Team Learning and Innovation in Nursing

Teamleren en Innovatie in de Verpleegkunde

Proefschrift voorgelegd tot het behalen van de graad van doctor in de medische wetenschappen aan de Universiteit Antwerpen te verdedigen door

Olaf Timmermans

Antwerpen, 2012

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Prof. dr. J. Denekens

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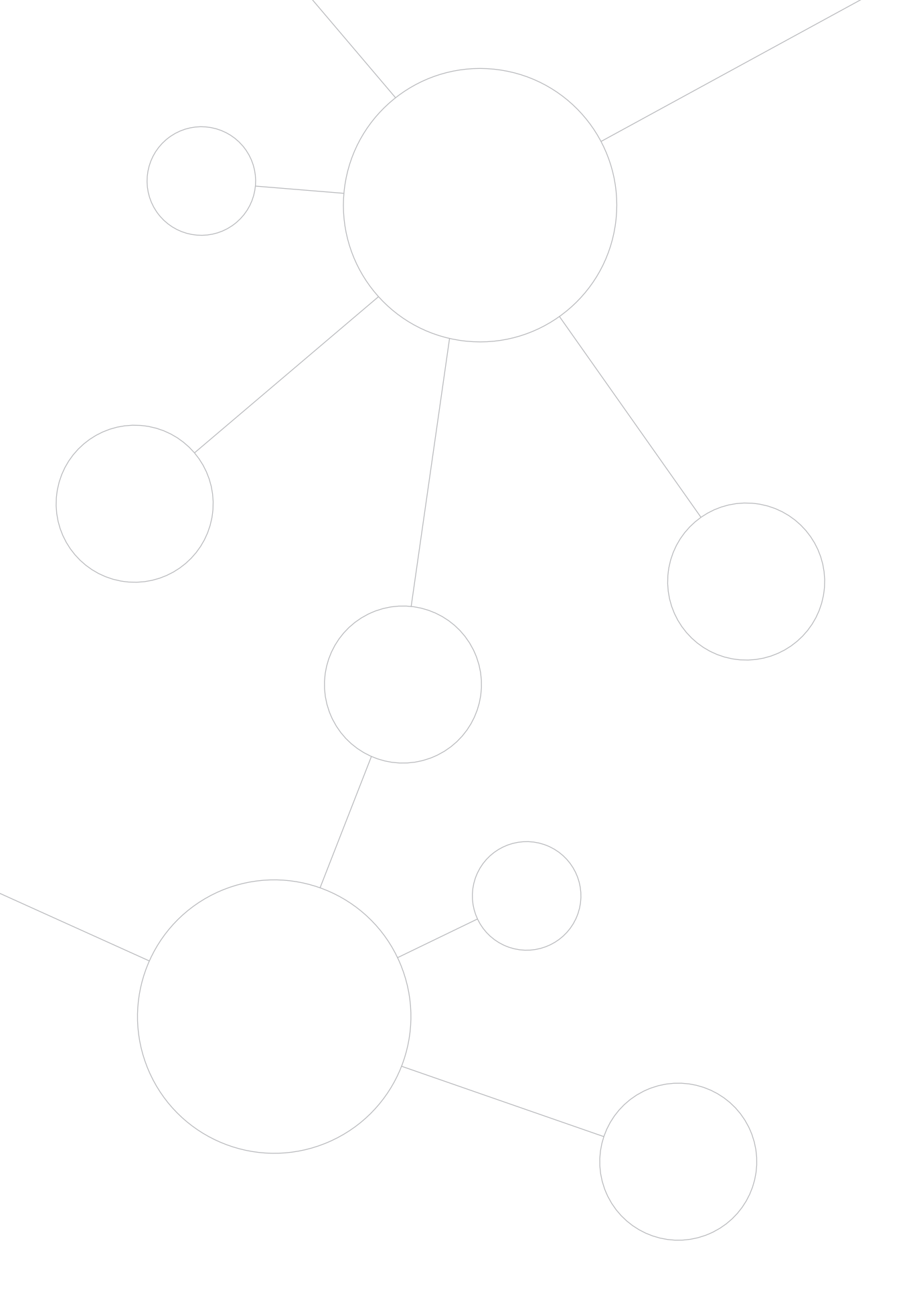

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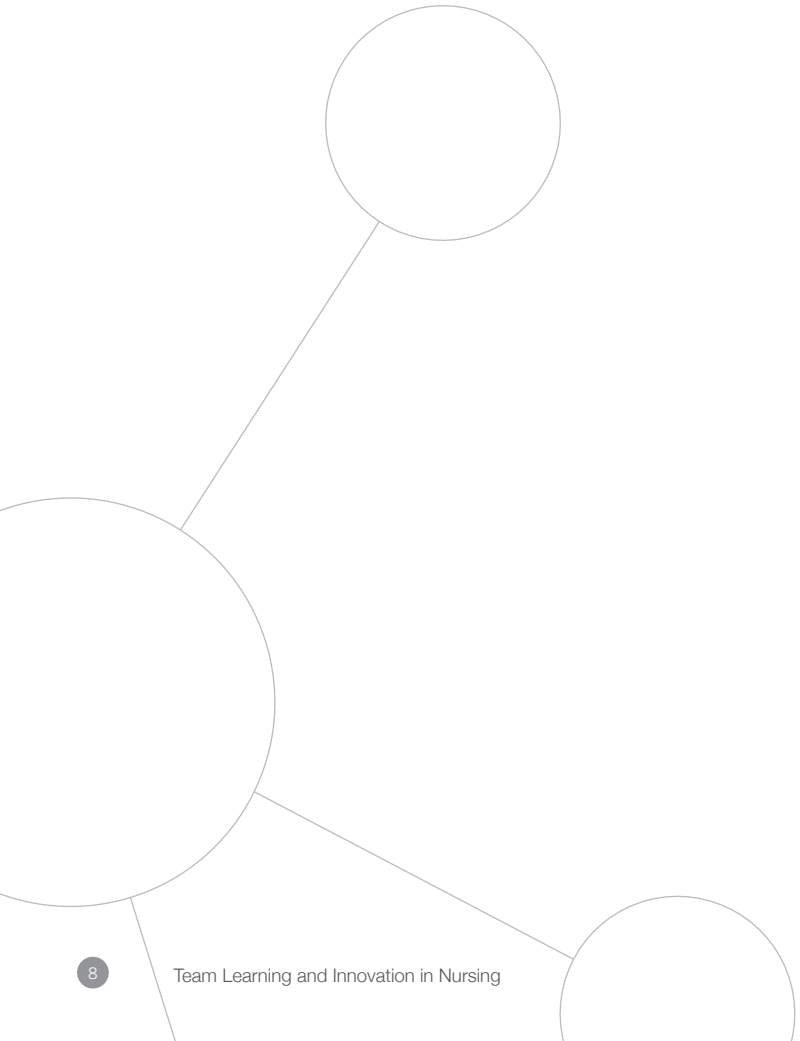
Table of Contents



Chapter

1

Introduction

Author: Olaf Timmermans

Abstract

The introduction defines the paradigm of this study. First, the problem statement provides a brief description of the rationales for the research project reported in this doctoral thesis. In addition, the background section explicates the rationales nursing teams, team learning in nursing teams and innovation in nursing teams in detail. Finally, the introduction presents the aims, research questions, and the outline of the doctoral thesis.

"Numerous examples from daily nursing practice show how implementation of evidence in practice is often not accomplished … examples of implementation strategies focused on group norms or interactions are seldom reported, but could be promising" [1].

1.1 Problem statement

Since the rise of Nursing Science as an academic discipline, nursing teams in clinical practice are expected to implement scientific and professional insights in their practices [1–3]. Nursing teams use innovations, e.g. evidence-based interventions or clinical guidelines, to improve their nurse-sensitive patient-outcomes and achieve high quality performances [4-6]. Innovations sometimes improve the quality of nursing performance, however, the effectiveness of a majority of the innovations is problematic [7;8]. Studies report substantial difficulties on the implementation of innovations in nursing teams, resulting in major non-compliance of nurses in teams towards implemented guidelines and protocols [6;9;10]. The noncompliance of nursing teams towards implementation of innovations is the first rationale for the research project in this doctoral thesis. For example, Ansell [11] reports noncompliance of nurses in teams to medication-policy accounted for 10%-25% of hospital admissions. In addition, a systematic review by Holly and Poletick [12] describes nurses' intershift handover practices stay anchored in rituals and endanger the nurse sensitive outcomes on hygiene. Grimshaw et al. [7] report in a comprehensive systematic review on the effects of implementation strategies a median of 10% of

actual change in performances. The noncompliance of nursing teams towards implementation of innovations is an actual problem, resulting in practices of nursing teams that are incongruent with actual protocols, standard operating procedures, clinical guidelines or applicable regulatory requirements and that endanger patient safety and nurse sensitive outcomes [1;3;7;10].

In nursing teams, nurses collaborate and exchange information on patients and work-related aspects to produce nursing care. In addition, team-based working hands nurses opportunities to collaborate in handling information that is essential to the implementation of innovations. Organizational learning and education research studies express the role of teams in organizations and propose team-learning activities as facilitators for implementation of innovations [13-15]. Contemporary theoretical models on implementation of innovations in nursing team include the concept of learning, however, ignore the role of teams and focus on individual learning only [16-18]. Recently, interventions and research on implementation of innovations in nursing teams are shifting their focus towards the nursing teams themselves [1-3;12]. The observation that the concept of team learning as determinant in the implementation of innovations in nursing teams is understudied, forms the second rationale of this doctoral study. To improve compliance and successful implementation effects, this doctoral study focusses on the learning processes in nursing teams and explores the relation between team learning and implementation of innovations in nursing teams. More specifically, the doctoral thesis reports on the nature of team learning in nursing teams and the examination of the relation between team learning processes and the implementation of innovations in nursing teams.

1.2 Background

1.2.1 Nursing teams

In origin, organizations set up nursing teams to produce nursing care in a specific health care setting [5;20]. Nowadays, nursing teams not only produce nursing care, but, also have to develop the nursing care to address standards of high quality performance en nurse sensitive patient outcomes [1;3;19;25;]. Nursing teams are transforming from production-oriented towards teams that have the capability to produce, as well as, innovate their nursing care. Because of their contribution to nurse-sensitive patient-outcomes in important areas of quality of care and patient safety nursing teams are defined as one of the cornerstones of many health care organizations [2;3;19]. Almost all nurses work in a team, as team-based working is the most applied manner to organize nursing care [20;21]. Nurses work in teams in a diversity of settings Since Nightingale stated the importance of nursing teams by centralizing all that was needed to provide nursing interventions to a specific population in one place, [22]. Nowadays, team-based working is the most applied way of organizing nursing care in [19]. Nursing teams are omnipresent in health care organizations and provide nursing care to patients in hospitals, mental

health or community care settings. Moreover, nurses are active in teams in nursing education on Bachelor and Diploma-Degree levels [20;21;23]. Nursing teams vary on composition, size and function. Nursing teams have their own team-dynamics and culture, influencing the values, norms and perspectives of the individual nurses and the overall performance of the team. Composition of nursing teams includes nurses and nurse-alike staff (nursing-aids, student) and varies within the different settings nursing teams act. In this doctoral study, nursing teams are defined as "a number of people with equivalent nursing education and skills, committed to common purposes, goals, and approaches for which they hold themselves mutually accountable" [24].

1.2.2 Team learning in nursing teams

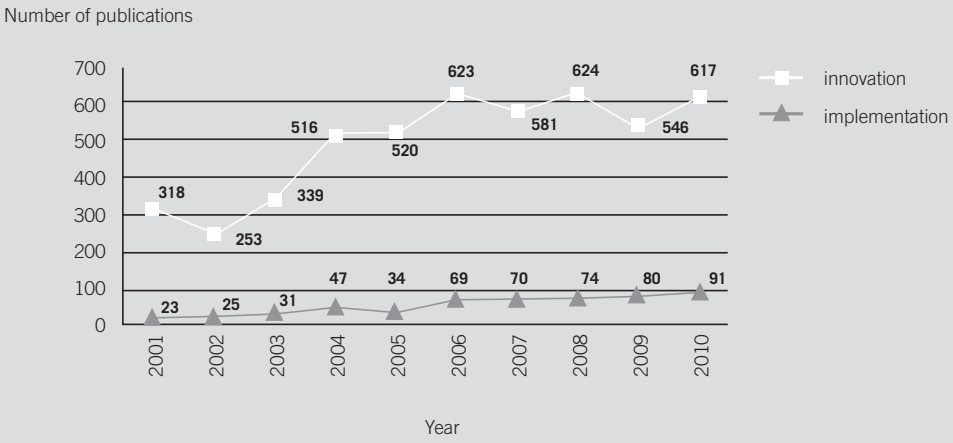
A number of theoretical studies express teams in organizations must learn in order to change what they are doing and propose team-learning activities as facilitators for change [13-15;25]. For example, the implementation of a new guideline on hand-hygiene or the introduction of a new way of intershift handovers enforces individual nurses in teams to learn in order to change knowledge, skills and to alter attitudes [6;8;10]. Nurses in teams can collaborate in team learning-activities as experimenting, using feed-back for improvement or challenging one another for new viewpoints [14;26;27]. Senge [28] was first to advocate the importance of team-learning activities in teams and suggests a relationship between team learning and change in organizations. Nine years later, Edmondson et al [25] study the team-learning activities in health care teams during the implementation of innovations. Nurses in teams use team-learning activities, as experimenting, giving one another feedback on interventions and helping each other, to change routines [25;27].

In the perspective of the social-constructivism on learning, team learning in work-teams originates from collaborative learning [14;29;30]. Team members in interdependent teams with durable tasks undertake collaborative activities to gather and process information. Argyris and Schön [31] and Edmondson [25] use concrete activities of team members to define team learning. Teams learn by undertaking activities, e.g. asking questions, reflecting on results or discussing errors [14]. Huber (1991) defines team learning as 'the activities between team members that process information on important issues in the team and create knowledge and behavioral change'. The team-learning activities are clustered in four team-learning processes; gathering, distributing, interpretation and storage/retrieval of information in a team [26;32]. In addition, team learning is delineated as the process of social interaction between team members to enhance shared understanding in teams [33]. In this doctoral study, team learning is defined as a continuing process of team-learning activities in nursing teams to gather, process and store information [14].

1.2.3 Implementation of innovations in nursing teams

During the last decade, research and consequently publications on innovation have increased, however, research and publications on implementation of innovations in nursing teams remain scarce. Figure 1.1 shows the number of hits in PubMed, with the limit on nursing journals selected by year from 2001 to 2011, for the keywords 'innovation', surpass the number of hits for the keyword 'implementation'.

Figure 1.1 Number of publications in pubmed from 2001 -2011



Overall, publications on the implementation of innovations in nursing teams are limited and the findings on the effects of different implementation-interventions inconsistent. Systematic reviews of studies evaluating implementation-interventions in nursing teams report modest implementation-effects of interventions, e.g. reminders, educational meetings and audits [1;6;7]. Implementation of innovations in nursing teams is covered by several theoretical models. Examples are the IOWA model of evidence based care to promote quality care and the Promoting Action in research implementation in health services (PARIHS) model. The theoretical models include implementation issues and indicate determinants that influence implementation [16-18;34].

Determinants relate to the characteristics of the innovation, characteristics of the intended users and characteristics of the contextual factors [1-3;16;18]. Examples of determinants are the patient population, the complexity of the innovation, the work environment, leadership and culture for the specific nursing team [5;10]. Overlapping concept in all theoretical models is learning, whereas all models include items on changing knowledge, attitudes or behaviors of the individual nurses in the nursing teams. Examples of interventions used to implement innovations and focused on learning in nursing teams are informational and educational sessions, audits and feedback, reminder systems and coaching on the workplace [3;4;10]. No single intervention, however, is solitaire effective. Moreover, interventions are focused on individual learning and ignore team learning in nursing teams.

An innovation in nursing teams arises when the individual nurses in the teams face something new and anomalous. Innovations in nursing teams include typically new products, protocols, services, or ways of working to provide (nursing) care [5;6]. The intended benefits of the innova-

tions are the improvement of direct patient care [2;3;25]. Literature provides a variety of definitions on innovation, differing on the type of business and research discipline. In industrial research innovation is the creation of something new [31]. In organizational research innovation includes creation of new products and the implementation of practices that are new to the teams adopting them [35]. In the perspective of organizational research, innovation does not have to be something new, as long as it is new to the nursing teams implementing the innovation. Innovation arises when nursing teams face something new and unfamiliar. To give an example from practice; patient-centered care is definitely not an innovation as it is around decades, but completely new to nursing team facing the transformation from task-oriented nursing towards patient-centered care. Implementation of an innovation in a nursing team involves the introduction of a novelty in daily routines, demanding effective communication, and removing of obstructions that hinder the use of the novelty [5;6]. In this doctoral study, innovation is defined as "the intentional introduction and use of a product or procedure, new to the relevant unit and designed to significantly benefit the nurse-sensitive patient-outcomes [5;25;36].

1.3 Aim of the doctoral study

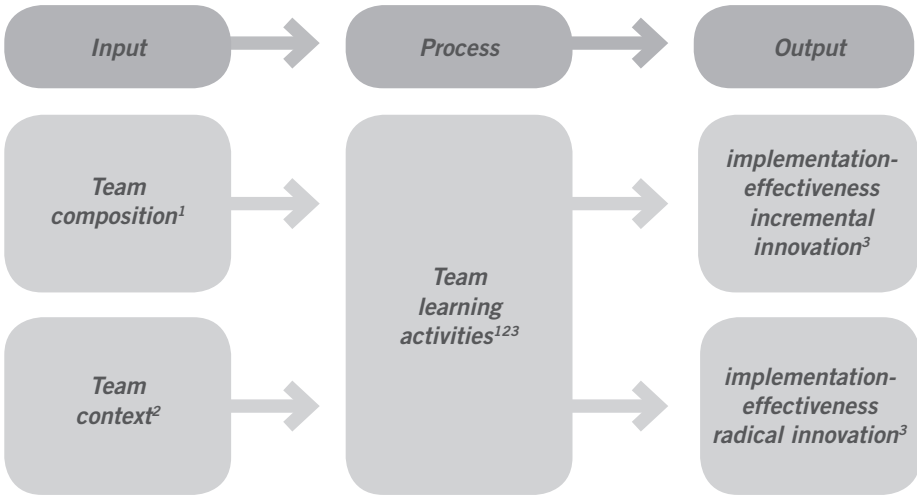
Research on team learning and implementation of innovations in nursing teams is underdeveloped. Until now, no existing comprehensive source yet has explored team learning in nursing teams. The prevalence of team-learning activities in nursing teams, the factors that contribute or hinder the prevalence of team-learning activities and the relation between team-learning activities and implementation of innovations in nursing teams are unclear. This doctoral study focusses on team learning and innovation in nursing teams. Moreover, the doctoral study aims to explore team-learning activities in nursing teams and examine the relation between team-learning processes and implementation of innovations in nursing teams, all to promote compliance towards nursing innovations. To address the aims this doctoral study considers five research questions:

Research Question 1:	What is the current knowledge on the relationship between team learning and implementation of innovations in nursing teams in the literature?
Research Question 2:	How does team learning reveal in nursing teams?
Research Question 3:	How is the relationship between team learning and team composition in nursing teams?
Research Question 4:	How is the relationship between team learning and contextual factors in nursing teams?
Research Question 5:	How is the relationship between team learning and implementation of innovations in nursing teams?

1.4 Outline of the thesis

This doctoral study presents four studies addressing the research questions. To answer the first research question, Chapter 1 '*Team learning and innovation in nursing teams'* reports a review of the literature on team learning and innovation in nursing teams. The purpose of this review is to detail literature on team learning and implementation of innovations in nursing teams and to find out whether individual and contextual characteristics hinder or contribute to team learning in nursing teams. The results of the literature review lead to a conceptual model wherein team learning and implementation of innovations integrate in an input-process-output model. This conceptual model addresses the research questions two to five and used in the empirical studies of this doctoral study (Fig. 1.2).

Figure 1.2 Conceptual model with overview of the empirical studies

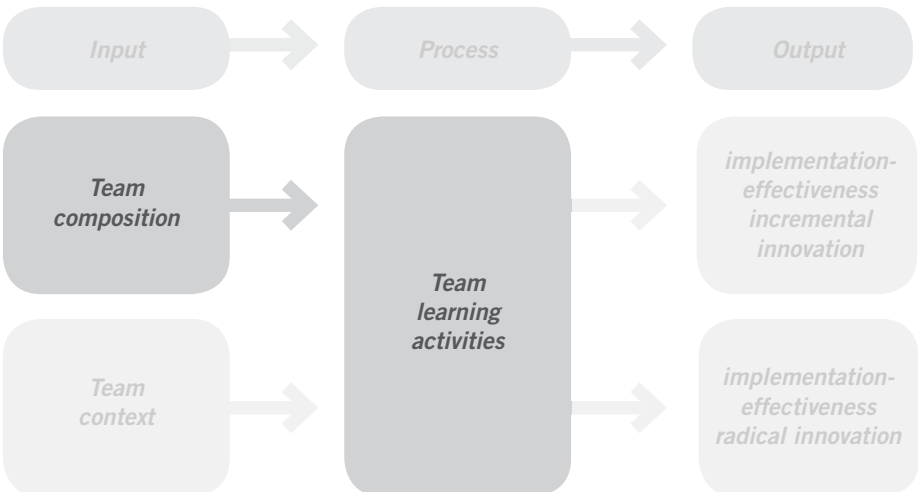


Note:
1 = empirical study 1 (research question 2 and 3),
2 = empirical study 2 (research question 4),
3 = empirical study 3 (research question 5).

Chapter 2 '*Team learning and team composition in Nursing'* addresses the second research question and presents the first empirical study. The first part of this study specifies the process-part of the research model and reports on the validation of a questionnaire on team-learning activities in nursing teams. The second part of this study handles the third research questions by examining the relation between the input characteristic 'team composition' and the

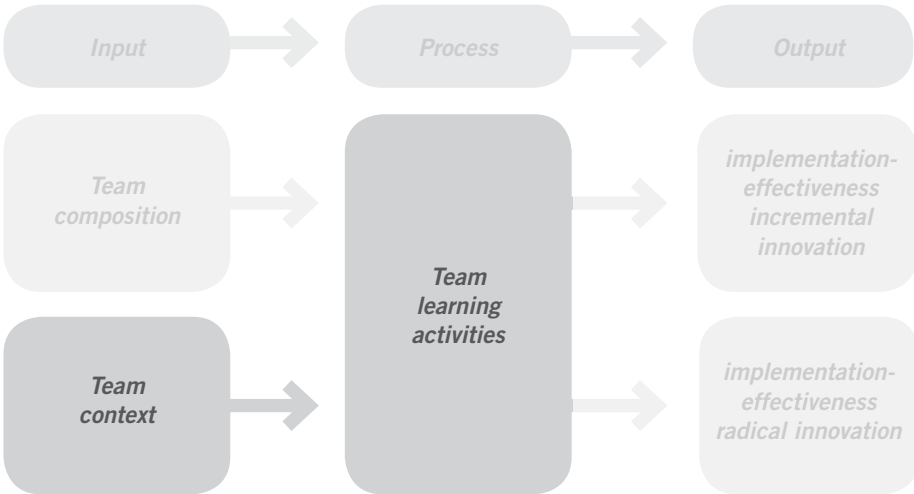
prevalence of team-learning activities (Fig. 1.3). Team composition variables, e.g. the setting and team size, type of nursing care, age, gender and professional education are related with the prevalence of team-learning activities. Overall, this chapter presents a new understanding of team learning in nursing teams and provides a valuable instrument to study team-learning activities. In addition, the results presented in this study show the effect of team composition on the prevalence of team-learning activities.

Figure 1.3 First empirical study



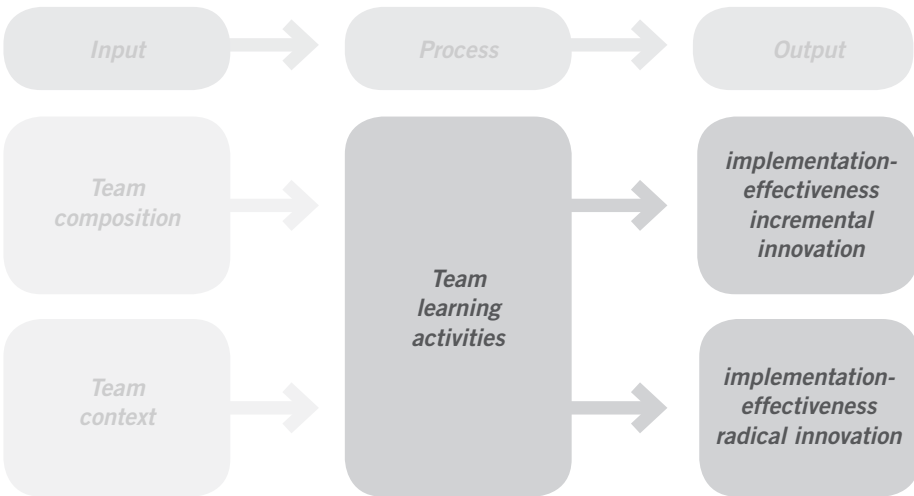
Chapter 3, *'Team Learning and Context'*, presents a second empirical study exploring relations between input and process variables in the research model. The study handles the fourth research question by analyzing the relation between team learning and contextual factors in nursing teams (Fig. 1.4). Team learning in nursing teams is related with five different contextual variables. One contextual variable illustrates the overall team-learning environment. Four contextual variables represent four basic configurations of organizational characteristics of a nursing team. The study emphasizes with contemporary theoretical insights on nursing teams and reveals how contextual factors can enhance the prevalence of team-learning activities in nursing teams.

Figure 1.4 Second empirical study



Chapter 4, *'A contingency perspective on team learning and innovation in Nursing'*, questions relations between the process and output variables in the research model (Fig. 1.5). Introducing a contingency perspective the study presents the fit between team-learning activities and implementation-effect of two contrasting types of innovations in nursing teams. The focus in this study is to gain insights in how nurses in teams use different team-learning activities to implement different types of innovations. This chapter uncovers new directions for future theory development on team learning and innovations in nursing teams that subsume the different team learning processes and different types of innovations as important elements of analysis. In addition, it provides realistic implications for nursing practices.

Figure 1.5 Third empirical study



Finally, Chapter 5 'Discussion' provides the general discussion, conclusions and future perspectives of this thesis to nursing education, nursing practice and research.

Note; styles of references in the different chapters vary because of the specific requirements of the journals wherein chapters are published.

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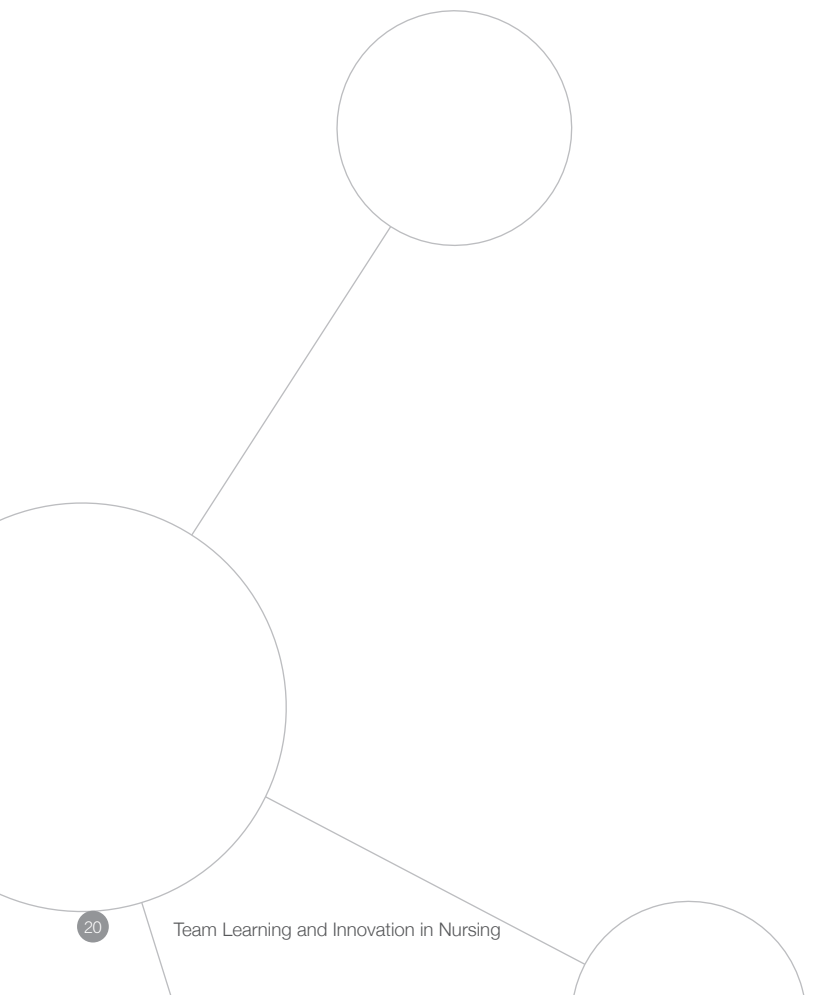

Chapter

2

Team learning and innovation in nursing, a review of the literature

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Olaf Timmermans, Roland van Linge, Peter Van Petegem, Bart Van Rompaey & Joke Denekens,

Team Learning and Innovation in nursing; a review of the literature.

Nurse Education Today, Jan. 2012, 32, (1), pp. 65-70 12. Epub. 2011 Aug 15.

Abstract

The capability to learn and innovate has been recognized as a key-factor for nursing teams to deliver high quality performance. Researchers suggest there is a relation between team-learning activities and changes in nursing teams throughout the implementation of novelties. A review of the literature was conducted in regard to the relation between team learning and implementation of innovations in nursing teams and to explore factors that contribute or hinder team learning.

The search was limited to studies that were published in English or Dutch between 1998 and 2010. Eight studies were included in the review. The results of this review revealed that research on team learning and innovation in nursing is limited. The included studies showed moderate methodological quality and low levels of evidence.

Team learning in nursing teams included processes to gather, process, and store information from different innovations within the nursing team and the prevalence of team-learning activities was contributed or hindered by individual and contextual factors. Further research is needed on the relation between team learning and implementation of innovations in nursing.

Key words: team learning, nursing, innovation

2.1 Introduction

To perform at their best, nursing teams continually need to develop and improve the way they practice and organize nursing care (Van Linge, 2006; Kalisch and Lee, 2009; Blakeney et al., 2009). Nursing teams are expected to test and implement novelties that adjust or change the teams' practices (Cheater et al., 2005; Van Linge, 2006; Van Achterberg et al., 2008). Almost every nurse working in a team is confronted with the implementation of newness such as clinical guidelines, new nursing techniques, or transformation of organizational structures, all demanding a change in their knowledge, skills, and attitudes (Van Linge, 2006; Van Achterberg et al., 2008; Blakeney et al., 2009).

In daily practice, however, nurses in teams report shortages on the time, facilitation, and education they need to alter their knowledge, skills, or attitudes in order to integrate novelty in their routines (Grol and Grimshaw, 2003; Cheater et al., 2005; Grol et al., 2007; Cornell et al.,

2010). Research findings and theoretical models that guide nursing teams on how to implement innovations in their clinical practice are scarce (Grol and Grimshaw, 2003; Van Linge, 2006; Van Achterberg et al., 2008). Empirical exploration of the theoretical models is limited and presents a lack of knowledge on how nursing teams effectively learn and change their practices (Cheater et al., 2005; Van Linge, 2006; Van Achterberg et al., 2008). Moreover, existing theoretical models seem to ignore the role of learning in nursing teams (Chan, 2003; Edmondson et al., 2007; Jeong et al., 2003).

2.2 Background

Innovation in nursing is represented in many different descriptions, modes, or events and is applied in a variety of situations (Cheater et al., 2005; Van Linge, 2006; Grol et al., 2007). Overall, it involves the implementation of novelties that effect minor as well as major changes in the way nursing teams practice and organize nursing care (Kassean and Jagoo, 2005; Grol et al., 2007). As a result, nurses encounter a variety of learning tasks to modify their knowledge, skills, and behaviors (Cheater et al., 2005; Keursten et al., 2006; Van Linge, 2006). For example, the introduction of an electronic patient record (EPR) creates learning tasks for the nurses in the team concerning knowledge of EPR content, their digital skills, and ability to leave pen and paper behind (Veer and de Francke, 2010). Novelties such as implementation of the bedside handover method, hand-hygiene protocols, or clinical pathways create different learning tasks for the individual nurses in the team (Cheater et al., 2005; Kassean and Jagoo, 2005; Van Linge, 2006). However, despite the variation in all the different innovations, the result of implementation depends upon the degree of attitudinal and behavioral changes made by the nurses in the team (Aylward et al., 2003; Van Linge, 2006; Edmondson et al., 2007; Van Achterberg et al., 2008; Holleman et al., 2009).

To learn new knowledge and skills and to change attitudes, nurses in teams can undertake team-learning activities to process various learning tasks (Clarke and Copeland, 2003; Cheater et al., 2005; Van Linge, 2006; Van Woerkom and Croon, 2009). In teams, nurses can give and take feedback, ask other nurses for help to solve problems, or share and apply knowledge on novelties in their field of nursing practice (Clarke and Copeland, 2003; Cornell et al., 2010). Edmondson et al. (2001) defined team learning as a team-level construct that enfolds the learning activities that team members exploit to gather and processes information, which allows the team to develop and perform. Team-learning activities, such as critical appraisal of shared values, standards, routines, and reflection on external developments seem essential to develop and innovate practiced nursing care (Clarke and Copeland, 2003; Edmondson et al., 2007; Fenwick, 2008). Moreover, team-learning activities are expected to benefit the cognitive, attitudinal, and behavioral changes of the individual nurses when they have to modify their own routines (Aylward et al., 2003; Edmondson et al., 2007; Keursten et al., 2006; VanAchterberg

et al., 2008). Still, team-learning methods are rarely used as strategies for the implementation of novelties in nursing teams (Cheater et al., 2005; Thompson et al., 2007; Holleman et al., 2009). Until now, no existing comprehensive source has yet explored team learning in nursing teams. The presence of team-learning activities in nursing teams, the factors that contribute or hinder the prevalence of team-learning activities, and the relation between team learning activities and implementation of innovations in nursing teams are unclear.

2.3 Aims

The aims of this literature review were to elaborate upon (1) the relationship between team learning and implementation of innovation in nursing teams, and (2) determine whether individual and contextual characteristics contributed or obstructed team learning in nursing teams.

2.4 Methods

The databases PubMed, ISI Web of Knowledge, CINAHL, Embase, and ERIC were searched for publications from January 1998 to May 2010. Because of their focus on organizational research in health care organizations, a manual search in databases of The Netherlands Institute for Health Services Research and The Netherlands Centre of Excellence—both non-governmental knowledge institutes—was performed.

The following keywords were used separately and in combination with the Boolean operator 'OR' and 'AND': team learning, innovation, implementation, learning in team(s), collaborative learning, learning environment, and nursing teams. To be included, studies had to address one or more of the following topics in nursing teams: team learning, the relationship between team learning and implementation of innovations, and the factors that contribute or hinder team learning activities. The studies had to address mono- or multidisciplinary teams wherein nurses work and had to be published in English or Dutch.

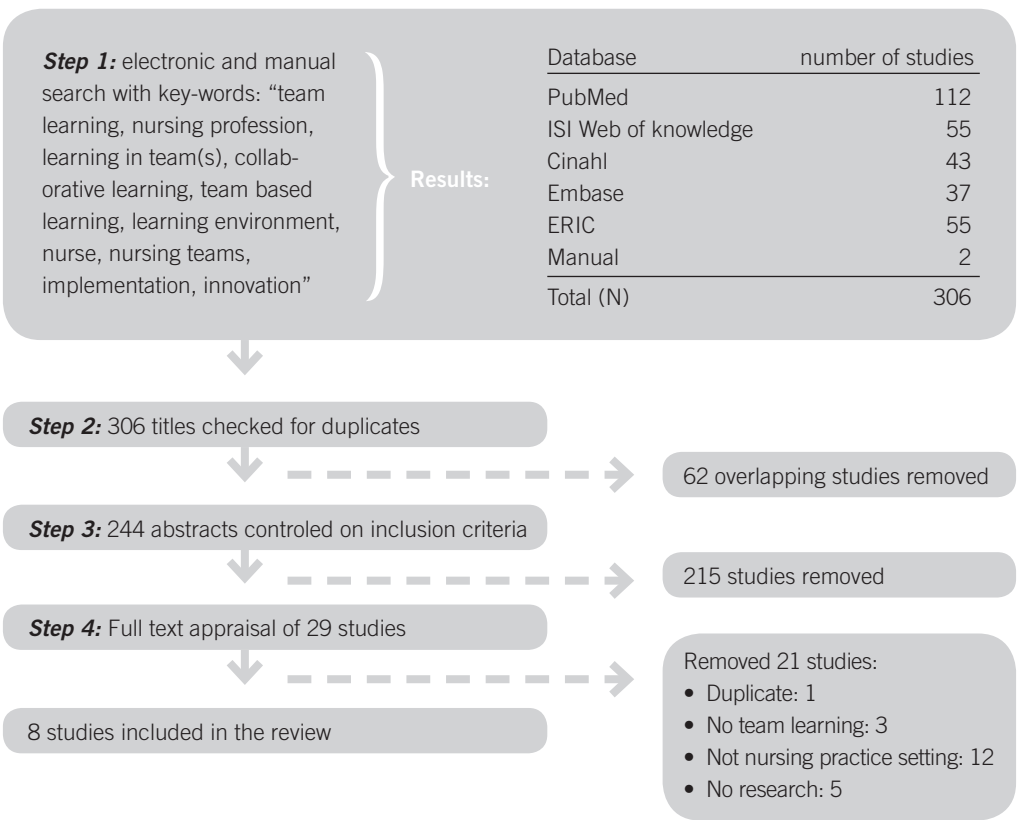
We used two different tools for critical appraisal of the methodological quality of selected studies. Quantitative studies were assessed using the Quality Assessment and Validity Tool (Meijers et al., 2006). This instrument consists of 13 items to evaluate the design, sample, measurement, and statistical analyses, resulting in a score between 0 and 14 points. The total score of each study was interpreted as low quality (0–4 points), medium quality (5–9 points), or high quality (10–14 points) (Meijers et al., 2006). Qualitative studies were evaluated using the QARI

critical appraisal instrument for qualitative research (Pearson, 2004). This instrument consists of 10 dichotomous evaluation criteria, resulting in a score between 0 and 10 points. Studies had to score at least a medium quality (score between 4 and 6) to be included. Data extraction was performed using a form that addressed the design, data collection, concepts used, and sample nature in the studies. The level of evidence in the included studies was defined through the grading system of the National Institute for Clinical Excellence (Kavanagh, 2009).

2.5 Results

The initial search located 306 articles, to which the manual search added two more. Sixty-two articles were removed after a first check for duplication. Of the other 244 articles, 215 did not meet inclusion criteria and were discarded after examining abstracts. The remaining 29 articles were fully appraised and 21 articles were discarded, because of duplication (n = 1), unclear definition of team learning (n = 3), no focus on teams with nurses (n = 12), or lack of a research approach (n = 5), leaving eight articles for review (Fig. 2.1).

Figure 2.1 Presentation of the bibliographic research



2.5.1 Quality of included studies

Four qualitative and four quantitative studies published between 2001 and 2009 were included (Table 2.1). All studies collected data on an individual level, but the level of analyses varied: two studies at the organizational (hospital) level, three at the team level, and three on individual levels. In the included qualitative studies, sample size varied between eight individual nurses (Bennett, 2001) to 16 teams (Edmondson et al., 2001). The qualitative studies used triangulation of data by combining interviews with literature (Platzer et al., 2000), observations (Bennett, 2001), and notes and clinical data (Edmondson et al., 2001). In the quantitative studies, samples varied between 189 individual nurses (Chan, 2003) and 84 teams (VanWoerkomand Croon, 2009). The reported response rate varied between24% (Chan, 2003) and 100% (Van Woerkom and van Engen, 2009). Different instruments were used to assess team learning: the Team Learning Behavior Intensity Inventory (van Offenbeek, 2001), the 'Team Learning Survey' (Edmondson, 1996), and components of the Learning Organizational Scale (Jeong et al., 2003). Applied statistics differed from descriptive only (Van Wetten et al., 2005) to regression analyses (Van Woerkom and Van Engen, 2009). Seven studies were based on an existing conceptual framework, while one study used a framework that was developed especially for that study. All included studies were assessed as medium quality (Table 2.2). The observed evidence of the results was level III; evidence from observational studies.

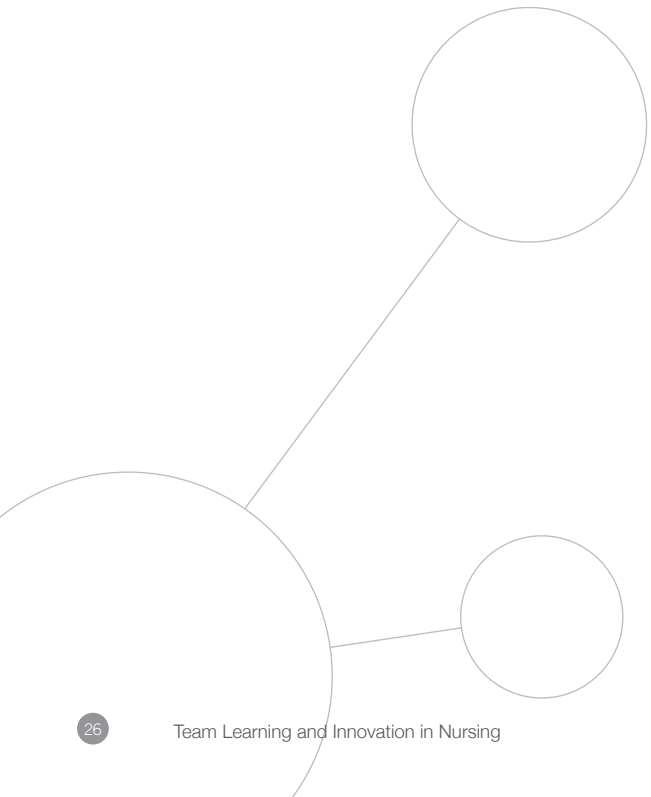


Table 2.1 General descriptive of included studies

	Author (year)	*design*	*Data collection*	*Concepts*	*Sample*
1	Chan (2003)	Cross-sectional survey	Individual learning orientation scale Team learning Survey (Edmondson 1996)	Individual learning Team learning Organizational learning	189 Hospital nurses
2	Van Wetten et al. (2005)	Mixed Method	Team Learning Behavior Intensity Inventory (van Offenbeek 2001)	Team learning Learning environment	14 mental health nursing teams
3	Van Woerkom & Van Engen (2009)	Cross-sectional survey	Team Learning Behavior Intensity Inventory (van Offenbeek 2001)	Team learning Task and Relationship conflict Team performance	54 health care teams/ 30 other
4	Van Woerkom & Croon (2009)	Cross-sectional survey	Team Learning Behavior Intensity Inventory (van Offenbeek 2001)	Team learning Team performance	43 health care teams/ 34 other
5	Platzer et al. (Platzer, Blake, and Ashford 2000)	Qualitative Survey	In-depth, semi-structured interview	Team learning Reflection	30 hospital nurses
6	Bennet (2001)	Qualitative survey	Interview Observation Notes	Team learning Organizational learning Innovation	8 nurses from 2 hospital teams
7	Edmondson (2001)	Embedded multi case design	In depth, semi-structured interview Observation Aggregation with clinical data	Team learning Technical innovation adoption	16 cardiac surgery teams
8	Edmondson (2004)	Qualitative Survey	interview observation	Learning environment Team learning Failure management	9 multidisciplinary hospital teams

Table 2.2 Critical appraisal of the included papers

Author	*Journal*	*Quality Score*
Quantitative studies (score range 0 – 14)[a]		
Chan (2003)	Learning in Health and Social Care	7
Van Wetten et al (2005)	NIVEL[b]	7
Van Woerkom & Van Engen (2009)	European Journal of Work and Organizational Psychology	8
Van Woerkom &Croon (2009)	Personnel Review	9
Qualitative studies (score range 0 -10)[c]		
Platzet et al.(Platzer, Blake, and Ashford 2000, 31)	Journal of Advanced Nursing	6
Bennet (2001)	International Journal of Health Care Quality Assurance	5
Edmondson (2001)	Administrative Science Quarterly	6
Edmondson (2004)	Quality and Safety in Health Care	5

a	Quality Assessment and the Validity Tool (Meijers, Janssen, Cummings, Wallin, Estabrooks, and Halfens 2006, 55): 13 items to evaluate the design, sample, measurement and statistical analyses. Scores interpreted as: low quality (scores 0 – 4 points), medium quality (scores 5 – 9 points) or high quality (scores 10 – 14 points) (Meijers, Janssen, Cummings, Wallin, Estabrooks, and Halfens 2006, 55)
b	Governmental research institute publication
c	QARI critical appraisal instrument for qualitative research (Pearson 2004): 10 dichotomous evaluation criteria, resulting in a score between 0 and 10 points. Scores interpreted as: 0 – 3 points were rated as low quality (0 -3 points), medium quality (4 – 6 points) and high quality (7 – 10 points).

2.5.2 Team learning and innovation

The specific relationship between team-learning activities and implementation of an innovation was demonstrated only in a qualitative study in which Edmondson et al. (2001) explored team-learning activities during the introduction of minimally invasive cardiac surgery (MICS). This technological innovation affected the routines of teams that provided care for cardiac surgery patients. Before the introduction of this procedure, cardiac surgery was a major operation, but after implementation of MICS the care towards patients changed dramatically because they recovered more quickly and their hospital admission declined. Edmondson et al. (2001) reported that teams who used team-learning activities to explore the fit between the effects of MICS and their routines experienced better implementation effectiveness. Teams that under-

took team-learning activities, such as gathering information from external sources and forming shared mental models over the effects of MICS on the way they organize and provide their care to patients, were active in modifying their own practice. In contrast, teams with unsuccessful implementation outcomes reported less team-learning activities compared to teams with successful implementation outcomes. These latter teams were characterized by a higher level of motivation, more experienced psychological safety, and a willingness to develop new behaviors in the team (Edmondson et al., 2001).

2.5.3 Influencing factors on team learning

Detailed analyses of the included studies identified six individual and 13 contextual factors that influenced the prevalence of team-learning activities in nursing teams (Table 2.3). The individual factors could be divided into personal and attitudinal characteristics. Personal characteristics included previous education (n=2), empowerment (n=1), and female gender (n=1), while attitudinal characteristics reflected a positive attitude to learning in a team (n=4), working in a team (n=3), and a focus on continuous improvement (n=2) (Bennett, 2001; Edmondson et al., 2001; Van Wetten et al., 2005). Nurses with positive experiences of team learning during basic nursing education were more likely to continue this in their future clinical practice (Platzer et al., 2000; Van Woerkom and Croon, 2009). If a nurse experienced positive appreciation of the team, this team formed a profound base for team-learning activities based upon reflection (Bennett, 2001; Chan, 2003). In particular, nurses with a focus on continuous improvement of their clinical practice showed a willingness to reflect and learn in the team. Van Woerkom and Van Engen (2009) pointed out that team-learning activities were affected by the gender ratio in the team and reported a positive relationship between team learning and the proportion of female team members. Contextual factors that contributed the prevalence of team-learning activities included a team learning infrastructure (n=5), facilitating leadership (n=5), dedicated time to learn (n=4), identifying learning needs in the team (n=2), team stability (n=3), an external focus of the team (n=3), crossing borders (n=3), shared vision and goals (n=3), collegial support (n=3), and psychological safety (n=3).Contextual characteristics that hindered team learning were hierarchical leadership (n=1), centralized organizational structures (n=2), and large team sizes (n=1).

The team-learning infrastructure (n=5) was described as regular team meetings, structured to learn from working practices (Bennett, 2001; Edmondson, 2004; Edmondson et al., 2001; Van Woerkom and Croon, 2009; Van Woerkom and van Engen, 2009). To organize these meetings in clinical practice, identifying the learning needs of the team (n=2) and time exclusively dedicated to learn (n=4) seemed important (Bennett, 2001; Edmondson, 2004; Van Woerkom and Croon, 2009; Van Woerkom and van Engen, 2009). The influence of leadership on an individual nurse's attitude and behavior towards team-learning activities was found to be either positive or negative (Bennett, 2001; Edmondson, 2004; Edmondson et al., 2001; Van Woerkom and Van Engen, 2009; Van Wetten et al., 2005). For example, hierarchically oriented leadership (n=1) in a team led to less psychological safety and hindered team learning (Edmondson et al., 2001), while facilitating leadership (n=5) enhanced team learning (Bennett, 2001; Edmondson, 2004; Edmondson et al., 2001; VanWoerkom and Croon, 2009; VanWetten et al., 2005).

Another issue in team learning and leadership is the type of leadership, in which supportive, team-oriented, tailored-made management is favored (Bennett, 2001; Edmondson, 2004).

An external focus of the team (n = 3) to track information and developments outside the team and explore the consequences for the way the nursing team practices and organizes their nursing care was contributory to the prevalence of team-learning activities (Bennett, 2001; Chan, 2003; Edmondson, 2004; Platzer et al., 2000). The external focus is visible in the crossing-borders activities (n = 2), e.g. attending symposia, reading literature, or visiting best-practices, that brought information regarding novelties to the team (Chan, 2003; Edmondson, 2004). The implication is that to exploit an external focus, nursing teams should cross the borders of their own team and profession and search for external knowledge and developments. It is interesting to note that the factor 'crossing borders' was found to facilitate team learning in two studies (Bennett, 2001; Edmondson et al., 2001).

Edmondson et al. (2001) introduced the construct of team psychological safety (n=3). Psychological safety is the shared belief that a group is safe regarding interpersonal risk-taking, which is conditional to learning (Bennett, 2001; Edmondson, 2004; Edmondson et al., 2001). Activities, such as crossing borders, identifying learning needs, and entering the first stages of a learning process demand open mindedness and vulnerability, and therefore safety within the team (Bennett, 2001; Edmondson et al., 2001). Reaching characteristics such as sharing goals and visions (n = 3), creating collegial support (n =3), and psychological safety requires time. Teams that worked with a stable membership also encountered more opportunities than teams with changing membership (Edmondson et al., 2001).

Table 2.3 Contributing and Limiting factors to team-learning activities in nursing teams (n = 8)

	Quantitative studies				*Qualitative studies*			
	Chan (2003)	Van Wetten et al. (2005)	Van Woerkom & Van Engen (2009)	Van Woerkom & Croon (2009)	Platzer et al. (2000)	Bennet (2001)	Edmondson (2001)	Edmondson (2004)
Individual factors								
Positive attitude collaborative learning	+					+	+	+
Positive appreciation of teamwork		+				+	+	
Focus on continuous improvement	+					+		
Pos. experience previous education			+		+			
Empowerment						+		
Female gender			+					
Contextual factors								
Team based learning infrastructure			+	+		+	+	+
Facilitating leadership		+	+			+	+	+
Hierarchal leadership							-	
Shared vision and goals	+	+				+		
External focus	+				+	+		+
Collegial support						+	+	+
Time to learn			+	+		+		+
Psychological safety						+	+	+
Crossing Borders						+	+	
Identify learning needs		+				+		
Authority based centralized structures							-	-
Team stability					+	+		+
Large team size				-				

2.6 Discussion

We conducted this review to explore the relationship between team learning and innovation in nursing teams. In addition, we expected to find individual and contextual factors that contribute or hinder the prevalence of team-learning activities. Although these premises have been widely accepted in theoretical papers (Argyris, 2003; Bennett, 2001; Edmondson et al., 2007), we detected a paucity of empirical research on the relationship between team learning and innovation, as well as a shortage of evidence on factors that contributed or hindered nurses to express team-learning activities. In spite of the evolving attention for team learning in literature, the absence of a systematic approach to study team learning in nursing teams seriously limits practical application in this area. The literature on team learning in nursing teams is scarce. Existing research restrains the insights of current theories on team learning and findings are limited to influencing characteristics or outputs of team learning. In addition, the moderate quality scores and the low level of evidence of included studies prohibited a more in-depth understanding of the relationship between team learning and innovation in nursing teams. This reflects the current state of research on team learning and innovation in nursing, in which empirical research with use of uniform instruments and outcomes is failing (Van Achterberg et al., 2008; Van Linge, 2006; Blakeney et al., 2009).

All in all, team learning in nursing teams included the activities the individual nurses undertook to gather, process, and store information they need to change their nursing care. Overall, Team learning showed up as a team-level learning construct with a difference of outputs varying from individual or organizational knowledge to performance outcomes, and was facilitated or hindered by individual and contextual factors. Synthesizing the results and literature, team learning can be viewed in an input process output (IPO) framework. The process of team-learning activities is influenced by input characteristics, e.g. the individual and contextual factors, and results in outputs as individual knowledge and skills and changed behavior (Sessa and Lonon, 2008; Holleman et al., 2009; Gnyawali and Stewart, 2003; Edmondson et al., 2007). Nevertheless, only Edmondson et al. (2001) demonstrated the importance of team-learning activities in the process of exploring and implementing innovations in the teams' clinical practice. Quantitative studies on the relationship between team learning and innovation in nursing teams are still absent (Van Achterberg et al., 2008; Holleman et al., 2009).

Similar to Fenwick (2008), who found gender issues in less than 10% of included studies, we found limited individual factors that influenced team learning. The individual factors we observed drew a picture of individual nurses who combined learning and working in a team, and were focused on continuous improvement. These characteristics reflected nurses as empowered team members, who were multi-tasking on productive as well as innovation skills (Van Linge, 2006; Blakeney et al., 2009). Individual factors also pointed out a positive attitude towards working and learning in a team seems a prerequisite for nursing, as nursing is organized into team-oriented structures (Van Achterberg et al., 2008; Cornell et al., 2010).

In line with Edmondson et al. (2007), the contextual factors derived in this study revealed important items for team learning as time, psychological safety, and an external focus (Edmondson et al., 2007). Still, current environments in which nursing teams act are dominated by quality-driven priorities and continuous operational pressure (Proudfoot et al., 2007; Holleman et al., 2009; Cornell et al., 2010). Already in 2004, Edmondson showed a regulation-oriented context with overarching work design and an internal focus on production. Instead of open mindedness and willingness to share information, the processes of defensive reasoning are dominant in nursing practice (Edmondson, 2004; Van Woerkom and Croon, 2009). Nurses work in an environment of operational pressure overload and constantly changing practices and almost never finish a task before starting a new one (Blakeney et al., 2009; Kalisch & Lee, 2009; Cornell et al., 2010). The contextual factors for team learning seem scarce for nursing teams that work on wards in which nurses are driven towards production and control and where current organizational methods and structures do not support team-learning processes.

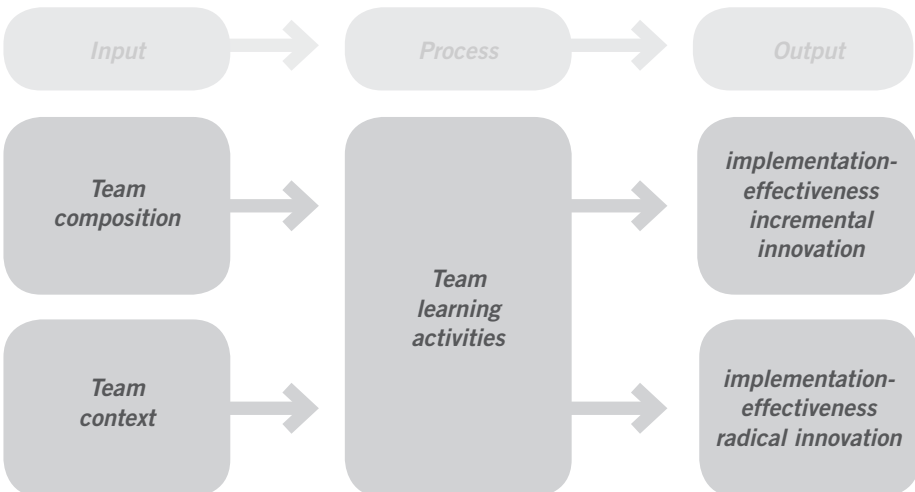
2.7 Conclusions and implications further research

A constant critical appraisal of current practice and innovative behavior seem important aspects for a nursing team to deliver high quality performance. This review showed individual and contextual factors that can either facilitate or hinder team-learning activities of nurses. The team-learning activities that nurses undertake can enhance continuous improvement of the way nursing teams practice and organize nursing care. Through team learning activities, information needed for both production and innovation is processed in nursing teams. Nevertheless, empiric findings on the relationship between team learning and implementation of innovations are limited.

The relationship between team learning and innovation in nursing urges further research in order to develop helpful guidelines for team managers and nurses to develop and change nursing care. Based on the results of this review we suggest further research using a model of team learning and implementation of innovations (see fig. 2.2). The created model hands a clear research agenda, questioning carefully all underlying assumptions. The first step could be a study to explore the process of team learning in nursing teams. Until now, empirical research on team learning has bypassed teams in nursing. It may well be that team learning is different in nursing teams, with team members working in shifts, delivering care 24 hours a day. Second, we argue for studies in a diversity of nursing settings to derive robust empirical evidence for the input factors of the framework, e.g., the individual and contextual factors that influence the processes of team learning in nursing teams. This could be done by expressing the individual characteristics in team composition variables with subsequent analysis of their effect on

team learning. In addition, contextual factors can be defined in team-learning environments and team configurations (Van Linge, 2006; Van Wetten et al., 2005). Last, we suggest studies to relate team-learning activities with variables that express implementation effect(s) of contrasting types of innovations to enlighten the relation between team-learning activities and innovation in nursing.

Figure 2.2 Research model



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Chapter

3

Team learning and team composition in nursing

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Abstract

Purpose: This study explored team learning activities in nursing teams and tested the effect of team composition on team learning to conceptually extend an initial model of team learning and to empirically examine a new model of ambidextrous team learning in nursing.

Design/methodology/approach: Quantitative research utilizing exploratory and confirmatory factor analyses, and correlation and multiple regression analyses was used for empirical validation.

Findings: Principal component analyses of the team learning activities scale revealed a five-factor model, explaining 78% of the variance on the team-learning scale. Being a nursing team in a community hospital, having high team longevity, and having high percentage female nurses explained 33% of team learning.

Research limitations/implications: Data aggregation in a cross-sectional design can be criticized for potential biases. However, statistical assumptions for aggregation were met, and the concepts used in this study were clearly formulated at team level. Thus, a valuable instrument is provided for further quantitative research on team learning in nursing.

Practical implications: The team learning activities in nursing teams reflected the ambidexterity of teams in modern nursing practice. The findings provide a rationale for managers to create infrastructures that support both productive, as well as developmental learning tasks in teams.

Originality/value: The study provides new insights regarding how team learning activities occur in ambidextrous teams in nursing. Contrary to prediction, the results show that team composition has little effect on team learning activities. This is valuable knowledge for researchers, trainers, teams and management in nursing.

3.1 Introduction

Team learning activities are important for nursing teams to perform and facilitate the production, as well as the innovation of nursing care or education. Nursing teams exist in a variety of

team compositions in different settings of nursing care and education, and vary on items as function, size, educational level, and the type of nursing care they provide (Heinemann and Zeiss, 2002; Lemieux-Charles and McGuire, 2006). Transferring research on ambidexterity, team learning, and innovation to nursing teams created the perspective that nursing teams are becoming ambidextrous. Raisch and Birkinshaw (2008) defined ambidextrous as the ability of a team to manage simultaneously production-oriented and development-oriented processes (Raisch and Birkinshaw, 2008). To transform into an ambidextrous team, team learning activities in the teams are inescapable (Chan, 2003; Merx-Chermin and Nijhof, 2005; van Achterberg *et al.*, 2008; Van Linge, 2006). The competence of nursing teams to be innovative and implement new developments has been argued as the most important competence of effective teams within the 21st century (Salas *et al.*, 2008). Whereas the concept of team learning is well known from organizational and educational science, studies on team learning activities in nursing teams are limited. Therefore, this study explored team learning in nursing teams throughout the validation of Offenbeeks' Team Learning Activities Scale. In addition, we examined the influence of team composition on team learning.

3.2 Background

Today, nursing teams are confronted with expectations on production, as well as the innovation of nursing (Blakeney *et al.*, 2009; Van Linge, 2006). To cope, nurses in the team undertake team-learning activities to exchange and process information needed to accomplish the productive and innovative tasks of the team (Cheater *et al.*, 2005; Chan 2003; Edmondson *et al.*, 2001; Van Woerkom and Croon, 2009).

The productive and innovative tasks of a nursing team lead to different learning tasks, possibly at the same time (Lemieux-Charles and McGuire, 2006; Van Linge, 2006). Learning tasks can be divided in production- and development-oriented learning tasks. Production-oriented learning is a reaction to learning tasks that are triggered from the daily production process and results in adjustments in the way nurses work together to produce nursing care or nursing education. On the other hand, developmental-oriented learning is triggered from the gap between current practice and new developments in the environment of the nursing team. Developmental-oriented learning includes the active seeking and processing of new knowledge and results in fundamental changes in the provision of nursing care or education (Edmondson *et al.*, 2007; Sessa and Lonon, 2008). In Organizational literature, Argyris and Schön (1978) were the first to distinguish production-oriented and development-oriented team learning processes in teams (Argyris, 1999). Production-oriented and development-oriented learning differ on the type of information processed. Information needed to execute the production process, such as information on patients and planning, creates production-oriented learning tasks in teams. Information used to reflect on the congruence between the current ways of practising in the production

process and developments outside the team, such as information on evidence based practice or clinical guidelines, brings up development-oriented learning tasks in the nursing team (Van Linge 2006; Edmondson *et al.*, 2007;Sessa & Lonon 2008). Because each learning task includes its own type of information, nursing teams are challenged to handle different types of information at the same time (Miller, 1996; Sessa and Lonon, 2008).

To accomplish both production and developmental oriented learning, nurses in teams undertake team-learning activities to gather, process and store information (Edmondson, 2004; Van Offenbeek, 2001). These team-learning activities result in constructing shared mental models and storing these in the memory of the team (Huber, 1991; Van den Bossche, 2006; Salas *et al.*, 2008). Throughout the team-learning activities, teams transfer and apply new insights in their practice to find innovative approaches to problems. Teams become more efficient over time, acquires and applies new skills, and changes values, norms, and procedures (Chan, 2003; Edmondson *et al.*, 2007; Van den Bossche, 2006).

Team learning arose from collaborative learning, finding its way in educational and organizational science (Dechant *et al.*, 1993; Edmondson *et al.*, 2007; Illeris, 2009). In educational science, studies focussed on the effects of team learning as a didactical tool from a cognitive perspective, whereas in organizational science, team learning was studied from a social perspective for the effects on team performance, with focus on why some teams are more effective (Sessa and Lonon, 2008; Van den Bossche, 2006; van Offenbeek, 2001).

Apart from the differences in theoretical perspectives, many of the concepts, designs, and instruments used in educational and organizational science overlapped. Integrated in an input-process-output framework they offered the possibility to study team-learning processes and their outcomes (Heinemann and Zeiss, 2002; Rowe, 2008; Salas *et al.*, 2008). Argyris and Schön (1996) and Edmondson (1999) focused on team learning as a concept effected by team-learning activities of the team members: when individuals were placed in an interdependent team with durable tasks, team learning arose through the activities between team members (Argyris, 2003; Enberg *et al.*, 2006; Huber, 1991; Hintz et al., 1997). Teams gathered and processed information by undertaking team-learning activities through asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions (Edmondson, 1999; Huber, 1991). Huber (1991) defined team learning in the activities between team members that created knowledge and behavioural change, while team-learning activities regulated the process of information exchange in important issues in the team (Van Offenbeek, 2001). Team learning activities in nursing teams led to improvement of performance on organizational learning and team-effectiveness, the way nursing teams handle patient safety and the implementation of innovations (Edmondson 2001, Chan, 2003, Edmondson *et al.*, 2004, Van Woerkom & Croon, 2009).

Chan (2003) studied team learning in nursing teams in relation with individual and organizational learning. Individual learning was a predictor of team learning, where team learning was related to organizational learning (Chan, 2003). Edmondson reported a positive relation

between team learning and implementation-effectiveness (Edmondson *et al.*, 2001).In addition, Edmondson *et al.* (2004) related team learning with learning from failure in nursing teams and urged team leaders to strengthen the psychological safety in teams, so nurses would feel safe to report and discuss openly (Edmondson, 2004). Van Woerkom and Croon (2009) studied different team learning processes in relation with team-effectiveness and reported team-effectiveness was positively related to the team-learning process 'processing information' and negative related with the team-learning process 'gathering information' (Van Woerkom and Croon, 2009). Still, the fact all studies used a cross-sectional design seriously hinders conclusion about the causality of the relations.

Van offenbeek (2001) developed a 26-item questionnaire through principal components analysis (PCA) with varimax rotation on an individual level (N = 156), as well as at the team level data (N = 29). PCA on individual data showed four factors (*distributing information*, *convergent information interpretation*, *divergent information interpretation*, and *storing and retrieving information*) explained 56% of the total variance of the team-learning scale. Another factor with items on *gathering information* was added on theoretical grounds. PCA at team level data also demonstrated two factors, which accounted for 65% of the variation, but was not used in the studies (Van Offenbeek 2001). Recently, the 26-item team-learning scale was validated by Van Woerkom and Van Engen (2009) in a sample of teams from private and public sectors, resulting in three factors (*gathering information*, *processing information*, and *storing/retrieving information*) explaining 67% of the total variance.

Nursing teams exist in a variety of compositions. Examples are clinical nursing teams composed to deliver nursing care to patients in hospital and mental health settings; teams in nursing education; management teams; and specialized teams being responsible for specific issues, such as patient safety or wound care in health care organizations (Heinemann and Zeiss, 2002). The particular setting in which a nursing team acts influenced nurses' values and normative expectations about working and learning in teams (Gibson and Zellmer-Bruhn, 2001; Lemieux-Charles and McGuire, 2006).

Several studies included the relation between team learning and team composition items. Team composition consisted of global and specific team properties with global team properties describing the team in overall characteristics, such as field of practice, type of nursing care, and team size (Heinemann and Zeiss, 2002; Klein and Kozlowski, 2000), and specific team properties expressing the different individual characteristics in essential variables at the team level, composed of aggregated individual characteristics of team members (Klein and Kozlowski, 2000; Lake, 2006). Van Woerkom and Croon (2009) assessed team learning in 88 teams, including 34 health care teams, finding team learning related to a larger proportion of females in the team. Edmondson (2006) concluded that similarity in educational level, clinical experience, and team longevity influenced the team-learning activities of shared model forming. Former experiences with collaborative learning methods as team learning or problem-based learning influenced team learning. For example, bachelor-degree nurses, having experiences with team-learning methods during their education were found more likely to continue

team-learning activities when they entered practice (Platzer *et al.*, 2000; Van Woerkom and Croon, 2009). Another important specific team composition item is the period of team membership, defined as team longevity (Edmondson *et al.*, 2001; Van Woerkom and Croon, 2009). Processes of sharing goals and visions, and creating collegial support and psychological safety require time. Teams working with a consistent membership also encounter more opportunities than teams with changing membership (Edmondson *et al.*, 2001).

3.3 Study aim

As yet, no comprehensive source has addressed team learning activities in nursing teams. Therefore, the aim of this study was to determine whether the scale items of Offenbeeks' 26-item team-learning activities scale is relevant and applicable for use with nursing teams practicing in The Netherlands and Belgium. In addition, we studied the influences of team composition on the scores on the team learning activities scale.

3.4 Design

A cross-sectional design was used to gather self-reported data from individuals in nursing teams, using a structured questionnaire. Data were collected between November 2008 and March 2009. In standardized meetings, the researcher or a trained nurse researcher distributed a questionnaire pack covering Offenbeeks' 26-item Team Learning Scale and team composition items. To increase the response rate, the nurse researcher returned frequently or a staff nurse was instructed to distribute the questionnaire to nurses not present at the meeting.

Convenience sampling created data from a diversity of nursing teams in mental health care, education, community, and university hospitals. All teams came from health care organizations and bachelor of nursing (degree) schools in The Netherlands and Belgium that participate in an academic service partnership on learning and innovation in nursing. Individual responders voluntarily cooperated to support the research project and signed an informed consent. Individual cases with an item non-response over 10% were not included (n = 17). Teams with less than 60% responders were also excluded (n = 3). To ensure confidentiality, returned questionnaires were coded before inputted into the database (Pollitt and Beck, 2003). Approval of the research committee of the academic service partnership was obtained for the study.

3.4.1 Instruments

Offenbeeks' Team Learning Activities Scale was developed in 2001 in Dutch and contains 26 items, covering team-learning activities across the theoretical assumption of Huber (van Offenbeek

2001; Van Woerkom and Croon, 2009; Wetten *et al.*, 2005;). With this instrument, team members indicate their perception of the frequency of team-learning activities in their team. Examples of items are 'in my team we exchange knowledge with others outside our team' or 'in my team we exchange knowledge and information'. All 26 items were rated on a 5-point Likert response scale ranging from 1 to 5 (from 'never' to 'very often'). Based on the total 26 items in the scale, this resulted in possible total scores between 26 and 130. Random missing data on items were replaced by scale mean, 0.04% data were imputed this way (Fox-Wasylyshyn and El-Masr, 2005).

The global team composition items in this study were characterized by 10 variables covering the setting, team size, type of nursing care, and whether or not the team was working on a nursing development unit. The setting was divided into four dichotomous items: nursing education, mental health, community hospital, and university hospital. Team size was measured by the number of nurses in the team. The type of nursing care was indicated in a dichotomous variable as 24-hour nursing care or non-24-hour nursing care. One variable addressed whether the team was active on a nursing development unit. All global team properties were inventoried by standardized questions.

Six variables represented the specific team composition items, including age, gender, professional education, postgraduate degree education, team members' clinical experience, and team longevity, and were assessed by standardized questions. Age represented the mean age of the nurses in the team; gender expressed the percentage of females in the team; professional education embodied the percentage of bachelor degrees nurses in the team whereas clinical experience represented the mean experience in years in the team; the percentage of nurses in the team with a postgraduate education was also used; team longevity was represented by the mean years of membership of the team.

First exploration of relations between team learning and team composition showed borderline significance levels of the Pearson product-moment correlation coefficients. Therefore, we decided to detect distinct subgroups in the original variables. We divided each continuous variable into three equal groups; then, for each group we created dichotomous variables, all of which were subject to explorative analyses to detect the distinct subgroups (Pollitt and Beck, 2003). This way, we created the dichotomous (subgroup) variables 'percentage female nurses in team under 71%', 'percentage bachelor degree educated nurses in team over 75%', 'percentage postgraduate education in team under 30%', 'clinical experience in team over 16 y' and 'team longevity between 7 and 13 y'.

3.4.2 Data aggregation

Because the theoretical concepts of team learning and team composition were on the team level, data were aggregated from individual to team level (Klein and Kozlowski, 2000). The global team properties, based on the questionnaire administered to the teams, were considered as variables directly defined at the team level. The team-learning items were aggregated by taking the mean scores. Where team learning was seen as a shared team property, the individual level data had to reveal substantial within-group agreement or homogeneity before

aggregation (Klein and Kozlowski, 2000; Van Woerkom and Croon, 2009). Therefore, the intra-class correlation of the team learning variables was tested. Continuous team composition items were aggregated by using the mean value of the team members scores, in which dichotomous variables were accepted as variables directly defined at the team level.

3.4.3 Data analyses

Analyses were completed using SPSS 16.0 and AMOS 16.0 (SPSS, Inc., Chicago, IL. USA). To validate Offenbeeks' Team Learning Scale, we repeated the procedures determined by Van Offenbeek (2001) and performed PCA with varimax rotation on individual (n = 1111) and team level data (n = 79). Results of the PCA were tested with confirmatory factor analyses. In addition, we repeated the procedures for analyses set forth by Van Woerkom and Croon (2009) and used both the overall 26-items scale, as well as the detected five underlying factors as subscales for analyses. Descriptive statistics were generated to summarize team learning and team composition variables. Relations between team learning and the team composition items were explored using the Spearman rank correlation coefficient for the continuous variable and independent *t* tests for dichotomous variables (Pollitt and Beck, 2003). All variables with significant relations were studied in univariate linear regression analyses, with team learning as dependent variable. We completed the analyses with stepwise multiple regression analyses. All tests were conducted at a 5% level of significance.

3.5 Results

3.5.1 Sample

Completed surveys were received from 1111 respondents representing 79 teams from mental health (32%), general hospitals (27%), university hospitals (28%), and nursing education (14%). All university hospital teams originated in Belgium; the other teams originated in The Netherlands. Mean response rate was 80%, with range of 60% to 100%. Mean team size was 17 with a minimum of 4 and a maximum of 40 nurses in the team. The majority of the sample (80%) provided 24-hour nursing care. A minority of teams (9%) was working on a nursing development unit, all in community hospitals. Mean age of nurses in the teams was 38.4 y. Mean percentage of females in the team was 77.3, with a minimum of 40% and a maximum of 100%. Teams with a low percentage of female nurses were prominent in nursing education (64%) and scarce in community hospitals (14%). University hospitals showed a high overall mean percentage of bachelor-educated nurses (83.8%), although a high percentage of bachelor-educated nurses were profiled in teams in community hospitals (62%). A mean of 50.6% of the team members had a postgraduate education in which teams in nursing education stood out on the mean score of the percentage nurses with a postgraduate education. Teams with a low percentage of nurses with a postgraduate education were detected in community hospitals (62%). Teams had a mean of clinical experience of 13.9 y, in which 50% of the teams in

university hospitals had a high clinical experience. Team longevity scored low in mental health (5.8 y), in contrast to teams in nursing education (14.8 y) and university hospitals (13.0 y). Descriptive statistics of the team composition items are presented in Table 3.1.

Table 3.1 Descriptive statistics team composition variables (N = 79).

Parameter	Total	Mental Health	Community Hospital	University Hospital	Nursing Education
Setting (%)	100	32	27	28	14
Team size in N (M, SD)a	17 (8.0)	13 (5.0)	14 (5.2)	15 (7.1)	23 (8.6)
24 hours-type nursing care (%)b	80	27	25	28	0
Nursing development unit (%)b	9	0	9	0	0
Percentage female nurses in team (M, SD)a	77.3 (16.6)	75.1 (15.9)	83.8 (17.0)	80.5 (16.5)	63.3 (12.2)
Percentage female nurses in team < 71% (%)b	32	32	14	27	64
Team members' age (M, SD)	38.4 (5.8)	36.8 (4.0)	35.8 (5.4)	38.2 (3.7)	47.4 (4.8)
Percentage bachelor-educated nurses in team (M, SD)a	50.6 (28.4)	42.2 18.9)	20.4 (13.8)	83.8 (12.3)	61.1 (9.9)
Percentage bachelor-educated nurses in team >75% (%)b	23	20	62	0	0
Percentage postgrad degree-educated nurses in team (M, SD)a	50.6 (28.4)	42.2 (18.9)	20.4 (13.8)	83.8 (12.3)	61.1 (9.9)
Percentage postgraduate degree education in team < 30% (%)b	32	24	48	41	0
Clinical experience team members (M, SD)a	13.9 (5.2)	11.1 (3.8)	14.3 (6.0)	15.8 (4.0)	9.3 (2.5)
Clinical experience in team > 16yrs (%)b	33	25	37	50	17
Team longevity (M, SD)a	9.9 (4.6)	5.8 (2.6)	8.9 (4.2)	13.0 (9.8)	14.8 (3.1)
Team longevity between 7-13 yrs (%)b	27	28	23	24	33

M = mean; SD = standard deviation; a = Continuous variable; b = dummy variable (1 = yes)

3.5.2 Application Offenbeeks' Team-Learning-Activities-Scale in nursing teams

PCA on individual data (n = 1111) showed a model with five factors explaining 61% of the total variance on the team learning activities scale, whereas PCA on the aggregated team level data (n = 79) resulted in the same five-factor model, now explaining 78% of the variance (Table3.2). Accounting for 49.7% of explained variance was a factor that included nine items related to *information processing* (eigenvalue 12.9; α .94). Factor loadings varied between 0.596 and 0.841. Items with strong factor loading were team-learning activities as 'in my team we listen well to each ones' ideas about nursing/education on our team' and 'in my team we help one another in opinion forming processes'.

Two factors related to gathering information: one factor consisted of four items on *gathering production-oriented information* (eigenvalue 1.1; α .87). This factor contained four items on the harvest of information used for production-oriented learning tasks. Examples of items in this factor were team-learning activities as 'in my team we exchange knowledge with others outside our team' and 'in my team we gain information from others outside our team'. The other factor contained five factors (α .86) on collecting information used for developmental-oriented learning tasks. Examples of items in this factor were team-learning activities as 'in my team we search for professional information outside our own organization' and 'in my team we wonder about external developments and its' possible consequences for the nursing on our team'.

Two factors were related to information storage and retrieval: one factor contained four items related to *storage and retrieval of production-oriented information* (eigenvalue 1.5; α .87). Examples of items in this scale were team-learning activities as 'in my team, we make minutes of team meetings' and 'in my team, we store agreements'. The other factor contained four items (eigenvalue 1.5; α .83) on the storage and re-use of information that was used for developmental-oriented processes on the nursing team. Examples of items in this factor were team-learning activities as 'in my team, we store knowledge in an archive' and 'in my team, all discussed professional information is accessible for all nurses'.

Confirmatory factor analysis (CFA) was employed to assess measurement quality of the five-factor model and showed acceptable overall fit (chi square = 16.55; *df.* = 5; *p* = .005: CFI [comparative fit index] = .94; IFI [incremental fit index] = .94; RMSEA [root mean square error of approximation] = .94). Results of the intraclass correlation (ICC) justified data to be aggregated to team level; ICC1 for the overall 26-item scale team learning was 0.20 and ICC2 was satisfactory with 0.79 (Bliese, 2000). ICC1 scores for the five subscales varied between 0.17 and 0.20; ICC2 varied between 0.71 and 0.83 (Bliese, 2000) (Table 3.2).

Table 3.2 Summary results of principal components analysis using varimax rotation, intraclass correlations, and Cronbachs' alpha for team learning (N = 79). 1 = gathering production oriented information; 2 = gathering developmental oriented information: 3 = processing information; 4 = storage and retrieval production-oriented information; 5 = storage and retrieval development-oriented information

Item	*Factor Loadings*				
	1	*2*	*3*	*4*	*5*
External knowledge exchange	0.772				
Information from externals	0.762				
Gathering information throughout collaboration	0.722				
Use of former documents	0.488				
External professional information		0.805			
Collecting professional knowledge		0.791			
Reflecting on external developments		0.757			
Trying out new methods		0.612			
Considering better ways of working		0.568			
Listening to each other ideas			0.841		
Opinion forming processes			0.819		
Giving and taking feedback			0.796		
Use feedback for improvements			0.755		
Discussion difficult decisions			0.745		
Challenge for new viewpoints			0.736		
Help and advice			0.719		
Shared views			0.657		
Sense on consensus			0.596		
Information in formal notes				0.917	
Storage of agreements				0.799	
Holding on to agreements				0.495	
Use of former knowledge				0.467	
Use of guidelines					0.849
Storage of knowledge					0.682
Internal knowledge exchange					0.562
Diversion professional knowledge					0.506
Eigenvalues	1.1	2.0	12.9	2.7	1.5
Percent of variance	4.3	7.6	49.7	10.5	5.7
ICC1 ICC2 Cronbachs' alpha	.11 .79 .87	.18 .65 .86	.20 .81 .95	.19 .83 .87	.17 .73 .83

3.5.3 Team learning and team composition in nursing

Mean score on the 26-item *team- learning scale* was 81.2 (SD [standard deviation]: 7.4) The subscales *'storage and retrieval production oriented information'* and '*processing information'* revealed the highest mean scores. Subscales related to *gathering information* showed the lowest mean scores (Table 3.3). All subscales of the team-learning activities scale showed moderate to strong interrelations. Corrected item-total correlations varied between 0.59 and 0.73, and Spearman's rho scores between 0.44 and 0.69 (Table 3.4).

Analyses revealed significant relations between the 26-item team-learning activities scale and team composition items. The 26-item team learning scale was positively related to teams nested in community hospitals, and with teams working on a nursing development unit (t = 2.529; p = .013). The created variables 'clinical experience in team over 16y', 'percentage bachelor-educated nurses in team over 75%' and 'percentage postgraduate education in team under 30%' were positively related to team learning. Negative relations were detected between team learning and 'team longevity between 7 and 13 y' and 'percentage female nurses in team under 71%'.

All subscales of the team-learning activities scale revealed positive, as well as negative correlations with the team composition variables. For example, the subscale *processing information* was positively related to teams in community hospitals, teams working on a nursing development unit, and teams providing 24-hours nursing care. Negative relations were found between the subscale *processing information* and teams in nursing education (t = –3.182: p = .008). Also teams in mental health showed negative relations on both gathering information scales. A summary of the relation test statistics are provided in Tables 3.4 and 3.5.

Univariate linear regression analyses revealed effect of teams in community hospitals (β = 0.427; p < .0005) and teams working on a nursing development unit (β = 0.277; p < .0005) on team learning (Table 3.6). In multiple regression analyses, 33% of the variance on team learning was explained by teams nested in community hospitals (β = 0.385; p < .0005), a mid-term team longevity (β = –0.313; p =.001), and low percentage female nurses in the team (β = –0.212; p = .032).

Table 3.3 Mean score, standard deviation, scale scores, Pearson product-moment correlation coefficients and Cronbach's alpha team learning variables.

Parameter	1	2	3	4	5	6
1. Team Learning (26-item scale)	.93[a]					
2. Gathering production oriented information	.727[b]	.87[a]				
3. Gathering professional oriented information	.593[b]	.685**	.86[a]			
4. Processing information	.743[b]	.584**	.484**	.95[a]		
5. Storage & retrieval production-oriented information	.716[b]	.588**	.464**	.680**	.87[a]	
6. Storage & retrieval professional information	.723[b]	.592**	.486**	.679**	.587**	.83[a]
Possible scale score	26-130	5–30	4–20	9-45	4-20	4-20
Mean score	81.2	10.7	14.6	29.0	14.7	12.1
Minimum score	64.1	8.7	10.8	22.3	9.6	8.9
Maximum score	96.5	13.1	18.8	35.7	17.8	15.7
SD	7.4	1.1	1.6	3.1	1.6	1.5

Table 3.4 Summary relations team learning and team composition items, using independent t-test.

Parameter	Description	N	t	df	P
Field of practice	Educational practice	11	–1.154	77	.252
	Mental health	25	–2.515	77	.014
	General hospital	21	3.947	77	< .0005
	University hospital	22	–0.156	77	.877
Country	Dutch	57	–0.156	77	.877
Type of nursing care	24 hours nursing care	63	0.970	77	.335
NDU	Nursing development unit	7	2.448	77	.017

Table 3.5 Summary relations team learning and team composition items using Spearman rank correlations (N = 79). A: team learning intensity; B: gathering production-oriented information; C: gathering developmental-oriented information; D: processing information; E: storage and retrieval production oriented information; F: storage and retrieval professional information.

Parameter	*A*	*B*	*C*	*D*	*E*	*F*
1. Percentage female nurses in team	0.235*	0.123	0.019	0.175	0.331**	0.320**
2. Percentage female nurses in team < 71%	–0.313**	–0.195	–0.031	–0.265*	–0.415**	–0.360**
3. Team members' age	–0.102	–0.009	0.277*	–0.307**	–0.044	–0.105
4. Percentage bachelor-educated nurses in team	0.232*	–0.155	–0.043	–0.306**	–0.397**	0.09
5. Percentage bachelor-educated nurses in team >75%	0.298**	0.126	0.079	0.373**	0.316**	0.171
6. Percentage postgraduate degree-educated nurses in team	–0.288*	–0.163	0.122	–0.378**	–0.192	–0.430**
7. Percentage postgraduate degree education in team < 30%	0.298**	0.221	-0.018	0.341**	0.195	0.402**
8. Clinical experience team members	0.137	–0.042	0.076	0.089	0.131	0.298**
9. Clinical experience in team > 16 y	0.312**	0.127	0.177	0.242*	0.296**	0.433**
10. Team longevity	0.021	0.122	0.290**	–0.171	–0.099	0.17
11. Team longevity between 7-13 y	–0.316**	–0.217	–0.21	–0.269*	–0.380**	–0.202

**Correlation < .05 level (2-tailed); **Correlation < .01 level (2-tailed).*

Table 3.6 Summary results relation between team learning (dependent) and team composition items using regression analyses.

Univariate Regression	R^2	*B*	β	*p*
Community hospital team	0.182	7.075	0.427	< .0005
Nursing development unit	0.077	7.134	0.277	.013
Percentage female nurses in team < 71%	0.098	–4.921	–0.313	.005
Percentage bachelor-educated nurses in team > 75%	0.089	5.196	0.298	.008
Percentage postgraduate degree education in team < 30%	0.089	4.684	0.298	.008
Clinical experience in team > 16 yrs	0.097	5.446	0.312	.005
Team longevity between 7–13 yrs	0.100	–4.802	–0.316	.005
Multivariate Regression	R^2	*B*	β	*p*
Constant		82.26		< .0005
Community hospital team		6.38	0.385	
Team longevity between 7–13 yrs		–4.75	–0.313	.001
Percentage female nurses in team < 71%		-3.33	-0.212	.032
	0.33			

3.6 Discussion

This study explored team learning in nursing teams by a quantitative count of perceived frequency of team-learning activities. Results underline recent insights from ambidexterity and team learning science: team learning in nursing teams was identified in five clusters of team-learning activities, and fitted the described phases of team learning as defined by Van Woerkom and Van Engen (2009). Two subscales referred to gathering of information; a third subscale referred to the actual processing of gathered information in the team, while the fourth and fifth subscales referred to storage and retrieval of information. The subscale *Information processing* turned out to be most powerful factor. The items in this subscale revealed the construct of internal team learning, the actual dissemination, interpretation, and application of information in the team (Chan *et al.*, 2003). Team-learning activities, such as listening to each other's ideas, use of feedback, and challenge for new viewpoints reflected the actual application of learning. The subscale also included team-learning activities on consensus and shared views, although this seems contradictory to authors who have pleaded for diversity in the team (Edmondson *et al.*, 2007; Van den Bossche, 2006). Although diversity exists between team members in nursing teams, nurses share personality characteristics as ambiguity and are socialized in the clinical placements of their professional education (Gopee, 2001).

In both the phases of information acquisition, as well as in the phase of information storage, we discovered factors that differed on the type of information handled: information used for production-oriented processes or information used for developmental-oriented processes in the team. In this way, the data expressed the ambidextrous reality in which nursing teams act. The original team-learning activities scale was developed in 2001 and revealed four underlying factors. However, the reality is that in nursing teams different kinds of information cross over, reflecting the various learning tasks present in the team (Lemieux-Charles and McGuire, 2006; Van Linge, 2006). In nursing teams, often an infrastructure exists to share and discuss items related to the production of nursing care; meetings are held and minutes are kept. However, an infrastructure for developmental items is scare, and might explain the difficulties nursing teams encounter with implementation of innovations (Mickan and Rodger, 2000; Parsons and Mott, 2003; van Achterberg *et al.*, 2008). Nursing teams were most active in storing and retrieving information about the production of nursing care, which underlines the production-oriented habitat of nursing teams (Edmondson, 2004).

Edmondson *et al.* (2007) and Bennett (2001) have already shown relations between team learning and the composition of the team. The results of this study indicated a relation between team composition items, such as nested in a community hospital, midterm longevity, low percentage of female nurses, and team learning in nursing. While one would expect a high fre-

quency of team learning activities in teams at university hospitals and nursing development units, teams in general hospitals stood out. Because all university hospital nursing teams were located in Belgium and all other teams in The Netherlands, there could well be a cultural difference that might explain the findings (Lemieux-Charles and McGuire, 2006). The findings on the percentage of females in teams also underpin the findings of Van Woerkom (2009): teams with more female nurses had a higher frequency of team-learning activities.

In our exploration of team learning activities in nursing teams several insights arose. Team learning in nursing involved activities on gathering, processing, and storing of relevant information to address learning tasks in the team. Different team-learning activities related to different learning tasks that handled production or development-oriented information. The validation of Offenbeeks' team-learning activities scale revealed an instrument to study team learning in nursing teams. Nursing teams were active in the processing and storing production-oriented information but scored poorly on the subscale related to gathering information. The implications for practice of this study relate to the fact that, nursing teams are changing from production-oriented teams into ambidextrous teams that simultaneously produce and development nursing care or education. Nursing teams are and will be confronted with developmental learning tasks, triggered by professional and societal expectations. Nowadays, nursing teams try to cope with these questions by implementing short-term infrastructures, with initiatives as a journal club, or evidence-based nursing meetings. Rarely, however, are these initiatives fully accepted and integrated into the communication structure of a nursing ward (Parsons and Mott, 2003; van Achterberg *et al.*, 2008). Van Woerkom en Croon (2009) suggests managers can strengthen the competence of a nursing team to be ambidextrous by the facilitation of team learning. First, team managers and organizational leaders should be aware that there are learning processes in the team, which can be hindered or facilitated (Edmondson *et al.*, 2007). The team learning activities scale presented in this study offers managers and nursing teams an instrument to analyze and reflect on the team learning processes in the team. Second, by creating facilitators for team learning, such as time and space dedicated to learning activities, team managers and organizational leaders can build and maintain infrastructures for productive-oriented as well as for development-oriented team learning processes in the nursing team. In addition, the results of this study offer team leaders considerations for the composition of a nursing team, including aspects as the proportion between female and male nurses and the educational level of the nurses in the team. Linking team-learning activities and team composition revealed a potential for generating insights into team learning across nursing teams, but also created a non-explained part on team learning.

3.7 Limitations of the study and issues for further research

We gathered data by self-reporting questionnaires, catching responders' perceptions on team-learning activities in the team at one time. These perception-based data were aggregated into team composition items at the team level, which has several drawbacks (Klein and Kozlowski, 2000; Lake, 2006). For example, this process causes a reduction in the effective sample size, and with that a possible reduction of the statistical power (Lake, 2006). Biases from individual perceptions due to recent events in teams work through responders perceptions and, eventually, into aggregated scores. In addition, aggregating mean scores could have led to a tendency of mean scores, which could be an explanation for the differences in explained variance between the analyses of the individual (61% explained variance on the team-learning scale) and aggregated data (78% explained variance on the team-learning scale). Still, the individual data showed acceptable scores on the statistical assumptions for aggregation. Also, the concepts used in this study were clearly formulated at the team level.

The question remains whether or not the indirect way of calculating the sum of individual scores really reflects team level characteristics. In this way of studying team learning and its influencing factors we strengthened the effect of the between-group differences, but neglected influences of within-group differences. We also realize the effect of the individual team member characteristics on latent contextual constructs that are present in the team, and which influence team learning (Edmondson *et al.*, 2007; Klein and Kozlowski, 2000). From this perspective, it is possible that individual characteristics, such as gender or experience influence latent constructs in terms of safety and openness within the team. This might explain the scores of teams with a high percentage of female nurses, in which females credit different values in work settings, focus on relationships, openness and safety in comparison to more masculine values, such as competitiveness, ambition, and target-oriented behaviour (Mickan and Rodger, 2000).

Finally, a limitation exists in the selection of the sample. Although the sample represents the variability of nursing practice, it was limited to organizations that participate in an academic partner service; possibly these organizations emphasized team learning more than others. In addition, the size of included teams must be addressed critically. We included teams sized from 4 up to 42 nurses, in which the latter tend to segment into subgroups (Van Woerkom and van Engen, 2009).

In this study, team composition items explained 33% of the variance on team learning. Therefore, we suggest future research on team learning activities in nursing teams to include latent contextual constructs that relate to team learning. Moreover, further research should address the relation between contextual items and team learning in nursing teams. This opens the possibility to study constructs on the team level, instead of extracting individual characteristics and

handling them as team composition items. Last, not only for nursing teams regarding team composition, but also for team constructs, the climate for learning and safety in the team and other specific team characteristics can explain why nurses differ in their scores on team learning.

3.8 Conflict of interest statement

No conflicts of interest to be reported.

3.9 References

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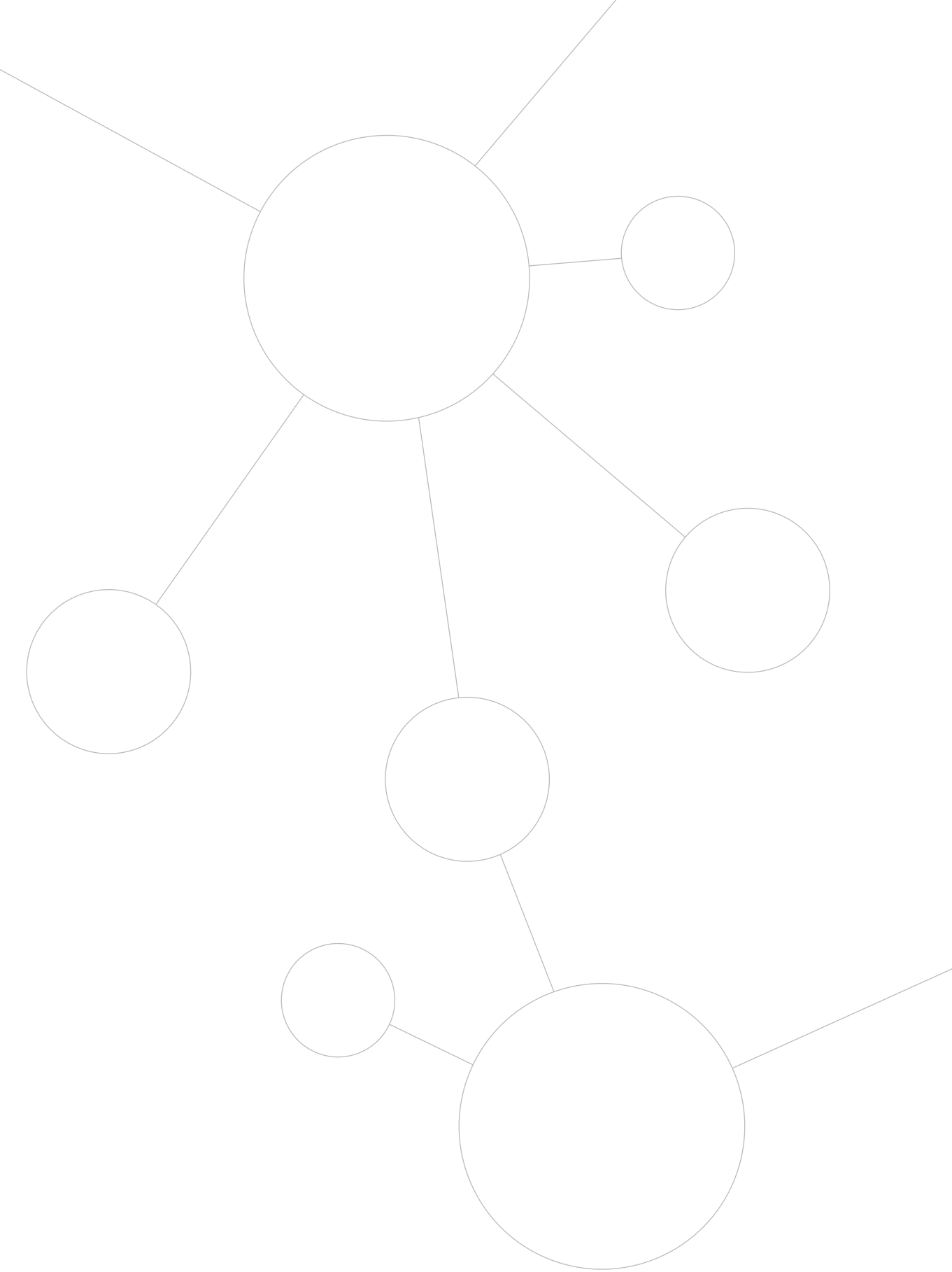

Chapter

4

Team learning and context

Assessing the relationship between team-learning activities and contextual factors of team-learning environment and team-configurations

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Abstract

Background –The prevalence of team learning activities in nursing teams is influenced by contextual factors. Although team learning is important for nursing teams to perform, there is a paucity of research exploring the relationship between team learning activities and contextual factors in nursing teams. The aim of this study was to study the relationship between team learning and contextual factors of the nursing team.

Methodology – Correlation and multiple regression analyses were used to study the relation between team learning and five contextual variables. One contextual variable represented the overall environment for learning. Four contextual variables characterized basic configurations of organizational characteristics of nursing teams. Because an interrelation between the contextual variables was expected, multiple regression models were tested for multicollinearity by regression commonality analysis to detect unique and common contribution of each independent variable.

Findings – Results of this study indicate that team-learning activities in nursing teams can be enhanced by contextual factors such as: (1) strengthening stimulation of the psychological safety, (2) openness, (3) shared goals, and (4) an open, external-oriented view. Multiple regressions yielded three models that explain 76%, 81%, and 83% of the variance in team learning. Commonality analyses showed the importance of interrelationships between the contextual factors.

Practical Implications – Nurses undertake team learning activities to process information needed to perform production-oriented and innovation-oriented tasks. Contextual variables effect the prevalence of team learning activities in nursing teams. To enhance team learning in nursing teams, management and nurses should strengthen the facilitation of a development-oriented team configuration and an intense team learning environment.

Keywords: team learning, nursing, contextual factors

4.1 Introduction

As in other businesses, nursing teams are transforming from production-oriented teams towards ambidextrous teams; teams that simultaneous produce and innovate.[1-3] In origin,

health care organizations set up nursing teams because of their expected influence on production-oriented processes.[1, 4] Nursing teams were established to produce nursing care to a specific population, e.g. clinical nursing team on a surgery ward with the function to provide nursing care to patients that undergo surgery, or to provide education in nursing schools. Currently, nursing teams are also expected to adapt to changes in their specific nursing care or in the structures they provide the care in.[5-7] Teams in nursing are becoming ambidextrous, as they have to be productive and at the same time have to develop the nursing care or education they provide. Ambidextrous teams have the ability to simultaneously manage both production- and development-oriented processes.[8] This ambidextrous function causes a continuity of different team learning activities in the nursing team.[5, 6, 9] In the workplace, nurses need information to execute the production-oriented as well as innovation-oriented tasks.[1,3] To process needed information, nurses in teams can undertake team learning activities, e.g. listening to each other ideas, giving and taking feedback, or challenge one another for new viewpoints on specific matters in the nursing team.[10]

Team learning in ambidextrous teams was first mentioned by Kang and Snell, who suggested that production- and development-oriented processes in teams create production-oriented and development-oriented team learning processes.[11] Each team-learning process has its own type of information, challenging nurses in teams to perform a variety of team learning activities. In daily practice, nurses in teams simultaneously undertake team learning activities that lead to production-oriented as well as development-oriented team learning.[11-14] Production-oriented team learning is triggered by information needed for the production processes the team stands for and results in actual production of nursing care or education.[11, 15] Development-oriented team learning is rooted in the incongruence between current practice and professional or societal developments. Development-oriented team learning results in radical changes in the way the nursing teams provide their nursing care or nursing education.[12, 16]

The concepts of production- and development-oriented team learning are in unison with the theoretical concepts of first- and second-order learning in organizations, wherein productive and developmental learning are defined as adaptive and transformational learning.[10, 15] In nursing teams, team learning is identified in five factors that clustered team-learning activities in 'gathering of information' (two factors), 'processing of information' (one factor) and 'storage and retrieval of information' (two factors). The factors representing 'gathering information' and 'storage of information' differed on information used for production-oriented processes or information used for developmental oriented processes in the team, which reflected today's ambidextrous character of nursing teams.[10]

Nursing teams exist in a variety of settings as university hospitals, mental health, community hospitals or nursing schools and differ in function, composition, and contextual factors as team learning environment or the teams' culture.[17] They differ in function, composition, and contextual factors as team-learning environments or the teams' culture.[17] Edmondson et al (18) introduced psychological safety in the team as a contextual factor for team learning. Psychological safety was defined as the shared belief that the team is safe for interpersonal risk-taking.[18]

Team learning activities like exchanging feedback and listening to each other demand an open attitude and vulnerability from the nurses in the team. Therefore, psychological safety within the team is essential to exploit team-learning activities.[16, 19, 20] Van Wetten et al[20] constructed an overall contextual factor denoted *"team- learning environment"* . In addition to reflecting Edmondson et al's[18] earlier work on psychological safety , the team learning environment concept included shared goals within the team, positive teamwork attitudes, and openness.[20]

In addition to the team learning environment in the team, team learning is supported by an external focus of the nursing team: tracking information and developments from outside the team and exploring their use within the team.[7, 16] Van Linge[7] defined such nursing teams as teams with a development-oriented configuration. Based on the theoretical work of Scheinn [21], Van Linge[7] delineated six team characteristics over two different dimensions (internal versus external focus and control versus flexibility) at the operational level, the level of espoused values, and the level of basic underlying assumptions of teams.[7, 21, 22] Consequently, four basic team configurations for nursing teams were constructed: the regulation-oriented team configuration, which aims to formalize processes and standards; the goal-oriented team configuration, which is characterized by the formalization of goals and targets for results; the team-oriented team configuration, which highlights the importance of cooperation, consensus, and fine-tuning; and the development-oriented team configuration, which focuses on flexibility, external focus, creativity, and autonomy.[7]

The literature does not include a study addressing team learning and contextual factors in nursing teams. Therefore, the aim was to study the relationship between team learning, team learning environment, and the configuration of teams' organizational characteristics in 79 nursing teams. The literature on team learning and contextual factors led us to the following hypotheses:

Hypothesis 1:	The contextual variables team-learning environment, team-oriented team configuration and development-oriented team configuration have a positive effect on the prevalence of team learning activities in nursing teams.
Hypothesis 2;	The contextual variables goal-oriented team configuration and regulation-oriented team configuration have a negative effect on the prevalence of team learning activities in nursing teams

4.2 Methods

In a cross-sectional design, self-reported data were gathered from individual members of nursing teams. Using a structured questionnaire that included team learning and context items, data were collected between November 2008 and March 2009. In meetings with the nursing teams, the researcher or a trained research nurse distributed the questionnaire packet after

explaining the rationale for the study. To increase the response rate in 24-hour nursing teams, either the nurse researcher returned frequently or a staff nurse was instructed to distribute the questionnaire to nurses not present at the meeting. Convenience sampling yielded data from 1111 individual responders, representing 79 nursing teams from mental health facilities (32%), general hospitals (27%), university hospitals (27%), and nursing education (14%) (table 4.1). All teams originated in health care organizations and Bachelor of Nursing schools in The Netherlands and Belgium and participated in an academic service partnership on learning and innovation in nursing. Individual team members voluntarily cooperated to support the research project and signed an informed consent form. Included were responders who were longer as six months a member of a nursing team. Excluded were students and untrained nursing staff. Included in the analysis were nursing teams wherein minimum 80% of the individual members were nurse-educated. Excluded from analyses were individual cases with an item non-response rate greater than 10% (n = 1). Also, teams with a response rate less than 60% of their members (n = 0) were excluded for analysis. Random missing data on items were replaced by the scale mean; 0.06% of the data were entered this way.[23] To ensure confidentiality, the returned questionnaires were coded before being entered into the database.[24] Approval from the research committee of the academic service partnership was obtained for the study.

Table 4.1 Descriptive statistics of the study population

(N = 79)	*total*	*mental health*	*community hospital*	*university hospital*	*nursing education*
Setting (%)	100	32	27	27	14
Team size in N (*M*,SD)	*17*(8.0)	*13*(5.0)	*14*(5.2)	*15*(7.1)	*23*(8.6)
Percentage Bachelor-level nurses in team (*M*,SD)	*50.6*(28.4)	*42.2*(18.9)	*40.4*(13.8)	*63.8*(12.3)	*81.1*(9.9)
Percentage Diploma Degree nurses in team (*M*,SD)	*41.2*(18.3)	*39.7*(5.0)	*51.1*(5.0)	*33.9*(5.0)	*0*
Percentage not-nurse educated team members (*M*,SD)	*8.2*(11.5)	*18.1*(6,2)	*8.5*(10.3)	*2.3*(3.8)	*19*(4.9)
Percentage 24 hours nursing care teams (*M*,SD)	*64*(14.6)	*83*(6.2)	*74*(18.5*)*	*92*(4.8)	*0*
Age team members (*M*,SD)	*50.6*(28.4)	*42.2*(18.9)	*20.4*(13.8)	*83.8*(12.3)	*61.1*(9.9)
Years of clinical experience team members (*M*,SD)	*13.9*(5.2)	*11.1*(3.8)	*14.3*(6.0)	*15.8*(4.0)	*9.3*(2.5)

Abbreviations: M = Mean, SD = Standard deviation

4.2.1 Instruments

Team learning was measured using the revisited team learning scale for nursing teams.[10] This scale was developed in Dutch and contains 26 items on team learning activities, divided over five subscales. The subscale pertaining to processing information contains nine items (α .94) representing the actual interpretation and application of information in the team. Two subscales containing four items refer to the gathering (α .86) and the storage or reuse (α .87) of information used for production-oriented processes in the nursing team. In addition, two subscales containing five items refer to the gathering (α .86) and the storage or reuse (α .83) of development-oriented information. Nurses used this instrument to indicate their perception of team learning behaviors in their team. All 26 items were rated on a Likert scale ranging from 1 ("never") to 5 ("very often").

In this study, context was defined as the "team-learning environment" and the "team configuration".[7, 20] Team-learning environment was assessed using a twelve-item questionnaire (α .96) constructed by Van Wetten et al. (20).[20] The questions represented three items on shared goals, two items on positive attitude towards teamwork, four items on psychological safety, and two items on openness. Items were stated as "in my team, we share the same goals" or "in my team, I feel safe." All items were rated on a Likert scale ranging from 1 ("never") to 5 ("very often").

Team configuration was measured using the 24-item observed team configuration scale of Van Linge[7]. This instrument represents the four basic team configurations as defined by Van Linge using four subscales with six items each[7, 21, 22]: (1) the regulation-oriented team configuration (α .87), (2) the goal-oriented team configuration (α .76), (3) the team-oriented team configuration (α .91), and (4) the development-oriented team configuration (α .89). For example, an item in the regulation-oriented team configuration was stated as "in my team, communication is based on protocols", as an item in the development-oriented team configuration was stated as "in my team, communication is based on general principles and norms." All items were rated on a Likert scale ranging from 1 ("never") to 5 ("very often").

4.2.2 Data aggregation

Where the constructs of team learning and context were seen as shared team properties, data were aggregated from the individual to the team level.[25] All 1111 individual cases were aggregated to 79 teams-level cases, by taking the sum of the mean scores of all items to compute the scales and subscales.[25, 26] Within-group agreement and homogeneity of individual-level data were tested before aggregation.[25, 27] The intraclass correlation (ICC) analyses of the team learning and context variables used in this study resulted in ICC1 values between .11 and .19. Analyses of ICC2 resulted in values between .72 and .79. The results of these analyses legitimized the aggregation to team-level variables.[25, 28]

4.2.3 Data Analyses

Data analyses were completed using SPSS (v 16.0; SPSS Inc, Chicago, IL). Statistics were generated to summarize team learning and team context variables. We used the subscales, as well as the overall 26-item scale of the revisited team learning scale for nursing teams to

explore relationships between team learning and contextual variables using the Pearson product-moment correlation coefficient.[24] In congruence with Van Woerkom and Croon (22), all hypotheses concerning the relation between team learning and contextual variables were tested simultaneously in a hierarchical multiple regression model with the overall 26-item scale of the revisited team learning scale for nursing teams as dependent variable. Due to the theoretical interrelation between all included variables, the regression models were tested for multicollinearity with the tolerance test and the variance inflation factor (VIF). Also, we added a regression commonality analysis to supply the unique and common contribution of each independent variable to the regression.[29] All tests were conducted at a 5% level of significance.

4.3 Results

Table 4.2 presents mean score, standard deviation, percentage of maximum score, Pearson product-moment correlation coefficient, and Cronbach's' alpha of the team learning and context variables. We detected high mean scores for the subscales 'storage and retrieval production-oriented information' (M = 14.7; SD = 1.6) and 'processing information' (M = 29.0; SD = 3.1). In contrast, for the subscales related to gathering information we detected low mean scores. All team learning variables showed moderate to strong interrelationships.

The correlation matrix in table 4.2 shows moderate-to-strong relationships between all team learning and context variables. The Pearson product-moment correlation coefficient varied between 0.324 and 0.870. The overall 26-item team learning scale was positively related with the development-oriented configuration, the team-oriented configuration and the team learning environment. Team learning environment was moderate positively related with the regulation-oriented and goal-oriented configuration. Team learning environment positively related with the team-oriented and development-oriented team configuration. Only the subscale 'gathering professional-oriented information' showed low correlation-coefficients with all contextual factor variables in this study. Strong relationships were detected between team learning environment and the team-oriented and the development-oriented configuration.

Univariate linear regression analyses with the 26-item team learning scale team as dependent variable showed associations with the development-oriented team configuration (β =0.759; p = 0.001), the team-oriented configuration (β = 0.762; p = 0.007) and the team learning environment (β = 0.722; p = 0.000).

Multiple regression analyses discriminated three models (Models 1, 2 and 3) that explain 75%, 81% and 83%, respectively, of the variance in team learning. Model 1 (p = 0.001) explains 75% of the variance in team learning and includes only the variable 'development-oriented configuration' (β = 0.871; p = 0.000) (table 4.3).

Model 2 explains 81% (p = 0.005) of the variance in the 26-item team learning scale and includes the variables 'development-oriented configuration' (β = 0.533; p = 0.000) and team

learning environment (β = 0.408; p = 0.000). Its tolerance score is 0.312, and its VIF score is 3.2. The commonality data in table 4.4 indicate that the regression was influenced by inter-relationships between the independent variables in this model: Development-oriented configuration uniquely explained 10.9% of the regression effect (0.811). Team leaning environment explained 6.4% of the regression effect. Common variance among the two predictor variables made up the remainder of the regression effect. These findings indicate that 82.62% of the regression effect was explained by the combination of the development-oriented configuration and the team learning environment.

Model 3 (p = 0.009) explains 83% of the variance in the 26-item team learning scale and contains the independent variables 'development-oriented configuration' (β = 0.533; p = 0.000), 'team-learning environment' (β = 0.408; p = 0.000), and the 'regulation-oriented configuration' (β = 0.177; p = 0.009). The commonality matrix in table 4.5 shows the unique contribution to the regression effect (%R2) of the variable 'development-oriented configuration' is 3.9%. The unique contribution to the regression effect (%R2) of 'team-learning environment' is 7.2%. The unique contribution to the regression effect (%R2) of 'regulation-oriented configuration' is 2%. The combination of the independent variables in this model explains 88.9% of the total regression effect (%R2) on team learning. The combination of team-learning environment and development-oriented configuration accounts for 36.5% of the regression effect. The combination of the independent variables 'team-learning environment', 'development-oriented configuration', and 'regulation-oriented configuration' accounts for 44.4% of the regression effect.

Table 4.2 Mean score, standard deviation, percentage of maximum score, Pearson product-moment correlation coefficient, and Cronbach's α of all team learning and context variables.

		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	Team learning	.93[a]										
2	Gathering production-oriented information	.727[b]	.87[a]									
3	Gathering development-oriented information	.593[b]	.685**	.86[a]								
4	Processing information	.743[b]	.584**	.484**	.95[a]							
5	Storage & retrieval of production-oriented information	.716[b]	.588**	.464**	.680**	.87[a]						
6	Storage & retrieval of development-oriented information	.723[b]	.592**	.486**	.679**	.587**	.83[a]					
7	Team learning environment	.850**	.637**	.514**	.886**	.710**	.557**	.96[a]				
8	Regulation-oriented configuration	.658**	.400**	.346**	.595**	.557**	.737**	.499**	.87[a]			
9	Goal-oriented configuration	.690**	.537**	.466**	.596**	.528**	.694**	.538**	.737**	.76[a]		
10	Team-oriented configuration	.852**	.625**	.449**	.861**	.769**	.632**	.891**	.588**	.630**	.91[a]	
11	Development-oriented configuration	.871**	.704**	.557**	.829**	.699**	.698**	.829**	.675**	.763**	.892**	.89[a]
Possible scale score		*26-130*	*5–30*	*4–20*	*9-45*	*4-20*	*4-20*	*11-55*	*6-30*	*6-30*	*6-30*	*6-30*
*M*ean		81.2	10.7	14.6	29.0	14.7	12.1	40.5	19.4	19.1	21.6	19.8
SD		7.4	1.1	1.6	3.1	1.6	1.5	4.2	2.1	1.7	2.0	1.9
Minimum score		64.1	8.7	10.8	22.3	9.6	8.9	31.9	15.6	14.7	16.1	15.0
Maximum score		96.5	13.1	18.8	35.7	17.8	15.7	51.0	24.0	22.5	24.7	24.0

*Notes: a = Cronbachs'alpha; b = Corrected item total correlation; ** = p < .001*

Abbreviations: SD, standard deviation

Table 4.3 Summary results and relationships between team learning (dependent) and contextual factors using regression analyses.

Univariate regression analyses	r^2	*B*	β	*p*				
Team learning environment	.722	2.302	.850	.000				
Regulation-oriented configuration	.433	37.448	.658	.000				
Goal-oriented configuration	.475	23.440	.690	.001				
Team-oriented configuration	.762	13.196	.852	.007				
Development-oriented configuration	.759	14.507	.871	.001				
Multiple regression analyses (stepwise)	***Mult.R^2***	***B***	**β**	***p***	***Unique***	***Common***	***Total (r^2)***	***%Mult. R^2 (rs^2)***
Model 1 (Constant)		14.507		.001				
Development-oriented configuration		3.369	.871	.000				
	.759							
Model 2 (constant)		11.184		.005				
Development-oriented configuration		2.062	.533	.000	.089	.670	.759	.936
Team learning environment		.720	.408	.000	.052	.670	.722	.890
	.811							
Model 3 (constant)		8.281		.037				
Development-oriented configuration		1.489	.533	.000	.0328	.727	.759	.917
Team learning environment		.781	.408	.000	.0596	.663	.722	.872
Regulation-oriented configuration		.607	.177	.009	.0167	.416	.433	.523
	.828							

Notes: Unique = x's unique effect; Common = Σx's common effects; Total = Unique + Common; % of R2 = Total/R2.

Table 4.4 Commonality matrix regression model 2

Variables	*Coefficient*	*% of R^2*
Unique to development-oriented configuration	0,089	10,9
Unique to team-learning environment	0,052	6,4
Common to development-oriented configuration and team-learning environment	0,670	82,6
Total	0,811	100

Note: Coefficient = variables unique regression effect. % of R2 = percent of total explained variance

Table 4.5 Commonality matrix regression model 3

Variables	*Coefficient*	*% of R^2*
Unique to development-oriented configuration	0.033	3.9
Unique to team-learning environment	0.060	7.2
Unique to regulation-oriented configuration	0.017	2.0
Common to development-oriented configuration and team-learning environment	0.303	36.5
Common to development-oriented configuration and regulation-oriented configuration	0.056	6.7
Common to team-learning environment and regulation-oriented configuration	- 0.008	-0.9
Common to development-oriented configuration, team-learning environment and regulation-oriented configuration	0.368	44.4
Total	0.828	100.0

Note: Coefficient = variables unique regression effect. % of R2 = percent of total explained variance

4.4 Discussion

The aim of this study was to study the relationship between team learning and the team learning environment and configuration of organization characteristics of the nursing team. Conventional organizational learning literature describes production- and development-oriented team learning in teams, but, reports an inability to exploit both learning processes simultaneously.[11, 30] Nonetheless, the results of this study underline modern theoretical insights on ambidexterity in nursing teams by revealing the simultaneous prevalence of production- and development-oriented team learning processes in nursing teams.[8, 10, 11] The conventional theories on learning in teams and organizations were created in an era when teams acted in a stable context in which changes and innovation were rare.[31] In contrast, the current context of nursing is characterized by an overload of operational pressure and constantly changing practices.[6, 32] Nowadays, nursing teams are forced to exploit ambidextrous team learning processes.[5, 7, 9]
The existence of ambidextrous team learning processes related positively to a supportive context in which individual team members modify their behavior as well as question and modify the underlying values, assumptions, and policies that led to the behavior in the first place.[15, 33] Regression effects in this study were not caused by the unique contribution of the independent contextual factors, but by the commonality of their concurrent prevalence. This underlines context as a multifactorial construct wherein the independent factors interrelate and create a specific configuration that hinders or facilitates team learning.[32, 34] Van Wetten et al.[20] and Edmondson[34] identified the team learning environment as one of the most important contextual factors for team learning.[20, 35] Still, we expected a stronger impact from the team learning environment. Team learning environment items such as “safety” and “shared goals” facilitated team learning, but above all, the results in this study highlighted the commonality with other contextual factors such as the development- and regulation-oriented team configuration relationships.

In accordance with Edmondson et al.[16] we detected relationships between team learning and a context with development-oriented organizational characteristics.[35-36] In this type of configuration, teams gather and process information on important developments outside the team and actively cross the boundaries of their own teams and professions.[7, 18] In line with the first hypothesis in this study, team learning was positively associated with the team-learning environment, the team-oriented configuration and the development-oriented team configuration.[7, 16] In contrast to the second hypothesis, the results of this study also revealed a positive relation between team learning and the regulation-oriented configuration on team learning. In accordance with the theoretical statements of Homan and Radstake[35] and Edmondson et al.[16], team learning in a nursing team requires regulation of the team learning processes, described as structured, regular team meetings with the goal of enhancing team learning.[16, 35] An infrastructure in the nursing team often exists to handle production-oriented learning tasks. Examples include the handover, daily meetings, and team meetings where information about production

is shared, processed, and stored in minutes or patient records. Infrastructures for handling development-oriented learning tasks are rare in nursing teams. Up and coming examples are initiatives such as journal clubs and evidence-based nursing meetings in nursing teams. These meetings are structured, regular meetings designed to facilitate developmental learning in the nursing team. Initiatives such as journal clubs only succeed if there is a supportive infrastructure on the ward that is visible as planned, regular meetings dedicated to the journal club.[36]

In conclusion, team learning in nursing teams was positively associated with a combination of the contextual factors: team learning environment, development-oriented team configuration, and regulation-oriented team configuration. Although the contextual factors can be divided into separate theoretical constructs, in reality, these factors exist in a configuration of independent contextual factors. This study has two important implications for practice. First, transferring the literature on team learning and ambidexterity to nursing teams reveals how nursing teams learn in modern times. Nurses in teams simultaneously undertake various team-learning activities to process the production-oriented and development-oriented information. Second, linking team learning and context revealed the insights in the commonality of contextual factors in nursing teams. This study underlines the importance of building a supportive context for team learning in nursing teams.

4.5 Limitations

In this study, we used questionnaires to capture responders' perceptions of both team-learning activities and contextual factors in their nursing teams. These perception-based data could cause several limitations of this study when aggregated to team-level data.[25, 26] The effective sample size was limited to 79 nursing teams. In addition, measurements could be influenced by tendentious perceptions of individual responders, which would also affect the aggregated scores. Statistical procedures, however, showed satisfactory scores on the assumptions for aggregation.[25] Also, the concepts in this study were formulated clearly at the team level.[7] In the regression analyses, team learning was analyzed with the overall 26-item scale, which limited information on the five different team learning factors. Consequently, analyses of the relationships between the five factors of team learning and the contextual factors were only provided as correlations.

4.6 Issues for further research

We suggest that future research uses more longitudinal designs to study team learning in relation to context over time. In addition, we suggest further research to include more in-depth analyses on the level of the five subscales of team learning. In terms of future research, one of the most interesting questions is the assumed relationship between ambidextrous team learning and the implementation of innovations in nursing teams. Therefore, we suggest studying the relationship between the five team-learning factors and the implementation effect of different types of innovations in nursing teams.

4.7 Disclosure

The authors report no conflicts of interest in this work.

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Chapter

5

A contingency perspective on team learning and innovation in nursing

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Abstract

Aims. This paper is a report of a Correlational study of the relation between team learning activities and implementation-effectiveness of innovations in nursing teams.

Background. Noncompliance to implementation of innovations is a problem in nursing teams. In literature, team learning is proposed as a facilitator for change. Nurses in teams undertake team learning activities to process information required to produce, as well as to innovate their practices. Still, studies reporting the effects of team learning activities on the implementation of innovations in nursing teams are scarce. To address this gap in literature, this study explored the influence of team learning on the implementation of two innovations.

Methods. A cross-sectional survey was conducted in 2008-2009 with a sample of 469 nurses, representing 30 nursing teams from The Netherlands and Belgium. The relation between variables representing team learning and the use and the knowledge of an incremental (n=14) or a radical innovation (n=16) was examined by correlation and multiple regression analyses.

Results. Correlation analyses revealed positive relationships between the team learning activities handling production-oriented information and implementation-effectiveness of an incremental innovation. In addition, team learning activities regarding development-oriented information positively affected the implementation of a radical innovation. Multiple regression yielded models that explain 83% of the variance on the use of an incremental variable, 73% on knowledge of a radical innovation and 80% on **use of a radical innovation.**

Conclusion. In nursing teams, team learning activities that relate to the production of nursing care affect the implementation of an incremental innovation. The implementation of a radical innovation is effected by team learning activities that relate to the development of the provided nursing care.

5.1 Introduction

The continuous development of health-care innovations forces nursing teams to adapt to changes and to implement innovations within their daily nursing practices (Blakeney et al. 2009, Hol-

leman et al. 2009, Carman et al. 2010). During work, nurses encounter the implementation of newness such as clinical guidelines, protocols or changing ways of working. The implementation of innovations demands a change of nurses' knowledge, skills, and attitudes. Literature, however, shows that there are major difficulties in the compliance of nursing teams to implement innovations (Grol & Grimshaw, 2003, Van Achterberg et al. 2008). Shaw et al., (2007) report noncompliance to the implementation of clinical guidelines of nursing teams in the USA, Canada, United Kingdom, Indonesia and Norway. In addition, Van Achterberg at al. (2008) quoted international examples wherein the implementation of innovation in daily practices of nursing teams was often not achieved (Van Achterberg et al. 2008). Moreover, methods that truly facilitate the implementation of innovations in nursing teams remain ambiguous (Grol & Grimshaw 2003, Shaw et al. 2005, Wallin 2009, Eizenberg 2011). Although literature expresses team learning activities can enhance change of practices in teams, empirical studies that relate team learning activities with the implementation of innovations in nursing teams are limited. Therefore, we performed a correlational study on team learning and innovation in 30 nursing teams.

5.2 Background

How teams learn and innovate has captured the attention of researchers in organizational learning and managerial sciences, and this area is defined as an important competence of teams and organizations (Jeong et al. 2007, Salas et al. 2008, Van Achterberg et al. 2008). A number of theoretical studies state that teams in organizations must learn in order to change what they are doing, and these studies define team learning as a facilitator for the production and development of nursing care (Chan 2003, Edmondson et al. 2007, Jeong et al. 2007). Throughout the appliance of team learning activities, teams become more efficient, apply new skills and change their business (Firth-Cozens 2001, Chan 2003, Friedman & Bernell 2006, Edmondson et al. 2007).

Nursing teams have to produce nursing care, as well as innovate their nursing care (Van Linge 2006, Van Achterberg et al. 2009, Blakeney et al. 2009). Consequently, teams in nursing are becoming 'ambidextrous' as they simultaneously exploit production-oriented and development-oriented processes (Raisch & Birkinshaw 2008). To act as ambidextrous teams, nursing teams undertake different team learning processes to process different types of information that cross over within the nursing team (Van Linge 2006, Timmermans et al. 2011). Production-oriented team learning processes handle the information needed to exploit the daily production processes of the team, such as patient information, interventions and staffing. Information needed to develop and innovate the teams' nursing practices in order to adapt successfully to changes is processed in development-oriented team learning processes (Kang & Snell 2009, Timmermans et al. 2011).

Edmondson et al. (2007) presented team learning as an ongoing process of team learning activities in nursing teams and urged the use of a contingency perspective in order to understand team learning. The contingency perspective is a type of behavioral theory that gener-

ally states that there is no single, best method for organizing things because every team acts in a specific context (Gerdin & Greve 2007). In the contingency perspective, there exists a fit between the different team learning processes and the different learning tasks in teams, and this affects team performance (Firth-Cozens 2001, Gnyawali & Stewart 2003, Van Linge 2006). The concept of fit is central to the contingency perspective. In this study, fit is defined as the internal consistency of the multiple configurations of a team learning activities with use and knowledge of different types of innovations (Fig. 1) (Gerdin & Greve 2007). In this contingency perspective, the optimal configuration of team learning activities in a team is contingent upon the various types of information needed by the team in order to implement innovations (Gnyawali & Stewart 2003, Kang & Snell 2009).

In the past, team learning was viewed as a linear process of activities with separate phases of acquiring, distributing, interpreting and storing information (Huber 1991). Another research stream defined team learning as a the activities between team members that promoted shared understanding in teams (Argyris 2003). Agryris and Schön (1996) defined team learning in the activities that created single and double loop learning, but, stated that it was not possible to simultaneously exploit both learning types (Argyris & Schön 1996). In contrast, Gnyawali and Stewart (2003) presented a contingency perspective on organizational and team learning describing the fit between team learning activities and the environmental conditions teams encountered at a particular point in time (Gnyawali & Stewart 2003). In reality, in nursing teams different types of information continuous cross over, creating different learning tasks (Cornell et al. 2010, Timmermans et al. 2011).

Nursing teams are expected to tune the interventions they provide with contemporary scientific or professional insights (Titler et al. 2007, Roth et al. 2009, Cornell et al 2010). Therefore, nursing teams confront the implementation of innovations that adjust or change the teams' practices (Van Linge 2006, Blakeney et al. 2009). Innovation is defined as "the intentional introduction and use of a product or procedure, new to the relevant unit of adoption and designed to significantly benefit the individual, the group, or wider society" (c et al. 2005; Van Linge 2006; Grol et al. 2007). Innovations in nursing teams involve the introduction of new products, the use of ict or changing ways of organizing the nursing care (Blakeney, 2009). In general, two types of innovation exist in nursing teams; incremental and radical innovations.

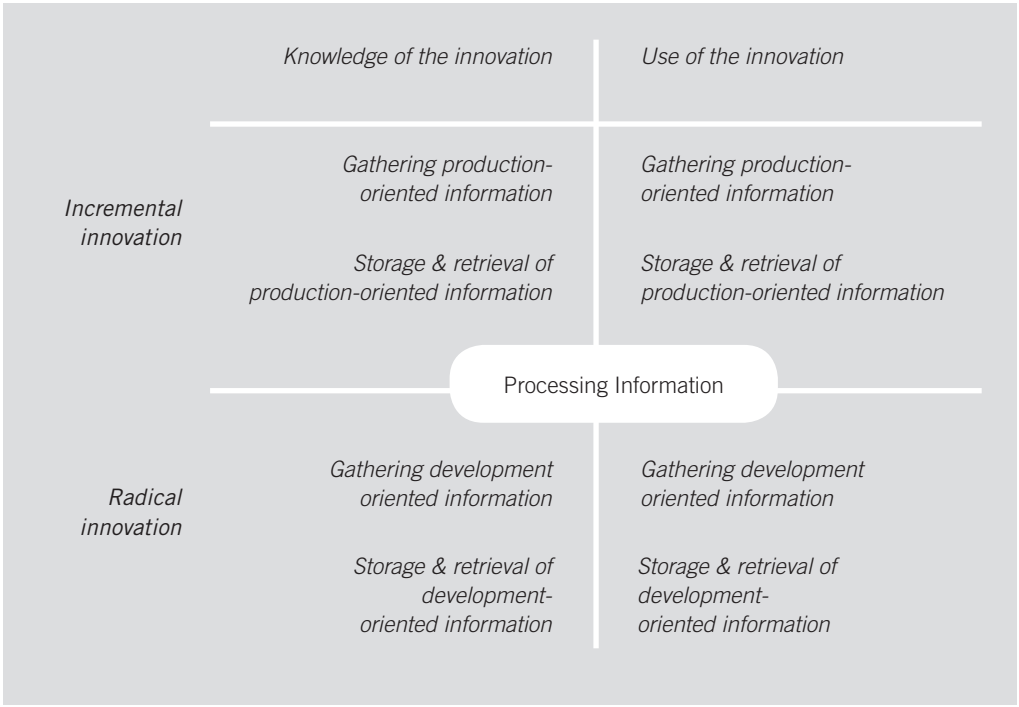
Incremental innovations are improvements of the current practices of nursing teams (Van Linge 2006). Although incremental innovations are generally limited in nature, they represent important improvements in nursing practices. An example of incremental innovations is the implementation of a clinical guideline for pressure ulcer care that resulted in a sustained decrease of pressure ulcers (De Laat et al. 2007). Another example is the introduction of clinical nutrition guidelines, which lead to a better understanding and improvement in the care of nutritionally-at-risk patients in hospitals is an incremental innovation (Amaral et al. 2007). Although these examples had high impact on nursing care, the innovation itself fitted within current nursing practices. In this study the incremental innovation is expressed in the implementation of the Nutritional Risk Screening-2002 (NRS-2002) in a university hospital in Belgium. The NRS-2002 is an instrument that describes necessary nutritional support for severely ill patients; it is

in congruence with the description of a production-oriented innovation (Van Linge 2006). The NRS-2002 has a limited time frame, focuses on the regulation and improvement of an aspect of nursing care and is consistent with regular nursing practice (Kondrup et al. 2003)

In contrast, radical innovations are fundamental changes to current nursing practices and are disruptive to the current ways of practicing, thinking and valuing in the team (Van Linge 2006, Windrum & García-Goñi 2008). Implementation of a radical innovation demands a transformation in the perspective of all individual nurses in the team regarding the practiced nursing care. Examples of radical innovations are the implementation of retail clinics and the implementation of a nursing model (Neuman & Fawcett 2002, Blakeney et al. 2009). The radical innovation in this study is characterized by the implementation of the Neuman Systems Model. The Neuman Systems Model is an open systems-based health care perspective that is used as a mono- or multidisciplinary health care model (Lowry 1998). The introduction of NSM in a nursing team can be defined as a radical innovation (Van Linge 2006, Windrum & García-Goñi 2008). The NSM is disruptive to the current practices of the nursing teams and the implementation involves a transformation of the way the individual nurses in the team think, value, organize and practice their nursing care.

Damanpour (1996) was first to use a contingency perspective on innovations in organizations and acknowledged the prevalence of different types of innovations. In addition, Van Linge (2006) used a contingency perspective to describe the prevalence of contrasting innovations. Synthesizing the literature on team learning and implementation of innovation created a contingency framework wherein different team learning activities relate to the implementation of different types of innovations (Fig. 5.1). In the contingency frame, we hypothesize a fit between production-oriented team learning process and the implementation-effectiveness of an incremental innovation. In addition, we hypothesize a fit between development-oriented team learning processes and the implementation-effectiveness of a radical innovation.

Figure 5.1 Contingency framework team learning and innovation



5.3 Aim of the study

The aim of this study was to examine the realtion between team learning activities and implementation-effectiveness of innovations in nursing teams.

5.4 Design

A cross-sectional design was used to gather self-reported data from individuals in nursing teams. Data were collected between November 2008 and March 2009 during meetings with teams that finished either the implementation of the Nutritional Risk Screening-2002 (NRS-2002) or the Neuman Systems Model, using a structured questionnaire.

5.4.1 Sample

Based on the specific research question of this study, we used a specific sample cohort and selected teams that finished the implementation of an incremental or radical innovation.

To study the relationship between team learning and an incremental innovation, we selected nursing teams (n = 14) that finished the implementation of the Nutritional Risk Screening-2002 (NRS-2002) in a university hospital in Belgium. The implementation process involved a presentation of the NRS-2002 during a hospital-wide training day. Nurses participated individually in this training with other nurses from other teams. To study the relationship between team learning and a radical innovation, we selected nursing teams (n = 16) that finished the implementation of the Neuman Systems Model in two mental health institutions in The Netherlands. The implementation process included several team-oriented activities in training, debating and reflection based on a structured one-year project design. The nursing team, not individual nurses, was the focus of the implementation activities. All participating health care organizations participate in an academic service partnership on learning and innovation in nursing. All individual responders voluntarily cooperated in this study and signed an informed consent. Approval from the research committee of the academic service partnership and of the board for all participating organizations was obtained for the study.

5.4.2 Data collection

All respondents completed a bouquet of instruments in a structured questionnaire (Table 1). Team learning was measured using the revisited team learning scale for nursing teams (Timmermans et al. 2011). This scale contained 26 items identified in five subscales (Cr. α: .80 - .94). Two subscales referred to the gathering of information, one subscale referred to the actual processing of information in the team, and two subscales referred to the storage and retrieval of information. The factors in both phases of gathering information and storage of information differed based on information used for production-oriented processes or information used for developmental-oriented processes in the team (Timmermans et al. 2011). For all of the items, individual nurses indicated their perception on a Likert scale ranging from 1 - 5 (from “never” to “very often”).

In this study, innovation was conceptualized by its implementation-effectiveness. To determine the implementation-effectiveness of both the incremental and the radical innovations, we evaluated both knowledge and use of the innovations as perceived by the individual nurses in the team. An intervention fidelity scale was developed to evaluate the knowledge and use of the incremental innovation. Intervention fidelity refers to the extent to which core components of the innovation are prevalent in current nursing practice (Gearing et al. 2011). The scale included 10 items related to knowledge of the protocol (Cr. α: .81) and 10 items related to the use of the nutrition protocol in daily practice (Cr. α: .85). All items expressed the core components of knowledge or use of the NRS-2002 and were peer-reviewed by experts (Pollitt & Beck 2003). The 10 knowledge items were expressed as multiple choice questions and were indicated on a Likert scale ranging from 1 - 4 (“totally disagree”-“disagree”-“agree”-“totally agree”).
To assess the implementation-effectiveness of the radical innovation, we used the Lowry-Jopp Neuman Model Evaluation Instrument (LJNMEI) (Lowry 1998, Marrs & Lowry 2006). The LJNMEI contained 41 items on the knowledge (Cr. α: .91) and 49 items on the use of NSM in daily nursing practice (Cr. α: .96). Team members indicated all items on a Likert scale ranging from 1 - 5 (from “never” to “very often”).

Table 5.1 Overview of measurement instrumentation.

Variable	*Instrument*	*Measures*	*Scales*	*Psychometric properties*

Team learning	revisited team learning scale for nursing teams (Timmermans et al. 2011)	26-item survey with a 5-point Likert Scale indicating the frequency of team learning activities	5 subscales:
			gathering production-oriented information (n = 4);
			gathering development-oriented information (n = 5);
			processing information (n = 9);
			storage and retrieval of production-oriented information (n = 4);
			storage and retrieval of development-oriented information (n = 4)
				Cronbach's α between .80 and .94;
				ICC1 between .13 and .18;
				ICC2 between .74 and .77

Implementation-effectiveness incremental innovation	NRS-2002 implementation fidelity scale	20-item survey indicating the knowledge and use of the NRS-2002 in the team	2 subscales: 10-item knowledge test with multiple choice indicating individual knowledge of the NRS-2002; 10-item survey with a 4-point Likert Scale indicating use of the NRS-2002	Cronbach's α between .81 and .85
Implementation-effectiveness radical innovation	Lowry-Jopp Neuman Model Evaluation Instrument (Lowry 1998, Marrs & Lowry 2006).	90-item survey with a 5-point Likert Scale indicating the knowledge and use of the Neuman System Model	2 subscales: 41-item scale knowledge of Neuman Systems Model (n = 41); 49 item scale use of Neuman Systems Model (n = 49)	Cronbach's α between .91 and .96

5.4.3 Data aggregation

If the construct of team learning was seen as a shared team property, data were aggregated from an individual to a team level (Klein & Kozlowski 2000). All individual items were aggregated using the mean scores of all items in computing the subscales (Klein & Kozlowski 2000, Van Woerkom & Croon 2009). Within-group agreement and homogeneity of individual-level data were tested before aggregation (Klein & Kozlowski 2000, Van Woerkom & Van Engen 2009). The intraclass correlation analysis of the team learning subscales in this study resulted in ICC1 values between 0.13 and 0.18. Analyses of the ICC2 resulted in values between 0.74 and 0.77. The results of this analysis legitimized the aggregation of team level variables (Bliese 2000, Klein & Kozlowski 2000). The implementation-effectiveness variables were aggregated using the mean values of the team members' scores.

5.4.4 Data analyses

The Statistical Package for the Social Sciences® version 16.0 was used to perform analyses (SPSS, Inc., Chicago, IL. USA). Individual cases with an item non-response over 10% were not included (n = 8). Teams with less than 60% responding were also excluded (n = 2). Random missing data on items were replaced by the scale mean; 0.06% of data were imputed this way (Fox-Wasylyshyn 2005). All sum scores of the subscales were transformed to a score between 0 and 1. Statistics were generated to summarize team learning and implementation-effectiveness variables. In congruence with the systems approach to contingency theory, the fit between team learning and implementation-effectiveness variables was analyzed using correlation and multiple regression analyses (Gerdin & Grevin 2007). Relationships between variables were explored using the Pearson product-moment correlation coefficient (Pollitt & Beck 2003). All significant relationships were studied using univariate linear regression analysis with implementation-effectiveness as the dependent variable. We completed the analysis with stepwise multiple regression analysis. Thus, we performed four different regression analyses that used knowledge of incremental innovation, use of incremental innovation, knowledge of radical innovation and use of radical innovation, respectively, as dependent variables. All reported regression models were tested on the assumptions for linear regression with the tolerance test and the variance inflation factor (VIF). Tolerance of reported regression models varied between 0.367 and 0.682, the VIF of the regression models varied between 1.024 and 3.285. All tests were conducted at the 5% level of significance.

5.5 Results

Completed surveys were received from 469 respondents representing 30 teams. The mean response rate was 86%, the minimum response rate was 64%, and the maximum response rate was 92%. Mean team size was 15 (SD. 8) nurses, minimum team size was six nurses and maximum team size was 40 nurses. The majority of the sample cohort (84%) provided 24-hour nursing care. The mean percentage bachelor educated nurses was 59 % (SD. 23). 35% (SD.

4) of the responders had a diploma degree in nursing. Mean age of the sample was 37 years (SD. 4.0), with an average clinical experience of 13 years (SD. 10).

5.5.1 Scores

Mean scores on the team learning subscales varied between 0.40 and 0.66. No differences were detected in scores on the team learning subscales between teams that implemented the NRS-2002 and NSM. The subscales related to the gathering of information showed the lowest mean scores. The subscale 'storage and retrieval of production-oriented information' showed the highest mean score. All of the team learning subscales showed moderate to strong inter-relations, and the Pearson product-moment correlation coefficients varied between 0.484 and 0.685 (Table 5.2).

Mean scores for the implementation-effectiveness of an incremental innovation were 0.70 on the knowledge subscale and 0.69 on the use subscale. Mean scores for the implementation-effectiveness of a radical innovation were 0.63 on the knowledge subscale and 0.43 on the use subscale.

5.5.2 Correlations

The implementation-effectiveness variables 'knowledge' and 'use' were positively related for the both the incremental ($r = 0.855$, $p < .001$) as well as for the radical implementation-effectiveness variables ($r = 0.631$, $p < .001$). In addition, correlation analyses revealed positive relationships between the team learning subscales and the implementation-effectiveness variables. The subscales 'gathering production-oriented information' ($r = 0.663$, $p < .001$), 'processing information' ($r = 0.561$, $p < .001$) and 'storage and retrieval of production-oriented information' were positively related to knowledge of an incremental innovation.

All of the team learning subscales except the subscale 'gathering production-oriented information' were positively related to knowledge and use of a radical innovation. The development-oriented learning process showed the strongest correlation coefficients. The subscales 'gathering development-oriented information' ($r = 0.733$, $p < .001$) and 'storage and retrieval of production-oriented information' ($r = 0.790$, $p < .001$) showed strong positive relationships with knowledge of a radical innovation. In addition, the same subscales were positively related to the use of a development-oriented innovation (Table 5.2).

Table 5.2 Mean score, standard deviation, percentage of maximum score, Pearson product-moment correlation coefficient and Cronbach's α for all team learning and implementation-effectiveness variables

		n	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	Gathering production-oriented information	30	.80[a]								
2	Gathering development-oriented information	30	.697**	.85[a]							
3	Processing information	30	.545**	.484**	.94[a]						
4	Storage & retrieval of production-oriented information	30	.605**	.464**	.680**	.86[a]					
5	Storage & retrieval of development-oriented information	30	.410**	.486**	.679**	.587**	.81[a]				
6	Knowledge of production-oriented innovation	14	.663**	.520	.561*	.550*	.293	.81[a]			
7	Use of production-oriented innovation	14	.676**	.517	.577*	.745**	.379	.855**	.85[a]		
8	Knowledge of development-oriented innovation	16	.577*	.733**	.669**	.473	.790**	n.a.	n.a.	.91[a]	
9	Use of development-oriented innovation	16	.553*	.637**	.556*	.545*	.615*	n.a.	n.a.	.631**	.96[a]
Mean			.40	.46	.55	.66	.51	.70	.69	.63	.46
SD			.067	.078	.078	.096	.108	.111	.059	.035	.106
Minimum score			.29	.33	.39	.35	.32	.54	.55	.58	.28
Maximum score			.55	.61	.71	.80	.73	.88	.79	.68	.62

*a = Cronbach's α | *p < .005 | **p < .001 | n.a. = not applicable*

5.5.3 Regressions

We performed four separate univariate and multiple regressions in which each innovation-effectiveness variable was the dependent variable. Overall, the regression underlined the relationships between production-oriented learning activities and the implementation-effectiveness of an incremental innovation (Table 5.3) and showed that development-oriented team learning activities related to the implementation-effectiveness of a radical innovation (Table 5.4).

Univariate linear regression analyses with knowledge of an incremental innovation as the dependent variable revealed effects of the team learning subscales 'gathering production-oriented information' ($\beta = 0.663$, $p = .010$), 'processing information' ($\beta = 0.561$, $p = .037$) and 'storage & retrieval of production-oriented information' ($\beta = 0.550$, $p = .021$). Multiple regression analyses with 'knowledge of an incremental innovation' as the dependent variable did not reveal a significant regression model (Table 5.3).

Univariate linear regression analysis with the 'use of an incremental innovation' as the dependent variable showed regression effects of the team learning subscales 'gathering production-oriented information' ($\beta = 0.663$, $p = .010$), 'processing information' ($\beta = 0.577$, $p = .031$) and 'storage & retrieval of production-oriented information' ($\beta = 0.745$, $p = .002$). Multiple regression analysis showed that 83% of the use of an incremental innovation was explained by the team learning variables 'gathering production-oriented information'

($\beta = 0.623$, $p = .001$) and 'storage & retrieval of production-oriented information' ($\beta = 0.534$, $p = .002$).

Univariate linear regression analyses with 'knowledge of a radical innovation' as the dependent variable showed regression effects of the team learning subscales 'gathering production-oriented information' ($\beta = 0.577$, $p = .019$), 'gathering development-oriented information' ($\beta = 0.733$, $p = .001$), 'processing information' ($\beta = 0.669$, $p = .005$) and 'storage & retrieval of development-oriented information' ($\beta = 0.790$, $p < .001$) (Table 5.4). Multiple regression analysis showed a model that explained 73% of the variance in the knowledge of a radical innovation.

The model included the team learning variables 'gathering development-oriented information' ($\beta = 0.574$, $p = .001$) and 'storage & retrieval of development-oriented information' ($\beta = 0.468$, $p = .006$).

Univariate linear regression analyses with use of a radical innovation as the dependent variable showed regression effects of the team learning subscales 'gathering production-oriented information' ($\beta = 0.556$, $p = 045$), 'gathering development-oriented information' ($\beta = 0.637$, $p = .008$), 'processing information' ($\beta = 0.553$, $p = .011$) and 'storage & retrieval of development-oriented information' ($\beta = 0.615$, $p = .006$). Multiple regression analyses showed a model that explained 80% of the variance in the knowledge of a development-oriented innovation. The model included the team learning variables 'gathering development-oriented information' ($\beta = 0.574$, $p = .001$) and 'storage & retrieval of development-oriented information' ($\beta = 0.468$, $p = .006$).

In sum, different team learning processes relate to the knowledge and use of different innovations, although not all assumptions in the contingency frame of this study were affirmed (Figure 5.2).

Table 5.3 Results of regression analyses for team learning and implementation-effectiveness of production-oriented innovation (dependent) (n= 14).

Multiple regression analyses (stepwise), dependent = 'knowledge' of production-oriented innovation				
	R^2	*B*	β	*P*
Model 1 (Constant)		.136		.476
Gathering production-oriented information		1.361	.663	.010
	.439			
Multiple regression analyses (stepwise), dependent = 'Use' of production-oriented innovation				
Multiple regression analyses (stepwise)	R^2	*B*	β	*P*
Model (Constant)		.263		.002
Gathering production-oriented information		.297	.623	.001
Storage & retrieval of production-oriented information		.586	.534	.002
	.826			

Table 5.4 Results of regression analyses for team learning and development-oriented innovation (dependent).

Multiple regression analyses (stepwise), dependent = 'knowledge' of development-oriented innovation				
	R^2	*B*	β	*P*
Model 1 (Constant)		.425		.000
Gathering development-oriented information		.236	.574	.001
Storage & retrieval of development-oriented information		.205	.468	.006
	.729			
Multiple regression analyses (stepwise), dependent = 'use' of development-oriented innovation				
Multiple regression analyses (stepwise)	R^2	*B*	β	*P*
Model (Constant)		.425		.000
Gathering development-oriented information		.236	.574	.001
Storage & retrieval of development-oriented information		.206	.468	.006
	.797			

5.6 Discussion

The noncompliance of nursing teams to innovations is an actual problem in health care (De Laat et al. 2007, Van Achterberg et al. 2008). Understanding the factors that influence change in a nursing team is a key objective of researchers and managers in health care organizations. The current environment of continuous change challenges nursing teams to enhance and sustain learning processes (Edmondson et al. 2007, Cornell et al. 2010). To contribute to factors that enhance implementation-effectiveness and compliance of nursing teams we explored the effect of team learning activities on the knowledge and use of nurses in teams of either an incremental or a radical innovation.

A limitation of this study is that the questionnaire was based on self-reports, which may be subject to bias due to influence by tendentious perceptions of the individual nurses. Statistical procedures, however, showed satisfactory scores for the assumptions of aggregation and internal consistency (Klein & Kozlowski 2000). In addition, research has indicated that self-reported data may not hinder internal validity (Wall et al. 2004). A second limitation of this study is that the contingency-frame was not studied in one setting; instead, the two contrasting innovations were divided over different teams and settings. In accordance with a contingency perspective on team learning and innovation, one would expect the simultaneous prevalence of different team learning processes and different innovations in one team. Finally, the analyses and results presented in this study are constructed in congruence with the systems approach to contingency theory. Other definitions of fit involve different statistical procedures and could produce different results (Gnyawali & Stewart 2003, Gerdin & Greve 2010).

Similar to the findings of Edmondson et al. (2007) the results of this study indicate that nurses in teams simultaneously activate different team learning activities to handle information on production and on development of their nursing care. Nurses give and take feedback, ask other nurses for help to solve problems or share and apply knowledge on novelties either to produce or to innovate their nursing or care (Cornell et al. 2010). In this study, team learning activities did not relate to obtaining knowledge of an incremental innovation. In this study, the NRS-2002 was defined as an incremental innovation. During the implementation of the NRS-2002 nurses individually participated in a hospital-wide training day, whereby knowledge was gathered throughout individual learning. In the use of the NRS-2002 in daily practice, however, team learning activities effect the implementation-effectiveness of this incremental innovation. In contrast, the implementation process of the radical innovation in this study included longitudinal team-oriented activities. Nurses in the included teams received collaborative training and education, what made team learning activities most relevant (Van Linge 2006, Holleman et al. 2009).

Previous literature endorses the importance of a contingency perspective with respect to team learning as well as innovation (Damanpour 1996, Edmondson et al. 2007). The use of the contingency frame allowed us to explore the general interactions between different team learning

activities and the implementation-effectiveness of different innovations. The synthesis, however, of team learning and innovation in a contingency framework is relatively new in nursing science. The contingency framework that is used in this study indicates that the fit between the team learning activities and the innovation enables nursing teams to enhance the implementation-effectiveness of different types of innovations. Depending the type of innovation, teams can adjust their team learning activities more effectively. Conversely, if a team applies inadequate team learning activities, it will decrease the implementation-effectiveness of an innovation (Edmondson et al. 2007).

In the complex process of changes practices of nursing teams it is not our intention to claim that team learning is the only mechanism involved, nor that the team learning activities addressed in this study are exhaustive. Reaching compliance of nursing teams to implemented guidelines or protocols is a complex process involving research, exploration, development and (team) learning (Roth et al. 2009, Carman et al. 2010, Eizenberg 2011). However, to simultaneously exploit production- and development-oriented processes, nursing teams should emphasize proper team learning processes for gathering, processing and storing relevant information (Van Woerkom & Croon 2009, Timmermans et al. 2011).

5.7 Conclusions

This study demonstrates the relevance of a contingency perspective for exploring the fit between different team learning processes and different innovations in nursing teams. In addition, this study explicates the relationship between production-oriented team learning processes and incremental innovations, as well as the relationship between development-oriented team learning processes and implementation of a radical innovation.

The findings of this study can be used in practice to develop effective team learning processes in nursing teams to cope with production-oriented as well as innovation-oriented processes (Van Achterberg et al. 2008, Cornell et al. 2010). Nurses in teams undertake individual and team learning activities within a context that includes elements that facilitate or hinder team learning, such as underlying values and belief systems of the nurses in the team and team culture (Van Linge 2006, Edmondson et al. 2007, Holleman et al. 2009, Timmermans et al. 2011).

The use of the contingency-frame provides nursing team managers with a tool to interpret team learning processes in relation to the implementation of innovations. Managers and nursing teams should analyze the learning needs of the nursing team before the implementation of an intended innovation. In addition, the proper learning processes in the nursing team should be initiated. To do so, managers should create an infrastructure that provides time and accommodations for learning. Managers should also address elements that are known to influence team learning, such as safety in the team and the competencies for team learning of individual

nurses in the team. Nurses in teams undertake individual and team learning activities within a context that includes elements that facilitate or hinder team learning, such as underlying values and belief systems of the nurses in the team and team culture (Van Linge 2006, Edmondson et al. 2007, Holleman et al. 2009, Timmermans et al. 2011).

We suggest researchers to use the created framework in future studies that explore relationships between team learning activities and implementation of innovations in nursing teams. Future studies should include nursing teams wherein a simultaneous prevalence of an incremental as well as a radical innovation exist. In addition, we suggest that further research expands the contingency-frame with individual learning and contextual factors to describe the multi-faceted and multi-level concept of team learning in nursing teams. Finally, we suggest that future studies not only include mono-disciplinary nursing teams, but, also multidisciplinary health care teams.

Figure 5.2 Contingency-frame team learning activities and implementation of innovations in nursing teams

	Knowledge of the innovation	*Use of the innovation*
Incremental innovation	---	*Team learning activities on gathering and storage/retrieval of production-oriented information*
Radical innovation	*Team learning activiteis on gathering and storage/retrieval of development-oriented information*	*Team learning activities on gathering and storage/retrieval of development-oriented information*

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Chapter

6

Discussion and Conclusion

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Team learning and innovation in nursing; results of a comprehensive research project.

6.1 Introduction

Nursing teams are omnipresent in health-care organizations, a business wherein continuous developments create an overflow of innovations. Besides the production of nursing care, nursing teams are expected to adapt to changes by the implementation of innovations [1,2,3]. The capability of teams to produce and develop is defined as a hallmark of effective teams within the 21st century. Studies report, however, serious problems in the compliance of nursing teams towards innovations as clinical guidelines and protocols. In result, nursing teams produce nursing care that does not meet up to standards of quality and patient-safety [4,5]. Moreover, Zeitz & McCutheon [6] report the strong perseverance of nursing teams towards routines and rituals. This doctoral study explored the problem of non-compliance of nursing teams towards innovations by focusing on how nursing teams learn and innovate.

In origin, nursing teams are set up to regulate and ensure production of nursing care. Nowadays, nursing teams are called on to be innovative and adaptive to the changing environment [2,5,7]. Studies on the impact of team learning on the implementation of innovations in nursing teams, however, are limited. Therefore, by studying the impact of team-learning activities on the implementation of innovations in nursing teams, this doctoral study aimed to strengthen the compliance of nursing teams towards innovations. Five research questions are stated, addressing team learning and implementation of innovations in nursing teams.

Research Question 1: What is the current knowledge on the relationship between team learning and implementation of innovations in nursing teams in the literature?

Research Question 2: How does team learning reveal in nursing teams?

Research Question 3: How is the relationship between team learning and team composition in nursing teams?

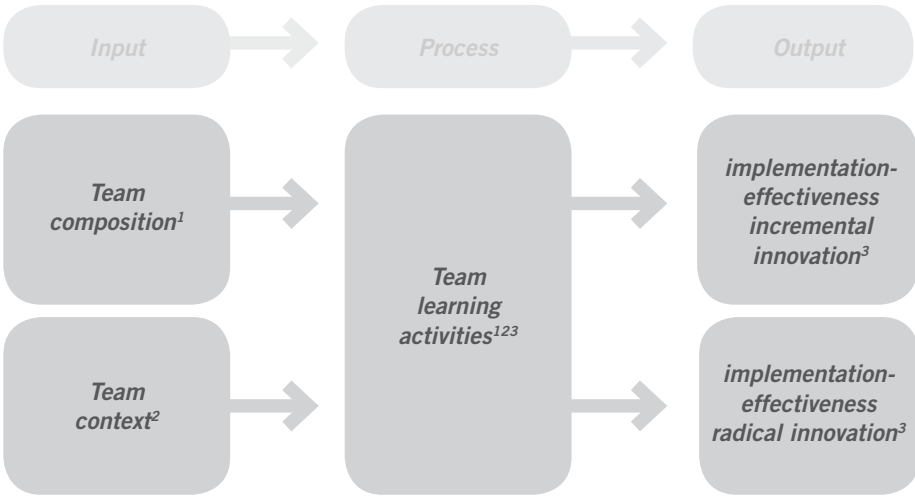
Research Question 4: How is the relation between team learning and contextual factors in nursing teams?

Research Question 5: How is the relation between team learning and implementation of innovations in nursing teams?

6.2 Method

To address the research questions the research project included a review of the literature and three empirical studies with a cross-sectional design. Based on the literature review a conceptual model was created and tested in the empirical studies (Fig.6. 1). The first empirical study addressed research question 2 *(how does team learning reveal in nursing teams?)* and research question 3 *(how is the relationship between team learning and team composition in nursing teams?)*. The second empirical study concentrated on research question 4 *(how is the relation between team learning and contextual factors in nursing teams?)* and explored the effect of the second input factor in the research model. The third empirical study handled research question 5 *(how is the relation between team learning and implementation of innovations in nursing teams?)* and focused on the output of team-learning activities on the compliance of nursing teams on implemented innovations.

Figure 6.1 Conceptual model with overview of the empirical studies



Note: 1 = empirical study 1 (research question 2 and 3), 2 = empirical study 2 (research question 4), 3 = empirical study 3 (research question 5).

In the empirical studies, a cross-sectional design was used to gather self-reported data from individuals in nursing teams with the use of structured questionnaires. Data were collected between November 2008 and March 20011. Convenience sampling created data from a diversity of nursing teams in mental health care, education, community, and university hospitals. All teams came from health care organizations and bachelor of nursing (degree) schools in The Netherlands and Belgium that participate in an academic service partnership on learning and innovation in nursing. Individual responders voluntarily cooperated to support the research project and signed an informed consent. Individual cases with an item non-response over 10% were not included (n = 17). Teams with less than 60% responders were also excluded (n = 3). To ensure confidentiality, returned questionnaires were coded before inputted into the database [8]. Approval of the research committee of the academic service partnership was obtained for the study.

6.3 Summary of the results

The review of the literature on the relationship between team learning and implementation of innovations in nursing teams revealed team learning in nursing teams was understudied [9]. There was a paucity of empirical research on team learning and innovation in nursing, as well as, a shortage of evidence on factors that contribute or hinder nurses to exploit team-learning activities. The systematic search provided eight studies on team learning in nursing. The analysis in this review showed merely one, qualitative, study on team learning and innovation in health care teams. The review of the literature disclosed six individual and 13 contextual factors influencing the prevalence of team-learning activities in nursing teams. In contrast to the evolving attention for team learning in literature other businesses, a systematic approach to study team learning in nursing teams was missing. The review of the literature was followed by three empirical studies that refined the conceptual model on team learning and innovation in nursing teams (Fig. 6 2).

In the first empirical study the nature of team learning in nursing team was explored by principal component analyses of Offenbeeks' team-learning activities scale, resulting in a five-factor model ((1) gathering production-oriented information, (2) gathering development –oriented information, (3) processing information, (4) storage and reuse of production-oriented information and storage and (5) reuse of development-oriented information), explaining 78% of the variance on the team-learning scale [10]. Team-learning activities were clustered in factors on gathering, processing, and storing of relevant information to address learning tasks in the team. The factor 'processing information' was responsible for 49.7% of the explained variance on the team-learning activities scale. Items in this factor represented the actual dissemination, interpretation and application of information in the team. Factors on gathering and storing information related to different learning tasks that handled production or development-oriented information. In the nursing teams, the prevalence of team-learning activities was most intense

in the factors on processing information and storing production-oriented information. Low prevalence of team-learning activities was detected in the factor gathering production-oriented information. The second part of this empirical study addressed the influence of team composition. Results indicated the way the nursing team is composed had a minor influence on the prevalence of team-learning activities. Team composition showed a minor effect (R2 33%) of team composition on the prevalence of team learning activities in nursing teams. Important items were being a team in a community hospital (positive effect), mid-term team longevity (negative effect) and a low percentage female nurses (negative effect).

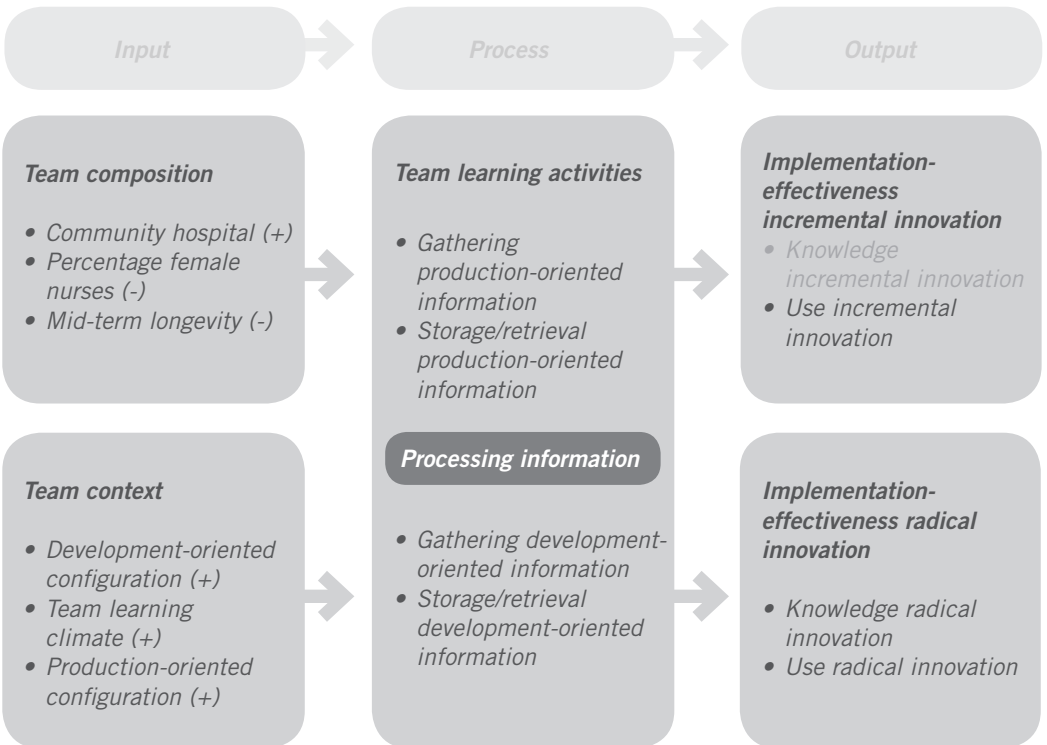
The second empirical study concentrated on the fourth research question and explored the relation between team learning and contextual factors in nursing teams [11]. Context was defined in one variable representing the overall environment for learning and four variables characterizing the basic configurations of organizational characteristics of nursing teams. Because an interrelation between all contextual variables was expected, multiple regression models were tested for multicollinearity by regression commonality analysis to detect the unique and common contribution of each independent variable in the regression model.

Literature indicated team-learning environment as one of the most important contextual variables for team learning. In contrast, analysis in this study indicated a minor effect of team learning environment in the prevalence of team-learning activities in nursing teams. Results indicated that contextual factors such as: (1) strengthening stimulation of the psychological safety, (2) openness, (3) shared goals, and (4) an open, external-oriented view enhanced the prevalence of team-learning activities in nursing teams. Multiple regressions yielded three models that explain 76%, 81%, and 83% of the variance in team learning. Regression commonality analyses showed the importance of interrelationships between the contextual factors. Overall, this study contributed to the understanding of the research model by revealing the commonality of contextual variables in nursing teams. Context was interpreted as a multifactorial construct wherein the different independent variables interrelated and created a specific team context having a major effect on the prevalence of team learning activities. This study accentuated the importance of building a supportive context for team learning in nursing teams.

The third empirical study handled the fifth research question and analysed the relation between team learning and the compliance of nursing teams on two contrasting innovations [12]. The study introduced a contingency perspective on team learning and the implementation of innovations in nursing teams. The contingency perspective proposed a ‘fit’ between the different team learning processes and the information needed in teams. The ‘fit’ was the internal consistency between team learning activities and implementation-effectiveness. The variables use and knowledge of an innovation represented the overall implementation-effectiveness. Result in this study indicated team-learning activities that handled information on the production of nursing care affected the implementation-effectiveness of an incremental innovation. The implementation of a radical innovation was effected by team-learning activities that related to handling of information about the development of the provided nursing care.

This study presented team learning as a facilitator for the implementation of innovations in nursing teams. Moreover, the use of the contingency perspective synthesised team learning and innovation by relating the different team-learning processes and the implementation of different types of innovations. In the contingency perspective, the 'fit' is optimal when the configuration of team-learning activities in a team is contingent upon the information needed by the team in order to implement innovations. In addition, the contingency perspective added new directions in research on compliance of nursing teams on implemented innovations in nursing teams and included team-learning processes and different types of innovations as important elements of analysis.

Figure 6.2 Results research project in conceptual model



6.4 Theoretical Considerations

In this research project, several theoretical considerations arise. Most important observation is that team learning in nursing teams was defined as a concept on team-level, constructed by the activities that team members undertake to process the necessary information to produce and innovate their products. In addition, team learning was conceptualised in 26 team-learning activities [13,14]. Team-learning activities, e.g. team-learning activities as seeking and giving help and advice, asking questions, seeking feedback or challenging one's viewpoints were clustered in processes of team learning as gathering, processing and storing/reuse of information.

This conceptualisation of team learning is congruent with earlier research, wherein concrete activities of team members build up to team learning processes [15,16]. Still, the definition limits team-learning to information handling only [17,18]. In literature, one can encounter different definitions of team learning resulting in different clusters of team-learning activities. For example, Huber (1991) defines team-learning activities in clusters of gathering, dissemination, processing and storage/reuse of information. Moreover, team learning is defined in processes of interpersonal context, learning behavior and team-effectiveness [16,18,19). The concept of team learning is reported in organizational as well as in educational studies, whereby researchers not only focussed attention on the frequency of team learning behaviors, but, include input and output variables [14,17,18]. Input-variables are reported as factors that hinder or facilitate team learning activities. Outcomes are reported as enhancement of shared understanding and shared models in teams as well as team-effectiveness [16,17]. The use of the conceptual model in this research project focusses on the team-learning activities in nursing teams and integrates input and output factors of team learning, congruent with the contemporary premise that both processes of team-learning activities, as well as inputs and outcomes are essential aspects of the conceptualization of team learning in research [16,18].

A second important theoretical consideration in this research project is the transfer of the perspective of ambidexterity from organizational to the team-level. Kang and Snell [19] introduced ambidextrous learning in teams and stated that production- and development-oriented processes in teams actualized production-oriented and development-oriented team-learning processes. Information related to accomplish daily production processes led to production-oriented learning processes. The information that is needed to develop and innovate practices in the nursing team resulted in developmental-oriented learning processes [7,16,20]. Results in this research project underlined the ambidextrous character of team learning in nursing teams, whereas nurses in teams undertook different team-learning processes to handle different types of information that cross-over in the nursing team. The validation of Offenbeeks' team-learning activities scale disclosed a five factor model that reflected the ambidexterity in team learning processes in nursing teams. Nevertheless, defining team learning in processes and specifically in terms of ambidextrous team learning is authors' based and open for dispute [16,20,21].

For example, the team-learning activities 'external knowledge exchange', 'information from externals', 'gathering information throughout collaboration' and 'use of former documents' were related to the gathering of production-oriented information. Kang and Snell [19] defined production-oriented information as the information needed to perform production-oriented tasks, however, this was not précised in Offenbeeks' team-learning activities [13].

Until now, scholars describe team learning as a linear process of different phases, e.g. gathering, processing and storing information [13,14,15]. Cornell et al. [3] studied how nursing teams act and reports a chaotic structure of the tasks that nurses exploit during their shifts with an intense crossover of information. Results of this doctoral study underline the continuous crossing-over of information nursing teams, deriving out of the various information needs in an ambidextrous nursing team. Overall, nurses in team exploit different team-learning activities to gather, process, store and reuse the information needed to handle production-oriented and development-oriented information in the nursing team.

In a third important theoretical consideration in this research project, the input factors were divided in team composition and team context variables. Two empirical studies dealt with the relations between the input-factors and team learning in the conceptual model and indicated determinants of team-learning activities in nursing teams. Team composition was conceptualized in global and specific team properties [22]. The global team properties represented the overall characteristics, such as field of practice, type of nursing care, and team size [22,23]. Specific team properties expressed characteristics of individual team nurses [22,24]. Team composition variables that arose from the literature review, as well as, team composition variables reported in literature were included. Overall, it has to be concluded that the reported results in this research project incompletely explain the relation between team composition and team learning. An in-depth analysis of the team composition variables was needed to detect relationships. Possibly, a more defined conceptualization of team composition is necessary to detect relations with team learning. Contradictory to reports in the literature, team diversity was not included as team composition variable. Diversity in teams reflects the variety on background, expertise and professional education. The individual nurses in the included nursing teams differed on items as age, education and experience. Still, all respondents were nurses or nurse-alike professionals limiting the diversity in the teams. Moreover, the variance in perspectives and backgrounds of nurses are limited, because nurses educate nurse-students. The minor effect of team composition on the prevalence of team learning activities, however, is reported in a number of studies [14,16,17]. Possibly, team composition is a less dominant determinant of team learning in mono-disciplinary teams as in project or project-based learning teams where the function is to solve problems from a multi-disciplinary perspective.

A fourth important theoretical consideration was the definition of context as a multifactorial construct wherein the independent variables interrelated and created a specific configuration [7,25,26]. Scholars and researchers stated context as an important determinant for team learning and conceptualized context in variables as learning climate or the overall team climate [16,27]. In this research project, one contextual variable represented the overall environment

for team learning and four variables characterized basic configurations of organizational characteristics of nursing teams. This way, both learning climate and teams' organizational characteristics were included. The results of this research project underscored the importance of the context nurses in teams perceive. Two observations regarding the reported results can be emphasized. First, congruent with the literature, a context based on psychological safety, openness and team characteristics as having external orientation and flexibility was most facilitating to the prevalence of team-learning activities in nursing teams [7,27,28]. The prevalence of team-learning activities and context are connected, due to the fact the construct of team learning is based in the social-constructivism [17,25]. Individual nurses learn by negotiating ideas and construct new knowledge, skills or alter attitudes in collaboration with other nurses in a social context. To express team-learning activities individual nurses have to perceive a context wherein they feel safe to unfold their uncertainties, start asking questions and enter learning stages [25,29,30]. In addition, the prevalence of team-learning activities benefitted of a structural regulation of the team learning processes [16]. This observation underlined the importance of having an infrastructure in nursing teams that facilitates team-learning processes. The facilitation of the nursing teams, however, originates in their history of production-oriented teams. In nursing teams, an infrastructure ascertains the continuity of handling production-oriented information [3,26]. Examples of the infrastructure are regular meetings, e.g. are the hand-over in 24-hour nursing teams or staff meetings wherein production-oriented information is gathered, processes and stored. Still, infrastructures on handling development-oriented information are scarce in nursing teams. Missing facilitation of development-oriented team learning may hinder the ambidextrous function of nursing teams. Luby et al. [31] reported the effects of infrastructures that focus on handling development-oriented information as new guidelines or results of evidence based practices. The concrete activities of nurses during these meetings are team-learning activities, e.g. 'external professional information', 'collecting professional knowledge', 'use of guidelines' and 'internal knowledge exchange'. The effects of these infrastructures on developmental-oriented team learning are promising, however, Edmondson [25] and Cornell et al. [3] described the context of teams in health organizations is characterized by an overflow of chancing work designs and an internal focus on production. Instead of supportive contextual elements as openness and willingness to share information, the processes of defensive reasoning were dominant in contexts of health care and nursing teams. Creating a supportive context for team learning seems difficult if nursing teams are driven towards production and control. Even without team structures backing the developmental-orientation in the included nursing teams, the results of this research project re-express the importance of a supportive context that is characterised by openness, safety, flexibility and external orientation.

The fourth theoretical consideration reflected the starting point of this doctoral study and focussed on the noncompliance of nursing teams towards innovations. When an individual nurse in a team is confronted with a newness, the team offers opportunities to discover aspects of integrating the newness into routines [7,16]. Throughout team-learning activities, e.g. asking questions or seeking feedback, the individual nurse has possibilities to solve learning questions that rise during the implementation of innovations. Therefore, theoretical considerations in the final empirical study addressed the relation between the team-learning processes and the implementation-effectiveness of two different types of innovations. Two important observations

can be made on this final empirical study. First, it synthesized the contingency perspectives on team learning and innovation and implied a fit between different team learning processes and implementation of different types of innovations. Second, it presented team learning as a facilitator for the implementation of innovations in nursing teams. Overall, the study opened new directions for future theory development on team learning and innovations in nursing teams, in which subsume the different team-learning processes and different types of innovations as important elements of analysis.

Literature defined learning during the implementation of an innovation as short-term learning-cycles wherein individuals were informed or trained on a specific innovation [7,32]. Research on learning during implementation-processes was focused on individual education or training and ignored the effects of team-learning methods towards innovative behavior and implementation of innovations [5,32]. Attention to learning activities in teams was limited, however, increasingly implementation scientist attend their focus on the intra-team-activities during the implementation of an innovation [5]. Still, team-learning activities have a minor role in existing theories on implementation of innovations in health care teams [33].

The fifth theoretical consideration is on the contingency perspective. In the contingency perspective, the team-learning processes on handling production-oriented information related to the implementation-effectiveness of an incremental innovation. In addition, team-learning processes that link to handling development-oriented information related to the implementation-effectiveness of a radical innovation. Implementation-effectiveness reflected the compliance of nursing teams towards the innovation and was conceptualized in the perceived knowledge and use of the specific innovation. In this contingency perspective, the optimal 'fit' was when the configuration of team learning activities in a team was contingent upon the various types of information needed by the teams [19, 34]. Previous literature supported the use of a contingency perspective on team learning as well as on innovation [16,35]. Gnyawali & Stewart [34] presented a contingency perspective wherein four types, e.g. reinventive, formative, adjustive and operative learning were related to two different learning processes, e.g. interactive and informational learning processes. The informational learning processes were the result of the exchange of information in team meetings dedicated to collect, share, distribute and store information. The interactive learning processes triggered intra-team interactions between team members to exchange information, over cross boundaries of the own team and create new knowledge or knowledge on newness. The interactive learning processes overlay with the development-oriented learning processes as defined in the results of this research project. In addition, the informational learning processes connect to the production-oriented team-learning processes in this doctoral thesis. Overall, results of this doctoral thesis refined how specific team-learning processes 'fit' with implementation-effectiveness of different innovations. Combining team learning and implementation-effectiveness in nursing teams in a contingency framework, however, was relatively new and not yet reported. The contingency framework used in this study refined the process-output part of the overall conceptual framework and provided empiric evidence for the crucial role that team-learning activities have on the implementation of innovations in nursing teams.

Overall, the conceptual framework in this research project involved an input-process-output model that specified the determinants, process and output on implementation-effectiveness of team learning. In this conceptual framework, the determinants of team learning seem general; concepts as openness, safety and external orientation facilitated team learning in all different teams. The process part of the conceptual framework represented the team-learning processes. Team-learning activities expressing the actual dissemination, interpretation and application of information in the team were most important. Team-learning activities handling production-oriented information had a positive effect on the use of an innovation that represented a simple adjustment of current production. In contrast, team-learning activities handling development-oriented information positively affected the implementation of a radical innovation. Still, the use of the IPO framework limits research by implying a single-cycle linear path, whereas an interaction between input and process variables is suggestible.

6.5 Methodological considerations

To interpret the results of this research project several theoretical considerations need to be taken into account. First, in the literature review, some, but, not all of the elements of the methodology of systematic review were adopted [8]. The included elements were the commitment to make the literature review replicable, scientific and transparent and the establishment of a number of steps to frame the enquiry and present the results. The state of knowledge on team learning and innovation in nursing teams limited the review of the literature. To determine the influence of team-learning activities on implementation of innovations in nursing, randomized clinical trials would provide best evidence. Still, this state of knowledge is not yet accomplished. Moreover, studying literature on team learning and innovation was a crossover of the fields of science on organizational learning and knowledge, management and innovation in health care and was hindered by the lack of paradigmatic consensus. There was a wide variety of in definition of the concepts of team learning and innovation in the literature, as well as, a range of ways in which the concepts were operationalized. Overall, the review had elements of a systematic review, as well as, of a conceptual synthesis with coverage of the literature and using data extraction sheets to make the sources and their results transparent.

A second methodological consideration is the inclusion of nursing teams from university and community hospitals, mental health and nursing schools in the empirical studies. Convenience sampling created the study population. All included teams originated from organizations that were engaged in research on learning and innovation in nursing. It is well possible these organizations emphasized teams and learning more than other health care organizations. In addition, differences in nursing teams can be biased because of the nationality of the included teams. The included nursing teams in Belgium originated from one university hospital, where the nursing teams in the Netherlands came from community hospitals, mental health institu-

tions and nursing schools. It is arguable that the professional environments wherein the nursing teams act in differ over countries and fields of practice [36]. Studies report national culture was responsible for considerable variation in attitudes towards teams and social behavior, decision-making and leadership behaviors. Moreover, one can discuss the sizing of included teams. Teams sized from four up to 42 nurses, in which the latter are likely to split up into subgroups [37]. Still, the variety in the included teams reflected the dissemination of nursing teams over hospitals, mental health and community care settings, as well as, nursing schools. Both health care and education are businesses wherein developments are widespread. The variety in the included teams is justifiable, as all teams have to make the transition to ambidextrous teams [19,38]. Both in direct patient care and educational settings, nursing teams encounter the distress of simultaneous production and innovative processes. Moreover, the variety of nursing teams opened possibilities to explore team learning in a diversity of settings.

A third methodological consideration relates to way of data-collection in this research project. Data were collected at individual level throughout structured self-report questionnaires with Likert-scales. This way, the perception of the individual nurses towards team learning, contextual variables and implementation-effectiveness was measured. As is well reported, the individual perception may be biased by the situation the individual nurse or the team is in at the time of data collection. Moreover, the measurement method with self-reporting questionnaires could cause systematic measurement errors and further bias in analysing data because common method variances. Moreover, researchers reported the importance of the response rate when grouping individual data to team-level characteristics [8]. Researchers reported studies on nursing teams with response-rates varying between 40 and 90% per cent, but underreport the critical amount of per cent to include teams in analyses [38]. In this research project, teams with 60 per cent response rate were included in analyses.

The fourth methodological consideration relates to the fact that the focus of this research project on teams with respect to team-level learning processes and -outcomes. Therefore, the appropriate unit of theory and analysis was at the team-level. All variables in this research project were defined at the team-level and individual data were aggregated in team-level variables. Because one purpose of this doctoral study was to relate team composition with team learning, it was essential to reflect on how global and specific characteristics of the nursing teams and the individual nurses were represented at the team level [22,23,38]. The methods explicated in this research project are consistent with other researchers who viewed the aggregated attributes of individuals as characteristics of the team [22]. Moreover, statistical procedures in this research project underwrote justification for aggregation [8]. In this way, team composition was characterized in global characteristics that were directly at the team-level, e.g. the setting of the team and whether or not the team delivers 24-hour nursing care. In addition, team composition was typified by the specific characteristics of the individual members, e.g. age or years of clinical experience, that were aggregated to emerge as team-level variables. Still, the perspec-

tive in this research project was limited to the team-level only. This perspective is relatively new to nursing science and underlines the stated importance of teams, but it limited definitions and analyses to one level. Recent studies on teams and learning reported the use of multi-level techniques to analyse dependent and independent variables at several levels simultaneously. This research project limited analyses to standard correlational and multiple regression analyses all on one level. It is well possible reported results were more detailed when multi-level techniques were used. Moreover, relations between variables on individual and team level may bias the reported results. In addition, the multiple regression analyses in this research project handled relations between parts of the conceptual model and neglected possible moderators.
A fourth methodological consideration discusses the concept of 'fit' in the contingency perspective in the final empirical study. The concept of fit is central to contingency theory. The development of the contingency model rests upon the assumption that a 'fit' between the "patterns of relevant team-learning processes and implementation-effectiveness" will yield better compliance of nursing teams towards innovations. In congruence with the systems approach in contingency theories, the 'fit' between team learning and implementation-effectiveness variables was analysed using correlation and multiple regression analyses [39]. A different approach and definition of 'fit' could have led to different data-analysing techniques with different results. For example, defining 'fit' in terms of profile deviation would led to the use of cluster-analyses to detect differences in implementation-effectiveness in the different teams. Detecting clusters with deviant implementation-effectiveness, however, could be based on minor differences and constrain the rest of the analysis. In addition, the use of correlation and multiple regression analyses resulted in reporting the influences of variables, whereas the identification of clusters in cluster-analyses can be difficult. Moreover, in cluster-analyses the numbers of clusters should be predefined, limiting the explorative character of the intended analyses.

A fifth methodological consideration is on the conceptualization of implementation-effectiveness in variables representing the knowledge and the use of the innovation. This way, the fidelity of the innovation was neglected. Gearing et al. [39] stated the importance of fidelity-analyses detecting implementation-effectiveness. Fidelity-analysis involves analyses compares the way the innovation is used in clinical practice to the way the innovation originally was supposed to be used. Fidelity-analyses include different data-enquiry methods, e.g. observation, analyses of patient records, interviews and questionnaires. This way, a more robust detection of implementation-effectiveness can be obtained.

Overall, the cross-sectional design of this doctoral thesis restricts conclusions on causal effects. The study handled one level of measurement as all variables are formulated at the team-level. The data in this study were collected at the individual level, however, the individuals were nested in teams. Therefore, multi-level analysis could have been appropriate. In addition, applying multi-level analysis could open the possibility to test the interactions of all variables in the research model, a stage that has not been reached yet.

6.6 General conclusions

Innovation is imperative in todays' work environments of nursing teams in health care organizations. Nursing teams are and will be continuously confronted with innovations. The compliance of nursing teams on innovations, however, is problematic and leads to negative effects on the safety and the quality of provided nursing care. This research project promoted the compliance of nursing teams on innovations by exploring a conceptual model on team-learning activities and implementation of innovations in nursing teams.

Nursing teams are undergoing a transformation from production-oriented teams into ambidextrous teams that simultaneously produce, as well as, innovate the nursing care they provide. To perform as an ambidextrous team, nurses in teams execute team-learning activities to gather, process and store the information that is needed to perform both production-oriented and innovation-oriented tasks. Team learning enhances the compliance of nursing teams on incremental and radical innovations. The way a nursing team is composed has a minor, whereas the context of the nursing teams has a major influence on the prevalence of team learning activities.

Research question		*Conclusion*
1	What is the current knowledge on the relationship between team learning and implementation of innovations in nursing teams in the literature?	Team learning in nursing teams included processes to gather, process, and store information from different innovations within the nursing team and the prevalence of team-learning activities was contributed or hindered by individual and contextual factors.
2	How does team learning reveal in nursing teams?	Team learning in nursing teams was identified in five clusters of team-learning activities. Two clusters referred to gathering and storage of production-oriented information, two subscales referred to gathering and storing of development-oriented information. One cluster referred to the actual processing of gathered information in the team, while the fourth and fifth subscales referred to storage and retrieval of information.
3	How is the relationship between team learning and team composition in nursing teams?	Team composition had a minor effect on team learning. Being a nursing team in a community hospital, not having moderate team longevity, and having high percentage female facilitated team-learning activities in nursing teams.
4	How is the relation between team learning and contextual factors in nursing teams?	Contextual factors had a major effect on the prevalence of team learning. A context based on openness, safety, flexibility and external focus was most facilitating on the prevalence of team-leaning activities in nursing teams. Commonality analyses showed the importance of interrelationships between the contextual factors.
5	How is the relation between team learning and implementation of innovations in nursing teams?	Team-learning activities that relate to the production of nursing care effected the implementation of an incremental innovation. The implementation of a radical innovation was effected by team learning activities that relate to the development of the provided nursing care.

6.7 Implications for education, clinical practice and research

Team learning in nursing teams showed up to be a promising factor for nursing teams to act as an ambidextrous team. In daily practice, nursing teams confront both continuous developments, as well as the pressure of the production-processes. The results of this research project indicate pathways for nursing teams to enhance team learning and perform their ambidextrous function. This research project has implications to the way nurses are educated, to practices of nursing teams during implementation of innovations and towards further research.

6.7.1 Implications for nursing education

Results of the study indicated personal characteristics of nurses to be incorporated in the curricula of nursing studies. The personal characteristics reflected in individual nurses that have the skills to combine learning and working in a team and were focused on continuous improvement. These nurses are skilled to present themselves as empowered team members, multitasking on productive and innovation tasks. Stokowski [40] stated existing nursing education programs do not fully prepare students for clinical practice. In nursing education, students should find possibilities to develop the personal characteristics and get prepared on the real world of nursing practice. One pathway is the integration of team-based education strategies in nursing education. Educational strategies based on team learning are well development in education [41]. Examples are problem-based and project-based learning, strategies wherein the student is prepared and skilled to work and perform in a team. In addition, the content of educated material should be critically examined and adjusted to the ambidextrous character of todays' clinical practice. For example, educating nursing students to handle hand-hygiene should incorporate practical training, as well as latest knowledge on hand-hygiene. This way, one combines the production-oriented and development-oriented information on hand-hygiene in the education. Nursing education wherein students learn in team-based contexts, combined with attendance on the development of personal skills will lead up to students that are well prepared for clinical practice.

6.7.2 Implications for clinical nursing practice

The team-learning activities in nursing teams in this research project reflected the ambidexterity of teams in clinical practice. The findings of this project provided a rationale for managers to enhance team learning in clinical practice by creating infrastructures that support both productive, as well as developmental learning tasks in teams. To enhance team learning in nursing teams management and nurses should strengthen the facilitation of a development-oriented team configuration and an intense team-learning environment. Upcoming examples in clinical practice are team-learning based initiatives as journal clubs and evidence based practice meetings. In addition, the instruments of this research project can be used to enhance team learning in nursing teams throughout application of the team-learning feedback method

[42,43,44]. In this method, the teams receive feedback on their scores on the team learning and context scales, thereafter the team outlines goals on team learning and context and discuss the progress during staff meetings. The team-learning feedback method created awareness of learning in teams. Before participating in the team learning feedback method, individual nurses were unaware of learning behaviour in their team. As an effect, the team learning feedback method constituted the attention for learning behaviour in teams and enhanced the prevalence of team-learning activities in nursing teams.

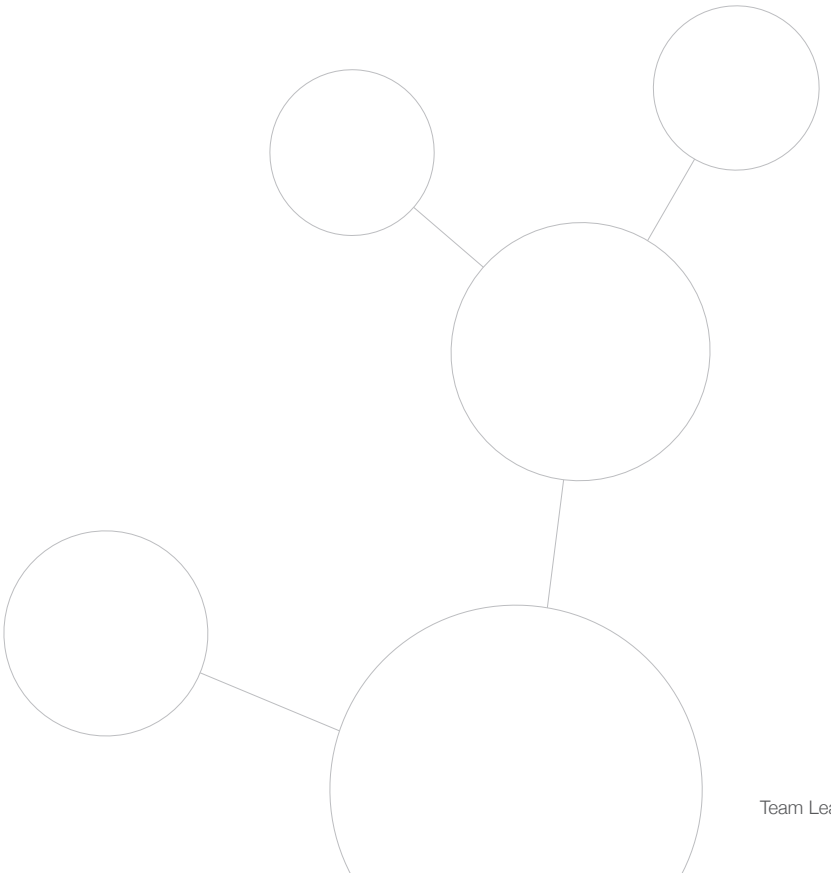
The results of this research project expressed the importance of situating team learning as a key variable in the process of implementation of innovations. Too often, learning during implementation was operationalized in short-term individual education programs. In order to enhance the compliance of nursing teams on implemented innovation and endorse a higher quality of care and patient safety there is a need on effective implementation strategies. Team learning should be incorporated in implementation-strategies. Nurse education provides examples to enhance team learning in nursing teams. With the results of this study, managers and nursing teams can develop effective team-learning processes that enable nursing teams to improve implementation-effectiveness of different types of innovations.

6.7.3 Implications for future research

Although important steps are made in understanding team learning and innovation implementation in nursing teams, further research is indicated to the important questions that remain. Three important observations of the results of this doctoral thesis implicate the design of future research and can help to refine the conceptual model on team learning and innovation in nursing teams. First, future research should focus on understanding the effects of individual and team characteristics and their influences on the prevalence of team-learning activities in nursing teams over time. Therefore, the concepts of individual learning and team learning should be connected [18,38]. The reported measurement instruments in this research project provide a tool to access team learning in nursing teams and are to be applied in practice. In addition, the second observation involves the multi-levelled nature of studying teams, team learning and important input and output factors. To determine relations on individual and team level, future studies should be using multilevel analyses techniques. Moreover, the IPO framework should be extended to examine interactions between input and process variables over time in longitudinal designs. The third observation concentrates on the conceptualization of compliance towards implemented innovations. Researchers increasingly start to report practices and characteristics that enhance health care organizations to cope with implementation of innovations [2,45]. Moreover, innovation-implementation literature focusses on the importance of compliance and effective innovation implementation. Still, major difficulties exist on the conceptualization of effective implementation innovation. Gearing et al. [46] proposed the application of fidelity in the conceptualization of effective implementation. The concept of implementation fidelity reflects how well an innovation is implemented in comparison with the original design.

Using fidelity improves and objectivises data collection in implementation research. Applying fidelity in research includes detailed study of (1) the adherence of the users of the innovation, (2) the frequency of implementation strategies, (3) the quality of implementation strategies and (4) the participants' responsiveness to the content of the innovation and (5) the effects on target populations (patients). Not only the actual implementation is studied, but also the effects of the innovation are included in the concept of implementation effectiveness.

Overall, Implementation science comprehends research of designs, implementation strategies and the variables that influence implementation of innovations. Implementation science is focussed on individuals, teams and organizations with the overall goal to improve clinical practices. The research presented in this research project aimed to enhance compliance of nursing teams towards innovations by a deeper understanding of team learning and innovation in nursing teams. The reported results add to the knowledge of what creates implementation-effectiveness in nursing teams. Moreover, the presented studies refine a conceptual model on team learning and innovation. Team learning was presented as a facilitator for compliance on innovations as clinical guidelines or protocols. Still, there is no claim that team learning is the only facilitator involved in the implementation of innovations in nursing teams. Implementation of innovations in nursing teams is a complex process involving individual, team and organizational factors and expresses a need for further understanding.



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Chapter

7

Summary

7.1 Summary

7.1.1 Background

Nursing teams are omnipresent in health care organizations. To deliver a high quality of care and patient safety, nursing teams are forced to match their practices with standards of nursing care that originate from science, political or social issues. Nursing teams implement innovations to match their practices with actual standards. Still, studies report serious problems in the compliance of nursing teams towards implemented innovations, e.g. clinical guidelines and protocols, endangering the quality and safety of supplied nursing care. Studies on what facilitates the implementation of innovations in nursing teams, however, are scarce. Research in other businesses proposed team learning as a facilitator for change. This doctoral study explored the problem of non-compliance by focusing on how nursing teams learn.

7.1.2 Aim

The aim of the doctoral thesis is to enhance compliance of nursing teams towards implemented innovations by understanding the impact of team learning activities on the implementation of innovations in nursing teams. Five research questions were formulated:

Research Question 1: What is the current knowledge on the relationship between team learning and implementation of innovations in nursing teams in the literature?

Research Question 2: How does team learning reveal in nursing teams?

Research Question 3: How is the relationship between team learning and team composition in nursing teams?

Research Question 4: How is the relationship between team learning and contextual factors in nursing teams?

Research Question 5: How is the relationship between team learning and implementation of innovations in nursing teams?

7.1.3 Method

To address the research questions this doctoral study included a review of the literature and three empirical studies with a cross-sectional design. Based on the literature review a conceptual model was created, which was tested in the empirical studies. The first empirical

study addressed research question 2 (how does team learning reveal in nursing teams?) and research question 3 (how is the relationship between team learning and team composition in nursing teams?). The second empirical study concentrated on research question 4 (how is the relation between team learning and contextual factors in nursing teams?) and explored the effect of the second input factor in the research model. The third empirical study handled research question 5 (how is the relation between team learning and implementation of innovations in nursing teams?) and focused on the output of team-learning activities on the compliance of nursing teams on implemented innovations.

7.1.4 Results

Literature review

The review of the literature included eight studies published in English or Dutch between 1998 and 2010. Analysis in this review showed merely one, qualitative, study demonstrated the importance of team-learning activities in the process of exploring and implementing innovations in the teams' clinical practice. At the time, quantitative studies on the relationship between team learning and innovation in nursing teams were.

Overall, team learning in nursing teams was reflected in activities to gather, process, and store information within the nursing. Results of the literature review indicated the prevalence of team learning activities was influenced by individual and contextual factors. Individual factors represented the characteristics of the individual nurses in the team, e.g. education, gender and experience. The environment of the team was reported in contextual factors as learning climate and psychological safety in the team. Analysis of the included studies showed six individual and 13 contextual factors impacting the prevalence of team-learning activities in nursing teams. Individual factors contributing to the prevalence of team learning activities included education, gender, empowerment, enjoying working and learning in a team and having a drive for continuous improvement of clinical practice. Contextual factors contributing to the prevalence of team learning activities were time dedicated to learning activities, psychological safety and an external focus. Three contextual factors hindered the prevalence of team learning activities, e.g. hierarchical leadership, an authority based centralized organizational structure and a large team size. Based on the results of the literature review a conceptual model was created wherein team learning was placed in an input-process-output model.

Empirical study 1, team learning and team composition

The first empirical study addressed the nature of team learning in nursing teams by determining whether the scale items of Offenbeeks' 26-item team-learning activities scale was relevant and applicable for use in nursing teams practicing in The Netherlands and Belgium. Second, the study investigated the influences of team composition items on the prevalence of team learning activities in included nursing teams. Analysis show the 26 team-learning activities in Offenbeeks' team-learning activities scale formed a five factor model that explained 78% of the variance on the team-learning activities scale. The five factors represented team-learning activities on gathering, processing and storing of relevant information to handle production or development-oriented information. The results of the second part of this study reported a minor effect (R2 33%) of team composition on the prevalence of team learning activities in nursing teams. Important items were being a team in a community hospital (positive effect), mid-term team longevity (negative effect) and a low percentage female nurses (negative effect).

Empirical study 2; Team learning and context

The second empirical study concentrated on the fourth research question and explored the relation between team learning and contextual factors in nursing teams. Context was defined in one variable representing the overall environment for learning and four variables characterizing the basic configurations of organizational characteristics of nursing teams. Because an interrelation between all contextual variables was expected, multiple regression models were tested for multicollinearity by regression commonality analysis to detect the unique and common contribution of each independent variable in the regression model.

In literature, team-learning environment is indicated as one of the most important contextual variables for team learning. In contrast, analysis in this study indicated a minor effect of team learning environment in the prevalence of team-learning activities in nursing teams. Results indicated that contextual factors such as: (1) strengthening stimulation of the psychological safety, (2) openness, (3) shared goals, and (4) an open, external-oriented view enhanced the prevalence of team-learning activities in nursing teams. Multiple regressions yielded three models that explain 76%, 81%, and 83% of the variance in team learning. Regression commonality analyses showed the importance of interrelationships between the contextual factors. Overall, this study contributed to the understanding of the research model by revealing the commonality of contextual variables in nursing teams. Context was interpreted as a multifactorial construct wherein the different independent variables interrelated and created a specific team context having a major effect on the prevalence of team learning activities. This study accentuated the importance of building a supportive context for team learning in nursing teams.

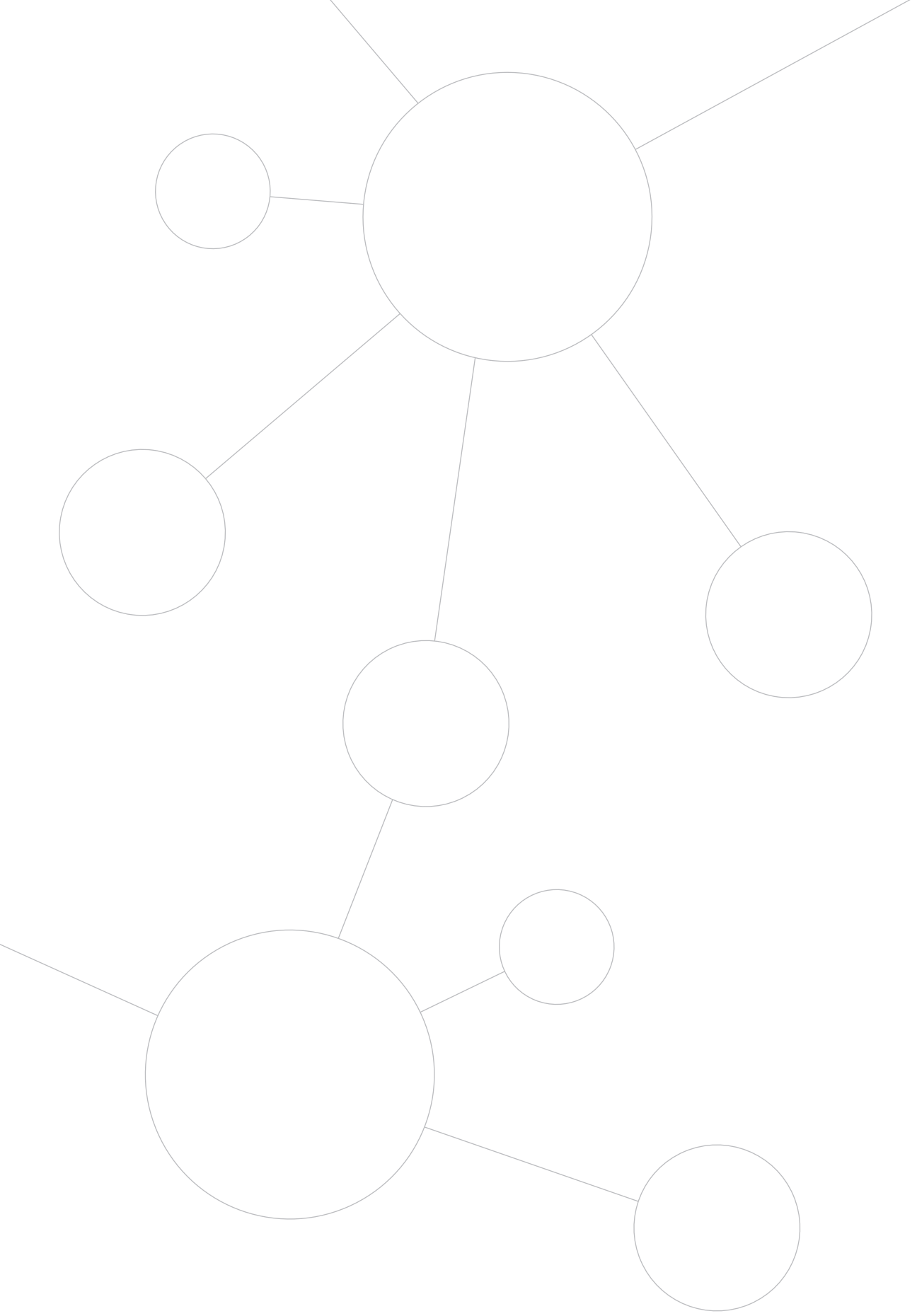
Empirical study 3; a contingency perspective on team learning and innovation in nursing teams

The third empirical study handled the fifth research question and analysed the relation between team learning and the compliance of nursing teams on two contrasting innovations. The study introduced a contingency perspective on team learning and the implementation of innovations in nursing teams. In the contingency perspective, a 'fit' was proposed between the different team learning processes and the information needed in teams. The 'fit' was defined as the internal consistency between team learning activities and implementation-effectiveness. The variables use and knowledge of an innovation represented the overall implementation-effectiveness. Result in this study indicated team-learning activities that handled information on the production of nursing care affected the implementation-effectiveness of an incremental innovation. The implementation of a radical innovation was effected by team-learning activities that were related to handling of information about the development of the provided nursing care.

This study presented team learning as a facilitator for the implementation of innovations in nursing teams. Moreover, the use of the contingency perspective synthesised team learning and innovation by relating the different team-learning processes and the implementation of different types of innovations. In the contingency perspective, the 'fit' is optimal when the configuration of team-learning activities in a team is contingent upon the information needed by the team in order to implement innovations. In addition, the contingency perspective added new directions in research on compliance of nursing teams on implemented innovations in nursing teams and included team-learning processes and different types of innovations as important elements of analysis.

7.1.5 General conclusions

This doctoral study reported nursing teams are undergoing a transformation from production-oriented teams into ambidextrous teams. Ambidextrous nursing teams have the capability to simultaneously produce and develop nursing care. To perform as an ambidextrous team, nurses in teams undertake team-learning activities to gather, process and store information that is needed to perform production-oriented and innovation-oriented tasks. The way a nursing team is composed had a minor influence on the prevalence of team-learning activities. In contrast, the context of nursing teams had a major effect on the prevalence of team learning activities. A context based on openness, safety, flexibility and external focus was found most facilitating. At last, team learning activities enhanced the compliance of nursing teams on incremental and radical innovations.



Samenvatting

7.2 Samenvatting

7.2.1 Achtergrond van de studie

Verpleegkundige teams leveren een belangrijke bijdrage aan de kwaliteit van zorg. Vanwege de prioriteit tot het leveren van hoge kwaliteit van zorg en patiëntveiligheid worden verpleegkundige teams gedwongen om de dagdagelijkse praktijken aan te passen aan standaarden en richtlijnen die voortkomen uit wetenschappelijke, politieke of maatschappelijke ontwikkelingen. Verpleegkundige teams implementeren innovaties om de huidig verleende verpleegkundige zorg aan te passen naar actuele standaarden en richtlijnen. Ondanks het belang van het leveren van zorg volgens actuele standaarden of richtlijnen rapporteren studies serieuze tekortkomingen in de compliance van verpleegkundige teams naar geïmplementeerde richtlijnen en protocollen. Gevolgen hiervan zijn dat verleende verpleegkundige zorg niet actueel is, waardoor de kwaliteit en veiligheid van de verpleegkundige zorg in gevaar komt. Om het geheel van implementatie en compliance in verpleegkundige teams te verbeteren rapporteert dit doctoraatsonderzoek studies over hoe de verpleegkundige teams leren bij het invoeren van innovaties. In de algemene onderzoeksliteratuur wordt teamleren voorgesteld als facilitator van verandering. Onderzoek buiten de gezondheidszorg positioneert teamleren als belangrijke factor bij het implementeren van veranderingen. Echter, recente studies over de impact van teamleren op de invoering en naleving van innovaties in verpleegkundige teams zijn beperkt.

7.2.2 doel van de studie

Het doel van dit doctoraatsonderzoek is het verbeteren van de compliance van verpleegkundige teams naar innovaties door het bestuderen van de invloed van teamleren op de implementatie van innovaties in verpleegkundige teams. Hiertoe zijn vijf onderzoeksvragen opgesteld:

Onderzoeksvraag 1: Wat is de huidige kennis over de relatie tussen teamleren en implementatie van innovaties in de verpleegkunde teams in de literatuur?

Onderzoeksvraag 2: Hoe manifesteert teamleren zich in verpleeg-teams?

Onderzoeksvraag 3: Hoe is de relatie tussen teamleren en de compositie verpleegkundige teams?

Onderzoeksvraag 4: Hoe is de relatie tussen teamleren en de context van verpleegkundige teams?

Onderzoeksvraag 5: Hoe is de relatie tussen teamleren en implementatie van innovaties in verpleegkundige teams?

7.2.3 Methode

Om de onderzoeksvraag van dit doctoraatsonderzoek te beantwoorden zijn een literatuurstudie en drie empirische studies met een cross-sectioneel design uitgevoerd. De literatuurstudie heeft als doel de huidige kennis over teamleren en innoveren te inventariseren. Op basis van de literatuurstudie is een conceptueel model opgesteld, dat in drie empirische studies is verkend. De eerste empirische studie is gericht op de tweede onderzoeksvraag en rapporteerde over hoe teamleren zich manifesteert. Tevens omvat deze studie de derde onderzoeksvraag over de relatie tussen teamleren en teamcompositie. De tweede empirische studie concentreert zich op de vierde onderzoeksvraag en onderzoekt de relatie tussen teamleren en context. De derde empirische studie behandelt de vijfde onderzoeksvraag en rapporteert over de relatie tussen teamleren en implementatie van innovaties in de verpleegkundige teams.

7.2.4 Resultaten

Literatuurstudie

De literatuurstudie includeerde acht studies gepubliceerd in het Engels of Nederlands tussen 1998 en 2010. Hierbij toonde slechts één, kwalitatieve, studie het belang van het teamleeractiviteiten in het proces van implementeren van innovaties in verpleegkundige teams. Op dat moment waren kwantitatieve studies naar de relatie tussen teamleren en innovatie in de verpleging teams afwezig.

Resultaten van de literatuurstudie duiden teamleren in de activiteiten die verpleegkundigen in teams ondernemen om informatie te verzamelen, te verwerken en op te slaan. De prevalentie van team-leeractiviteiten wordt beïnvloed door de individuele en contextuele factoren. De individuele factoren omvatte kenmerken van individuele verpleegkundigen in het team, zoals opleiding, gender en klinische ervaring. De contextuele factoren van het team betroffen items als leerklimaat en psychologische veiligheid in het team. Verdere analyse van de geïncludeerde studies toonden zes individuele en dertien contextuele factoren die de prevalentie van teamleeractiviteiten in verpleegkundige teams positief of negatief beïnvloedden.

Individuele factoren die positief bijdragen aan de prevalentie van team-leeractiviteiten waren hoger opleidingsniveau, geslacht, en de persoonseigenschappen empowerment, het willen combineren van werken en leren in een team en het streven naar voortdurende verbetering van de klinische praktijk. Contextuele factoren die bijdragen aan de prevalentie van teamleren activiteiten waren tijd voor leren, psychologische veiligheid en een externe focus. Drie contextuele factoren verminderden de prevalentie van team-leeractiviteiten, namelijk hiërarchisch leiderschap, een gecentraliseerde organisatiestructuur en een grote omvang van het team. Op basis van de resultaten van de literatuurstudie werd een conceptueel model aangaande teamleren en innoveren opgesteld. Dit conceptueel model is verder ingevuld door het uitvoeren van drie empirische studies.

Empirische studie 1, team leren en teamcompositie

De eerste empirische studie was gericht op de tweede en derde onderzoeksvraag. Allereerst werd in deze studie verkend hoe teamleren zich in verpleegkundige teams manifesteert, door validatie van Offenbeeks' 26-items team-leeractiviteiten-schaal in verpleegkundige teams in België en Nederland. In het kader van de beantwoording van de derde onderzoeksvraag is vervolgens de relatie tussen de prevalentie van team-leeractiviteiten en de compositie van het verpleegkundig team geanalyseerd. Principale componenten analyse van Offenbeeks' 26-items team-leeractiviteiten-schaal leverde een vijf factor model dat 78% van de variantie verklaarde. Één factor verklaarde 49.7% van de verklaarde variante. Deze factor omvatte team-leeractiviteiten gericht op het verwerken en toepassen van informatie. De andere vier factoren vertegenwoordigen team-leeractiviteiten gericht op het verzamelen en opslaan van productie- of ontwikkeling-gerichte informatie. De resultaten in het tweede deel van deze studie meldden een gering effect (R^2 33%) van teamcompositie op de prevalentie van team-leeractiviteiten in verpleegkundige teams. Significante variabelen in de teamcompositie waren (1) of het een verpleegkundig team in een algemeen ziekenhuis was (positief effect), (2) een middellange termijn dat het team bijeen was (negatief effect) en (3) een laag percentage vrouwelijke verpleegkundigen in het team (negatief effect).

Empirische studie 2, Team leren en context

De tweede empirische studie concentreerde zich op de vierde onderzoeksvraag en onderzocht de relatie tussen teamleren en contextuele factoren in verpleegkundige teams. Context werd hierbij geoperationaliseerd in één variabele die het team-leerklimaat vertegenwoordigde en vier variabelen die configuratie van organisatorische kenmerken van de verpleegkundige teams duidden. Omdat een interferentie tussen de onafhankelijke, contextuele variabelen werd verwacht zijn deze getest op multi-collinariteit.

In de literatuur is team-leerklimaat aangeduid als een van de belangrijkste contextuele variabelen voor teamleren. In tegenstelling gaven de resultaten in deze studie echter een gering effect van team-leerklimaat op de prevalentie van team- leeractiviteiten in verpleegkundige teams. De prevalentie van team-leeractiviteiten werd bevorderd door de mix van het team-leerklimaat met variabelen van de configuratie van organisatorische kenmerken van verpleegkundige teams. Multiple regressie leverde drie modellen die respectievelijk 76%, 81%, en 83% van de variantie op teamleren verklaarden. Hierbij onderschreven de resultaten van het uitsplitsen van verklaarde variantie (commonality analysis) de belangrijke werking van de onderlinge relaties van de onafhankelijke, contextuele variabelen in de regressiemodellen. De prevalentie van team-leeractiviteiten werd vooral gestimuleerd door een ontwikkelingsgerichte team-configuratie. In dit type configuratie is het team extern gericht. Deze teams verzamelen en verwerken informatie over belangrijke ontwikkelingen over de grenzen van het eigen team heen. Een belangrijk aspect van deze tweede empirische studie is de onderkenning van het multifactoriële karakter van context. Resultaten onderschreven context als een multifactorieel construct, waarin de verschillende onafhankelijke variabelen met elkaar interfereren en specifieke context team creëren.

Empirisch onderzoek 3; een contingentie perspectief op team leren en innovatie in verpleeg-teams

Deze studie behandelde de vijfde onderzoeksvraag en analyseerde de relatie tussen teamleren en implementatie-effect van twee contrasterende innovaties in verpleegkundige teams. In deze studie werd een contingentie perspectief op teamleren en de implementatie van innovaties in verpleegkundige teams geïntroduceerd. In dit contingentie perspectief bestaat er een 'fit' tussen de verschillende team- leeractiviteiten en de informatie die nodig is in het verpleegkundig team. In deze studie werd 'fit' gedefinieerd als de interne consistentie tussen de team-leeractiviteiten en implementatie-effect. Implementatie-effect werd geoperationaliseerd in variabelen die het gebruik en de kennis van de innovatie weergaven.

Resultaten in deze studie gaven aan dat team-leeractiviteiten die gericht zijn op hanteren van informatie met betrekking tot de productie van de verpleegkundige zorg een positieve invloed hadden op het gebruik van een incrementele innovatie. De implementatie van een radicale innovatie werd versterkt door team-leeractiviteiten die waren gerelateerd aan informatie die was gerelateerd aan de ontwikkeling van de verpleegkundige zorg. Multiple regressie leverde modellen waarin team-leeractiviteiten 83% verklaren van de variantie op het gebruik van een incrementele innovatie, 73% op de variantie van kennis van een radicale innovatie en 80% van de variantie op het gebruik van een radicale innovatie.

Deze studie onderschrijft het belang van team-leeractiviteiten bij de implementatie van innovaties in verpleegkundige teams. Door gebruik te maken van het contingentie perspectief werden teamleren en implementatie-effect van verschillende soorten innovaties gesynthetiseerd. Resultaten van deze studie onderschreven dat in het contingentie perspectief is een optimale situatie ontstaat wanneer de team-leeractiviteiten overeenkomen met de informatie die nodig is voor het implementeren van innovaties. Daarnaast borgt deze studie teamleren als belangrijke variabele in verder onderzoek naar compliance van verpleegkundige teams op implementatie van innovaties.

7.2.5 Algemene conclusies

Verpleegkundige teams ondergaan momenteel een transformatie van productie-gerichte teams naar ambidextere teams. Ambidextere teams hebben de competentie om tegelijk verpleegkundige zorg te produceren én te ontwikkelen. Om als een ambidexter team te handelen dienen teams informatie die nodig is voor de productie- en innovatie gerichte taken uit te voeren. Hiertoe ondernemen verpleegkundigen team-leeractiviteiten, waardoor informatie wordt verzameld, verwerkt en opgeslagen. De prevalentie van team-leeractiviteiten in verpleegkundige teams wordt weinig beïnvloed door de manier waarop het verpleegkundig team is samengesteld. Echter, de context waarin het verpleegkundig team acteert toont een forse invloed op de prevalentie van team-leeractiviteiten. Een context op basis van openheid, veiligheid, flexibiliteit en externe focus bevorderde de prevalentie van team-leeractiviteiten in verpleegkundige teams. Tot slot tonen de resultaten in deze doctoraatsstudie de faciliterende werking van team-leeractiviteiten op het implementatie-effect van zowel een incrementele alsook een radicale innovatie.

List of Figures and Tables

List of figures and tables

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The idea of this doctoral study originated in my former position as manager in a child-and juvenile psychiatry, where I was caught by learning mechanisms in nursing teams and, especially, by the question of how to create innovation in intramural nursing teams. Later, my career in nursing education handed me opportunities to start research on this matter, resulting in this doctoral study. Still, the accomplishment of the doctoral study would not have been possible without the support I have encountered during the past years.

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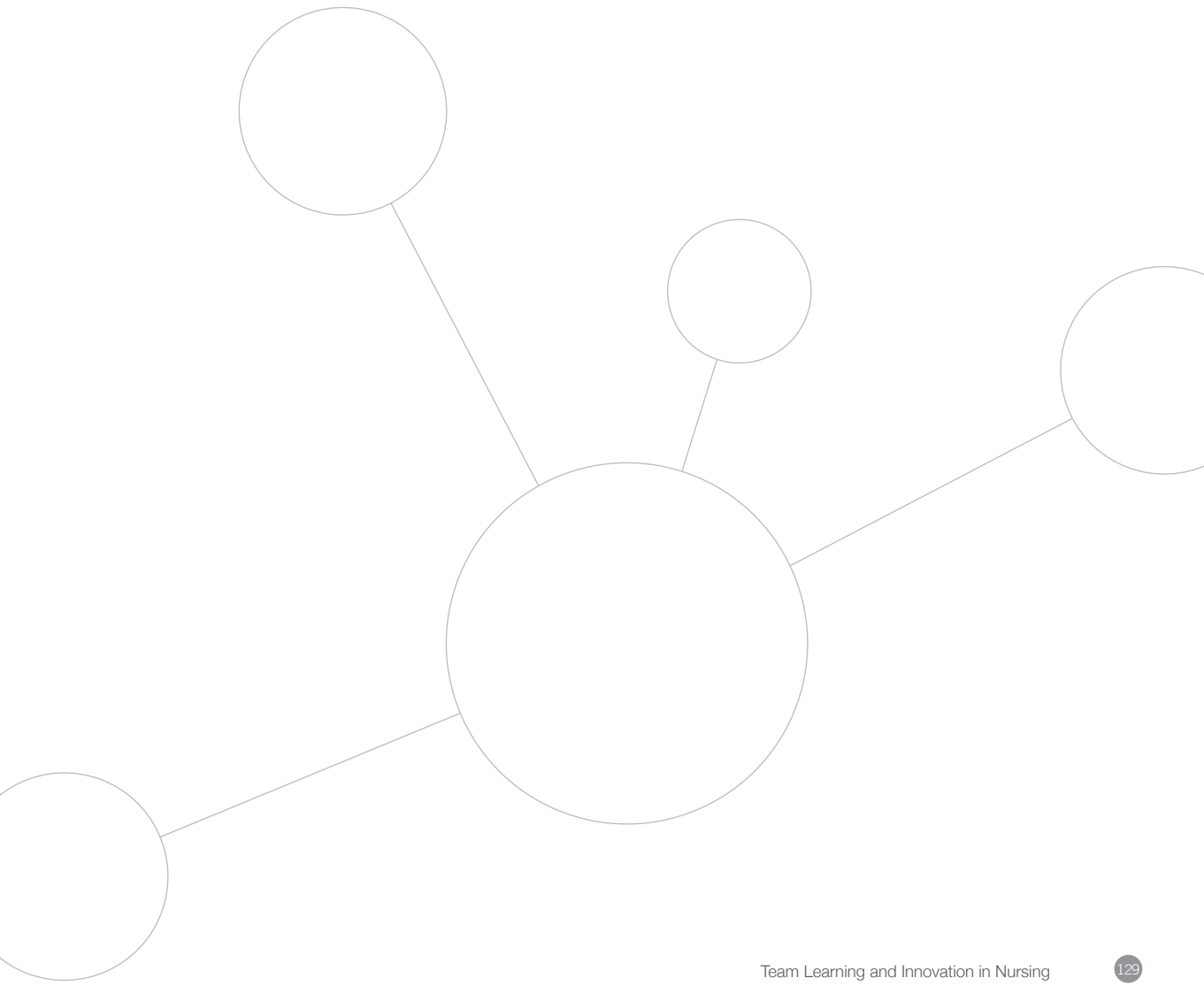

Curriculum Vitae

About the author:

Olaf Timmermans (01-09-1963) started in Nursing in 1981 with internal scholarship nursing in General Hospital and graduated as a Registered Nurse in 1985. Started an internal scholarship in Psychiatric Nursing in 1988 and became a Registered Nurse Psychiatry in 1991. Worked in a Mental Health Hospital in various functions; as nurse on a Geriatric ward, as nurse educator (for practice training and implementation of institutional Nursing Model Programs) and as Manager of a clinic for Child and Juvenile Psychiatry. Finished the Studies Clinical Nurse Specialist (Utrecht, 1994) and Master of Science in Nursing (Cardiff, 2001).

Since 2002, Olaf is a senior-lecturer bachelor of nursing studies of HZ University of Applied Sciences in The Netherlands and since 2005 assistant-professor Master of Science in Nursing and Midwifery at University Antwerp in Belgium. Olaf is founding-member of the Rho Chi Chapter of Sigma Theta Tau International.

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1987 - 1989	Management for non-profit	Institute Business Sciences
1988 - 1991	Diploma Degree Psychiatric nursing	Zeeuws Instituut Zorgopleidingen
1992 - 1994	Clinical Nurse Specialist	Hogeschool Utrecht
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1981 - 1988	Oosterschelde Ziekenhuizen	Student-nurse/Registered Nurse
1988 - 1991	Emergis	Student-nurse/RN Psychiatry/Educator/ Manager clinic Child Psychiatry
2004 -	HZ University of Applied Sciences	Senior-Lecturer, bachelor of nursing studies
2004 -	University Antwerp	Assistant-professor Faculty of Medicine and Health Sciences

Publications

Articles peer reviewed

2011 Olaf Timmermans, Roland van Linge, Peter Van Petegem, Bart Van Rompaey & Joke Denekens, Team Learning and Innovation in nursing; a review of the literature. *Nurse Education Today,* Jan. 2012, 32, (1), pp. 65-70 12. Epub. 2011 Aug 15.

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Scientific communications

Oral Presentations on national and international congresses/symposia

2006 Vlissingen, Zeeuws Innovation Event
A first exploration of the linkage between team learning and organisation readiness for innovation (in Dutch)

2006 Albacete, 10th International Nursing Conference
Coping and Emotional Burden in Child and Youth Psychiatry

2007 Breda, Implementation platform Neuman Systems Model
Team learning and implementation of nursing models (in Dutch)

2007 Aarhus, Knowledge in Nursing, 6th International Research & Development Conference,
Organisational Readiness for Evidence Based Education in Bachelor of Nursing schools

2008 Utrecht, Congress of Bachelor of Nursing Educators
Relation between team learning and readiness for evidence based education (in Dutch)

2008 Cambridge, NET2008 Conference
Team learning and evidence based readiness in Bachelor of Nursing Schools

2011 Terneuzen, Opening sTimul Experience
Team learning and innovations in helath care organizations

Poster presentations on international congresses/symposia

2009 Cardiif, RCN Research conference
Team learning, learning climate and implementation of the Neuman Systems Model

2009 Alicante, 13th International Nursing Conference
Team learning and readiness for evidence based practice

2011 Amsterdam; Sigma Theta Thau International leadership Summit
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