in relation to value creation and their influence on shaping collective learning within professional learning communities (PLCs) composed of members from two educational organizations. By comparing two PLCs with similar contexts and conditions, the study addressed the research question: "Through what mechanisms do the interplay between connectedness and diversity contribute to collective learning in PLCs composed of members from two educational organizations?"

Members of PLC1 initially experienced strong connectedness and positive collaboration, but over time, this diminished as subgroups formed along organizational lines. Diversity, which initially provided stimulation and new perspectives, became a hindering factor as deep-seated organizational and cultural differences emerged. In contrast, PLC2 initially struggled with diversity, but through deliberate facilitation and the gradual building of trust, members developed productive collaboration and increasingly positive perceptions of value creation. By the end of the process, PLC2 exhibited strong connectedness, effective use of diversity, and collective learning outcomes across four of the five value cycles.

The trajectory of PLC 1 aligns with Srikanth et al. (2016) findings suggest that surface-level diversity can initially enhance coordination and information-sharing processes within groups. However, deep informational differences, which are not immediately visible, may fail to trigger coordination mechanisms and, over time, can lead to ineffective group functioning. Such inefficiencies often remain undetected in the short term but become apparent over time (Srikanth et al., 2016). This aligns with boundary-crossing theory (Akkerman & Bruining, 2016), which identified four mechanisms of learning across organizational boundaries: identification (understanding one's identity relative to another organization), coordination (establishing shared artifacts for collaboration), reflection (gaining insight into the other organization's perspective), and transformation (mutual change for enhanced collaboration). In PLC 1, self-categorization processes failed to foster a collective identity (Reimer et al., 2020; Shteynberg et al., 2020) instead amplifying perceived differences between the two organizations. Although the mechanism of identification occurred, it was not followed by coordination. Toward the end of the PLC's timeline, the boundaries between the organizations solidified into differences perceived as insurmountable.

The process observed in PLC 1 supports prior research suggesting that surface-level diversity may initially enhance coordination, but that deep informational or cultural differences can later hinder group functioning (Srikanth et al., 2016). While members recognized organizational boundaries and attempted identification, subsequent coordination and reflection were limited, preventing the development of a shared understanding or transformation (Akkerman & Bruining, 2016). The absence of a collective identity and coordination processes led

to fragmentation and declining motivation.

Trust appeared to be an important factor. In PLC 1, initial trust eroded over time, leading to cautious behaviors; members described "holding back a bit" and the use of divisive language ("we" versus "they"). This inhibited both emotional and cognitive connectedness, resulting in the collapse of collective ambition and perceived value. Conversely, PLC 2's facilitator intentionally fostered trust by establishing shared routines, creating space for informal conversations, and promoting a positive, inclusive climate. These actions enabled the formation of shared language, knowledge, and culture, functioning as the "social glue" (Wind, Klaster, & Wilderom, 2021) that supported sustained collaboration and collective learning.

The contrasting outcomes between the two PLCs align with findings that increased connectedness has a strong motivational impact, enhancing perceived immediate value, while a decrease or lack of connectedness has the opposite effect (Gevers, Li, Rutte, & van Eerde, 2020). Common knowledge plays a critical role in facilitating coordination processes, and both coordination and motivational processes such as the perception of immediate value are strongly interrelated (Braun, Kozlowski, Brown, & DeShon, 2020). In this study, these processes mutually reinforced either positive outcomes (PLC 2) or negative ones (PLC 1).

Diversity within PLCs can serve as a powerful resource; through argumentation, discussion, and clarification, members work toward collective understanding (Van den Bossche et al., 2006). This process fosters the creation of a collective frame of reference by connecting members' varied personal views, experiences, norms, and values (Huffman et al., 2016). However, integrating diverse perspectives into new knowledge requires trust among members (Hudson, 2023). In PLC 2, the facilitator intentionally nurtured trust by establishing shared work routines, setting agendas, allocating time for informal conversations such as "news and gossip," and fostering a positive atmosphere. These actions contributed to the development of shared language, knowledge, and culture, which acted as the "social glue" binding the PLC network together (Wind et al., 2021).

In contrast, PLC 2 succeeded in achieving this balance by fostering both cognitive and emotional connectedness while leveraging diversity as a source of energy and motivation. This created a self-reinforcing system: greater motivation led to increased experienced value, which, in turn, deepened emotional and cognitive connectedness. The process highlights the critical role of formulating a collective ambition as a key coordination mechanism essential for enabling collective learning.

Additionally, the interplay between connectedness and collective ambition appears to operate as a mutually reinforcing system, rather than a linear process as suggested by Shteynberg et al. (2020). In PLC 2, some initial connectedness was necessary to formulate a collective ambition, which further strengthened emotional and cognitive connectedness. This recursive relationship underscores the complexity of these dynamics. Further research is needed to deepen our understanding of the intricate interplay between connectedness, diversity, and collective learning processes.

A crucial finding is that collective ambition, an artifact of connectedness, acts as an expression of collective attention (as defined by Shteynberg et al. (2020)) and serves as a coordination mechanism. Its absence can hinder group processes. This aligns with existing literature that emphasizes the importance of collective goals in more formalized groups (Garavan & Carbery, 2012; Wenger-Trayner & Wenger-Trayner, 2020). However, positioning collective ambition within collective attention is novel, extending Shteynberg et al. (2020) who frame collective attention as a linear process leading to collective knowledge. In contrast, our data suggest that these processes are reciprocal and intertwined, making it difficult to establish causality. To facilitate PLCs, it is suggested that establishing trust for instance, through informal talk and working on collectively creating and understanding a shared ambition could be key components of successful functioning.

The divergent trajectories indicate that merely assembling professionals does not automatically produce an effective PLC where collective learning emerges (Nijland & Vermeulen, 2025). Despite adhering to established design principles, participation in both PLCs was partly obligatory, which influenced the processes of identification and knowledge construction. As a result, group dynamics differed from those observed in voluntary learning collectives (Shteynberg et al., 2020; Wenger-Trayner & Wenger-Trayner, 2020).

A central insight is that both value creation and collective ambition function as reciprocal drivers of collective learning. Once members begin to experience immediate and potential value, their motivation and engagement increase, deepening both cognitive and emotional connectedness. This heightened connectedness, in turn, fuels further value creation, establishing a positive feedback loop. Similarly, collective ambition operates both as a product and a catalyst of connectedness. In PLC 2, the gradual emergence of a collective ambition strengthened members' identification with the group and aligned diverse perspectives toward common goals. Together, value creation and collective ambition formed a reinforcing system that sustained collaboration, trust, and motivation over time. This finding extends Shteynberg et al. (2020) by suggesting that collective attention, ambition, and value creation interact in reciprocal rather than linear ways. For practice, this implies that facilitators should actively nurture trust, make emerging value visible, and guide groups in co-constructing collective ambition through informal dialogue and shared reflection to sustain motivation and learning.

6. Limitations

This study has inherent limitations. First and foremost, although in-depth, only two PLCs were studied. The coding process employed was thorough, systematic, and transparent. Discrepancies in interpretation were resolved through discussion among the authors. However, coding remains an intersubjective process. The study was confined to two PLCs originating from the same organizations over the same period, enabling direct comparison. However, this scope limits the generalizability of the findings, as PLCs with different compositions or organizational foundations may exhibit distinct processes. Therefore, the results should be interpreted as theories regarding the mechanisms between connectedness and diversity that shape collective learning. These theories warrant further research.

Second, the members were interviewed via digital means to capture their experiences within a PLC. Although the interviews were conducted diligently, the one-hour time frame sometimes limited in-depth exploration of all topics. Notably, in the third round of interviews, the facilitator from PLC 1 could not participate due to family

circumstances, which resulted in an absence of insights from this role in the PLC process.

To interpret the findings, empirical evidence from various fields was integrated, including cognitive sciences (Gevers et al., 2020; Shteynberg et al., 2020), social psychology (Tajfel, 1981), team learning, organizational sciences (Akkerman & Bruining, 2016; Van den Bossche et al., 2006; Van Knippenberg & Schippers, 2007), and situated learning theories (Wenger-Trayner & Wenger-Trayner, 2020). This interdisciplinary approach highlights the multifaceted nature of diversity, connectedness, and value-creating processes in social learning.

Future research should explore this fragmented field more deeply, integrating diverse perspectives to better understand the complex dynamics that foster or hinder collective learning. Developing a comprehensive concept that synthesizes current insights could enhance the functioning of learning communities, particularly those involving members from multiple organizations.

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Appendix A. Connectedness.

Table A1. Overview of findings regarding the perceived connectedness in PLC Self-Regulation (SR), interview rounds 1, 2 and 3.

	SR interview round 1	SR interview round 2	SR interview round 3
Relation	Stimulating Colleagues know each other and are interested in each other (H) A click is experienced. (J) Fine cooperation. (I)	The relationship is experienced (G)	Started with a personal conversation and then immediately went into depth. That was okay. (G)
	Bottleneck Perhaps it is better to have a group that still needs to get to know each other. (L) A person is absent a lot. (I) Pleasant collaboration, but still have the feeling "is there more needed?" (L)	Relationship is experienced differently (J) "No Flame" (K) Nice to work together, but it would be even more fun if I could also use it myself (J)	The PLC members know each other well, that should work, but perhaps there is an old sore. (L) The changes in the team. (L)
To trust	Stimulating PLC feels familiar (L) Building trust together and the experiences with each other are positive. (K) Candid conversations. (K)		
	Bottleneck Images of each other live. (L) There is distrust of each other. (L) There is confidence in the process, connection between the organizations is in its infancy (I)		
Shared frame of reference	Stimulating Conversations are valuable. (J) Joint association with input from each individual. (H) Knowledge creation, knowledge sharing, and joint theoretical exploration take place. (I) The interaction ensures triple loop learning (L)	We have defined the term "this is what we mean by it". (L)	Drawing and sketching together will take you a lot further. This made it a little more concrete and defined. (J) We find each other on content, that is the connecting factor. (G)
	Bottleneck Tipping each other on articles is done. This is from sending, not questioning. (J)	When we go into depth, we may disagree on fundamental matters (H)	
Common goal	Stimulating We have a common goal. (G) Formulating ambition is helpful. (I) Discussed in your own organization, then put goals together and the same conclusion... that's great. (H) Knowing where we are going. (H) The joint vision has been agreed upon in the PLC. (L)		

	SR interview round 1	SR interview round 2	SR interview round 3
Bottleneck	Delay due to changes. (J) Staying stuck in theory for too long provides no concreteness. (I) New members take a step back. (J)	No shared goal yet feels "swimmy". (L) Feeling: "not working towards the same goal" (K). The framework is not clear: Student or teacher perspective. (G)	Need: become concrete and results-oriented faster. (J) Feeling of being "sent into the woods with a ball", there was no real common interest. (K) There is competition after all. It is not possible to come up with something together. (J)

Table A2. Overview of findings regarding perceived connectedness in PLC Deep Learning (DL), interview rounds 1, 2, and 3.

	DL interview round 1	DL interview round 2	DL interview round 3	
Relation	Stimulating	There is a nice atmosphere. (D) There is respect for each other. (E) It is the phase of getting to know each other. (B) Careful contours are visible/sidewalk chalk unit (C)	There is a pleasant way of working, based on relationships (E) There is time for lightheartedness and jokes (B) There is a balance between formal and informal (D)	Good atmosphere (F) Attention to the personal part. (F) PLC rounded off with lunch. (B) Interest in each other. (D)
	Bottleneck	There is a better connection with some people than with others. (B) The way of working is new and is experienced as exciting. (E)		
To trust	Stimulating	Knowing who takes which role creates trust. (B) There is confidence in the PLC process. (E)	It feels safe. (F) There is trust in each other and in each other's contribution (E) Pleasant collaborative culture with mutual trust. (G)	Everyone feels safe. (F) You are taken seriously (F) You can be vulnerable (B)
	Bottleneck	PLC members are still reluctant and do not take the lead. (C) People do not yet have the confidence in each other as they do in their own colleagues. (B)		
Shared frame of reference	Stimulating	Process from individual to joint understanding formation. (E) There is a joint approach (mind map, recording of contents). (B) The direction is determined together. (D) Nurturing each other philosophically. (A)	We get to know each other's values and motivations. (C) The decision has been made with the choice of the Q- sort. We are on the same page. (F) The framework we stand behind together is clear; there is no doubt. (G)	Proceeds for both target groups, keeping each other alert. (G) Sharing ideas, entering into dialogue and sparring with each other. (D) Talk to each other by placing the prototype in the PLC. (F) with the team tie, which gave great insights. (B)
	Bottleneck	Going around in circles: you can continue the conversation... There is always a different perspective (1.1)		
Common goal	Stimulating	Choice of a topic that can be bridged. (C) As it becomes more concrete, an image forms. (G) We are now going to work towards something...this was also the need. (B) We found each other in terms of returns on knowledge and product. (E)	Stability provides motivation. (G) Joint product development: meaningful and fruitful collaboration. (E) All PLC members can explain the choice. (B) A common goal provides depth, research in literature and contact "external expert". (F)	"This is where we're going" was a turning point. (B) A concrete goal is nice (F) Ensures workflow and synergy. (D) Teamtie was the main goal, and a selfie was added as an additional element. (B) A concrete goal ensures concrete agreements. (F)
	Bottleneck	Being stuck in your "head" for too long...turn the switch (B) Talking slowed down (A) Feeling of "what now?" (C)	There was no real assignment. Only two sub-themes were provided. (E). The follow-up wish "selfie" has been delayed due to corona.	

Appendix B. Diversity.

Table B1. Overview of findings regarding the perceived diversity in PLC Self-Regulation (SR), interview round 1, 2 and 3.

Diversity	SR interview round 1	SR interview round 2	SR interview round 3
Expertise	Stimulating	Who fits in terms of content, load capacity, travel distance? (I) The differences in approach provide balance. (K) There is a difference in work and experience. (I)	The different angle. (L)
	Bottleneck	People in PLC who do not fit in with the PLC in terms of expertise and interest. (K)	Difficult to work together with six people. (K)
	Stimulating	Literature is consulted. (I – G) A teacher may be involved for the practical perspective. (H)	Let people from outside listen in. (L) Interviews held to break the impasse. (L)
	Bottleneck		Questioning people gives a different perspective, which puts the PLC a step back. (G)
External frame of reference	Stimulating	The change is nice and it's always nice to have 2 perspectives: commercial and training. (G) They have a lot to offer each other and provide the same training. (L)	ECO members do not get hours for the PLC. This was an eye-opener (L)
	Bottleneck	Searching to combine two worlds: speed of educational consultancy and doing research. (J) In the past it has not been possible to tackle something together (K) There are concerns: "What are we going to do with implementation?" (L) There are interests that come into play. (L)	ECO members do not prioritize PLC. (K) Disappointment by: Matters were selected per organization, when sharing, there was a different vision and elaboration detail. (K)
	Stimulating		Working individually on the goal in connection with the need to become more concrete and results-oriented faster. (J) Feeling that PLC members from ECO no longer feel like it. (K) Difference in profit and nonprofit organization and time investment "invoice comes before PLC. (L)
	Bottleneck		
Working together based on diversity	Stimulating		
	Bottleneck		
	Stimulating		
	Bottleneck		

Table B2. Overview of findings regarding perceived diversity in PLC Deep Learning (DL), interview rounds 1, 2 and 3.

Diversity	DL interview round 1	DL interview round 2	DL interview round 3	
Expertise	Stimulating	Fascinating other people with different perspectives. (D) Different perspectives are interesting. (A) Everyone has a different background, which challenges you to read, research and engage in conversation. (E)	The mix of people and other institutions is pleasant. (E) Fascinating: collaborating with another organization and running smoothly. (F) Good synergy and addition in the specialty. (E)	Equality in input from everyone's expertise. (F) Interesting to look at it from different angles. (G) Everyone brings their own perspective, valuable for sparring with each other and entering into dialogue. (D)
	Bottleneck	Colleagues with expertise that is not needed. (C) Information advantage of one of the PLC members causes influence and a less open mind in the PLC (A). Difficult progress due to differences in personality (B) Difference in PLC members: need for guidance versus broad conceptual thinking. (C)		
	Stimulating	Contacts have been made with Fullan and Quinn. (G) Theoretical models are sought. (D) Internet and books consulted (A)	Discussions with an external expert. (G) Connection 1 between research and science with input from an external expert and stimulus from M. Vermeulen (C). Check for input and a critical view from the outside. (D) Speaking to someone personally adds nuance to what you read. (F)	Used the theory external expert, and made an appointment with him (G) Literature: Fullan (F) Input from trying out in practice and with students (D, B & F) PhD research by colleague (D)
	External frame of reference			

	Bottleneck	There is not much literature available. (G)		
	Stimulating	Deploying strength "from training to further education". (B) The difference in approach, route and profiling of the organizations is not negatively noticeable in the PLC. (D) Consult within your own organization to accelerate and feed the PLC (E)	Adjustments to make collaboration even easier: share point, physical contact, adjusting time, or email contact. (B) Preparation for meeting pairs (D) Teams from ... and ... are asked for this, which provides a broader perspective. (C)	Conscious choice for working in mixed pairs between the organizations. Provides you with a different level of thinking and stepping out of your own world. (F) Stimulating sense of competition: a bit of John Lennon and Paul McCartney. Not wanting to be inferior to each other (D)
Working together based on diversity	Bottleneck	Conversations are still mainly within the own organization (G) There is a nuance in transparency when sharing internally or with a collaboration partner (C) Prepare in your own setting, not over the walls. (D) It's annoying...how do you operationalize something for both contexts? (E)		