Research paper

Fostering teachers' team learning: An interplay between transformational leadership and participative decision-making?

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HIGHLIGHTS

- Transformational leadership was directly and indirectly positively associated with team learning.
- Transformational leadership also was positively associated with participative decision making.
- Participative decision making was positively associated with team commitment and task interdependence.
- Team commitment and task interdependence were positively associated with team member proactivity.
- Team member proactivity was positively associated with all team learning activities.

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ABSTRACT

The implementation of educational innovations by teachers seems to benefit from a team approach and team learning. The study's goal is to examine to what extent transformational leadership is associated with team learning, and to investigate the mediating roles of participative decision-making, team commitment, task interdependence and teachers' proactivity in this association. Data were analysed using multilevel structural equation modeling ($N = 992$ teachers, 92 teams). Results show that transformational leadership had direct and indirect positive associations with team learning through all mediators. These results provide insights into how transformational leaders can have a positive influence on team learning.

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1. Introduction

Worldwide, governments and schoolboards initiate educational innovations to improve student attainment and the quality of educational programmes. As a result, schools constantly work on educational innovations (Runhaar, Konermann, & Sanders, 2013). Teacher teams play a crucial role during these innovations, because it is only when teams change the way in which they work that effective change can be achieved at the organisational level (Edmondson, 2002). This implies that the success of school improvements depends, in part, on team performance (Park, Henkin,

& Egley, 2005). Team learning, which consists of building shared knowledge on innovations by sharing information and ideas with each other and questioning, concretising and discussing this shared information (Decuyper, Dochy, & Van den Bossche, 2010), is needed to increase team performance (Vangrieken, Dochy, & Raes, 2016). By engaging in team learning activities, teacher teams can better understand ideas behind educational innovations, reach agreement among team members on educational innovations, increase their innovativeness and make progress towards realising educational changes (Drach-Zahavy & Somech, 2001; Runhaar, Ten Brinke, Kuijpers, Wesselink, & Mulder, 2014; Wijnia, Kunst, Van Woerkom, & Poell, 2016).

Although team learning is important for realising educational innovations, simply putting people together in a team is no guarantee that team learning will occur (Van den Bossche, Gijselaers, Segers, & Kirschner, 2006). Research shows that team learning occurs more in teacher teams that are 'real teams' (Vangrieken

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et al., 2016). A real team is defined as "a collection of individuals who are interdependent in their task, who share responsibility for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems" (Cohen & Bailey, 1997, p. 241). However, teacher teams do not always meet these criteria (Vangrieken, Dochy, Raes, & Kyndt, 2013). Instead, teachers are often individually occupied with everyday issues, and may find it difficult to disengage themselves from these issues in order to collectively invest in team learning (Oude Groote Beverborg, Sleegers, & van Veen, 2015; Vangrieken, Dochy, Raes, & Kyndt, 2015). Consequently, teachers tend to engage in more superficial levels of collaboration, such as planning practical tasks and activities, and discussing existing course materials (Vangrieken et al., 2015). Therefore, Vangrieken et al. (2015) argue, teacher teams often resemble an aggregate of individuals who are not interdependent and who feel only limited team commitment, which hinders team learning.

Our study aims to examine how team learning can be fostered through the leadership style of team leaders, by focusing on transformation leadership. Previous studies reveal multiple positive research results. For example, a transformational leadership style of school leaders or team leaders enhances a school's innovative climate (Moolenaar, Daly, & Sleegers, 2010), teachers' involvement in individual learning activities (Geijsel, Sleegers, Stoel, & Krüger, 2009; Oude Groote Beverborg et al., 2015; Runhaar, Sanders, & Yang, 2010; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011), and teachers' involvement in collective learning activities (Lodders, 2013; Silins & Mulford, 2002; Vanblaere & Devos, 2016). Additionally, research outside the educational context shows that transformational leadership is positively related to team learning (Raes et al., 2013).

Although these studies show the importance of transformational leadership in general and for teachers' team learning in particular, more research is needed to understand the underlying mechanisms and to unravel effective components. For instance, some studies show a direct association between transformational leadership and teachers' team learning activities (e.g. Lodders, 2013; Vanblaere & Devos, 2016), while others suggest indirect associations (e.g. Raes et al., 2013; Silins & Mulford, 2002). Therefore, in this study we identify and explore possible underlying mechanisms in the relationship between transformational leadership and team learning by examining the mediating roles of: 1) teachers' collective opportunities to participate in decision-making, defined as joint decision-making processes by leaders and teachers (Thoonen et al., 2011); 2) teachers' individual team commitment, defined as teachers' affective bond with the team (Van der Vegt & Bunderson, 2005); 3) teachers' individually perceived task interdependence, defined as the extent to which teachers need support from their colleagues to fulfil their task (Van der Vegt, 2008); and 4) teachers' proactivity, defined as teachers' behaviour aimed at improving the team's performance (Griffin, Neal, & Parker, 2007).

More specifically, we examine whether transformational leaders decentralise influence in teacher teams by giving teachers the opportunity to participate in decision-making (Avolio & Gibbons, 1988; Mulford & Silins, 2003; Thoonen et al., 2011) and whether this stimulates team learning. Additionally, we examine whether participation in decision-making enhances teachers' team-oriented attitudes in terms of their team commitment and perceived task interdependence. Finally, we examine whether these team-oriented attitudes encourage proactive team behaviour and whether these proactive teachers participate more in team learning. As such, the following research questions are answered: 'To what extent are there positive associations between transformational leadership and team learning activities?', and: 'To what extent are associations between transformational leadership and team learning activities mediated by participative decision-making, affective team commitment, perceived task interdependence and team member proactivity?'

1.1. Theoretical framework

In this section, the concept of team learning is first elaborated by explaining the core team learning activities that are central to this study. We then explain why we expect transformational leadership to stimulate team learning directly and indirectly through the aforementioned potential mediators.

1.2. Teachers' team learning

Team learning enables teams to respond to changing environments and to learn how to collaborate more effectively (Decuyper et al., 2010; Edmondson, Dillon, & Roloff, 2007). In the literature, different team learning activities are identified, such as discussing errors, learning from mistakes, seeking feedback and integrating knowledge (Edmondson, 1999; Edmondson et al., 2007; Kostopoulos, Spanos, & Prastacos, 2013; Tjosvold, Yu, & Hui, 2004). In their review study, Decuyper et al. (2010) combine these different activities into three processes that they believe form the core of team learning: information sharing, which refers to team members sharing previously unshared information with other team members; co-construction, which refers to team members collectively combining insights and information into shared interpretations through dialogue and reflective communication; and constructive conflict, which refers to team members negotiating and discussing different perspectives of team members. These processes describe what happens in teams when they learn. In practice, these three processes do not occur linearly but are very much intertwined (Decuyper et al., 2010; Van Woerkom & Van Engen, 2009). Van Woerkom and Van Engen (2009) therefore suggest combining these processes under the denominator *information processing*. Here, we follow their suggestion and consider information processing as the central team learning process in teacher teams. Information processing is essential for enabling learning in teams because it helps teams to reduce ambiguous information and to define what actions they need to take (Van Offenbeek, 2001).

Before team members can share information with each other and discuss, question and concretise information in such ways that necessary actions can be formulated and planned, it is important that new information flows into the team. Individual team members play a central role in this, because it is they who acquire relevant new information (Van Offenbeek, 2001). They can do this by engaging in *information acquisition* and *boundary crossing*. Both activities imply that team members search for new and relevant information, but the way in which they do this differs. Information acquisition involves carrying out an active search within the known environment when more information is needed, to strengthen existing knowledge or to fill existing knowledge gaps (Van Offenbeek, 2001). This can be done by consulting different information sources, for example collecting information from the Internet and books, participating in professional development activities or asking other team members for advice (Van Offenbeek, 2001; Wijnia et al., 2016). Boundary crossing implies that team members ask people *outside* the team, such as experts, stakeholders or members of other teams, for feedback and advice on team tasks and team performance (Wong, 2004). In other words, new information is gathered from people outside the mental, physical and organisational team borders (Kasl, Marsick, & Dechant, 1997). Through boundary crossing, team members can acquire advice or feedback on ideas that the team has come up with or on the

direction a team is heading in. Such feedback and advice may necessitate reconsidering plans and ideas to make them more efficient and effective. In this sense, boundary crossing helps to point team learning in the 'right' direction (Decuyper et al., 2010). One aspect that information acquisition and boundary crossing have in common is that they are both initiated by individual team members.

When combined, information acquisition and boundary crossing by individual team members and information processing in the team describe how new information flows into the team and how this information is interpreted and discussed in the team.

1.3. Transformational leadership and team learning

Transformational leaders help organisations deal with changing environments by encouraging their followers to generate creative solutions for complex problems (Bass, 1997; Bass, Avolio, Jung, & Berson, 2003) and to put extra effort into their performance by challenging their values, beliefs and attitudes (Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Transformational leadership has been widely studied in different contexts (Wang, Oh, Courtright, & Colbert, 2011), including the educational context (Leithwood & Jantzi, 2005). Although most studies focus on how transformational leadership is related to individual employee outcomes, studies increasingly show that transformational leadership is positively related to team outcomes as well (Schaubroeck, Lam, & Cha, 2007; Wang et al., 2011).

Within the educational context, scholars have suggested that transformational leadership consists of three dimensions (Geijsel, Sleegers, & Van Den Berg, 1999; Leithwood & Jantzi, 2006). First, by *initiating and identifying a vision*, transformational leaders contribute to vision development in schools, which can increase teachers' commitment to the organisation and may result in the greater willingness of teachers to put extra effort into realising organisational goals (Thoonen et al., 2011). Second, through *individual support and consideration*, transformational leaders focus on the development and mentoring of teachers by, for instance, delegating challenging tasks, providing feedback, and recognising and satisfying teachers' needs and concerns (Raes et al., 2013; Thoonen et al., 2011). Third, through *intellectual stimulation*, transformational leaders stimulate creativity and professionalization by encouraging teachers to question their own beliefs and values and by enhancing their problem-solving abilities (Geijsel et al., 1999; Raes et al., 2013; Thoonen et al., 2011).

These three dimensions can be divided into a charismatic and an empowerment component. The charismatic component (*initiating and identifying a vision*) refers to inspiration and influence through the expression of ideals, and the empowerment component (*individual support and consideration* and *intellectual stimulation*) refers to the participative aspect of transformational leadership (De Hoogh, Den Hartog, & Koopman, 2004): stimulating groups to be creative and enhancing their collective problem-solving abilities (Bass, 1997). This empowerment component is more explicitly aimed at stimulating interactions in groups or teams than the charismatic component. Through empowerment, transformational leaders can stimulate team members to move beyond their self-interest and to invest in their team (Raes et al., 2013), and can create a learning climate in teams that stimulates the team's development (Zaccaro, Ely, & Shuffler, 2008). Therefore, we expect that when transformational leaders empower their teams, this is positively related to teachers' participation in team learning activities, and we formulated our first hypothesis as follows:

Hypothesis 1. *Empowering transformational leadership is positively associated with teachers' participation in information acquisition,* boundary crossing and information processing.

1.4. Unravelling possible mediators

Participative decision-making. As mentioned in the introduction, transformational leaders tend to decentralise influence within teams (Avolio & Gibbons, 1988; Mulford & Silins, 2003). For instance, research shows that transformational leaders encourage teachers to participate in decision-making (Geijsel et al., 2009; Thoonen et al., 2011). Participative decision-making implies that the decision-making process is not regulated by and reserved for team leaders and a few teachers, but that each team member has the opportunity to participate in decision-making. Such participation can increase teachers' support for educational change and contribute to school improvements (Harris, 2009; Scribner, Sawyer, Watson, & Myers, 2007).

We expect participative decision-making to partially mediate the associations between transformational leadership and team learning because participative decision-making increases the mutual influence among team members. This mutual influence creates interaction between team members, encourages team members to share knowledge, and stimulates the further creation of a learning climate in teams (Liu, Hu, Li, Wang, & Lin, 2014). For example, teachers' involvement in team decisions may increase the need for information processing in terms of sharing information with each other and concretising shared information together in order to make informed and considered decisions. Teachers' involvement in decision-making may also increase their individual information acquisition and boundary crossing behaviour because they feel responsible for making considered decisions, and may therefore want to consult all the available and relevant information.

Although this association between participative decision-making and team learning lacks empirical evidence, previous research does confirm that empowering teams and distributing leadership among team members are positively associated with team learning (Liu et al., 2014). We expect a similar association between participative decision-making and team learning. Therefore, based on these concepts, the following hypothesis was formulated:

Hypothesis 2. *Participative decision-making will partially mediate the positive associations between transformational leadership and information acquisition, boundary crossing and information processing.*

Affective team commitment, perceived task interdependence and team member proactivity. Empowering teachers with the opportunity to participate in decision-making processes may increase their team-oriented attitudes. Research shows that participative decision-making is positively associated with employees' affective commitment to the organisation (Scott-Ladd, Travaglione, & Marshall, 2006; Seibert, Wang, & Courtright, 2011), and similar associations are found at the team level. For instance, the study of Kirkman and Rosen (1999) shows that, when teams are empowered and team members share decision-making, team members feel collectively responsible for the team's performance and feel more committed to their team. Furthermore, because participative decision-making means that team members have a shared responsibility for the realisation of team tasks, they may feel that they need to interact more to complete their tasks. In other words, participative decision-making may be associated with increased levels of perceived task interdependence of team members. While this possible association misses a solid empirical base, research does show that task interdependence positively affects the positive association between team empowerment and team performance

(Chen, Kirkman, Kanfer, Allen, & Rosen, 2007; Liden, Wayne, & Bradway, 1997), which indicates that there is an important association between empowerment and task interdependence. Therefore, we expect that participative decision-making will be positively associated with teachers' team commitment and their perceived task interdependence.

In turn, we expect that teachers' increased affective commitment and perceived task interdependence (i.e. teachers have stronger team-oriented attitudes) will be positively associated with higher levels of proactive team member behaviour by teachers (i.e. they show more team-oriented behaviour). This mechanism can be explained by the role theory (Griffin et al., 2007; Katz & Kahn, 1978): when individuals feel part of a team and recognise a bond of identity, they will act in ways to support their team by carrying out activities to increase the team's performance. Proactive individuals aim to change their work environment by taking control over the situation and trying to cause change at their own initiative. Their behaviour is future-oriented and involves risk-taking, because they anticipate future problems and needs (Griffin et al., 2007; Parker & Collins, 2010). Proactive *team* behaviour is a specific form of proactive work behaviour, aimed at changing the team's situation, such as its performance (Griffin et al., 2007). For example, proactive team members try to improve team procedures and search for new ideas and methods to change team performance, and communicate their ideas with other team members (Parker & Collins, 2010). Because of their search for new ideas and methods, we expect that proactive team members will participate more in information acquisition and boundary crossing activities. Furthermore, because proactive team members want to convince others of their ideas, we believe that they will also participate more in information processing than less proactive team members.

Combining our expectations, we first expect transformational leadership to be positively related to participative decision-making (Hypothesis 2). Second, we expect that 1) participative decision-making is positively associated with teachers' team commitment and perceived task interdependence, that 2) these team-oriented attitudes are positively associated with teachers' proactive team behaviour, and that 3) this proactive behaviour is positively associated with teachers' engagement in team learning activities. Based on this line of reasoning, we formulated the following hypothesis (all hypotheses are depicted in the conceptual model in Fig. 1):

Hypothesis 3. *The positive associations between transformational leadership and information acquisition, boundary crossing and information processing will, in addition to participative decision-making, be partially mediated by affective team commitment, perceived task interdependence and team member proactivity.*

2. Methods

2.1. Sample and procedure

Data were collected as part of a study on vocational education and training (VET) teachers' team learning. The VET context was chosen for this study because VET institutions are currently implementing competence-based education (CBE) to better meet increased labour market demands such as employers' expectations regarding employees' lifelong learning skills and professional competencies (Mulder, Weigel, & Collins, 2007). CBE involves revising existing curricula to increase the integration of theory and practice, and enhancing students' self-regulated learning (Mulder, 2017). VET teacher teams are regarded as the central organisational unit in the implementation of these reforms (Runhaar & Sanders, 2016). These teacher teams are multidisciplinary and consist of teachers with different skills, areas of expertise and roles.

For example, some teachers have expertise in specific courses, while others have additional tasks such as development or coaching tasks (Wesselink, 2010). To implement CBE in educational programmes, teachers within these teams need to combine their expertise and collaborate with each other (Truijen, 2012).

Data were collected through an online survey that was sent to 1650 teachers in 104 teams in 23 VET institutions in the Netherlands, over the period April to December 2014. To obtain this sample, team leaders at every VET institution in the Netherlands were contacted and asked to allow their teacher team to participate. Teachers were sent an email with a personal invitation to take part in the survey and were assured that data would be processed anonymously.

Only those teams with a minimum response rate of 33% and a minimum response of 3 teachers in teams with 4 or more members, or 2 teachers in teams with 3 members, were included to obtain a good representation of each team in the analysis. This resulted in a final sample of 92 teams with a total team size of 1565 team members ($M = 17.01$, $SD = 9.61$), of whom 992 completed the survey (63.4%). These 992 team members were included in our analysis. 52% of these 992 teachers was female, and the mean age was 47.26 years old ($SD = 11.27$, $Mdn = 48.96$), which is representative of the Dutch VET teacher population, in which approximately 51% is female and the average age is 49 years old (Lubberman, Van Rens, Hovius, & Wester, 2013). On average, these team members had worked as a teacher for 14.43 years ($SD = 10.74$, $Mdn = 11.00$). Most of the teachers had a Bachelor's degree (70.6%), 10.1% had a Master's degree, 11.9% had a senior secondary vocational education degree, and the remaining 7.5% was either following an educational programme or had received a post-education degree.

2.2. Measurements

The measurement model was analysed primarily using existing and validated scales plus two adjusted and pilot-tested scales for information acquisition and information processing. For most scales, original Dutch items or existing translations were used. The scales for team member proactivity and boundary crossing were translated into Dutch using back-forward translation by a native English speaker.

For the team learning scales and the team member proactivity scale, a 5-point Likert scale with 1 (*never)* to 5 (*always*) was used; for the remaining scales, a 5-point Likert scale with 1 (*completely disagree)* to 5 (*completely agree*) was used, except for the perceived task interdependence scale, for which the original 7-point Likert scale with 1 (*completely disagree)* to 7 (*completely agree*) was used.

Team learning. Boundary crossing (four items) was measured using the translated scale of Wong (2004). A referent shift from 'our team' to 'I' was used on all items, because boundary crossing is regarded as an individual team member activity. An example item is, 'I seek feedback about the team's work from people external to the team' (Cronbach's alpha = 0.79). Information acquisition (five items; Cronbach's alpha = 0.65) and information processing (nine items; Cronbach's alpha = 0.90) were measured using an adaptation of the team learning instrument of Van Offenbeek (2001). These adapted scales were pilot tested among 128 VET teachers who did not participate in the current study. Explorative factor analysis with oblimin rotation in SPSS 21 showed a clear two-component structure, and the scales had acceptable to good reliabilities (in the pilot, the Cronbach's alpha for information acquisition = 0.75 and for information processing = 0.89). An example item of information acquisition is, 'I ask my team members for help and advice about my work', and for information processing, 'In my team we challenge each other to take new perspectives concerning our work'.
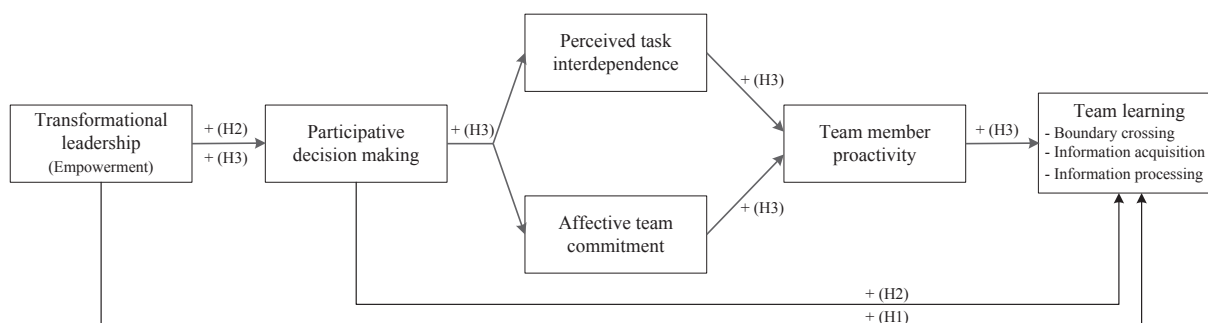
Fig. 1. Conceptual model.
Notes: + indicates a positive association.

Transformational leadership. Transformational leadership was measured using the empowerment items of the transformational leadership scale developed by De Hoogh et al. (2004) (five items; Cronbach's alpha = 0.89). Example items are, 'My manager delegates challenging responsibilities to employees' and, 'My manager stimulated employees to think in new ways about problems'.

Participative decision-making. Participative decision-making was measured using the translated items of De Dreu and West (2001) of the scale developed by Campion, Medsker, and Higgs (1993) (three items; Cronbach's alpha = 0.84). An example item is, 'My team is designed to let everyone participate in decision-making'.

Affective team commitment. Affective team commitment was measured using the translated items of Jak and Evers (2010) of the collective team identification scale developed by Van der Vegt and Bunderson (2005) (four items; Cronbach's alpha = 0.81). An example item is, 'I feel a strong sense of belonging to the team'.

Perceived task interdependence. Perceived task interdependence was measured using the three-item scale of Van der Vegt (2008). The three-item scale had a low reliability (Cronbach's alpha = 0.58). Item statistics showed that the reliability of the scale could be improved to an acceptable level by removing the item 'In our team there is little need for collaboration, team members perform their task independently without help from others (reverse coded)' (Cronbach's alpha = 0.70). Consequently, task interdependence was measured using the remaining two items: 'The members of this team have to exchange information and advice in order to do their work properly' and, 'In our team, team members are dependent on each other to perform their tasks properly'.

Team member proactivity. Team member proactivity was measured using the translated scale of Griffin et al. (2007) (three items; Cronbach's alpha = 0.89). An example item is, 'I improved the way my team does things'.

Table 1 shows the reliabilities, means, standard deviations, intraclass correlations (ICCs) and correlations of all scales. A confirmative factor analysis (CFA) of the 8 scales and all 35 items in Mplus Version 7.4 was performed to assess the fit to the data using multiple fit indices: chi-square, the root mean square error of approximation (RMSEA), the Tucker-Lewis index (TLI), the comparative fit index (CFI), and the standardised root mean square residual (SRMR). A measurement model fit is good when RMSEA ≤ 0.05, TLI >0.95, CFI > 0.95 and SRMR ≤ 0.08 (Hu & Bentler, 1999), while RMSEA<0.08, TLI>0.90 and CFI>0.90 are considered acceptable (Byrne, 2012). The CFA showed an acceptable fit to the data, with $\chi^2(532) = 1666.362$, $p < 0.001$, TLI = 0.922, CFI = 0.931, RMSEA = 0.046 and SRMR = 0.048.

2.3. Analyses

The conceptual model of Fig. 1 was assessed using multilevel structural equation modeling (MSEM) in Mplus Version 7.4 (Muthén & Muthén, 1998—2012). Because teachers were nested within teams, we computed the ICCs for all variables to determine what proportion of the variables' total variance was explained by team membership. In education, ICCs of 0.10 are considered as medium and values of 0.15 or higher as large (Hox, 2010). Table 1 shows that four of the eight scales had ICCs above 0.10. Perceived task interdependence, team member proactivity, information acquisition and boundary crossing had ICCs below 0.10, which indicates that these were individual level constructs.

Therefore, to obtain correct model results, the nested structure of the data and the individual level constructs were taken into account using MSEM with complex structure analysis. MSEM with complex structure analysis implies that the conceptual model was assessed at the individual team member level, while controlling for their team membership. This complex structure analysis offers the possibility to correctly analyse models at the individual level, while controlling for the nested structure of the data by including the non-independence of the sample by correctly computing standard errors and the chi-square test of the model fit (Muthén & Muthén, 1998—2012). This reduces the type I error rate (false positive results in the measurement model) (Oude Groote Beverborg et al., 2015).

The measurement model fit was assessed using the fit indices RMSEA, TLI, CFI and SRMR. Nested models were compared using the chi-square difference test (Satorra & Bentler, 2001) and, when applicable, adjustments to the measurement model were made based on the modification indices given by Mplus.

The control variables gender, age and team size were included in the analyses by adding their regression coefficients on all variables of the model.

3. Results

The fit of the measurement model to the data was analysed. The first model fit (Model 1) was insufficient, with $\chi^2(13) = 113.890$, $p < 0.001$, TLI = 0.737, CFI = 0.930, RMSEA = 0.088 and SRMR = 0.041. Based on the modification indices, one association was added to the model: the direct association between affective team commitment and information processing. This resulted in Model 2, with an acceptable fit ($\chi^2(12) = 39.296$, $p < 0.001$, TLI = 0.923, CFI = 0.981, RMSEA = 0.048, SRMR = 0.025). The second model fitted the data significantly better than the first model ($\Delta\chi^2(1) = 74.594$, $p < 0.001$). Next, all non-significant associations were removed from Model 2. This resulted in Model 3, which also had an acceptable fit ($\chi^2(30) = 77.573$, $p < 0.001$,

Table 1
Descriptive statistics.

		M	SD	ICC	1	2	3	4	5	6	7	8
1.	Transformational leadership[1]	3.65	0.73	0.165	(0.89)							
2.	Participative decision-making[1]	3.58	0.77	0.158	0.51***	(0.84)						
3.	Task interdependence[2]	5.20	1.17	0.085	0.18***	0.27***	(0.70)					
4.	Affective team commitment[2]	3.47	0.76	0.118	0.28***	0.37***	0.40***	(0.81)				
5.	Team member proactivity[1]	2.41	0.84	0.040	0.08**	0.17***	0.22***	0.24***	(0.89)			
6.	Boundary crossing[1]	2.41	0.70	0.036	0.05	0.05	0.10**	0.05	0.43***	(0.79)		
7.	Information acquisition[1]	3.23	0.58	0.036	0.19***	0.18***	0.19***	0.18***	0.40***	0.50***	(0.65)	
8.	Information processing[1]	3.05	0.67	0.144	0.37***	0.49***	0.41***	0.47***	0.27***	0.19***	0.34***	(0.90)

Note: Cronbach's alphas are in parentheses reported on the diagonal. $N = 992^1$, 932^2. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

TLI = 0.946, CFI = 0.967, RMSEA = 0.040, SRMR = 0.032). However, Model 2 fitted the data significantly better than Model 3 ($\Delta\chi^2(18) = 38.277$, $p < 0.01$). Model 2 was therefore retained and used for further analyses. Fig. 2 presents the results of this model and the direct, indirect and total results are reported in Table 2.

The results show that Hypothesis 1, which expected a direct positive association between transformational leadership and information acquisition, boundary crossing and information processing, was partially confirmed. Transformational leadership was significantly positively associated with information acquisition and information processing, but had no significant association with boundary crossing.

Hypothesis 2, which expected that the association between transformational leadership and the three team learning activities would be partially mediated by participative decision-making, was also partially confirmed. We found that transformational leadership had a significant positive association with participative decision-making, and that participative decision-making had a significant positive association with information processing and was not significantly associated with boundary crossing and information acquisition. Therefore, participative decision-making only partly mediated the association between transformational leadership and information processing, while participative decision-making did not mediate the associations between transformational leadership and boundary crossing and information acquisition. The significant mediation was complementary, which implies that both the direct and indirect associations between transformational leadership and information processing existed, and both were positive.

Hypothesis 3, which expected that the association between transformational leadership and the three team learning activities would, in addition to participative decision-making, also be partially mediated by affective team commitment, perceived task interdependence and team member proactivity, was fully confirmed. Participative decision-making was significantly positively associated with affective team commitment and perceived task interdependence and these, in turn, were significantly positively associated with team member proactivity. Team member proactivity was significantly positively associated with boundary crossing, information acquisition and information processing. Therefore, all indirect paths from transformational leadership through these mediating variables for boundary crossing, information acquisition and information processing were significant: transformational leadership had small indirect positive associations with the three team learning activities.

4. Conclusion and discussion

In this study, we examined to what extent a transformational leadership style of team leaders would be associated with team learning in VET teacher teams. More specifically, we examined the mediating roles of participative decision-making, affective team commitment, perceived task interdependence and team member proactivity in this association. Three main conclusions can be drawn from this study.

First, transformational leadership was positively associated with two team learning activities, namely individual teacher's information acquisition and teacher teams' information processing. In other words, the more teachers perceived the leadership style of their team leaders to be transformational, the more teachers reported engaging individually in information acquisition and engaging as a team in information processing. This finding can be explained by the empowerment characteristic of transformational leaders. On the one hand, transformational leaders focus on stimulating individual teachers to be creative and on enhancing their problem solving abilities. On the other hand, transformational leaders try to move these individual teachers beyond self-interest and delegate responsibilities to them, which creates a climate in which teachers need to interact with each other (Geijsel et al., 1999; Raes et al., 2013; Zaccaro et al., 2008). In that sense, it is noteworthy that transformational leadership was not associated with teachers' boundary crossing. One would expect that transformational leaders would also stimulate teachers to engage in boundary crossing so that teachers could obtain feedback and advice from outsiders, which is needed to increase their performance with regard to educational innovations. However, it is possible that transformational leaders primarily focus on stimulating teacher teams to act more as 'real teams'. This would imply an *internal focus* on their team and, consequently, less investment in stimulating teachers to cross their team's boundaries. Another possible explanation could be that transformational team leaders believe that the necessary expertise for the educational innovation is available *within* their team. Therefore, they may stimulate team learning within the team, but do not feel an urgency to stimulate teachers to engage in boundary crossing. Our data did not provide insights into these possible explanations. Future research on the motives of transformational team leaders for stimulating specific team learning activities, and on whether they are aware of stimulating specific team learning activities, could provide more in-depth insights into the association between transformational leadership and specific team learning activities.

Second, we delved deeper into the associations between transformational leadership and team learning by providing insights into how the opportunity to participate in decision-making mediated the associations between transformational leadership and team learning activities. Results showed a positive association between transformational leadership and participative decision-making, in line with previous research (Geijsel et al., 2009; Thoonen et al., 2011). Additionally, teachers who experienced more opportunities to participate in decision-making also reported higher levels of information processing in their team. Therefore, these findings support our assumption that participative decision-
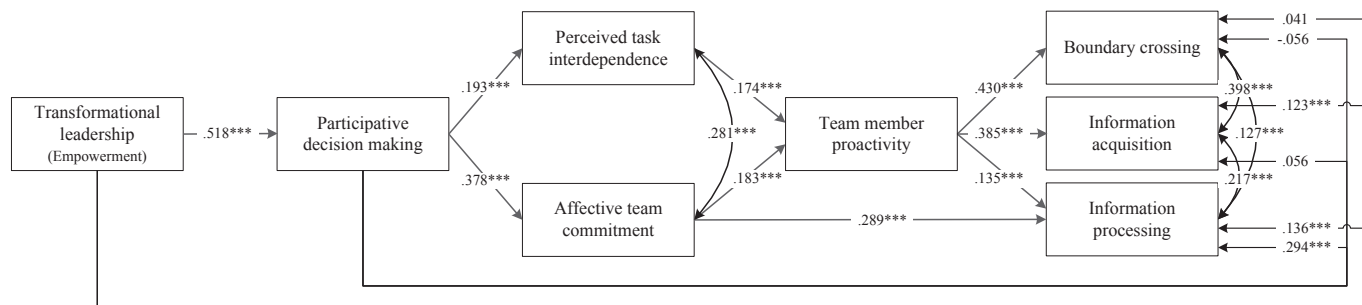
Fig. 2. Results measurement model.

Notes: Standardised estimates of *direct associations* are reported. *p < 0.05, **p < 0.01, ***p < 0.001. Indirect associations and associations of control variables with dependent variables are included in Table 2. Control variables are not included for display reasons.

Table 2

Direct, indirect and total associations of transformational leadership, and direct associations of control variables with team learning activities.

	Boundary crossing			Information acquisition			Information processing		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
TLF	0.041	−0.006	0.035	0.123***	0.049**	0.173***	0.136***	0.216***	0.352***
Indirect paths									
TFL → PDM		−0.029			0.029			0.152***	
TFL → PDM → ATC		−			−			0.057***	
TFL → PDM → ATC → TMP		0.015***			0.014***			0.005**	
TFL → PDM → PTI → TMP		0.007**			0.007**			0.002**	
Control variables									
Gender (female)			0.003			0.026			−0.028
Age			−0.061*			−0.045			0.038
Team size			−0.035			0.028			−0.032

Notes: Standardised estimates are reported. *p < 0.05, **p < 0.01, ***p < 0.001. TFL = Transformational leadership; PDM = Participative decision-making; ATC = Affective team commitment; PTI = Perceived task interdependence; TMP = Team member proactivity.

making mediates the association between transformational leadership and team learning. However, it is notable that participative decision-making was not associated with information acquisition and boundary crossing by individual team members and did not mediate between transformational leadership and these two team learning activities. A possible explanation for the absence of these mediations is that participative decision-making primarily influences what happens *in* the teams and *between* team members (e.g. by increasing the mutual influence among team members; Liu et al., 2014), and has less influence on the behaviour of *individual* team members. This would imply that behaviours for which other team members are not needed, such as engagement in boundary crossing and information acquisition, are not affected by the opportunity to participate in decision-making. So, while we expected that participative decision-making would be *directly* associated with individual team members' search for relevant information so that they could make informed and considered decisions in the team, the results rejected our assumption. However, we did find that participative decision-making was *indirectly* associated with information acquisition and boundary crossing, as explained in the third conclusion.

Third, we examined the associations between transformational leadership and team learning further, by assessing other possible underlying mechanisms. More specifically, we examined whether participative decision-making was positively associated with the team-oriented attitudes of teachers in terms of affective team commitment and perceived task interdependence, whether these team-oriented attitudes were positively associated with higher team member proactivity, and whether team member proactivity was positively associated with more engagement in team learning. The data led to some interesting findings.

To start, participative decision-making was positively associated with both affective team commitment and the perceived task interdependence of teachers. These findings support our assumption that empowering team members with the opportunity to participate in team decision-making increases teachers' team-oriented attitudes. This is important, because teachers have long been characterised as working in isolation and not feeling connected to their team (Runhaar & Sanders, 2013). Through participative decision-making, teachers seem to come out of their isolation and feel more part of a real team.

In turn, these team-oriented attitudes were positively associated with more team-oriented behaviour in terms of team member proactivity. As such, the results suggest that when team members feel more connected to their team, they want to put extra effort into improving their team.

Consequently, more proactive team members reported higher engagement in all three team learning activities. These findings therefore suggest that more team learning will occur if teams have more proactive team members. It is noteworthy that the associations between team member proactivity and information acquisition and boundary crossing were considerably stronger than the association between team member proactivity and information processing. A possible explanation for this difference is that proactive teachers feel individually responsible for the quality of the educational innovation, and therefore feel the urgency to collect relevant information through information acquisition and boundary crossing. Consequently, because information processing is a collective activity, it is less dependent on individual proactivity. Nonetheless, proactive teachers still reported more information processing than less proactive teachers. This finding can also be explained by the increased feeling of responsibility of the former: as a result of participative decision-making, all team members engage to some extent in information processing, but proactive

team members engage in *additional* information processing because they want to communicate their ideas to others.

Throughout this set of mediating variables, transformational leadership had significant, yet small, positive associations with boundary crossing, information processing and information processing. As such, this study contributes to previous research on the association between transformational leadership and team learning (e.g. Lodders, 2013; Raes et al., 2013; Silins & Mulford, 2002; Vanblaere & Devos, 2016) by suggesting that transformational leaders do not only directly, but also indirectly, influence engagement in team learning activities.

4.1. Limitations and future research

Our research model suggests how transformational leaders can contribute to team learning through the identified underlying mechanisms, but we should not neglect the possibility of other underlying mechanisms. First, transformational leaders can empower teams in other ways, not just by giving teams the opportunity to participate in decision-making. For example, leaders can distribute leadership in teams and take a step back as visible leaders to promote the mutual influence between team members (e.g. MacBeath, 2005; Spillane, 2005), which could also influence team learning. Second, other individual team member characteristics, such as the willingness to work in teams, and other team characteristics, such as team culture and psychological safety, could play important roles as well (Raes et al., 2013; Vangrieken et al., 2015). Third, there may be explanatory variables for the team-oriented attitudes and behaviours that we did not include in our model. For example, we only examined whether team member proactivity was associated with affective team commitment and perceived task interdependence, while other variables — such as personality and the learning and performance orientations of individuals — can also be associated with proactive behaviour (Parker & Collins, 2010). Therefore, we suggest that future research delves deeper into the associations between transformational leadership and team learning by including other mediating and explanatory variables.

A limitation of this study is the use of self-report data. Teachers were asked to rate their own attitudes and behaviour and their perceptions of leadership practices. The structure of the survey and the way in which scales were formulated could result in teachers unknowingly relating scales overly consistently with each other, leading to common method bias. Therefore, for future research it is recommended to combine survey data from different sources (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). For example, combining data on leadership from teachers and team leaders could lead to less biased results and strengthen conclusions. Additionally, more in-depth studies, for example based on interviews or observations, may provide more detailed insights into how transformational leadership and the underlying mechanisms influence team learning.

Moreover, by using MSEM with a complex structure analysis, we analysed the research model at the individual teacher level while controlling for the team level. This implies that we did not analyse associations at the team level. Analysis at the team level is recommended by some authors when examining collective team learning activities (such as information processing) because these activities are team-level constructs (e.g. Van den Bossche et al., 2006). However, we chose to examine all variables at the individual level and controlled for the team level because analysis showed that only half of the variables in the research model had high enough ICCs for team-level analysis. It was therefore theoretically inconsequent and not statistically permitted to analyse variables such as team member proactivity and boundary crossing at the

team level. This implies that an alternative MSEM with two-level analysis instead of complex structure analysis was not suitable here; if we had analysed at least one team learning variable at the team level, all indirect associations would need to be analysed at the team level as well (Preacher, Zyphur, & Zhang, 2010). This would be undesirable, because the individual level constructs are only meaningful at the individual level. Consequently, in our study we only offered insights into individual teachers' reports on the team level activity of information processing, corrected for their team membership.

Lastly, cross-sectional data was used in this study, which makes it impossible to make causal claims. It would therefore be interesting to test similar measurement models on longitudinal data, for example to explore whether increased opportunities to participate in decision-making processes foster team learning.

4.2. Practical implications

This study offers team leaders some guidance for stimulating teachers' team learning. First, transformational leaders stimulate teachers to be creative, and they move them beyond self-interest. It is therefore suggested here that, by applying a transformational leadership style, team leaders can stimulate teachers to participate more in team learning. Additionally, we also suggest that transformational team leaders can stimulate team learning by involving teachers in decision-making processes. Participation in decision-making not only seems to increase the teachers' feeling of belonging to a real team, but also seems to make teachers behave in ways more beneficial to the team (i.e. team member proactivity). By enhancing these teachers' team-oriented attitudes and behaviours, participative decision-making can stimulate team learning. Overall, our results indicate that, in terms of stimulating team learning, it is worthwhile to actively stimulate teachers to come out of their comfort zone, to give them responsibilities and to give them the opportunity to express their creativity within their team.

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