Do teachers' educational beliefs affect the relationship between departmental leadership and PLC characteristics?

Abstract

This study explores whether the relationship between departmental leadership (i.e. group-oriented and development-oriented departmental leadership) and interpersonal professional learning community (PLC) characteristics (i.e. collective responsibility and reflective dialogue) varies across departments, depending on whether teachers hold traditional or constructivist beliefs. Data are collected through an online survey with 197 French teachers in 30 French departments in 26 Flemish (Belgian) secondary schools. Data is analysed using multi-group path analyses. The results show that there are no differences in the relationship between departmental leadership and interpersonal PLC characteristics in departmental PLCs in secondary schools, depending on teachers' educational beliefs. Furthermore, the results reveal that teachers with a group-oriented department head experience more collective responsibility and report a higher frequency of reflective dialogue in their department.

1. Introduction

Given recent changes in education (e.g. ICT and self-regulated learning), it is essential for teachers to co-evolve as well (Hargreaves, 2000). Parallel to many other educational contexts, in Flanders, this has led to the importance of teachers' continuous professional development (Stoll et al., 2006; Vangrieken et al., 2015). Teachers' professional development is necessary to help teachers cope with the complexity of the profession and the many demands and challenges they experience (Vanblaere & Devos, 2018). In other words, teachers' professional development can improve the quality and practice of teaching, however teachers differ greatly in the extent to which they are engaged in their own professional development (de Vries et al., 2014). There has been an increase in research into teachers' professional development, and in recent years ever more attention has been paid to the role played by collaboration with colleagues, often termed professional learning communities (PLCs) (Valckx et al., 2018, 2019; Van Meeuwen et al., 2020; Vanblaere, 2016). PLCs seem promising contexts as they can help create an environment in which teachers' professional development is encouraged and supported (Stoll et al., 2006; Valckx et al., 2018, 2019; Vangrieken et al., 2015). Since the context of this study is secondary education, and secondary schools are organised into departments, this study investigated the extent to which a department can function as a PLC (Lomos, 2012; Valckx et al., 2018, 2019; Vanblaere & Devos, 2018). However, according to Verbiest (2008), the educational research literature has not yet fully explored the importance of departmental PLCs and the ways in which these PLCs can be facilitated in secondary schools.

Until now, research into how to facilitate PLCs in schools has strongly focused on principal leadership (Leithwood et al., 2020; Stoll et al., 2006). Although, PLCs are often studied at the department level in secondary schools (Huberman, 1993; Lomos, 2012), the potential of department heads to facilitate departmental PLCs remains scarce (Vanblaere & Devos, 2018). Moreover, existing research into factors influencing teacher participation and collaboration in PLCs has paid limited attention to the effects of teachers' beliefs (de Vries et al., 2014). Teachers' educational beliefs or how teachers think about 'good' education seem to have a strong influence on how teachers deal with changes and innovations (Hermans, 2009; Organisation for Economic Co-operation and Development [OECD], 2009), and how they collaborate and learn (OECD, 2009). Many researchers (e.g. Belo et al., 2014; van Driel et al., 2007; van Manen, 2008) have pointed to the need to include teachers' educational beliefs to better understand what hinders or facilitates changes and innovations, teachers' professional development and their collaboration in PLCs. Therefore, this study aims to fill these research gaps by examining how departmental leadership is associated with departmental PLCs, considering teachers' educational beliefs. Research into teachers' educational beliefs tends to comprise two main orientations: (1) a traditional and (2) a constructivist orientation (Van Driel et al., 2007). Several researchers (OECD, 2009; van Veen &

Sleegers, 2006; van Veen et al., 2001) regarding teacher participation and collaboration in departmental PLCs have suggested that collaboration with colleagues is positively related with constructivist beliefs and negatively related with traditional beliefs. However, since teachers will inherit characteristics from both orientations (de Vries et al., 2014), the present study explores whether teachers can be grouped based on their belief structure and whether and how the identified belief structures are related to the relationship between departmental leadership and departmental PLCs. The lack of research into the relationship between teachers' belief structures and their participation and collaboration in departmental PLCs makes this study necessary.

2. Theoretical framework

2.1. PLC characteristics

The concept of PLCs comes from the work of Little (1982) and is mainly derived from qualitative studies that have further elaborated the concept of teacher collaboration in the field of school reform (Lomos, 2012; Vanblaere, 2016). Although various characteristics were associated with a PLC, it was previously seen as a one-dimensional concept (Lomos, 2012; Vanblaere, 2016). Subsequent studies have operationalised PLCs from a multidimensional perspective, with various characteristics (Lomos, 2012; Vanblaere, 2016). However, researchers differ significantly in their definitions of a PLC and in the dimensions used to operationalise a PLC (Sleegers et al., 2013). This study is based on the existing international consensus to describe a PLC as '*a group of people (i.e. teachers) who share and critically question their practice (i.e. teaching practice) in an ongoing, reflective, collaborative, and inclusive, learning- and growth-oriented way*' (Stoll et al., 2006, p.223). Additionally, this study uses Mitchell and Sackney's (2000) conceptual model of PLCs to operationalise the concept. Their model consists of three interrelated dimensions: the organisational, interpersonal, and personal dimension. The present study focuses on the interpersonal dimension to operationalise PLC characteristics, as this dimension is central to the descriptions of PLCs in the vast majority of studies in the field (Vanblaere, 2016). This interpersonal dimension refers to the ability of teachers to collaborate and learn from shared conceptions of teaching and learning, and moreover to construct, reconstruct and apply knowledge as a team (Sleegers et al., 2013; Vanblaere, 2016). In an attempt to address this conceptual vagueness, the present study examines various interpersonal PLC characteristics in a specific relationship to each other. In line with previous research (e.g. Bryk et al., 1999; Valckx et al., 2019; Vanblaere, 2016; Verbiest, 2016), interpersonal PLC characteristics are broken down into mental and behavioural characteristics. Mental PLC characteristics refer to the conditions required to enable teacher collaboration (Vanblaere & Devos, 2018). Behavioural PLC characteristics refer to the collaborative activities between teachers (Little, 2003), such as reflective dialogue, consultation, and shared practices. Researchers (e.g. Bryk et al., 1999; Valckx et al., 2019; Verbiest, 2016) have shown that mental characteristics drive behavioural characteristics. A commonly

used mental PLC characteristic is 'collective responsibility' (Vanblaere, 2016), meaning that teachers in successful PLCs do not consider school operations, improvement and student learning as a responsibility exclusively assigned to the school or other teachers, but rather they feel collectively responsible (Stoll et al., 2006). Regarding behavioural PLC characteristics, teachers in successful PLCs often engage in 'reflective dialogue' (Stoll et al., 2006; Wahlstrom & Louis, 2008). They have reflective and in-depth conversations with colleagues about educational matters, such as instruction, student learning and student performance (Stoll et al., 2006; Wahlstrom & Louis, 2008). This allows teachers to collect new information, reflect on their teaching practice or their educational beliefs and experiment with new insights into their teaching practice (Bryk et al., 1999). A second behavioural PLC characteristic is 'deprivatised practice', which refers to the extent to which teachers observe each other's teaching practice, and give and receive feedback with the aim of improving their teaching practice (Stoll et al., 2006).

2.2. Departments

The context of this study is secondary education. In research into secondary schools, authors often distinguish between schools and departments as PLCs (Lomos, 2012). The department-based approach has the largest number of adherents and is most commonly used, as secondary schools are large organisations in which multiple departmental PLCs can operate (Vanblaere, 2016). Departments are seen as the main organisational units in secondary schools that regulate teacher behaviour with regard to the educational goals to be achieved, the material to be taught and the way in which students' progress is evaluated (Visscher & Witziers, 2004). In other words, departments are more than the administrative units into which secondary schools are divided, and they have the potential to encourage teacher collaboration and their professional development (Brown et al., 2000; Melville & Wallace, 2007). In this study, the concept of 'department' means a collaboration between a group of teachers who teach the same subject. The advantage of this type of collaboration is that teachers in the same department often share common interests, interact more and regularly discuss educational issues with each other (Busher & Harris, 1999; Huberman, 1993; Melville & Wallace, 2007; Vanblaere & Devos, 2018).

The present study focuses on French departments in Flemish secondary education, where French is the first foreign language taught in all secondary schools. This subject has a high percentage of full-time teachers, which generally supports stronger departmental practices (Turner & Bolam, 1998). Moreover, language teachers consider collaboration with department colleagues to be important (van Veen et al., 2001).

2.3. Departmental leadership

The review study by Stoll et al. (2006) examined antecedents of PLCs, concluding that leadership at all levels is crucial to successful PLCs. Mulford and Silins (2003) identified two further leadership sources that are important to PLCs: principal leadership and distributed leadership. Since previous research (e.g. Busher & Harris, 1999; Ghamrawi, 2010; Vanblaere & Devos, 2018) has shown that department heads contribute to the performance of a department to the same extent as principals contribute to the performance of a school, this study focuses on departmental leadership for departmental PLCs. Indeed, departmental leadership is considered more essential to the development of departmental subcultures than principal leadership (Ghamrawi 2010). Only recently (e.g. Valckx et al., 2018; Vanblaere & Devos, 2018) has research into the contribution of departmental leadership for departmental PLCs received more attention. While responsibility for the effective functioning of a department cannot be placed with one person and must be realised in collaboration with all department members, it is recognised that teams cannot manage without someone taking on a leadership role (Truijen et al., 2013). Department heads are often experienced teachers who are mandated to carry out certain leadership practices, even though they are not middle leaders (Busher & Harris, 1999; Valckx et al., 2018; Vanblaere & Devos, 2018). These leadership practices might include creating a collegial culture and facilitating group processes within the department (Brown et al., 2000; Busher & Harris, 1999; Vanblaere & Devos, 2018). In addition, it is important that department heads adopt a supportive attitude, rather than controlling colleagues on behalf of the principal, and pay attention to teachers' professional development (Valckx et al., 2018). Moreover, department heads often act as a bridge between the department and the school (Busher & Harris, 1999). Department heads therefore play a crucial role in helping departments to function as PLCs (Vanblaere & Devos, 2018). According to Vanblaere and Devos (2018), these leadership practices can be divided into two main roles taken on by department heads: group-oriented and development-oriented departmental leadership. Group-oriented departmental leadership includes department heads who shape and manage departmental culture, encourage and facilitate collaboration and the development of a group identity within the department (Busher & Harris, 1999). Particularly, these department heads guide departmental meetings, manage group processes and motivate teachers to collaborate within the department by supporting their staff in exchanging ideas, developing materials together and discussing practices (Schelfhout et al., 2015; van der Want et al., 2015; Vanblaere & Devos, 2018). Development-oriented departmental leadership includes planning, monitoring and coordinating the improvement of teaching and learning within the department (Arzu Hernandez, 2013). Department heads monitor their department colleagues' professional development, as well as student performance, and they have a coaching role in supporting teacher development (Busher & Harris, 1999; Dinham, 2007).

2.4. Teachers' educational beliefs

As mentioned above, teachers in successful PLCs often engage in reflective and in-depth conversations with colleagues about educational matters (Stoll et al., 2006; Wahlstrom & Louis, 2008). However, Newmann (1991) identified the importance of examining teachers' beliefs on these issues. The purpose of discussing beliefs is not to convince others to agree with the beliefs, but to clarify practices and underlying assumptions (Verbiest, 2008). Many studies (e.g. Belo et al., 2014; OECD, 2009) distinguish between the use of more traditional and constructivist beliefs to map and measure beliefs about teaching and learning. The traditional approach to teaching and learning involves teachers transmitting knowledge in a clear and structured way, explaining correct solutions, providing students with clear and solvable problems and ensuring peace and concentration in the classroom (OECD, 2009). These beliefs reflect the idea that teachers should master classroom activities (Belo et al., 2014). They actively regulate and evaluate the learning processes of students (Meirink et al., 2009). Learning takes place when students follow instructions and act in accordance with these instructions (Bolhuis & Voeten, 2004). In other words, here learning is understood as the reproduction of knowledge (Meirink et al., 2009). In contrast, the constructivist approach to teaching and learning focuses on students as active participants in the knowledge acquisition process (Meirink et al., 2009). Teachers facilitate student inquiry, give students the opportunity to develop solutions to problems themselves and enable students to play an active role in instruction (Belo et al., 2014). Put differently, teachers believe that it is not just their job to present facts and give their students the opportunity to practice (OECD, 2009). Constructivist beliefs are associated with increased use of practices that aim to create a stimulating, challenging and individually adapted learning environment that supports students' knowledge construction (OECD, 2009).

Surprisingly, until now, little research has been conducted into beliefs and practices specific to any particular subject (OECD, 2009). Recent research has shown that the dichotomy between traditional and constructivist beliefs can also be found in teachers' subject-specific beliefs about French (as a second) language teaching (Valckx et al., 2021). Teachers' traditional subject-specific beliefs about French language teaching refers to teachers using an approach that focuses on learning knowledge of French, such as vocabulary and grammar, and what students know about French (Valckx et al., 2021). This approach focuses on the transfer of knowledge from teacher to students and the reproduction of knowledge of French (Valckx et al., 2021). Teachers' constructivist subject-specific beliefs about French language teaching refer to the teachers using a communicative, functional and action-based approach that focuses on skills (e.g. oral communication) and the development of communicative competence in French, and focusing on what students can do with French in their daily lives (Council of Europe, 2001). The latter approach states that teachers should help their students build their own knowledge of French,

as teachers here believe that students are active respondents in their own personal development in French, for example through language tasks (Valckx et al., 2021).

3. Research aim and questions

First, this study examines the relationship between departmental leadership and departmental PLCs. Quantitative research into the role of departmental leadership for interpersonal PLC characteristics in departmental PLCs is scarce (e.g. Vanblaere & Devos, 2018). It is therefore relevant to investigate how department heads can facilitate interpersonal PLC characteristics in their department:

> **RQ1**: How is departmental leadership (group-oriented and development-oriented) directly related to interpersonal PLC characteristics in departmental PLCs?

Second, previous research (Valckx et al., 2019) also showed that the mental PLC characteristic of collective responsibility is positively related to the behavioural PLC characteristic of reflective dialogue. This study therefore goes a step further and examines whether collective responsibility acts as a mediator in the relationship between departmental leadership and behavioural PLC characteristics:

> **RQ2:** How is departmental leadership (group-oriented and development-oriented) indirectly related to behavioural PLC characteristics via collective responsibility as a mental PLC characteristic?

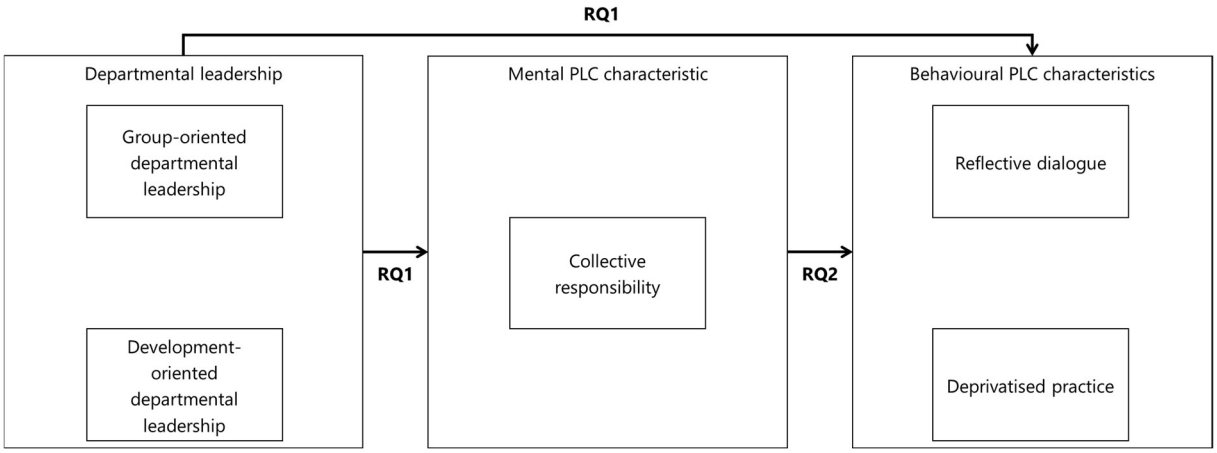
Third, this study extends previous studies (e.g. Valckx et al., 2019; Vanblaere & Devos, 2018) by examining whether and how these relationships vary between teachers with traditional beliefs and those with constructivist beliefs. On the basis of social network literature, it can be stated that similar teachers collaborate more and better (Van Waes, 2017). In social network literature, this is indicated by the concept of 'homophily' (McPherson et al., 2001). Studies have shown that individuals are more likely to develop relationships with other individuals who are similar to them (McPherson et al., 2001). This homophily is often localised around a specific characteristic, such as age, gender or education level (Ibarra, 1995; McPherson et al., 2001). Therefore, individuals who share a specific characteristic, such as their educational beliefs (traditional beliefs versus constructivist beliefs), are more likely to also share information and interact with each other. The reverse is also true in the sense that individuals who do not share many characteristics are less attracted to sharing information and interacting with one another (McPherson et al., 2001). In conclusion, teachers with different beliefs can be expected to differ in their relationships between departmental leadership and interpersonal PLC characteristics in departmental PLCs. However, previous research has not explored how these relationships can vary for teachers with traditional beliefs or constructivist beliefs. As a result, potential differences in the relationships between departmental leadership and interpersonal PLC characteristics in departmental PLCs are explored based on differences in educational beliefs:

RQ3: How do the direct and indirect relationships of departmental leadership (group-oriented and development-oriented) according to behavioural PLC characteristics (via collective responsibility as a mental PLC characteristic) vary depending on teachers' educational beliefs?

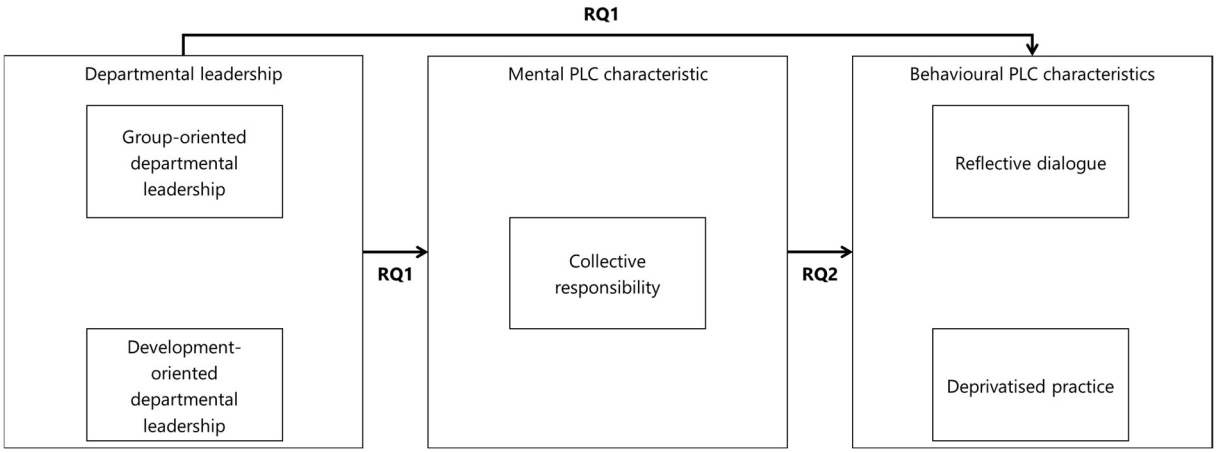
The research model is presented in Figure 1.

Figure 1

Path diagram of the research model for the direct and indirect relationships between departmental leadership (group-oriented and development-oriented) and behavioural PLC characteristics via collective responsibility as a mental PLC characteristic.



Versus



4. Method

4.1. Sample

A total of 26 secondary schools participated in this study. At each school, teachers from the French department(s) received an online survey. However, because the study's purpose was to investigate the contribution of departmental leadership for interpersonal PLC characteristics in departmental PLCs, only those departments who declared that they have a department head were included (Vanblaere & Devos, 2018). A total of 197 surveys were used for the analyses. The sample included 174 (88.3%) female and 23 (11.7%) male teachers. The average teaching experience was 16 years, ranging from 1 to 39 years.

Moreover, teachers were nested in departments. This nested design was included in the analyses. The sample included 30 departments.

4.2. Measures

The central concepts of this study have been measured with validated scales. Confirmatory factor analyses (CFAs) were performed and the fit of the scales was adequate to good.

4.2.1. Interpersonal PLC characteristics

Interpersonal PLC characteristics in departmental PLCs were measured using three subscales from the 'Professional Community Index' (Wahlstrom & Louis, 2008). Three items related to collective responsibility (e.g. '*Teachers in my department feel responsible to help each other improve their instruction*'). Five items referred to reflective dialogue (e.g. '*How often in this school year have you had conversations with colleagues from your department about the development of a new curriculum?*'). Three items related to deprivatised practice (e.g. '*How often in this school year have you had colleagues from your department observe your classroom?*'). All items were anchored on a five-point Likert scale, ranging from one (strongly disagree) to five (strongly agree) for collective responsibility and from one (never) to five (very often) for reflective dialogue and deprivatised practice. The scales of collective responsibility (α=.68) and reflective dialogue (α=.75) were reliable (Kline, 2000). The reliability of the deprivatised practice scale (α=.64) was lower, and the results indicated that removing the item: '*How often in this school year have you invited colleagues from your department to help you teach?*' would increase α to .78. This implies, however, that the number of items on the deprivatised practice scale was limited to two. Furthermore, the mean of deprivatised practice was very low (M=1.44), indicating that this was rare. After careful consideration, the deprivatised practice scale has been removed from further analyses.

4.2.2. Departmental leadership

Departmental leadership was measured with two scales developed by Vanblaere and Devos (2018). Four items were related to group-oriented departmental leadership (e.g. '*Encouraging horizontal alignment and coordination between teachers of the same grades*'), and five items referred to development-oriented departmental leadership (e.g. '*Following up on the academic and social development of students for the subjects involved in the department*'). The items measured teachers' perception about how frequently their department head engaged in these activities and were rated on a five-point Likert scale ranging from one (never) to five (very often). The reliability of both scales was good (group-oriented: α=.79, development-oriented: α=.74).

4.2.3. Teachers' general beliefs about teaching and learning

To measure teachers' general beliefs about teaching and learning, this study used a shortened version (17 items) (Valckx et al., 2021) of a Dutch instrument developed by Meirink et al. (2009) and adapted by Belo et al. (2014) and Valckx et al. (2021). This instrument contained three subscales: beliefs about student regulation of learning processes and knowledge construction (eight items, e.g. '*Students learn better when they think about their learning performance themselves*'), beliefs about knowledge reproduction (four items, e.g. '*Students learn better when they take a lot of factual knowledge*'), and beliefs about teacher regulation of learning processes (five items, e.g. '*Students learn better when they receive precise instructions for improving their assignments*'). These items were rated on a five-point Likert scale, ranging from one (totally disagree) to five (totally agree). The reliability of the beliefs about student regulation of learning processes and knowledge construction scale (α=.73) and the beliefs about knowledge reproduction scale (α=.70) was acceptable, but the reliability of the beliefs about teacher regulation of learning processes scale was questionable (α=.63). Therefore, the beliefs about student regulation of learning processes scale was removed from further analyses.

4.2.4. Teachers' subject-specific beliefs about French (as a second) language teaching

Teachers' subject-specific beliefs about French (as a second) language teaching were measured using two scales developed by Valckx et al. (2021). Nine items referred to traditional subject-specific beliefs about French language teaching (e.g. '*Acquiring knowledge, such as vocabulary and grammar, is the most important goal of the French lessons*'). Three items referred to constructivist subject-specific beliefs about French language teaching (e.g. '*The final evaluation must be a language task in order to gain insight into the competences of students in relation to French*'). These items were rated on a five-point Likert scale ranging from one (totally disagree) to five (totally agree). Both scales were reliable (traditional subject-specific beliefs about French language teaching: α=.81, constructivist subject-specific beliefs about French language teaching: α=.70).

4.3. Data analysis

First, the descriptives for all study variables were calculated (see Table 1).

Second, regression analyses were performed according to a procedure proposed by Baron and Kenny (1986) to provide evidence for the mediating relationship of collective responsibility in the relationship between departmental leadership and reflective dialogue (RQ2). Baron and Kenny (1986) proposed three conditions to support a mediating effect. (1) The independent variable should significantly influence the mediator in the first equation. (2) The independent variable should significantly affect the dependent variable in the second equation. (3) The mediator should significantly influence the dependent variable in the third equation. If all these conditions are met, the relationship between the independent and

dependent variable should disappear (full mediation) or decrease (partial mediation) when the mediator is also included in the equation. Sobel's (1982) test was used to calculate whether the indirect effects of the independent variables, group-oriented and development-oriented departmental leadership, on reflective dialogue via collective responsibility were significant.

Third, cluster analyses were conducted to explore whether the French teachers could be divided into homogenous subgroups with distinctive scores on the belief scales (RQ3). A two-step procedure was followed to ensure the reliability of the clusters. First, hierarchical cluster analyses were performed using squared Euclidian distances as the measure of distance and Ward's method as the clustering method. To maintain high-stability cluster solutions, a double-split cross-file approach was implemented by performing hierarchical cluster analyses in subsample one (n=99) and subsample two (n=98) (Breckenridge, 2000). Second, the initial cluster centres, extracted according to the hierarchical cluster analyses, were used as non-random starting points in a non-hierarchical K-means clustering procedure in the full sample (n=197) to profile and validate the final cluster solution (Gore, 2000).

Finally, the data were analysed via path analyses to investigate both the direct and indirect effects of departmental leadership (group-oriented and development-oriented) on reflective dialogue via collective responsibility (RQ1 and RQ2). Path analysis allows to specify that one or more variables are dependent simultaneously in one relationship and independent in another relationship (i.e. collective responsibility). Hence, path analysis makes it possible to test indirect effects. In addition, the multi-group version of path analysis allows to test whether specific paths of interest differ across groups. This was used to determine if the research model was different according to teachers with traditional beliefs versus teachers with constructivist beliefs (RQ3). More specifically, two multi-group path models were compared. A first model with different regressions across groups (i.e. teachers with traditional beliefs versus teachers with constructivist beliefs) was compared to a second model with equal regressions across groups. Following this procedure, significant differences between the two models indicate significant differences in the regressions across groups.

Since the nested structure of the data cannot be ignored (teachers are nested in departments), the path analyses were performed using Mplus, considering the clustered structure of the data, using the command type=complex in combination with a specification of the department cluster variable (Muthén & Muthén, 1998-2017). This approach calculates standard errors and a χ^2 of the model fit, considering the fact that observations are non-independent due to the clustered structure of the data (Muthén & Muthén, 1998-2017). The need to address the clustered structure of the data has been demonstrated by the 'intraclass correlation coefficient' (ICC) for both group-oriented and development-oriented departmental leadership (Bliese, 2000). ICC is the proportion of the total variance explained by group membership, and a large ICC indicates that respondents are more similar (Bliese, 2000). According to

Hox (2010), in educational contexts, ICC values of .15 are considered large. In this study, group-oriented and development-oriented departmental leadership had an ICC of .36 and .37, respectively. Therefore, ignoring the clustered structure of the data would lead to incorrect results. In addition, because the data were not normally distributed (kurtosis values ranging from -.51 to 1.33), the robust maximum likelihood estimation method with a Satorra-Bentler scaled (SB) χ^2 was used (Yuan & Bentler, 2000).

5. Results

5.1. Descriptive analyses

The descriptives are reported in Table 1. The means of collective responsibility (M=3.75, SD=.62) and reflective dialogue (M=3.37, SD=.63) were higher than the middle score of the scale, indicating that, on average, French teachers experience a high degree of collective responsibility in their department and regularly engage in reflective dialogue with their department colleagues. In addition, the mean of group-oriented departmental leadership (M=4.15, SD=.70) was higher than the mean of development-oriented departmental leadership (M=3.39, SD=.84). This shows that, on average, the French teachers in this study see their department head more as someone who often encourages them to collaborate rather than someone who focuses strongly on teachers' and students' development. In addition, the descriptives indicate that teachers' general beliefs about teaching and learning are characterised by recognising the importance of student regulation of learning processes and knowledge construction (M=3.93, SD=.39), but not by recognising the importance of knowledge reproduction (M=2.71, SD=.62). Put differently, the teachers agree that students actively build knowledge and control, monitor and regulate their own learning processes, rather than reproducing knowledge. Furthermore, the French teachers in this study seem to prefer constructivist over traditional subject-specific beliefs about French language teaching ($M_{constructivist\_subject\text{-}specific}$=3.53>$M_{traditional\_subject\text{-}specific}$=3.05, $SD_{constructivist\_subject\text{-}specific}$=.70; $SD_{traditional\_subject\text{-}specific}$=.59). This means that teachers are more likely to agree that they should help their students build their own knowledge of French. More specifically, they tend to believe that students are active respondents in their own personal development in French, for example through language tasks. Table 1 also shows some significant correlations. Based on the CFAs and the fact that none of the correlations exceeds .70, the study variables measure individual concepts.

Table 1

Means (M), Standard Deviations (SD), and correlations of the scales (n=197).

	M	***SD***	**1**.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**
1. Collective responsibility	3.75	.62	-							
2. Reflective dialogue	3.37	.63	.292**	-						
3. Group-oriented departmental leadership	4.15	.70	.244**	.323**	-					
4. Development-oriented departmental leadership	3.39	.84	.206**	.261**	.625**	-				
5. Beliefs about student regulation of learning processes and knowledge construction	3.93	.39	.110	.115	.018	.087	-			
6. Beliefs about knowledge reproduction	2.71	.62	.035	.094	.046	.095	-.168*	-		
7. Traditional subject-specific beliefs about French language teaching	3.05	.59	-.014	-.007	-.048	.057	-.259**	.465**	-	
8. Constructivist subject-specific beliefs about French language teaching	3.53	.70	.060	-.010	-.023	.024	.224**	-.179*	-.158*	-

*Note: *p<.05; **p<.01.*

5.2. Regression analyses

To study a possible mediating relationship of collective responsibility in the relationship between departmental leadership and reflective dialogue (RQ2), several regression analyses were performed, according to a procedure proposed by Baron and Kenny (1986). The results (see Table 2) show that the three conditions are met (cf. Data analysis). First, the independent variables – group-oriented (b=.216, p=.001) and development-oriented (b=.152, p=.004) departmental leadership – significantly influence the potential mediator, collective responsibility. Second, the independent variables – group-oriented (b=.288, p<.001) and development-oriented (b=.194, p<.001) departmental leadership – significantly influence the dependent variable, reflective dialogue. Finally, when the potential mediator is introduced into the model, the effect of both group-oriented and development-oriented departmental leadership on reflective dialogue decreases, indicating a partial mediation effect of collective responsibility in the relationship between departmental leadership (group-oriented and development-oriented) and reflective dialogue. The mediating effect is partial because the effect of group-oriented (b=.239, p<.001) and development-oriented (b=.156, p=.003) departmental leadership on reflective dialogue remains significant. This is also supported by Sobel's (1982) test, which indicates that both indirect effects are significant (see Table 2).

Table 2

Regression analyses for assessing the mediating effect of collective responsibility in the relationship between group-oriented and development-oriented departmental leadership, and reflective dialogue.

	Effect of predictor on collective responsibility		**Effect of predictor on reflective dialogue**		**Partial effect of collective responsibility on reflective dialogue**		**Partial effect of predictor on reflective dialogue**		**Sobel's (1982) test for mediating effect**	
Predictor	**b**	**se**	**b**	**se**	**b**	**se**	**b**	**se**	**Z**	**se**
Group-oriented departmental leadership	.216**	.061	.288***	.061	.229***	.069	.239***	.061	2.422*	.020
Development-oriented departmental leadership	.152**	.052	.194***	.051	.251***	.069	.156**	.051	2.279*	.017

*Note: *p<.05; **p<.01; ***p<.001.*

5.3. Cluster analyses

Hierarchical cluster analyses were performed to investigate whether teachers of French could be divided into homogenous subgroups with distinctive scores on the belief scales (RQ3). Visual inspection of the dendrograms and analyses of the squared Euclidean distance increase at each stage of the agglomeration process indicated a solution with two clusters in both the subsamples and the full sample. The cluster solutions of the two subsamples were compared to the cluster solution of the full sample containing Cohen's Kappa for agreement. The highest Kappa cluster solution is preferred because it reflects a more stable and replicable clustering structure. In this study, the two-cluster solution showed the highest agreement (κ=98.0%). In a next step, a non-hierarchical K-means clustering procedure was performed. The results showed that Cluster 1 consisted of 88 teachers (44.7%), who had significantly higher scores for constructivist general beliefs about student regulation of learning processes and knowledge construction and constructivist subject-specific beliefs about French language teaching. Cluster 2 included 109 respondents (55.3%), who had significantly higher scores for traditional general beliefs about knowledge reproduction and traditional subject-specific beliefs about French language teaching. Table 3 shows the means and standard deviations of all study variables for the two clusters found. Statistics show that teachers with a constructivist belief structure show no significant differences from teachers with a traditional belief structure for the other study variables. The mean cluster scores and standard deviations of the belief scales on Cluster 1 and Cluster 2 are shown in Figure 2.

Table 3
Means, Standard Deviations (SD), and differences between the two clusters.

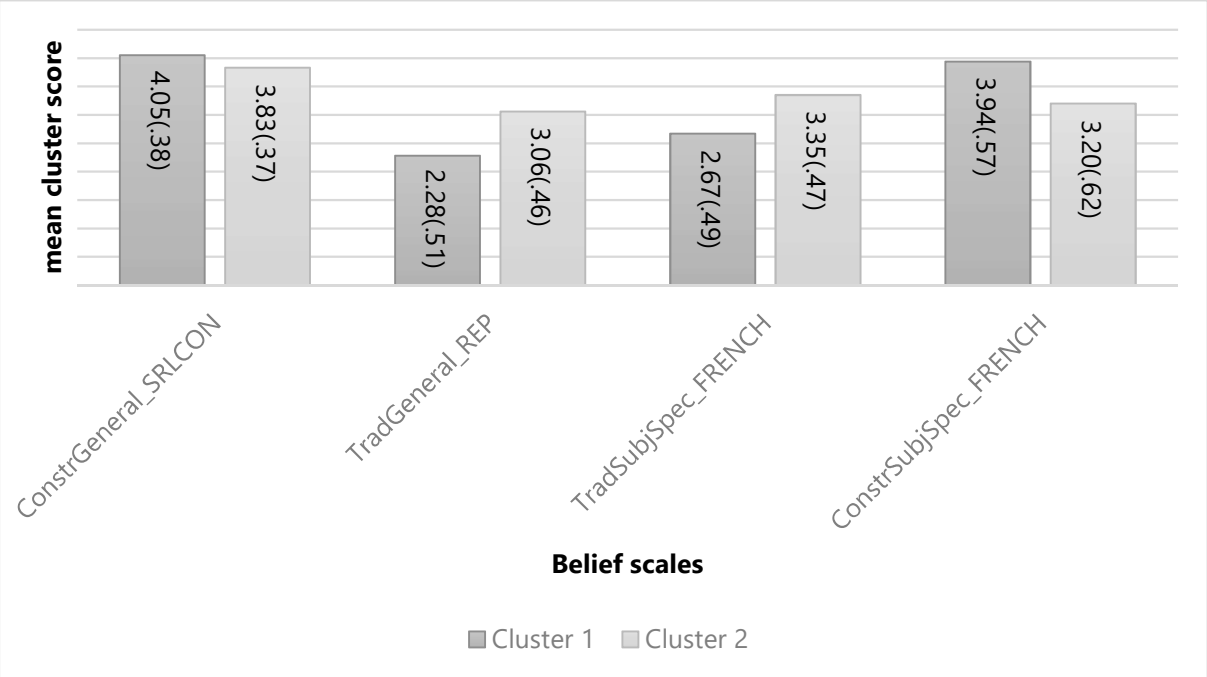
	Cluster 1 (SD) *n*=88	**Cluster 2 (SD) *n*=109**	**ANOVA**	**Effect size (Cohen's d)**
1. Collective responsibility	3.79 (.60)	3.72 (.63)	*F*=.61	.11
2. Reflective dialogue	3.38 (.64)	3.36 (.61)	*F*=.06	.03
3. Group-oriented departmental leadership	4.17 (.71)	4.13 (.69)	*F*=.12	.06
4. Development-oriented departmental leadership	3.38 (.87)	3.40 (.82)	*F*=.02	-.02

5. Beliefs about student regulation of learning processes and knowledge construction	4.05 (.38)	3.83 (.37)	*F*=16.97***	.59
6. Beliefs about knowledge reproduction	2.28 (.51)	3.06 (.46)	*F*=129.28***	-1.61
7. Traditional subject-specific beliefs about French language teaching	2.67 (.49)	3.35 (.47)	*F*=97.41***	-1.42
8. Constructivist subject-specific beliefs about French language teaching	3.94 (.57)	3.20 (.62)	*F*=74.95***	1.24

*Note: *p<.05; **p<.01; ***p<.001.*

Figure 2

Graphic representation of mean cluster scores (and standard deviations) on Cluster 1 (dark grey) and Cluster 2 (light grey).



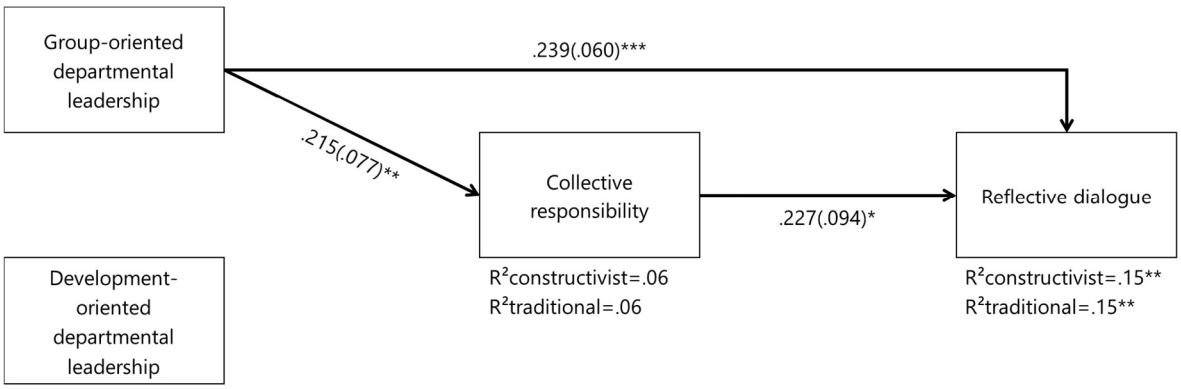
5.4. Multi-group path analyses

To analyse the relationships between departmental leadership, collective responsibility and reflective dialogue between clusters, two multi-group path models were compared (RQ1, RQ2, RQ3). More

specifically, a model in which all regressions differed (model 1) between teachers with a constructivist (Cluster 1) and those with a traditional belief structure (Cluster 2) was compared to a model in which all regressions were equal across both clusters (model 2). The results showed that the models do not differ significantly ($SB\chi^2$=5.24, *df*=5, *p*=.388), indicating that there are no significant differences in belief structure in the regressions. However, considering the possibility that small differences in specific regressions are 'invisible' because all regressions were estimated simultaneously, model 2 (i.e. equal regressions across clusters) was modified by varying a specific path of interest between teachers with constructivist beliefs and those with traditional beliefs (see Table 4). The difference between the log-likelihood values associated with both models had a χ^2 distribution with one degree of freedom and depended on the scaling correction factors of the two models (Satorra & Bentler, 2001). The results showed no significant differences in belief structure in the regressions (see Table 4). Therefore, the second model (i.e. equal regressions across clusters) was advanced as the multi-group path model for teachers with a constructivist belief structure and those with a traditional belief structure, which fits well with the data ($SB\chi^2$=5.24, *df*=5, *p*=.388; χ^2/df *ratio*=1.05; *CFI*=.99; *TLI*=.99; *RMSEA*=.02[.00–.14]; and *SRMR*=.05). Second, individual relationships were evaluated using the 'critical ratio' (CR). Non-significant CR relationships were removed one at a time, starting with the highest 'p-value'. The remaining models were rerun because of the principle of parsimony, with the simplest model being preferred (Kline, 2015). Two individual relationships were removed: the relationship (1) between development-oriented departmental leadership and collective responsibility (*b*=.067; *se*=.073; *p*=.360) and (2) between development-oriented departmental leadership and reflective dialogue (*b*=.057; *se*=.061; *p*=.353). After removing these non-significant relationships, all other relationships were significant. This model explained 15% of the variation in reflective dialogue for both belief structures (see Figure 3), with an acceptable fit to the data ($SB\chi^2$=2.29, *df*=3, *p*=.515; χ^2/df *ratio*=.76; *CFI*=1.00; *TLI*=1.05; *RMSEA*=.00[.00–.15]; and *SRMR*=.07). Group-oriented departmental leadership is positively and directly related to both collective responsibility (*b*=.215, *se*=.077, *p*=005) and reflective dialogue (*b*=.239, *se*=.060, *p*<.001). Additionally, the relationship between group-oriented departmental leadership and reflective dialogue is partially mediated by collective responsibility (*b*=.049; *se*=.022; *p*=.028). Development-oriented departmental leadership has no significant direct and indirect relationships with the interpersonal PLC characteristics.

Figure 3

Result model with unstandardised regression coefficients, significance levels and explained variances for teachers with a constructivist belief structure and teachers with a traditional belief structure.



*Note: *p<.05; **p<.01; ***p<.001.*

Table 4

Multi-group path modelling: Comparison of different models across clusters.

	SBχ^2	**df**				
Models						
Model 2	5.24	5				
Adaptations of model 2: allowing one specific regression to vary across clusters						
	SBχ^2	**df**	**Compared models**	**Δ SBχ^2**	**Δ df**	**p**
Collective responsibility → reflective dialogue	4.34	4	Versus model 2	.87	1	.351
Group-oriented departmental leadership → reflective dialogue	6.03	4	Versus model 2	.00	1	.950
Development-oriented departmental leadership → reflective dialogue	5.08	4	Versus model 2	.39	1	.534
Group-oriented departmental leadership → collective responsibility	3.58	4	Versus model 2	1.59	1	.208
Development-oriented departmental leadership → collective responsibility	4.92	4	Versus model 2	.11	1	.736

6. Discussion

Leaders play a key role for PLCs (Stoll et al., 2006). However, quantitative research into the importance of departmental leadership for interpersonal PLC characteristics in departmental PLCs remains scarce (Vanblaere & Devos, 2018). This study addressed this gap by examining the relationship between departmental leadership and each of the interpersonal PLC characteristics in departmental PLCs. Furthermore, this study explored whether and how these relationships vary for teachers with constructivist beliefs and those with traditional beliefs. Multi-group path analyses were performed. The results of RQ1 show that only group-oriented departmental leadership increases the presence of collective responsibility in the department and the frequency of reflective dialogue with department colleagues. In other words, teachers who have a strongly group-oriented department head experience more collective responsibility in their department and report more reflective dialogue with department colleagues compared to teachers who claim their department head had no such focus. From this result, it can be concluded that group-oriented departmental leadership contributes to the functioning of departmental PLCs (Busher & Harris, 1999; Vanblaere & Devos, 2018). This emphasis on group-oriented departmental leadership can also be found in the (inter)national educational research literature (e.g. Schelfhout et al., 2015; Vanblaere & Devos, 2018) and a Flemish policy document about departments in secondary education that mainly focuses on group-oriented departmental leadership (Katholiek Onderwijs Vlaanderen, 2009). This is consistent with the notion that department heads are reluctant to monitor teacher development and/or performance within their department (i.e. development-oriented departmental leadership), as teachers generally value their autonomy (Clement & Vandenberghe, 2000). In conclusion, our findings regarding departmental leadership corroborate previous research (e.g. Busher & Harris, 1999; Dinham, 2007; Vanblaere & Devos, 2018), which states that department heads play a central role in defining a collegial departmental culture and in developing a sense of collective responsibility that is in line with group-oriented departmental leadership.

The results for RQ2 showed a positive indirect relationship between group-oriented departmental leadership and reflective dialogue via collective responsibility. Put differently, teachers who believe that their department head focuses on stimulating and facilitating collaboration, experience more collective responsibility in their department. Collective responsibility, in turn, is an important mental PLC characteristic, as it provides teachers with a broader view of their responsibilities within their department (Hargreaves, 2007), such as discussing teaching methods with department colleagues (Valckx et al., 2019). This is in line with previous studies, suggesting that teachers who are involved in each teacher's teaching practice and each student's learning (i.e. through collective responsibility) are strongly encouraged to engage meaningfully with their department (i.e. engage in reflective dialogue) (Bryk et al., 1999; Hargreaves, 2007; Valckx et al., 2019; Vanblaere & Devos, 2018).

Regarding whether teachers can be grouped according to their belief structure, this study has managed to identify two clusters to answer RQ3: a smaller 'Cluster 1' of teachers whose beliefs can be described as constructivist and a larger 'Cluster 2' of teachers whose beliefs can be defined as traditional. According to van Driel and Verloop (2002), individual teachers can have significantly different belief structures, even if they teach the same subject. Furthermore, contrary to our expectations, the multi-group path analyses showed that there are no differences in the direct and indirect effects of departmental leadership on reflective dialogue (via collective responsibility) in departments, based on belonging to the cluster of teachers with constructivist beliefs or the cluster of teachers with traditional beliefs. While this result contradicts the expectations of this study, it should not be considered negative. For example, the TALIS study found that teachers with different beliefs can work side by side in the same school or department (OECD, 2009). In addition, this can also ensure that new ideas and insights enter the department. Homophily can go 'too far' (Van Waes, 2017). Social network literature has shown that network or group diversity is always something to strive for, as diverse networks or groups show more innovation (Mehra et al., 2001). In addition, a lack of network or group diversity can lead to decline or stagnation in the development of members towards expertise, or it can limit innovation in the group (Burt, 2000). As such, the existence of a variety of beliefs for a department to function as a PLC is beneficial to its development.

6.1. Limitations

This study has several limitations. First, both the mean and the reliability of deprivatised practice were low. This is in line with the findings of Lomos (2012) and Vanblaere and Devos (2018), who found that secondary school teachers rarely observe each other's teaching practice or give each other feedback. This scale therefore had to be removed from further analyses. Hence, only two interpersonal PLC characteristics were included in the analyses. Therefore, the results should not be generalised to all PLCs, but rather understood in relation to the specific interpersonal PLC characteristics explored in the French departments in Flemish secondary schools. More research is needed to confirm the role of deprivatised practice within departments to function as a PLC.

A second limitation concerns the instruments used to measure departmental leadership and teachers' subject-specific beliefs about French language teaching. As far as we know, this is the second study in which these scales are used. It would be advisable to further assess the validity of the scales in other contexts. In addition, the role of department heads is complex and more functions are fulfilled than included in this study (Busher & Harris, 1999). For example, future research could explore the relationship between broader departmental leadership roles, interpersonal PLC characteristics and subject-specific beliefs. It would therefore be advisable to replicate this study in other fields and determine whether the significant relationships for departmental leadership are replicable in other subjects (van Veen et al., 2001).

Finally, our findings showed that some of the study variables were significantly related to interpersonal PLC characteristics, but much of the variance remained unexplained. This implies that group-oriented departmental leadership represented only a limited part of the influence on the interpersonal PLC characteristics and that collective responsibility explained only part of the variance in reflective dialogue. This is because only a limited number of relationships were examined in this study. Future research can examine multiple relationships by questioning multiple respondents. Many factors can play a role in influencing interpersonal PLC characteristics in departmental PLCs (e.g. Valckx et al., 2019).

6.2. Implications

This study suggested that group-oriented departmental leadership plays a critical role in facilitating interpersonal PLC characteristics in departmental PLCs (Vanblaere & Devos, 2018). Department heads must therefore be carefully selected and adequately supported (Vanblaere & Devos, 2018). More specifically, building on the findings of previous research (e.g. Valckx et al., 2018) showing that department heads should have expertise in their field, it is also important that they know how to lead a team. Selecting and choosing department heads is therefore not a purely administrative procedure, but suggests that various interpersonal skills are necessary for a teacher to be appointed as department head who will develop their department into a PLC. Department heads should support group dynamics, contribute to a culture of collaboration and take on the organisation of meetings (Vanblaere & Devos, 2018).

Since this study has shown that teachers with constructivist beliefs and those with traditional beliefs do not differ significantly in collaboration (i.e. they engage in collective responsibility and reflective dialogue) in their department, it is important that principals develop their school in accordance with their own vision and that they focus on creating a shared vision and a culture of collaboration (Gaikhorst et al., 2019), because differences in educational beliefs between teachers do not necessarily lead to a loss of collaboration.

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