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# Team learning behaviours and innovative work behaviour in work teams

TLBs and IWB  
in work teams

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## Abstract

**Purpose** – The purpose of this paper is to get deeper insight into the complex nature of the relationship between team learning conditions, team learning behaviours (TLBs) and innovative work behaviour (IWB) by considering and combining different neglected aspects in research.

**Design/methodology/approach** – A questionnaire was filled out by 593 vocational educators of 117 interdisciplinary work teams in vocational colleges in Germany. Correlations were calculated and structural equation modelling at two levels was conducted.

**Findings** – The results indicate that TLBs, especially team reflexivity and boundary spanning, relate positively to IWB. Furthermore, team structure, task interdependence and group potency relate positively to TLBs. It means that TLBs can be fostered by establishing these team learning conditions and, thus, IWB can be fostered.

**Research limitations/implications** – The main limitation of the study is that the data collection was cross-sectional. Longitudinal studies are required to capture the dynamic character of team learning and to identify causal relationships.

**Practical implications** – It is important to make all employees in vocational education aware of the importance of TLBs especially of team reflexivity and boundary spanning.

**Originality/value** – This study provides practical implications for organisations to foster IWB and indications for a better understanding of the relationship between team learning conditions, TLBs and IWB considering and combining different neglected aspects such as examining TLBs separated in one study.

**Keywords** Team learning, Task interdependence, Innovative work behaviour, Vocational education, Interdisciplinary work teams, Team reflexivity

**Paper type** Research paper

Organisations need to develop innovations to meet emerging problems and challenges due to increasing global competition, customer expectations or market changes (Savelsbergh *et al.*, 2012; Somech and Khalaili, 2014). These challenges require employees to create solutions in organisations. Such solutions, the innovations, are new products or processes for individuals, teams or organisations that can be useful to address challenges or to improve the current state (Messmann and Mulder, 2012). Because of the complexity of the challenges, employees need to work and learn together and co-operate with other institutions to develop novel, innovative solutions (Truijen *et al.*, 2013). This also goes for vocational education where there are many challenges to meet the demands of students, the labour market and society. Thus, interdisciplinary work teams were formed that consist of educators with different qualifications, different responsibilities in their college and teach different subjects. They have to accomplish together organisationally relevant and knowledge intensive tasks and develop solutions to meet various challenges. Knowledge intensive tasks are non-routine tasks for accomplishing them a lot of knowledge from different disciplines is required. Such teams are embedded in the organisational context and consist of two or more individuals who socially interact and are interdependent to accomplish the team tasks. Other teams, such as R&D teams, have the same three characteristics (cf. Huang, 2009; Liu *et al.*, 2013). Specific for the context of education is teachers' long-standing individualism (Vangrieken *et al.*, 2017), a higher stability of the teams with regard to their team composition in contrast to teams in some other domains,



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and the fact that the teams often work on projects that have to be carried out during one school year.

Developing innovations requires innovative work behaviour (IWB) (Messmann and Mulder, 2012). IWB is defined “as the sum of physical and cognitive work activities carried out by employees in their work context, either solitarily or in a social setting, to accomplish a set of tasks that are required to achieve the goal of innovation development” (Messmann and Mulder, 2012, p. 45). Based on models of creativity and innovation, the four different categories of IWB are distinguished: first, opportunity exploration entails activities to scan the environment for opportunities to improve products, services, processes or strategies; second, idea generation means to develop new ideas on how problems can be solved or something novel can be developed; third, idea promotion entails activities to win and organise supporters for the idea. The promoter must explain the benefit of the idea, discuss the resources with team members and try to get permission; and fourth, idea realisation involves activities to implement the idea. It includes the development of the innovation, making it part of regular work processes and testing and modifying the outcome (De Jong and Den Hartog 2010; Messmann and Mulder, 2012). These different activities that lead to innovations require social interaction.

Given the social nature of IWB, interdisciplinary work teams have significant potential for extensive engagement in IWB. There is also evidence that teams with team members that engage in team learning behaviours (TLBs) can develop a high level of engagement in IWB and are crucial to manage complex problems in organisational practice by developing innovations (cf. Schippers *et al.*, 2015; Tjosvold *et al.*, 2009). With TLBs, we mean collective behaviours team members must engage in during their work to attain a high quality of team interaction and generate as a result change or improvement (Decuyper *et al.*, 2010). Due to the attained high quality of interaction within the team, attained by engagement in TLBs, the teams create an optimal condition for required social interaction during innovation development.

However, the relationship between TLBs and IWB is not yet fully understood and, thus, more in-depth insight is needed (Widmann *et al.*, 2016). Some relationships of several TLBs and IWB are well understood but others are neglected (Widmann *et al.* 2016). For instance, there is no study that examined the meaning of boundary spanning or storage and retrieval for creative behaviour or IWB as a holistic construct, which is a gap in research. However, external interaction to gather new information (boundary spanning) and bring that into the team enriches multiple perspectives, which can facilitate generate new ideas (Somech and Khalaili, 2014). Storing common knowledge ensures that nothing gets lost and teams can reuse stored materials as a starting point for tackling knowledge intensive tasks like innovation development (Van Woerkom and Croon, 2009). Another shortcoming in research is that only four studies (e.g. Bednall *et al.*, 2014) considered IWB as a holistic multi-dimensional construct. Other studies (e.g. Zhang *et al.*, 2011) examined the relationship between TLBs and an innovative outcome or a part of IWB, such as idea implementation. However, IWB is a complex, dynamic and context-bound construct with social-interactive facets. By measuring IWB it is crucial to take these characteristics into account and to consider IWB as holistic construct (Messmann and Mulder, 2012). Further, research identified different TLBs that are intertwined and take place at the same time (Decuyper *et al.*, 2010) but can also follow a specific sequence (Leicher and Mulder, 2016). Although team learning includes many different TLBs (Decuyper *et al.*, 2010) some studies summarise different TLBs to one construct (e.g. Choo *et al.*, 2007; Savelsbergh *et al.*, 2012) others consider only one type, such as knowledge sharing, isolated from the other ones (e.g. Shin, 2014; Tjosvold *et al.*, 2004). However, it is important to consider different TLBs in one study simultaneously as separated variables, as in this present study, because in reality TLBs can occur simultaneously and can interact. In such a way the most important ones for a certain

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outcome and how the TLBs take place can be identified. Especially for practice of HRD it is crucial to know a starting point to foster IWB. Finally, another research gap concerns domain specific differences that have been mentioned above. Most existing studies on the relationship between TLBs and IWB are conducted with teams in industrial companies (Widmann *et al.*, 2016). Especially the domain of education is neglected and more studies are requested (cf. Truijen *et al.*, 2013; Thurlings *et al.*, 2015). By considering and combining these different neglected aspects, this study contributes to understand the complex relationship between TLBs and IWB more accurately and to get more generalisable results.

Teams are influenced by specific conditions that affect the team members by engaging in TLBs (cf. Decuyper *et al.*, 2010). Accordingly, it is important to take into account conditions that influence TLBs that, in turn, are important for IWB. Therefore, the aim of this study is to gain a deeper understanding of the relationship between team learning conditions, TLBs and IWB of interdisciplinary work teams to be able to derive implications for future research and practice. The assumption is that various team learning conditions relate to various TLBs that, in turn, relate positively to IWB. We address the mentioned gaps in research by trying to answer the following research questions:

RQ1. Which TLBs relate to IWB?

RQ2. What team learning conditions foster the TLBs that are relevant for IWB in interdisciplinary work teams?

### **IWB in interdisciplinary work teams**

Research on team learning emphasises that teams have potential value for innovation (Schippers *et al.*, 2015; Tjosvold *et al.*, 2009). As aforementioned, IWB consists of different activities based on social interaction – distinguished in the four categories opportunity exploration, idea generation, idea promotion and idea realisation – that must be accomplished to ensure the successful development of innovations. These four categories do not follow a linear order. That is, IWB does not take place as an orderly process where the four categories and their activities follow consecutively. Rather innovation development is a complex, intuitive and chaotic process with interconnections among the categories and activities. It follows that IWB requires the engagement of multiple employees (cf. Thurlings *et al.*, 2015). Thus, the development of innovations is also a social-interactive process (Woodman *et al.*, 1993). For instance, social activities are required to promote an idea and to find supporters that facilitate the realisation of the idea. Also to develop innovations it is beneficial that individuals share their problems and ideas for opportunity exploration or that they search with colleagues for strategies to implement their ideas.

Due to the social nature of IWB, work teams have a high potential for extensive engagement in IWB because a team setting provides a framework for frequent social interaction because the team members are readily and frequently available for interactions (Van der Vegt and Janssen, 2003). However, people sitting close to each other and working together do not *per se* interact more than other ones (Pinto *et al.*, 1993). Rather it is important to create a learning environment where team members are interdependent to accomplish their team task. In interdisciplinary teams, the knowledge and multiple perspectives of different disciplines can be used (Nancarrow *et al.*, 2013). Thus, more exchange of ideas and strategies to develop innovations can occur in interdisciplinary teams than in disciplinary teams (Yong *et al.*, 2014). Moreover, interdisciplinary teams can use extensive knowledge to explore opportunities and generate ideas. However, they must use their advantage for innovation development over individuals such as a wider knowledge base by engaging in TLBs to build common extensive knowledge and a shared understanding about their tasks and strategies for innovation development (Müller *et al.*, 2009).

Researchers have identified several TLBs, such as reflexivity, that are important for teams to work and learn successfully (e.g. West, 2002) and for team innovation (e.g. Hu and Randel, 2014). Accordingly, we assume that these TLBs are also important to reach a high degree of IWB in teams.

### TLBs and IWB

There are several definitions and conceptualisations of team learning in research on team learning. Some focus on the acquisition of new and common knowledge as an output of team interactions (e.g. Ellis *et al.*, 2003). Others focus on change and improvement by regulatory and reflexive processes of the team (e.g. Kozłowski and Bell, 2008). In addition, others focus more on TLBs and their influences, whereby the different conceptualisations focus on different TLBs and capture only a part of that what happens when team members work together (e.g. Edmondson, 1999; Wilson *et al.*, 2007). Decuyper *et al.* (2010) developed an integrative model for team learning based on a review of existing literature from different disciplines. They identified the most essential forms of team learning conditions, TLBs and team learning outcomes from the different models and combined these in their model. Therefore, we use this model as basis for our study.

Team learning is defined as “[...] a compilation of team-level processes that circularly generate change or improvement for teams, team members, organisations, etc. Being a compilation, it consists of changing combinations of different types of processes [...]. Working circularly, it dynamically translates a complex body of influences from multiple levels into different types of outputs at multiple levels, which in turn influence team learning” (Decuyper *et al.*, 2010, p. 128).

In this study, the team-level processes are referred to as TLBs. In line with Decuyper *et al.* (2010), we distinguish three categories of TLBs. The first category includes basic behaviours that describe what happens when teams learn. They influence the team interaction and result in change, but they do not necessarily lead to improvements in team interaction (Decuyper *et al.*, 2010; Sessa and London, 2008). The second category of TLBs consists of facilitating behaviours that are important for the efficacy and efficiency of the team interaction (Decuyper *et al.*, 2010). These facilitating behaviours allow teams to create a specific focus, decide upon strategies and develop routines. Finally, the third category is storage and retrieval that is important for teams to create continuity. That is, by storing and retrieving information teams enable themselves to establish links between activities and corresponding outcomes in past, present and future. These TLB categories are not independent from each other. Rather team learning is a dynamic process in that the different TLBs are intertwined. In detail, basic behaviours are contextualised by facilitating behaviours and storage and retrieval bridges the gap between past, present and future team learning (Decuyper *et al.*, 2010).

In the following, a brief overview will be presented on research results on all TLB categories and the relationships with components of IWB (e.g. Shin, 2014; Widmann *et al.*, 2016). Based on a literature review from Widmann *et al.* (2016) and existing literature about teachers’ learning behaviours, we selected different TLBs. In order to fill the identified research gaps two selection criteria are applied. The first selection criterion concerns the simultaneous consideration of different TLBs as separate constructs. For examining the relationships between different TLBs, we include TLBs from each TLB category. The other selection criterion was to consider the neglected TLBs, boundary spanning and storage and retrieval.

There is consistency in research findings on teachers’ learning activities that especially learning by experimenting, interaction, using external sources and reflection on one’s own practices are important learning activities in the context of educational innovation (e.g. Henze *et al.*, 2009; Van den Bergh *et al.*, 2015). In a teachers’ collaborating learning setting

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are sharing and reflecting important learning behaviours (Bednall *et al.*, 2014; Henze *et al.*, 2009). Because, in addition, the available evidence concerning the relationship between knowledge sharing and team reflexivity and IWB as holistic model is somewhat limited (Widmann *et al.*, 2016) both TLBs were included in this study.

Knowledge sharing is a basic behaviour. It includes the exchange of information, opinions, knowledge, etc. among team members to build a shared knowledge base. In interdisciplinary teams, diverse knowledge from different domains is available and can be used. To exploit the potential advantage of teams, compared to individuals, implicit knowledge of the individuals must be made communicable and exploitable for the whole team. Making implicit knowledge explicit is an important task for the successful regulation of complex and ill-structured problems and the innovation development (Müller *et al.*, 2009). Shared knowledge enables team members to evaluate alternative solutions during idea realisation (Somech and Drach-Zahavy, 2007) to identify the organisation's needs and to analyse problems and in such way team members' opportunity exploration can be fostered. Furthermore, research indicates a positive relationship between knowledge sharing and creativity (Zhang *et al.*, 2011) as well as innovation (Somech and Drach-Zahavy, 2007). That is why we expect a positive relationship between knowledge sharing and IWB:

*H1a.* Knowledge sharing relates positively to IWB.

Team reflexivity and boundary spanning are facilitating behaviours: team reflexivity refers to team members' interaction and discussion about strategies, methods, tasks, processes, etc. to get a clear vision about their goals, methods and the current situation (Decuyper *et al.*, 2010). The aforementioned engagement in reflexivity as a work-related learning behaviour leads to a high degree of team members' flexibility in new challenges (Messmann and Mulder, 2015). Grounded in theories of experiential learning (e.g. Kolodner, 1997) flexibility facilitates the transfer of knowledge and skills from well-known situations to novel situations. Thus, it allows team members to adapt to novel or unexpected situations, which innovation development entail, more easily. The increased flexibility refers to the routinisation of engaging in team reflexivity, which is essential for coping with challenges and which the team can draw on in situations requiring an innovative approach (Widmann *et al.*, 2016). Reflection enables team members to get a clear vision about the status quo and what they have to achieve and how they can achieve that (Decuyper *et al.*, 2010). This clarity enables teams to recognise opportunities for innovation development and so generate new ideas. Previous findings support this theoretical notion and indicate a positive relationship between reflexivity and IWB (e.g. Bednall *et al.*, 2014):

*H1b.* Team reflexivity relates positively to IWB.

Boundary spanning describes the communication of a team with individuals, teams or organisations outside the team to seek information, resources and support (Hirst and Mann, 2004). Communication outside their team conduces teams to create its permeable boundaries and consequently they may develop an identity as a team. Thus, teams can develop their own strategies and solutions for team tasks (Akkerman and Bakker, 2011). Through interaction with people outside the team, a variety of ideas can be enriched by different perspectives redundant. Moreover, boundary spanning enriches the diverse knowledge bases and multiple perspectives that foster innovation development, such as the generation of appropriate ideas, the identification of shortcomings of a prototype or the adoption of ways of doing things (Somech and Khalaili, 2014). Research indicates a positive relationship between boundary spanning and innovativeness (e.g. Van Woerkom and Croon, 2009) and innovation as an outcome of IWB (Timmerman *et al.*, 2013). Based on these findings, we propose the following hypothesis:

*H1c.* Boundary spanning relates positively to IWB.

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Finally, storage and retrieval describes information processing. This includes activities to store information for the future and to locate and reuse that information at a particular later time (Van Offenbeek, 2001). Storing the results of team meetings or the knowledge of the team, for instance by keeping the minutes, facilitates reusing materials by the team and provides a starting point for generating new ideas or developing strategies to implement the new ideas. Moreover, documentation enables teams to moderate their internal reflexivity on tasks, challenges and needs. The work of Timmerman *et al.* (2013) indicates a relationship between storage and retrieval and innovation, but also indicates that the appropriate information and knowledge must be stored and retrieved by the team according to demand of the work task. Accordingly, we hypothesise that storage and retrieval relates positively to IWB as a whole:

*H1d.* Storage and retrieval relates positively to IWB.

These TLBs lead to a team learning output circularly (Decuyper *et al.*, 2010). In our study, IWB is considered a behavioural team learning output, which means a result generated by TLBs (Stagl *et al.*, 2008). Consequently, TLBs relate directly to IWB. Due to the complexity of IWB, TLBs are necessary to get a shared understanding of the work task objectives and new ideas for meeting challenges, and the relevance of the ideas for individuals, the team or organisation. Moreover, by gathering information outside the team and by sharing information within the team, the team can have multiple perspectives and the tasks for innovation development can be attained more effectively (Widmann *et al.*, 2016). On the one hand, TLBs can take place during daily work to prepare and support teams for handling complex tasks by activating their advantage over individuals. By engaging in TLBs team members develop their professional knowledge and skills that are important for innovation development (Sanders and Lin, 2016). On the other hand, TLBs can take place during the process of innovation development as a factor for enhancing individuals' IWB. For instance, by using diverse knowledge bases and multiple perspectives, created by engagement in TLBs, team members can conduct the activities of the process of innovation development more easily (Widmann *et al.*, 2016).

Next to TLBs and outputs, it is necessary to understand the conditions for TLBs. In the next section, team learning conditions are discussed.

### **Team learning conditions, TLBs and IWB**

Teams are exposed to many different influences that can hinder or enhance teams to learn effective. TLBs can be influenced by different conditions at team level. That is, different conditions can hinder or enhance effective team learning by influencing TLBs (Decuyper *et al.*, 2010; Edmondson, 1999).

Team structure describes the extent of specialisation, hierarchy and formalisation within the team. Specialisation means the division of project relevant tasks and roles within the team; hierarchy means that the team has a clearly identified leader and clearly defined roles of the team members; formalisation is the extent to which the team clearly formulates its objectives, priorities and processes (Bresman and Zellmer-Bruhn, 2013). Based on previous research (e.g. Bresman and Zellmer-Bruhn, 2013; Pugh and Hickson, 1976), we consider these as related indicators of one underlying construct, namely, team structure. Well-structured teams can monitor and address mistakes better than others and can understand who knows what and who is responsible for what (Bunderson and Boumgarden, 2010). Thus, knowledge sharing can be facilitated because every team member knows where it can get information for the different tasks. If nobody within the team has the necessary information the team can cross boundaries and can gather information outside the team. Moreover, the danger in teams without a clearly defined leader is that knowledge sharing results in an irrelevant focus on knowledge that is shared (Larson *et al.*, 1996). The division

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of work and clear defined roles can facilitate storing knowledge for instance because one team member might be responsible for that. Bresman and Zellmer-Bruhn (2013) indicated a positive relationship between team structure and team learning, but they made no distinction between various TLBs:

*H2.* Team structure relates positively to (a) knowledge sharing, (b) team reflexivity, (c) boundary spanning, (d) storage and retrieval.

Task interdependence refers to the shared belief of the team members that they depend on one another to perform their tasks successfully (Van den Bossche *et al.*, 2006). A high degree of task interdependence means that team members can only successfully perform if other team members also successfully perform (Decuyper *et al.*, 2010). Thus, the more the team members depend on each other, the more interaction is necessary to carry out tasks (Rupprecht *et al.*, 2011) and the higher the quality of interaction (Runhaar *et al.*, 2014). In that way, team members share knowledge and reflect on their goals, tasks and processes. That is how they build shared knowledge that can be stored. Moreover, increased interaction leads to detecting when the team needs information from outside the team. Consequently, the team members could gather information outside the team in a timely manner. Previous studies have shown the proposed positive relationship between task interdependence and TLBs (e.g. Van den Bossche *et al.*, 2006):

*H3.* Task interdependence relates positively to (a) knowledge sharing, (b) team reflexivity, (c) boundary spanning, (d) storage and retrieval.

Group potency describes the extent to which the team believes that it can work effectively across multiple tasks it encounters (Guzzo *et al.*, 1993). Team learning occurs more in phases of high levels of group potency (Raes *et al.*, 2015). However, research focused on basic behaviours and neglected facilitating behaviours and storage and retrieval (Raes *et al.*, 2015; Van den Bossche *et al.*, 2006). Teams with high levels of potency frame challenges as an opportunity and not as a threat. This can trigger teams to reflect about their behaviours and think about alternatives and solutions. Thus, the team could regulate TLBs and share and process information effectively (Gully *et al.*, 2002). A positive relationship between group potency and basic behaviours is found (Van den Bossche *et al.*, 2006). Therefore, we propose that:

*H4.* Group potency relates positively to (a) knowledge sharing, (b) team reflexivity, (c) boundary spanning, (d) storage and retrieval.

## Methodology

### *Procedure and sample*

A survey was conducted in which 117 interdisciplinary work teams with 593 team members participated. The work teams consist of vocational educators in vocational colleges in Bavaria, Germany. They have different qualifications, different responsibilities within the college and teach different subjects. A total of 325 (57.2 per cent) persons were male and 243 (40.8 per cent) female. Fitting to the aforementioned definition of innovation, and the need for situations where learning and innovation development are most likely to happen, interdisciplinary vocational educator teams were selected on the basis of interviews with the school principals about team characteristics. So teams were selected that exhibit task interdependence and deal with knowledge intensive work tasks that require the development of novel useful solutions for different challenges to improve the current state. The teams dealt with the integration of refugees, with quality management or with school management. The team size ranged from 2 to 23 persons ( $M=6.56$ ,  $SD=3.67$ ) and the age ranged from 26 to 68 years ( $M=45.3$ ,  $SD=9.86$ ). We contacted 339 vocational



colleges from Bavaria, Germany by phone and/or mail and presented the research in several school meetings. Private vocational colleges were excluded because of other goals and challenges and because of their special position in the German vocational educational system. A total of 124 teams from 77 colleges agreed to participate in the survey. Data from 117 teams (= 94.4 per cent) from 76 colleges were collected at the beginning of the 2015/2016 school year.

### *Measures*

The questionnaire consisted of sections for team learning conditions, TLBs and IWB. All the scales used were based on existing validated scales. The items of the scales IWB and group potency were adapted to the context of vocational education. In addition, individual-level conditions as control variables and background variables, such as gender, age and expertise of the team members, are measured.

*Dependent variable.* IWB is measured with the scale from Messmann and Mulder (2012), in an adapted form. This 28-item scale ( $\alpha = 0.96$ ) is a self-reporting scale and measured the individual evaluation of the team members with respect to their engagement in IWB in the context of their team work. The 28 items are based on concrete work activities of the four innovation tasks, opportunity exploration (seven items), idea generation (seven items), idea promotion (seven items) and idea realisation (seven items), described above. The answering format was a six-point Likert-type scale format, ranging from 1 = never to 6 = nearly always. Examples of items are: "Keeping up with structures and processes in the school", "Keeping up with the latest developments in the organisation" (opportunity exploration), "Discussing one's own ideas for changes with close colleagues", "Exchanging ideas for concrete changes at work with close colleagues" (idea generation), "Recruiting colleagues for actively supporting the realisation of an idea", "Recruiting superiors for actively supporting the realisation of an idea" (idea promotion), "Thinking carefully about the goals that should be attained through the realisation of an idea", "Systematically reflecting on experiences gained during the realisation of an idea" (idea realisation).

*Predictor variables.* For all predictor variables a five-point Likert-type scale answering format was used. The TLBs ranging from 1 = never to 5 = very often. The team learning conditions ranging from 1 = "does not apply at all" to 5 = "definitely applies".

Knowledge sharing was assessed using an eight-item scale ( $\alpha = 0.89$ ) that consists of five items from Staples and Webster (2008) and was extended with three self-developed items. Team reflexivity was assessed using the measure from Schippers *et al.* (2007) ( $\alpha = 0.95$ ). Boundary spanning was investigated with a four-item scale ( $\alpha = 0.72$ ) from Hirst and Mann (2004). Storage and retrieval was assessed using a five-item scale ( $\alpha = 0.76$ ). It consists of three items from Van Offenbeek (2001). The items for the different TLBs are presented in Table I.

Team structure was assessed using the five-item scale ( $\alpha = 0.77$ ) of Bresman and Zellmer-Bruhn (2013), which contains items such as "Team members are sure about what they are expected to do"; "The team spends time making sure every team member understands the team objectives"; "The team leader makes sure that the team has clear, explicit expectations for its performance".

Measuring task interdependence we used a seven-item scale ( $\alpha = 0.84$ ) that consists of five items from Rupprecht (2014), such as: "To succeed in handling tasks in the team, my colleagues need information from me"; "To succeed in handling tasks in the team, we have to coordinate our task activities". That was extended with two self-developed items: "To succeed in handling tasks in the team, it is necessary that all team members do a good job"; "To succeed in handling tasks in the team, I must collaborate closely with the people in my team".

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Category	Variable	Items
Basic behaviour	Knowledge sharing (Staples and Webster, 2008)	People in this team keep their best ideas to themselves (reverse coded)
		People in this team are willing to share knowledge/ideas with others
Facilitating behaviour	Team reflexivity (Schippers <i>et al.</i> , 2007)	People in this team share their ideas openly
		People in this team with expert knowledge are willing to help others in this team
		Our team is good at using the knowledge and ideas of different team members
		In this team we exchange our practical experiences regarding the common task
		In this team, we share project-relevant know-how
		In this team, we share our previous knowledge
		As a team we usually take well-considered decisions
		We review our methods of working as a result of changes in the environment
		We talk about different ways in which we can reach our objectives
		We examine the implications that changes in the environment may have for the aims of the team
		We work out what we can learn from past activities
		Before we get to work, we make sure everyone on the team has the same problem definition
Boundary spanning (Hirst and Mann, 2004)	Boundary spanning (Hirst and Mann, 2004)	During task execution, we stop to assess whether the team is on the right track
		If a team member discovers a problem, he or she will talk about it with other team members
		We examine the long-term consequences of certain activities
		Problems are looked at from different points of view in this team
		We check whether our activities produced the expected results
		In this team the results of actions are evaluated
		We reflect on the question of whether a pattern can be discerned in events
		If things do not work out as planned, we consider what we can do about it
		If we are successful as a team, we take the time to analyse how we achieved this
		If things do not work out as they should, we take the time as a team to find the possible cause of the problems
		The team reviews its objectives
		The methods used by the team to get the job done are discussed
We regularly discuss whether the team is working effectively		
We review whether it's getting the job done		
We reflect on the way in which we communicate		
We review how we make decisions		
We discuss how well we communicate information		
Storage and retrieval	Storage and retrieval (Van Offenbeek, 2001)	When necessary team members consult with individuals who possess knowledge relevant to the project
		Team members scan the environment inside and outside the organisation for technical ideas and expertise
		Team members seek relevant information from across the organisation
		Team members have access to individuals who possess technical expertise relevant to the project
		My team uses team documents
Storage and retrieval	Storage and retrieval (Van Offenbeek, 2001)	We store in minutes
		We store our knowledge in an archive
		We use team documents created by the team for the team
		We store team documents in a common archive

**Table I.**  
Overview of TLBs containing categories of TLBs, variables and items

Group potency was measured with a scale of seven items, such as: “Our team has confidence in itself”; “Our team feels it can solve any problem it encounters”; “Our team feels it can solve any problem it encounters”. The items were taken from the scale described by Gibson *et al.* (2000) and based on Guzzo *et al.* (1993).

Considering the individual level, intrinsic motivation was measured as a control variable with a five-item scale from Tierney *et al.* (1999) ( $\alpha = 0.90$ ) with a six-point Likert-type scale answering format ranging from 1 = “does not apply at all” to 6 = “definitely applies”. Sample items are “I enjoy finding solutions to complex problems” and “I enjoy engaging in analytical thinking”.

### *Analyses*

We calculated the correlations between the team learning conditions, TLBs and IWB at the individual level using the IBM SPSS Statistics 21 program.

Due to the nested nature of the data of individuals in work teams and the conceptual meaning of the constructs at the team level, we aggregated the TLBs and team learning conditions at team level. IWB and intrinsic motivation was not aggregated because these are individual-level variables. To justify using the team average as an indicator of team-level variables the within-group interrater agreement ( $r_{wg(j)}$ ) and the intraclass correlation coefficient (ICC) were calculated (LeBreton and Senter, 2008). For all the TLBs as well as the predictors, the ICC (1) varied from 0.14 to 0.33 and ICC (2) from 0.47 to 0.72. The values of ICC (1) exceeded the proposed score of 0.12 (Bliese, 2000). Regarding  $r_{wg(j)}$ , all scales also exceeded the proposed cut-off value for aggregation of 0.70, as presented in Table I (LeBreton and Senter, 2008).

For the TLBs a measurement model was specified. The measurement items were used as indicators of latent variables. Due to parsimony, we conducted item parcelling by averaging scores of similar, content related and substantially correlated items (Little *et al.*, 2002). Fit indices provided an adequate fit for the measurement model ( $\chi^2 = 231.84$ ,  $p < 0.01$ ; SRMR = 0.04; CFI = 0.96; TLI = 0.95; RMSEA = 0.04). Due to the high reliability of the scales of the team learning conditions, IWB and the control variable and with the view reducing complexity, we used the means of each variable as manifest variables.

In a next step, to test the research model, we conducted two-level structural equation modelling according to Stapleton (2013) using the MPLUS 7 program. For model evaluation, we used proposed standard fit indices and cut-off criteria ( $< 0.05$  for SRMR and RMSEA and  $> 0.95$  for CFI and TLI; Heck and Thomas, 2009).

## **Results**

### *Descriptive statistics and correlations*

Table II presents the means, standard deviations, Cronbach's  $\alpha$  and correlations. Mean scores indicate that the teams have a high level of engagement in TLBs, and the values of team learning conditions are high. Furthermore, the team members strongly engage in IWB.

*Relationships between team learning conditions, TLBs and IWB.* With respect to the relationships among the investigated variables, the correlations are consistent with the hypothesised research model. The correlations indicate a positive relationship between the TLBs knowledge sharing ( $r = 0.28$ ,  $p < 0.01$ ), team reflexivity ( $r = 0.51$ ,  $p < 0.01$ ), boundary spanning ( $r = 0.45$ ,  $p < 0.01$ ) and storage and retrieval ( $r = 0.27$ ,  $p < 0.01$ ) and IWB. Between team learning conditions team structure ( $r =$  from 0.43 to 0.77,  $p < 0.01$ ), task interdependence ( $r =$  from 0.27 to 0.63,  $p < 0.01$ ), and group potency ( $r =$  from 0.38 to  $r = 0.68$ ,  $p < 0.01$ ) and all TLB positive correlations were found.

*Control variable.* Regarding the control variable, the results indicate a positive relationship between intrinsic motivation and team structure ( $r = 0.29$ ,  $p < 0.01$ ), task

Variables	<i>M</i>	SD	$\alpha$	$R_{avg(U)}$	1	2	3	4	5	6	7	8	9
(1) Intrinsic motivation	5.09	0.42	0.90	–	1								
(2) Team structure	3.78	0.72	0.77	0.85	0.36*	1							
(3) Task interdependence	3.86	0.65	0.84	0.90	0.33*	0.56*	1						
(4) Group potency	3.66	0.65	0.82	0.91	0.38*	0.65*	0.65*	1					
(5) Knowledge sharing	4.13	0.69	0.89	0.92	0.21*	0.68*	0.50*	0.42*	1				
(6) Team reflexivity	3.61	0.64	0.94	0.95	0.36*	0.77*	0.63*	0.67*	0.71*	1			
(7) Boundary spanning	3.73	0.76	0.72	0.76	0.30*	0.60*	0.53*	0.54*	0.64*	0.70*	1		
(8) Storage and retrieval	3.94	0.85	0.76	0.75	0.32*	0.44*	0.27*	0.37*	0.21*	0.47*	0.35*	1	
(9) IWB	4.64	0.79	0.96	–	0.55*	0.35*	0.47*	0.47*	0.31*	0.52*	0.46*	0.30*	1

Notes:  $n = 593$ . \* $p < 0.01$

**Table II.**  
Means (and standard  
deviation), reliability,  
and correlations

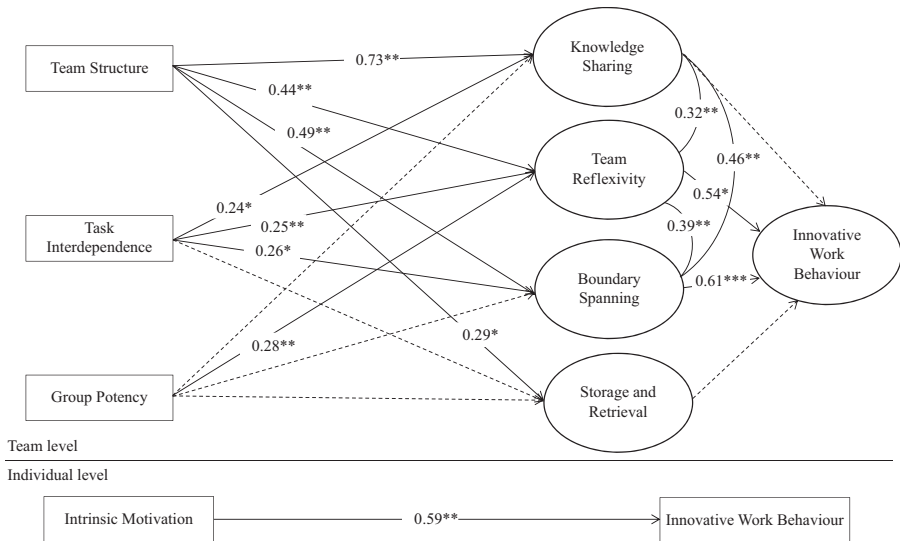
interdependence ( $r=0.30, p < 0.01$ ) and group potency ( $r=0.32, p < 0.01$ ). Intrinsic motivation also relates positively to IWB ( $r=0.56, p < 0.01$ ) and the TLBs team reflexivity ( $r=0.33, p < 0.01$ ), boundary spanning ( $r=0.25, p < 0.01$ ) and storage and retrieval ( $r=0.31, p < 0.01$ ).

### Hypotheses testing

The model in Figure 1 represents the results of the structural equation model at two levels, the individual level and the team level. The fit indices provide an adequate fit for the structural equation model ( $\chi^2=97.82, p < 0.01, df = 53$ ; SRMR = 0.00/0.05; CFI = 0.97; TLI = 0.96; RMSEA = 0.03).

*Relationships between TLBs and IWB.* The results of the analyses indicate a positive relationship between the TLBs team reflexivity ( $\beta=0.54, p < 0.05$ ) and boundary spanning ( $\beta=0.61, p < 0.10$ ) and IWB. No significant results were found between the TLBs knowledge sharing and storage and retrieval and IWB. We hypothesised that knowledge sharing (*H1a*), team reflexivity (*H1b*), boundary spanning (*H1c*) and storage and retrieval (*H1d*) relate positively to IWB but the results provide only support for the *H1b* and *H1c*.

*Relationships between conditions and TLBs.* We hypothesised a positive relationship between the team learning conditions team structure (*H2*), task interdependence (*H3*) and group potency (*H4*) and the TLBs (a) knowledge sharing, (b) team reflexivity, (c) boundary spanning and (d) storage and retrieval. The results indicate a relationship between team learning conditions and TLBs. Team structure relates positively to knowledge sharing ( $\beta=0.73, p < 0.01$ ), team reflexivity ( $\beta=0.44, p < 0.01$ ), boundary spanning ( $\beta=0.49, p < 0.01$ ) and storage and retrieval ( $\beta=0.29, p < 0.05$ ). These results provide support for *H2a-H2d*. Task interdependence relates also positively to the TLBs, knowledge sharing ( $\beta=0.24, p < 0.05$ ), team reflexivity ( $\beta=0.25, p < 0.01$ ) and boundary spanning ( $\beta=0.26, p < 0.05$ ). Between task interdependence and storage and retrieval no significant



**Figure 1.** Standardized estimates for the structural equation model

**Notes:** Fit indices:  $\chi^2=97.82, p=0.00, df=53$ ; SRMR=0.00/0.05; CFI=0.97; TLI=0.95; RMSEA=0.03. Standardized significant  $\beta$  are reported; between several team learning behaviours standardized significant correlations are reported. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.01$

relationship was found. These results provide support for *H3a-H3c* but not for *H3d*. Group potency relates positively to team reflexivity ( $\beta = 0.28, p < 0.01$ ) but not to knowledge sharing, boundary spanning and storage and retrieval. These results provide only support for *H4b*. Regarding the control variable we found a positive relationship between team members' intrinsic motivation and their IWB.

Summarised, the results provide support for *H1b* and *H1c* (relationships between TLBs and IWB), *H2a-H2d* (relationships between team structure and TLBs), *H3a-H3c* (relationships between task interdependence and TLBs), and *H4b* (relationships between group potency and TLBs).

## Discussion

The aim of the study is to gain insight into the relationship between different team learning conditions, TLBs and IWB. This topic was examined in the context of educator teams in vocational education. The results indicate that all TLBs relate positively to IWB, and team reflexivity and boundary spanning seem to be the most important components of TLBs for IWB. In addition, the results indicate that TLBs and, in turn, IWB can be fostered by the team learning conditions team structure and task interdependence, and group potency. However, the team learning conditions relate differently to the TLBs.

### *Relationships between TLBs and IWB*

The results indicate the participating team members have a high level of engagement in IWB. The reason for the high degree could be that all teams work on solutions to meet the challenges encountered in their work. Furthermore, they exhibit a high interdependence in respect of their team task and share knowledge to a high extent. These results confirm the appropriateness of the selection of the teams on the basis of the aforementioned criteria.

To foster IWB, a high level of engagement in the facilitating behaviours team reflexivity and boundary spanning are crucial. Although we found positive correlations between the four TLBs and IWB, the most important TLBs seem to be the facilitating behaviours team reflexivity and boundary spanning, as the results of the SEM indicate. By considering different TLBs simultaneously as separate constructs we were able to identify relationships between the four selected TLBs and to identify the most important ones, which fills the mentioned gap. However, the correlations indicate the importance of knowledge sharing and storage and retrieval for IWB and should not be neglected. Storage and retrieval is important so that information and knowledge in the team do not get lost and stored knowledge can be used as starting point for future tasks. Knowledge sharing is important in teams to gain a shared understanding of the ideas, the goals, etc. It could be considered as a starting point, but to transfer knowledge to new situations adequately, reflexivity is essential (West, 1996). Moreover, by team reflexivity and boundary spanning, multiple perspectives can be enriched. By having multiple perspectives, attaining the tasks for innovation development, such as the generation of appropriate ideas, becomes easier and more effective (Widmann *et al.*, 2016). These results of the structural equation modelling with respect to team reflexivity and boundary spanning and storage and retrieval are consistent with previous studies that only considered certain aspects of IWB, such as creative behaviour (e.g. Shin, 2014; Somech and Khalaili, 2014). Moreover, these results are consistent with studies in other domains and other types of teams (Shin, 2014). However, in contrast to previous research that only considered certain aspects of IWB (e.g. Bednall *et al.*, 2014; Somech and Drach-Zahavy, 2007), we found no relationship between knowledge sharing and IWB in the structural equation model. This could be caused by specific characteristics of teams in vocational education. All the teams already existed before the survey and are stable over time with regard to team composition. In addition, it is likely that

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these teachers have worked before with the same teachers for instance in other projects. Thus, team members could have built a common knowledge base before they were together in this current team, and knowledge sharing within this current team could then be rather an exchange of information because they already know each other. Another reason could be that knowledge sharing is only important for certain parts of IWB, as examined in previous research, but not for IWB as a whole. In addition, it could also be caused by the positive interrelation between knowledge sharing, team reflexivity and boundary spanning. However, as aforementioned it is important to consider different TLBs together as separated constructs, which was done here. The different relationships between various team learning conditions and various types of TLBs and between TLBs and IWB, that we found in our study, underlines the importance of distinguishing different TLBs. For how TLBs can be distinguished, the classification of TLBs from Decuyper *et al.* (2010) provides good indications, as the results indicate. This study contributes to specify previous research and to get a deeper insight in the nature of the relationship between team learning and IWB.

#### *Relationships between team learning conditions and TLBs as well as IWB*

Regarding the relationship between team learning conditions and TLBs, the results indicate that TLBs can be fostered by all four measured team learning conditions. However, team structure seems to influence all four TLBs, task interdependence three, and group potency only team reflexivity. In accordance with other studies (e.g. Bunderson and Boumgarden, 2010; Bresman and Zellmer-Bruhn, 2013), we found a positive relationship between team structure and all four TLBs. However, our study specifies the results from previous research because we distinguish between the relationship between team structure and different TLBs. The more explicit the division of project relevant tasks, clearly defined roles and the formulation of objectives, the more the team reflected and stored and retrieved knowledge. The division of tasks and roles may not lead to the independence of the team members because task interdependence relates positively to the TLBs knowledge sharing, team reflexivity and boundary spanning. The more the team members depend on each other in their tasks, the more they communicate openly to share knowledge and reflect.

Group potency relates to some aspects of TLBs and differently to the four TLBs. The results confirm previous research results (e.g. Raes *et al.*, 2015) that group potency is important for engagement in TLBs. However, whereas Raes *et al.* (2015) found relationships between group potency and basic behaviours, we found positive relationships between group potency and the facilitating behaviour team reflexivity that are crucial for IWB. Teams with a high level of potency seem to use challenges as an opportunity whereby they engage highly in team reflexivity that relates positively to IWB. In addition, motivational factors such as intrinsic motivation seem to be key factors for team members to engage in IWB.

#### *Limitations and implications for future research*

This study has several limitations that provide opportunities for further research. The first limitation refers to the comparability of the teams. The teams differ in the content of their work tasks. Some teams work on quality assurance, others on the integration of refugees and others on school management. However, due to the selection criteria, supported by the descriptive results, it is ensured that these teams work on knowledge intensive tasks and develop novel and useful solutions to improve the current state and are interdependent with respect to their task completion. In this way, the teams are comparable. However, future research could be carried with teams that have the same content of work task.

A second limitation is that the results are specifically valid for the domain of vocational education. Previous research indicates domain specific differences (e.g. Widmann *et al.*, 2016). Thus, some results of this study could be domain specific. For instance, the importance of

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team structure that includes the division of roles within the team could be a domain specific result. However, there are other studies that indicate the importance of team structure in other domains as well (e.g. Bresman and Zellmer-Bruhn, 2013). It, therefore, can be assumed that these outcomes are valid for similarly characterised teams in other domains. Another example of domain-specific results could be the missing relationship between knowledge sharing and IWB, as aforementioned. The consistency of the results with those of other domains, such as high-tech industry or health cares (cf. Widmann *et al.*, 2016), emphasises the comparability of our results and indicate generalisable results. However, future research should test the results in other neglected domains.

A third limitation concerns the team learning conditions. We focus on conditions that relate to project related work tasks which innovative teams have to deal with. However, previous research showed that also cultural conditions, such as organisational culture (e.g. Zellmer-Bruhn and Gibson, 2006), feedback culture (Van der Rijt *et al.*, 2012) or safe team climate (e.g. Leicher and Mulder, 2016) are important team learning conditions for different TLBs. Future research should examine further possible team learning conditions for different TLBs and IWB, in vocational educator teams and elsewhere.

A fourth limitation is that the data collection was cross-sectional, and it took place at the beginning of school year. Although different research gaps could be filled by this study, such as the consideration of neglected TLBs, it is necessary to take into account that the TLBs and their conditions can change over time. There can be different combinations or sequences of the various TLBs that change over time. Because of the design, we need to be careful with interpreting the links between team learning conditions, TLBs and IWB as causal. Therefore, longitudinal studies are required to capture the dynamic character of team learning and to understand how teams evolve over time.

Finally, the focus in this study is on cognitive processes within teams. However, to understand TLBs more accurately, insight into affective processes within the team is necessary. Moreover, the scales of TLBs capture the extent to which team members engage in TLBs. They do not capture how teams do so, for instance how knowledge was shared in the teams or in which way the teams reflect. To capture the manner how teams engage in TLBs and to improve our understanding of affective processes of TLBs in teams qualitative studies are required.

### *Practical implications*

Innovations are needed to meet different challenges caused by changing needs of students, of the labour market, societal developments and policy developments (Truijen *et al.*, 2013). This requires IWB. In this study, relationships were found between the TLBs knowledge sharing, team reflexivity, boundary spanning and storage and retrieval and IWB. Thus, increasing awareness is crucial of the importance of IWB, as well as of the different TLBs. It seems important to make all employees in vocational education, team leaders and school principals, but also the team members, aware of the importance of TLBs. In particular, awareness of the relevance of team reflexivity and boundary spanning should be increased. A high level of engagement in reflexivity leads to a high amount of IWB. Therefore, for instance the team leader should foster discussions on critical opinions. One way to foster discussions is to include members with different kinds of expertise and experience and diverse areas of responsibility. Moreover, inviting experts from outside the team could also enrich TLBs caused by multiple perspectives and diverse opinions.

For instance team leaders or school principals can foster TLBs by creating optimal learning conditions for teams. This means a work environment with a high degree of task interdependence and a clear structure within the team. The results indicate that team structure and task interdependence are particularly important for TLBs. The school principal as a non-member and supervisor of the team or the team members themselves



should ensure that the team has a clear team structure, where roles within the team are clearly defined. Clearly defined roles enable team members to develop a clear understanding of who has the expertise for specific tasks and who is responsible for different tasks. Moreover, the team members should ensure that the team formulates their objectives, priorities and processes clearly. A team should be organised in such a way that team members depend on each other in carrying out tasks and finding innovative solutions to problems. The more the team members depend on each other, the more interaction is necessary to carry out tasks. This fosters open communication for knowledge sharing and reflexivity, which are crucial for increasing IWB.

### Conclusion

This study provides deeper insight in the relationship between team learning conditions, TLBs and IWB. In order to fill the three identified gaps, present study considered IWB as a whole construct, considered different TLBs simultaneously as separate constructs (including neglected TLBs), and examined the relationship between TLBs and IWB in vocational education. Therefore, this study provides indications to understand the relationship in more detail and provides practical implications for HRD to foster IWB. IWB can be fostered by different TLBs that, in turn, can be fostered by team learning conditions. The most important TLBs to foster IWB are the facilitating behaviours, team reflexivity and boundary spanning. Thus, the awareness of TLBs should be increased, and the TLBs and team learning conditions should be fostered in organisations. This can lead to the development of innovations that are required meet emerging challenges.

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