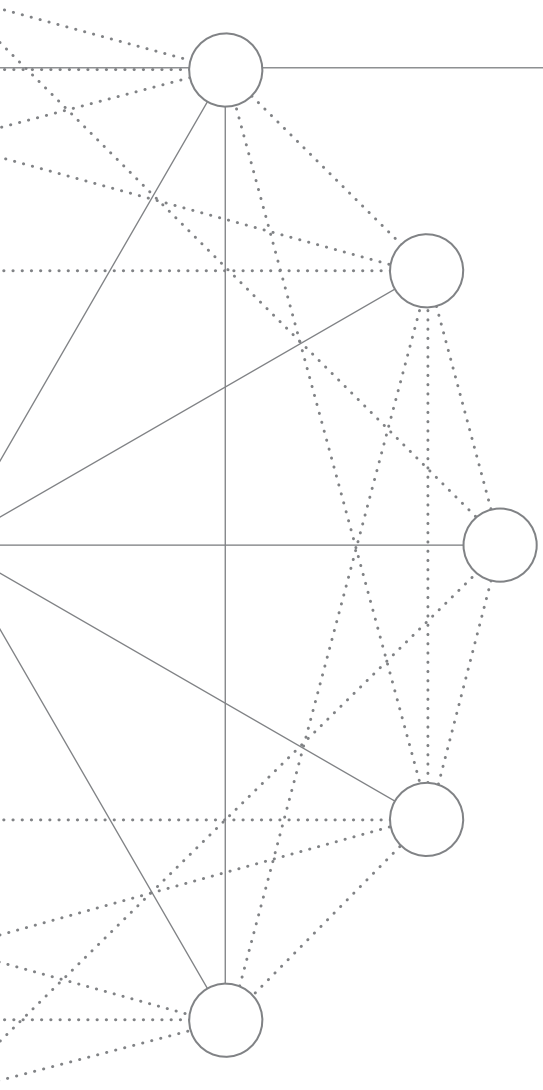

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LEARNING OF VETERINARY PROFESSIONALS IN COMMUNITIES

Using the theory of critically reflective work behaviour with regard to evidence based practice

LEREN VAN VETERINAIRE PROFESSIONALS IN LEERGEMEENSCHAPPEN

Toepassen van de theorie over kritisch reflectief werkgedrag met het oog op evidence based practice

(met een samenvatting in het Nederlands)

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Universiteit Utrecht op gezag van de rector magnificus, prof.dr. G.J. van der Zwaan, ingevolge het besluit van het college voor promoties in het openbaar te verdedigen op dinsdag 22 mei 2012 des middags te 12.45 uur

door Esther de Groot
geboren op 12 februari 1966 te Haarlemmermeer

Promotoren: Prof.dr. P. van Beukelen
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Co-promotor: Dr. M. D. Endedijk

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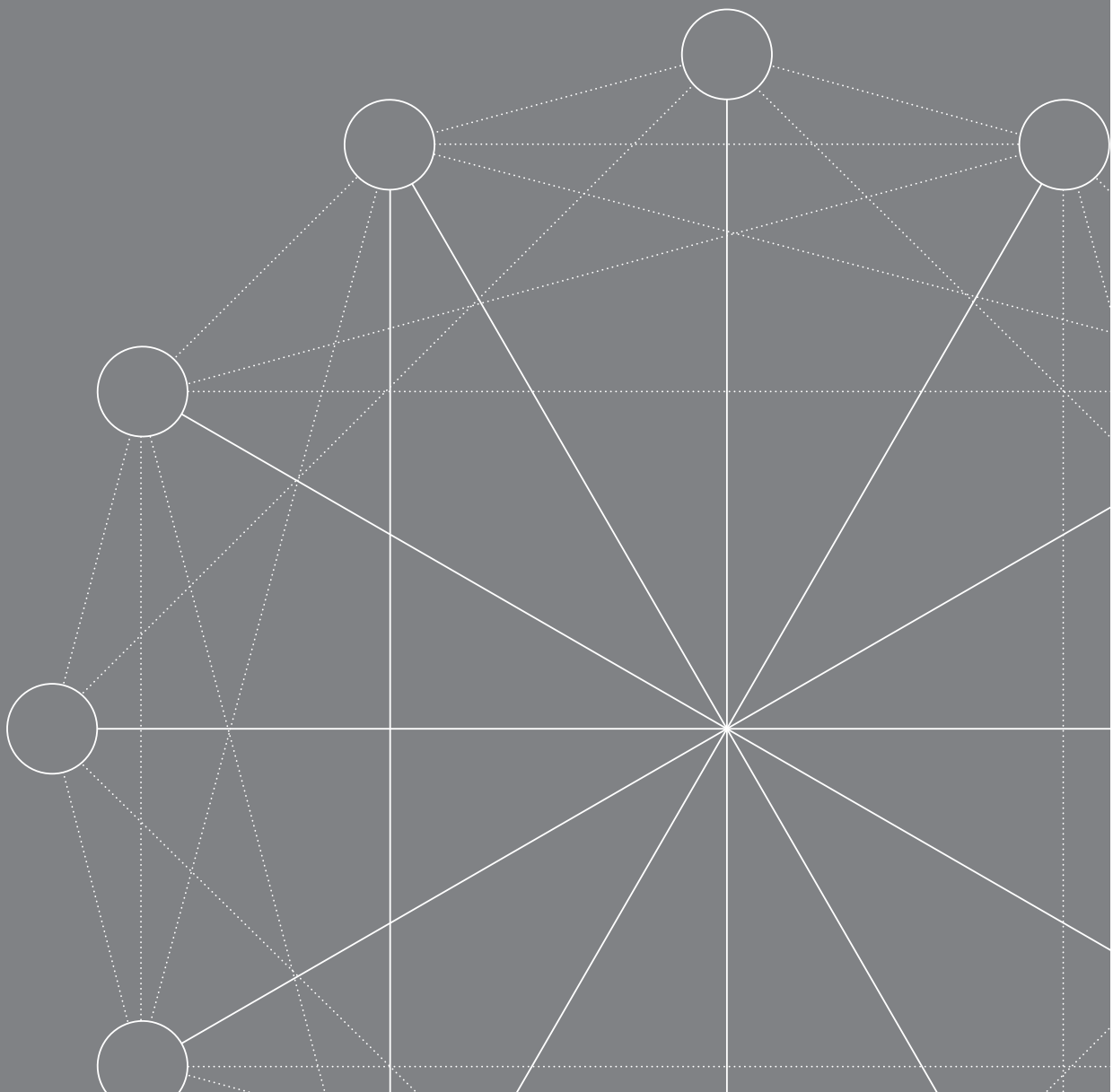


1

INTRODUCTION

How veterinary professionals learn in communities and how their learning can be enhanced, with regard to evidence based practice is the main topic of this thesis. We started this work from the premise that in the context of veterinary medicine two developments are becoming increasingly important: professionals are required to continue learning during their career, and they need to practise in an evidence based manner. In our studies we seek to connect both; studying how learning takes place in communities of veterinary professionals and how participation in communities might at the same time support the transition of individual members to evidence based practice. Our assumptions are that critically reflective work behaviour (CRWB) is essential for learning in communities of professionals, and that CRWB covers behaviour that is necessary for evidence based practice. CRWB has not yet been investigated in a context of communities with autonomous veterinary professionals as members; therefore a necessary first step is to acquire deeper understanding of CRWB in this context. In addition we hope to identify factors critical for the enhancement of CRWB, and consequently for learning. In this general introduction we address developments in research on continuing learning within communities, and developments in evidence based practice. We ask: what are these developments, what is their relevance for the veterinary profession, and which major questions are still open? Next, we explore the theory of CRWB and give an overview of the concept. This overview will lead to specific research questions.

Continuing Learning of Professionals in Communities

Within the health professions there is increasing interest in learning of professionals, because knowledge is developing at a rapid rate and health professionals will sometimes be confronted with challenges for which they were not equipped during their studies (Eraut, 2003; Ratanawongsa et al., 2008). In educational studies, a great amount of literature has been generated to promote transformation of the classic continuing education model, in which experts transmit knowledge by giving lectures to a receiving audience, to one that advocates more collegial learning communities (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004; Paavola, Lipponen, & Hakkarainen, 2004; Wenger, 1998; Wenger, MacDermott, & Snyder, 2002). Medical education has followed and learning in social interaction is becoming more common (Bleakley, 2010; Parboosingh, 2002; Davis et al., 1999; Price & Felix, 2008). Professional learning in communities could solve the problem of transfer that has been described for continuing education (Simons, 1999), and harvest the possibilities of learning in social interaction (Bleakley, 2006; Mann, 2011).

First, we make the definition of learning communities as used in this thesis explicit. In the educational literature and in literature on knowledge management, different words are employed for concepts that have many similarities, or the same word is

applied for notions that have little in common (Cox, 2005), such as; learning networks (Koper et al., 2005), learning communities (Ferguson, Wolter, Yarbrough, Carline, & Krupat, 2009; Wood, 2007), knowledge communities (Hakkarainen et al., 2004), communities of practice (Wenger et al., 2002), peer meetings (Tigelaar, Dolmans, Meijer, De Grave, & Van der Vleuten, 2008) and critical companionship (Baguley & Brown, 2009; Wright & Titchen, 2003). Even the same word for a concept does not always have the same meaning, as Andrew Cox has shown in his analysis of four seminal works on communities of practice. He showed that the concept of communities moved from first a nearly medieval model with a master and his apprentices, second to a model focussing on the interaction between collegial individuals engaged in creating and sharing knowledge, and third to a knowledge management concept, with matching words such as targets and deliverables (Cox, 2005). In this thesis, we adopt the second interpretation and consider learning communities to be: small groups, approximately 10 members, in which autonomous professionals engage in dialogue independently; without a master-apprentice relation, sharing and creating knowledge about their profession collaboratively, without predefined targets, deliverables or returns expected (Wood, 2007).

Different learning theories have been suggested to explain and understand the learning taking place in communities (O'Donnell & O'Kelly, 1994), among them social constructivist theories such as the socio-cultural theory, which has been expanded to explain learning in groups and networks (Mann, 2011). These theories suggest that participants in communities should be active in their learning process and "engage in collective inquiry in order to weigh their practices and innovations against empirical evidence and critical dialogue" (Wood, 2007, p. 282). Here, people do not just listen to what others say, but use "this information to examine their own perceptions in a different light" (Savelsbergh, Van der Heijden, & Poell, 2009, p. 581). As such, learning in communities is considered a social process, not only to socialise people into existing practices but to develop new practices (Paavola et al., 2004). In this field of research the cognitive aspect of learning and learning as a process of social participation become integrated (Tynjälä, 2008; Wenger, 1998, Wenger et al., 2002). Hence, theoretical perspectives on learning communities could help to shape pedagogical practices for professionals.

In spite of these advantages in theory, little is known about learning communities of healthcare professionals, and most research is done on communities where teachers are the learning professionals (Knight, 2002; Warren Little, 2002). John Parboosingh (2002) suggested that communities create the best environment for learning of physicians, to enhance professional practice, but he mainly outlined directions for further research. Pereles, Lockyer and Fidler (2002), in their studies on small groups,

found that physicians did not achieve a level of sharing assumed to define communities. Linda Li and her colleagues (2009) ascertained, based on a literature search with 2005 as a cut-off year, a lack of studies on communities in the healthcare sector. Since then more articles on communities in healthcare have been published but the number remains relatively small, as identified in a recent review article (Ranmuthugala et al., 2011). Many of these papers do not move beyond measures based on self-report of participants in communities (Ranmuthugala et al., 2011). To our knowledge no studies have been done to investigate communities with veterinarians as members; the relevance of communities for continuing education for veterinarians is recognised but not studied (Caple, 2005), and it is not mentioned at all in a series of studies about continuing learning of veterinarians (Moore, 2003; Moore & Klingborg, 2007).

To understand how learning in communities takes place, a conceivable approach would be to study dialogue; as from a socio-cultural perspective learning is assumed to occur mainly through language. Usually studies on dialogue have been performed in formal educational settings (Alexander, 2010; Mercer, 1996; Nussbaum, 2008). Studies on dialogue in groups of clinicians largely take the perspective of socialising and have investigated how clerks learn to talk like professionals (Lingard, Garwood, Schryer, & Spafford, 2003), or looked at doctor-patient interactions (Pilnick, Hindmarsh, & Gill, 2009; Street Jr., Gordon, & Haidet, 2007). For veterinarians, the situation is similar but a much smaller amount of literature is available; including studies of conversations on costs between veterinarians in clinical practice (Coe, Adams, & Bonnett, 2009), studies about communication of veterinarians with clients by means of talking to their pets (Roberts, 2004) and analyses of communication between veterinarians and clients (Shaw, Adams, Bonnett, Larson, & Roter, 2004, 2008; Shaw, Bonnett, Adams, & Roter, 2006). In the veterinary domain most fine-grained analyses of dialogue were done with small or medium-sized groups of students, looking at interactions in groups in formal education (Jaarsma et al., 2009a; Ramaekers, 2011; Thurman, Volet, & Bolton, 2009). How authentic dialogues take place within learning communities of professionals is largely unknown (Hagler & Brem, 2008). In order to know how the learning that is expected to occur within professional communities actually does take place, it is essential to collect and analyse empirical data.

Evidence Based Practice and Learning

Evidence based medicine is a development that has its origin in human medicine, and which has gained importance in recent decades in other domains such as veterinary medicine, management and educational science (Biesta, 2007; Schmidt, 2007; Timmermans & Angell, 2001; Weaver, Warren, & Delaney, 2005). The following definition of evidence based medicine is widely accepted: “evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions

about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). Practice according to the principles in this definition is called evidence based practice, which is associated mostly with quality management, and improvement of medical care. However, another perspective on evidence based practice is that of a process of lifelong, self-directed problem-based learning (Cockcroft & Holmes, 2003). Although some other authors, such as Liz Trinder and Shirley Reynolds (2000), have referred to the connection between evidence based practice and lifelong learning, until quite recent times this perspective has received little notice. Lately, the plausible cross-fertilisation between evidence based practice and learning of professionals has come to the fore more often (McWilliam, 2007; Phillips, Ranmuthugala et al., 2011), but empirical studies are scarce.

Evidence based practice is interpreted in various ways (Vos, Houtepen, & Horstman, 2002) and is seen as the application of guidelines based on results of randomised clinical trials (Biswas, Umakanth, & Strumberg, 2007), or more as utilisation of research findings from multiple research methodologies (Norman, 1999; Sackett et al., 1996). And evidence based practice can be described as restricted to capabilities such as information seeking skills (Shuval, Shachak, Linn, Brezis, & Reis, 2007); or as attitudes or behavioural aspects in clinical practice (Shaneyfelt et al., 2006). Furthermore, it is seen as utilisation of evidence in clinical decision making within the consultation room, as well as taking advantage of evidence during reflection on practice (Schön, 1983). In reflection on practice, clinical questions are considered essential for learning of physicians (Ebell & Shaughnessy, 2003; Schilling, Steiner, Lundahl, & Anderson, 2005). In this thesis evidence based practice is seen as an approach to working and learning, by reflecting critically on practice, questioning what counts as evidence along the way (Goldenberg, 2006). In our view, evidence based practice is not confined to following or implementing guidelines, nor is it purely about consultation of scientific literature. Even so, critical evaluation of findings from scientific research is an important dimension of critical reflection on practice (Estabrooks, 1999; Squires, Estabrooks, Gustavsson, & Wallin, 2011). It offers opportunities for seeing different perspectives on a problem and alternative options for action, and evaluating whether the evidence supports one's existing approach (Profetto-McGrath, Negrin, Hugo, & Smith, 2010).

Veterinary professionals increasingly recognise that although clinical experience is important, clinical experience alone can be misleading (Everitt, 2008; Holmes & Ramey, 2007) and they seek to make their practice more evidence based (Cockcroft & Holmes, 2003, 2004; Holmes & Cockcroft, 2004a). Likewise, Alastair Summerlee (2010) predicted that one of the three forces that will shape veterinary education in the coming decade is the continued information explosion. Subsequently, schools of veterinary medicine around the world recognise that the explosion of new knowledge requires that veterinary doctors are capable of appropriately appraising and using new knowledge, and adjust

their curricula accordingly (Hardin & Robertson, 2006; Jaarsma, Dolmans, Scherpbier, & Van Beukelen, 2009b; Laidlaw, Guild, & Struthers, 2009). In the Netherlands a competency framework for veterinarians has been developed recently which includes scholarship encompassing "the ability to critically appraise the scientific literature, use the resulting information, and discuss it with others" (Bok, Jaarsma, Teunissen, Van der Vleuten, & Van Beukelen, 2011, p. 266). Although evidence based practice in the veterinary domain resembles the medical domain, differences exist. In the domain of veterinary medicine the body of research literature available is not as extensive as it is for medical professionals (Toews, 2011); more than their medical counterparts, veterinarians frequently have to make decisions in the paucity of best evidence and deal with clinical uncertainty. Systematic reviews are rare in veterinary medicine owing to the scarce available primary literature (Holmes & Ramey, 2007). According to Mark Holmes and David Ramey (2007), who publish frequently about evidence based practice, to substantiate decisions with reference to expert opinion only (without explicit critical appraisal) is common in veterinary medicine. Besides some older studies on information searching by veterinarians (Pelzer & Leysen, 1988, 1991), the veterinary literature on evidence based practice is mostly about the importance of learning more about it (Holmes & Ramey, 2007), the difficulties encountered by veterinarians (Everitt, 2008; Van de Weerd et al., 2011), the fact that it is similar to existing veterinary care (Schmidt, 2007) or about skills to be added to curricula (Cockcroft & Holmes, 2004; Holmes & Cockcroft, 2004b; Robertson, 2007).

Learning Communities and Evidence Based Practice

In recent years (learning) communities have been advocated as advantageous to convey evidence to clinicians (Gabbay & Le May, 2004; Welch & Dawson, 2006) after it became apparent that passive dissemination aimed at the individual practitioner of evidence utilising journals and clinical practice guidelines is inadequate (Bero et al., 1998), and because communities are expected to be aligned with already existing patterns of interactions among clinicians (Gabbay & Le May, 2004). A small but increasing number of studies have explored whether communities are effective in facilitating the uptake of guidelines in hospital settings (Barwick, Peters, & Boydell, 2009; Kilbride, Perry, Flatley, Turner, & Meyer, 2011; Ranmuthugala et al., 2011), in line with the third perspective on communities that Andrew Cox described (2005). These papers are mostly non-empirical. In our work we explore linkages between learning of veterinary professionals in communities and evidence based practice.

Critically Reflective Work Behaviour

In the descriptions above, on developments in research on learning (of professionals) within communities and on developments in evidence based practice, it can be seen that major questions are still open, in particular related to veterinary professionals.

There is a lack of empirical studies on whether the intended, idealised, purpose of communities is met for healthcare professionals, and on how the plausible cross-fertilisation between evidence based practice and learning of professionals in communities is to be understood. We study learning in communities of healthcare professionals empirically making use of the theory behind critically reflective work behaviour (CRWB). CRWB is a concept developed for learning at work in large organisations, but we believe the concept to be suitable to understand learning in communities with professionals as members. Furthermore, we assume that the CRWB concept covers behaviour necessary for evidence based practice; both these concepts about working and learning imply reflecting critically on practice. The intention of our studies is to find evidence to back up these assumptions, as well as to identify adaptations to the concept that would be necessary. The research question that guides our studies is: how can the theory of critically reflective work behaviour enlighten and enhance the learning of veterinary professionals in communities, with regard to evidence based practice?

CRWB is considered potentially suitable to study learning in a healthcare context because the concept adds a new theoretical perspective to more familiar ideas such as 'critical reflection' and 'reflection' (which are often used interchangeably) (Kuhn, 1999; Mann, Gordon, & MacLeod, 2007). Critical reflection is described mainly as an individual cognitive process (Leung, Pluye, Grad, & Weston, 2010; Lowe, Rappolt, Jaglal, & Macdonald, 2007; Mamede, Schmidt, & Rikers, 2007; Mamede, Schmidt, & Penaforte, 2008), in the words of Karen McArdle and Norman Coutts (2010, p. 205): "a narrow and isolating individual and internalised activity". Because CRWB is founded in social constructivist learning theories, it goes beyond cognition and beyond the individual: it adds a social dimension to an individual dimension (Van Woerkom & Croon, 2008). CRWB is defined as "a set of connected activities carried out individually or in interaction with others, aimed at optimising individual or collective practices, or critically analysing and trying to change organisational or individual values" (Van Woerkom, 2003, p. 64). In social constructivist theories, learning is less focussed on tangible outcomes, and more about processes which are interpreted as learning (Bleakley & Bligh, 2007; Edmondson, 1999). CRWB is therefore described by Van Woerkom (2003, p.37) as "a specific learning process that is valuable in itself" and "the side effect of the activities one undertakes". Such processes do not automatically lead to relatively permanent changes in knowledge, attitudes and skills related to work and in the ability to learn (Bolhuis & Simons, 1999), but offer opportunities for those changes (Van Woerkom & Croon, 2009). These activities one undertakes in CRWB can be seen as expressions of critical reflection, which involves an analysis of experiences to make supporting evidence and assumptions explicit and which helps to achieve deeper meaning and understanding (Brookfield, 2009; Kuhn, 1999; Kuhn, Wang, & Li, 2011; Leung & Kember, 2003; Mann et al., 2007; Webster-Wright, 2009).

A focus on learning as a process, in unstructured settings and with attention on social interaction; these new perspectives make CRWB potentially valuable for studying communities. The social dimension is especially important when exploring informal learning from work experiences, because of the collaborative nature of many health care work settings (Billett, 2008), even though medical education still often takes individual learning as a start (Bleakley, 2006; Mann, 2011). Van Woerkom (2003) and Van Woerkom and Croon (2008) have explored CRWB in the context of learning at work in large organisations only, and how the theory behind CRWB suits learning communities of healthcare professionals, such as veterinarians remains unknown.

To understand how the theory of CRWB could help to understand learning communities, a more detailed description of the concept is needed. The aforementioned set of activities, identified by Marianne van Woerkom in case studies, consists of several distinct and concrete learning behaviours, called aspects: openness about mistakes, challenging groupthink, asking for feedback, experimentation, critical opinion sharing, reflection and career awareness. To apply CRWB to studying learning in communities we take into consideration perspectives on team learning such as Edmondson (1999), who defined team learning as an ongoing process of collective reflection characterised by exploring, reflecting, discussing errors and unexpected outcomes of actions, seeking feedback, and experimenting within and as a team (Edmondson, 1999, p. 353). Consequently, we leave out two aspects from the framework of Van Woerkom and Croon (2008): individual reflection and career awareness. To summarise the remaining aspects and their relevance for learning: First, openness about mistakes helps to develop knowledge about what does and what does not work, when and why; which helps to improve performance (Bauer & Mulder, 2007; Gartmeier, Bauer, Gruber, & Heid, 2008). Openness about mistakes and reflecting on them is essential for learning from experience (Gartmeier et al., 2008). Second, groupthink can develop in communities when members strive for consensus and unanimity (Cruz, Henningsen, Henningsen, & Eden, 2006; Janis, 1982), and at the same time create an atmosphere discouraging critical evaluation (Hogg & Hains, 1998). To prevent the negative effects, such as lack of learning, it is necessary to challenge groupthink. Third, asking for feedback is considered a regulative learning activity (Ashford, Blatt, & Van de Walle, 2003; Swank, 2010; Sweeny, Melnyk, Miller, & Shepperd, 2010), and for learning to occur receiving feedback is indispensable (Hattie & Timperley, 2007). Fourth, experimentation is treated by Van Woerkom (2003) as a broad concept; trying out new ideas with reflection in action to explore alternatives (Brookfield, 2009; Schön, 1983). Fifth, critical opinion sharing is about contributing ideas, information and opinions; to discuss them with others and ask critical questions (Van Woerkom, 2003). Sharing opinions in a critical way is important for the development of knowledge (Atwood, Turnbull, & Carpendale, 2010). In their work on team learning Van Woerkom and Croon (2009) refer to distribution and shared interpretation of information within teams, but in their work they are silent

on scientific evidence and use thereof in critical reflection and behavioural change. The premise from which we started our studies led to an interest in learning within communities from the point of view that professionals can learn in such a way that it helps to achieve evidence based practice. Therefore, research utilisation seems to be missing in the concept, while critical evaluation of findings from scientific research is expected to be an important dimension of critical reflection on practice (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003; Estabrooks, Squires, Cummings, Teare, & Norton, 2009; Profetto-McGrath, Hesketh, Lang, & Estabrooks, 2003).

Above, we have elaborated upon the possible value of the theory of CRWB to understand learning in professional communities. Apart from understanding learning we also take an interest in enhancement of learning, as a consequence of the consideration that critical reflection perhaps does not come naturally. It has been said that critical reflection might be very idealistic (Schellens, Van Keer, De Wever, & Valcke, 2009; Van Woerkom, 2008), and studies on group meetings of medical professionals revealed that behaviour seen as expressions of critical reflection is infrequent (Gambrill, 1990). While thinking about improvement, it remains unclear whether initiatives should be directed at individuals within communities, at the community or at changes in the (work) environment that must provide opportunities for behavioural changes to take place. In other words, do individual attributes matter most, or attributes of the group, or are issues in the workplace more important in determining CRWB? For example, is the personal need for lifelong learning expected to have more effect on CRWB than an environmental factor such as work load? Work-related learning models often include predictors associated with workplace qualities as well as with individual perceptions (Billett, 2002; Billett, Ehrich, & Hernon-Tinning, 2003; Billett & Pavlova, 2005). Looking at the group level, the question is what factors in and around communities offer affordances for CRWB to come about (Kumpulainen & Mutanen, 1999)? And, when some factors are expected to affect CRWB in communities, how could these factors to be designed for in order to enhance learning? These questions are relevant because designing for learning is complex; perhaps even more when thinking about learning of autonomous veterinary professionals, who work in loosely coupled organisations (Pinelle & Gutwin, 2006) and therefore will not be very sensitive to managerial approaches.

To understand how learning in communities occurs and how this learning can be enhanced, it helps to identify factors that are critical to support participation in communities. This thesis intends to make a contribution to understand learning and enhancement thereof. Understanding both could help professional bodies, schools of veterinary medicine and veterinary professionals to establish and sustain learning communities. Furthermore, the results can indicate directions in the development of veterinary curricula because in the schools of veterinary medicine future professionals are and will be prepared for lifelong learning.

Overview of the Thesis and the Research Questions

From the previous sections it follows that the overall question we aim to answer in our thesis is: How can the theory of critically reflective work behaviour enlighten and enhance the learning of veterinary professionals in communities, with regard to evidence based practice? To answer this question, four studies are carried out.

Chapter 2

In our first study we aim to develop a better understanding of learning at work through CRWB in the context of veterinary professionals, and to obtain insight into the extent to which CRWB is affected by personal attributes and work environment characteristics. Because our main question is to be answered with regard to evidence based practice, this study explores also whether research utilisation adds to the concept of CRWB of healthcare professionals. This study is carried out with a self-developed survey distributed to all veterinary practitioners in the Netherlands. The questions guiding this study are:

- Does research utilisation add to the concept of CRWB of healthcare professionals?
- To what extent CRWB is affected by perceived workload, opportunities for feedback and perceived need for lifelong learning of these professionals?

Chapter 3

Questionnaires have the disadvantage of self-report. To study behaviour, behaviour that has been self-reported in some way is not sufficient; some form of observation of this behaviour was needed. Subsequent studies have a focus on communities and we perform case studies, the first of which we describe in chapter 3. We explore how the nature of aspects in critically reflective dialogues (CRD), which we consider a better term for observed CRWB in communities, can be described. CRD includes the same aspects as CRWB but is tailored to dialogical behaviour. In this study we also investigate differences between communities. The questions guiding this study are:

- How can the nature of aspects of critically reflective dialogues within learning communities of veterinary professionals be described?
- To what extent do communities differ in the way they express aspects of critically reflective dialogues?

Chapter 4

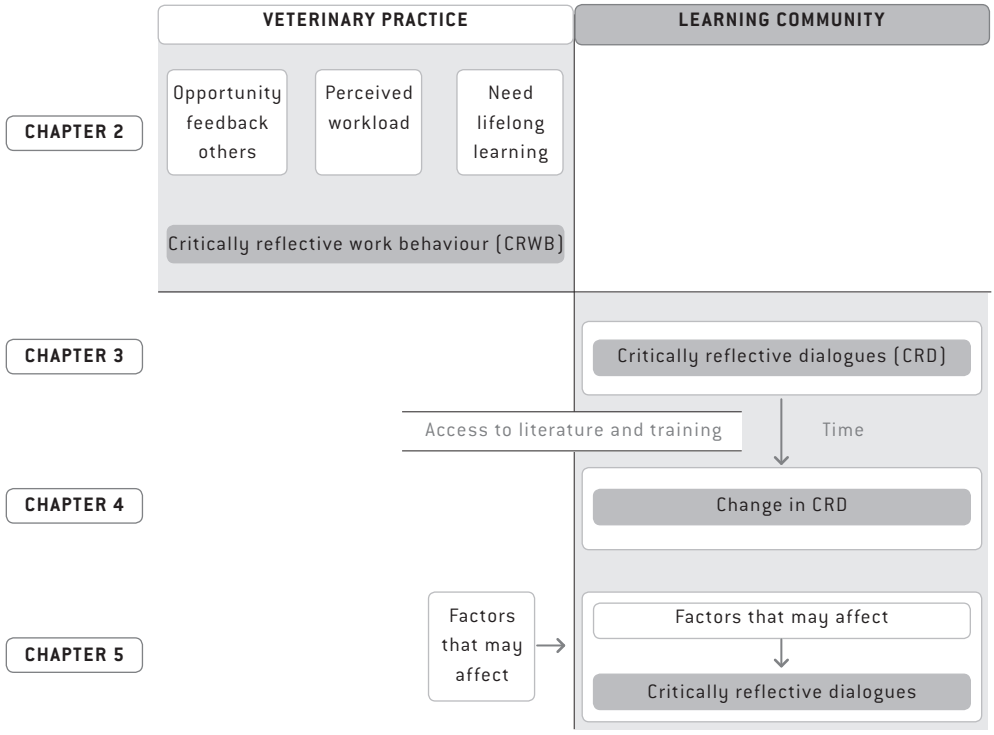
Enhancement of learning is investigated in chapter 4, looking into changes over time in communities. Applying the framework developed in the first case studies, we compare two measurements over time on aspects of CRD. With regard to evidence based practice, the effect of access to the research literature and a short training expected to have an effect on CRD are explored in these case studies. The questions guiding this study are:

- To what extent do learning communities of veterinary professionals change over time in their *observed* levels in *aspects* of critically reflective dialogues?
- To what extent do members in these learning communities perceive these aspects of critically reflective dialogues to have changed over time?
- What factors are related to *observed* and *perceived* change in aspects of critically reflective dialogues, and to differences between *observed* and *perceived* change?

Chapter 5

To identify how the theory of CRWB could enhance learning, we set up (prior to the case studies, during the time when we were collecting cases and data for our case studies) a Delphi study to look into what factors could enhance CRD, as it has been known that critical reflection and expressions thereof often do not occur spontaneously. The abbreviation CRD is utilised in this chapter even though this study was executed and reported upon before the case studies had been finalised where the concept CRD was introduced. The questions guiding this study are:

- What factors, acting as social affordance(s) for critically reflective work behaviour within blended learning communities with autonomous professionals as members, can be abstracted from literature?
- Which of these factors are considered to be important by experts in the field of communities, knowledge management and e-learning?
- What strategies could an external organisation employ to realise the factors in blended learning communities, with autonomous professionals as members?



Chapter 6

In chapter 6, we discuss the theoretical consequences of our findings, reflect on the practical relevance of our studies for the veterinary profession as well as for the veterinary curriculum, and reflect critically on the research (process) as a whole. Finally, we bring forward directions for future studies which emerge from our studies.

Context for the Present Studies: Veterinary Professionals

The studies in this thesis have been made possible thanks to the cooperation of veterinary professionals in the Netherlands, who mainly work in practitioner-owned group practices. Continuing professional development for veterinarians is mandatory in some countries (Lee, 2003), but presently not in the Netherlands. In this country veterinarians enjoy much professional freedom; clinical guidelines are not imposed by professional bodies or the government although some practices develop their own clinical protocols. Most of these veterinary professionals have been educated at the Faculty of Veterinary Medicine, in Utrecht, the only school of veterinary medicine in the Netherlands. Since the mid-1990s the curriculum of this school has included not only specific veterinary knowledge and technical competencies but also emphasised two main goals; awareness of lifelong learning and academic skills (Faculty of Veteri-

nary Medicine, 2011; Jaarsma et al., 2009b; Van Beukelen, 2004). The professionals who participated in the case studies did not follow the same curriculum. The research described in this thesis was carried out in a research group that is embedded within the Faculty of Veterinary Medicine in Utrecht; the chair of Quality Improvement in Veterinary Education.

2

A MODEL FOR CRITICALLY REFLECTIVE WORK BEHAVIOUR OF HEALTHCARE PROFESSIONALS[1]

Better understanding of critically reflective work behaviour (CRWB), an approach for work-related informal learning, is important in order to gain more profound insight in the continuing development of healthcare professionals.
A survey, developed to measure CRWB and its predictors, was distributed to veterinary professionals. The authors specified a model relating CRWB to a Perceived Need for Lifelong Learning, Perceived Workload and Opportunities for Feedback. Furthermore, Research Utilisation was added to the concept of CRWB. The model was tested against the data, using structural equation modelling (SEM).
The model was well represented by the data. Four factors that reflect aspects of CRWB were distinguished: 1) Individual CRWB 2) Being critical in interactions with others 3) Cross Checking of Information and 4) Openness to New Findings. The latter two originated from the factor Research Utilisation in CRWB. The Perceived Need for Lifelong Learning predicts CRWB. Neither Perceived Workload nor Opportunities for Feedback of other practitioners was related to CRWB.
The results suggest that research utilisation, such as cross checking and openness to new findings is essential for CRWB. Furthermore, perceptions of the need for lifelong learning are more relevant for CRWB of healthcare professionals than qualities of the workplace.

1. Accepted in adapted form as: ***Critically reflective work behaviour of healthcare professionals, A model for critically reflective work behaviour.*** *Esther de Groot, Debbie Jaarsma, Maaike Endedijk, Tim Mainhard, Ineke Lam, Robert-Jan Simons and Peter van Beukelen.* ***Journal of Continuing Education in the Health Professions***

Healthcare professionals such as general practitioners, dentists, pharmacists, and veterinarians employ work-related informal learning approaches (Sargeant et al., 2006). Among them is critically reflective work behaviour (CRWB), which Van Woerkom and Croon (2008, p. 317) define as "a set of connected activities carried out individually or in interaction with others, aimed at optimizing individual or collective practices". Studying CRWB and how to better support and stimulate it in the healthcare context is worthwhile for several reasons. First, CRWB is important for continuing professional development (CPD) because it makes learning from experiences conceivable (Van Woerkom, 2003; Van Woerkom & Croon, 2008). Second, studying work-related informal learning helps to clarify how to make the work environment into a learning environment, which is relevant given the dissatisfaction with formal training approaches (Billett, 2008a) and the growth of attention to practice-based learning. Finally, understanding CRWB better can help to develop ideas about facilitating the adoption of evidence-based practices in healthcare. Some of the constituent skills of CRWB, such as asking others for their perspectives and challenging assumptions through critical opinion sharing, are also essential for evidence based practice (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

Informal Learning and CRWB

Work-related informal learning (WRL) has been the focus of many recent studies (Doornbos, 2006; Eraut, 2004; Felstead et al., 2005; Tynjälä, 2008; Van Woerkom, 2003). In the workplace, informal learning may occur more or less as an accidental by-product of work activities (Felstead et al., 2005) or more deliberately by means of reflection on incidents (Doornbos, Simons, & Denessen, 2008; Schön, 1983). Although "critical reflection" and "reflection" are often used interchangeably (Leung & Kember, 2003; Mann, Gordon, & MacLeod, 2007), we consider critical reflection to be a particular kind of reflection, involving the analysis of work experiences to make supporting evidence (Leung & Kember, 2003; Webster-Wright, 2009) and assumptions (Brookfield, 2009) explicit, helping to achieve deeper meaning and understanding (Mann et al., 2007).

CRWB both incorporates and extends the concept of reflection. Critical reflection and reflective practice are described in the literature mainly as individual cognitive processes (Leung, Pluye, Grad, & Weston, 2010; Lowe, Rappolt, Jaglal, & Macdonald, 2007; Mamede & Schmidt, 2004; Mamede, Schmidt, & Penaforte, 2008). CRWB goes beyond cognition and addresses the behaviour that results from critical reflection (Van Woerkom & Croon, 2008). CRWB also goes beyond the individual and incorporates a social dimension. Social aspects of CRWB include asking others for feedback, sharing critical opinions, challenging groupthink, and being open with others about mistakes. The social dimension is especially important when exploring informal learning from work experiences (Billett, 2008a), because of the collaborative nature of many health care work settings.

CRWB has received little theoretical or empirical attention in the health care literature. The concept of CRWB has up till now been explored exclusively by Van Woerkom and Croon (Van Woerkom, 2003; Van Woerkom & Croon, 2008) from a workplace learning perspective and models for work-related learning such as CRWB (Billett, 2008b; Doornbos et al., 2008; Van Woerkom, 2003; Van Woerkom & Croon, 2008) are often based on data from large businesses or other contexts outside of healthcare (Doornbos et al., 2008; Rowden, 2002). We argue that the aforementioned characteristics, such as the addition of social interaction, make CRWB potentially useful for the healthcare context, where learning is still often construed as individual learning (Bleakley, 2006).

One shortcoming of the CRWB concept is its silence on scientific evidence and its use in critical reflection and behaviour change. This is a significant gap given the emphasis on evidence based practice in health care (Sackett et al., 1996). We hypothesise that critical evaluation of findings from scientific research is an important dimension of critical reflection on practice in that it offers opportunities for seeing different perspectives on a problem and alternative options for action, and evaluating whether the evidence supports one's existing approach. Thus, the influence of research evidence may be evident at the level of a change in practice behaviour, but it may also influence a practitioner's thinking and understanding (Profetto-McGrath, Negrin, Hugo, & Smith, 2010). To address this shortcoming in the CRWB model, we introduced Research Utilisation as a factor and investigated whether this expansion is valid.

We did not just explore the CRWB concept itself; we also wanted to understand which contextual factors have an effect on CRWB. Work-related learning models often include predictors associated with workplace qualities as well as individual perceptions (Billett, 2002; Billett, Ehrich, & Hernon-Tinning, 2003; Billett & Pavlova, 2005). In the healthcare context, understanding predictors of CRWB can be helpful in assessing work environments and designing interventions to create a learning environment in the workplace (Billett, 2008a). Therefore, we have specified a model with CRWB as an outcome measure and several relevant factors. Many factors have been described as potentially affecting informal work-related learning including autonomy, task obscurity, and experience in social integration (Doornbos, 2006; Doornbos et al., 2008). We searched for factors that we considered most relevant for medical professionals, especially those who work in small business-like settings. In the veterinary field, most practices are solo (12%) or practitioner- owned small-group practices (88%). Solo practices are becoming less common for veterinarians in the Netherlands.

Based on our review of factors, we selected three contextual factors for inclusion as predictors in the model. Perceived Workload was selected because we judged this to be an essential predictor in this context, allegedly determining participation in

informal learning activities (Doornbos, 2006; Lam, Fielding, Johnston, Tin, & Leung, 2004; Maurer, Weiss, & Barbeite, 2003; Tynjälä, 2008; Van Woerkom & Croon, 2008). Somewhat paradoxically, perceiving a high workload has been found to promote CRWB and work-related learning in general, presumably because work pressure triggers the search for different work strategies (van Ruysseveldt & van Dijke, 2011). In other studies, a lack of a clear-cut relationship between workload and learning has been described (van Ruysseveldt & van Dijke, 2011), but in these studies CRWB had not been included. Learning at work occurs when others are accessible for discussion or questions (Doornbos et al., 2008; Eraut, 2007; Gagliardi, Wright, Anderson, & Davis, 2007). Having Opportunities for Feedback from other professionals was therefore included as a second predictor of CRWB in our model. Finally, the Perceived Need for Lifelong Learning was included, in terms of acknowledging the need for requiring up-to-date knowledge to perform one's job (Doornbos, 2006).

The conceptual model tested in this study is depicted in figure 1. It incorporates the three predictors (Perceived Workload, Opportunities for Feedback, and Perceived Need for Lifelong Learning) and the three factors of the CRWB concept (Individual CRWB, CRWB in Social Interaction and Research Utilisation). We tested this model in a target group of veterinary professionals working in a small business setting.

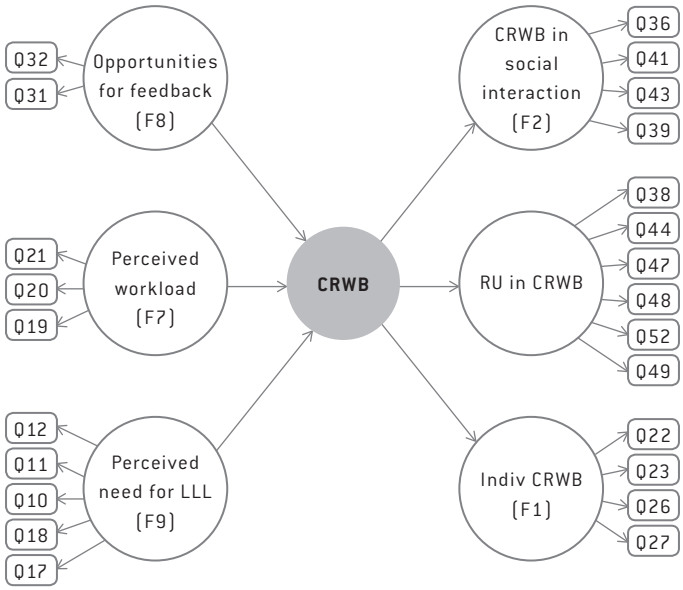


Figure 1: Overview of the conceptual model with three factors of the CRWB concept: Individual CRWB, CRWB in Social Interaction and Research Utilisation in CRWB, and three factors that potentially have an effect on CRWB: Perceived Workload, Perceived Need for Lifelong Learning and Opportunities for Feedback.

Our objective was to explore this hypothetical model guided by the following research questions:

- Does Research Utilisation add to the concept of CRWB (Individual CRWB and CRWB in Social Interaction) of healthcare professionals?
- To what extent is CRWB affected by Perceived Workload, Opportunities for Feedback and Perceived Need for Lifelong Learning of these professionals?

METHOD

Since we were interested in adapting the concept of CRWB in a new context, and investigating the factors having an effect on this concept, we employed a multi-step methodology that began with development and testing of an adapted survey to obtain data from our subjects. After conducting the survey, we used the factors of our CRWB concept to test a measurement model with Structural Equation Modelling (SEM), which is a necessary preliminary step in SEM as well as confirmatory to answer our first research question. Next, we evaluated a structural model to explore the effects of three factors on our CRWB concept with SEM.

Survey

A survey was constructed incorporating items from the literature on CRWB (Doornbos et al., 2008; Mamede & Schmidt, 2004; Mamede et al., 2008; Van Woerkom, 2003; Van Woerkom & Croon, 2008) adjusted to the medical context, particularly that of the veterinary professional (Appendix A). Most items measuring the individual dimensions of CRWB, as well as items measuring the dimensions of CRWB in Social Interaction, were derived from Van Woerkom's questionnaire on CRWB (Van Woerkom, 2003). We developed and added items about research utilisation to the questionnaire. For the predictors Perceived Need for Lifelong Learning and Opportunities for Feedback, we adapted the items developed by Doornbos in her scales for assessing Value of Learning in Work, Opportunities for Feedback and Possibilities for External Input (Doornbos, 2006). For Perceived Workload, all three items from Doornbos' Workplace and Workload scales were included (Doornbos, 2006), slightly adapted to fit our context. The resulting questionnaire (Appendix A) was made up of 40 items with a 5-point Likert scale from 1 (disagree strongly) to 5 (agree strongly).

The subjects in this study were veterinarians working in practices in the Netherlands. Names and contact information were obtained from the professional body of

veterinarians in the Netherlands. These practitioners received a letter describing the purpose of the study and explaining that their answers would be reported in such a way that they could not be connected to individual practitioners. At first, all veterinarians with a known e-mail address (2695 veterinarians) were sent an online survey with a reminder 21 days later. Because online response was low (362 respondents), we sent a paper version of the survey to all veterinarians who had not yet responded (2333) and to all practitioners without an e-mail address (180). Only the last group received a reminder three weeks later. Respondents were asked to rate their agreement with the statements in the survey. The data were kept strictly confidential; only the main researcher had access to the responses on a protected server.

Assessment of the Survey

We assessed the overall quality of our adapted survey using Exploratory Factor Analysis (EFA) to see whether the anticipated factors were actually identified and make changes as needed. We checked for correlations between the resulting factors, internal consistency and tested for uni-dimensionality. To accomplish this analysis, we selected a random sample of approximately 50% of the respondents (n = 659) to allow for confirmatory analyses of the other half of the dataset. We explored the factor structure using a principal component analysis applying a direct oblimin rotation (Field, 2005). The criteria for keeping or eliminating items were established (Pett, Lackey, & Sullivan, 2003). We retained only those items that correlated with any other item within the sample by at least 0.3; as a result, 16 of the original 40 items were left out. Next, we retained only factors with Eigenvalues larger than 1 and which were identified after visual inspection of the screeplot (Pett et al., 2003). Factor structure was determined based on the highest loadings on a specific component in the Pattern Matrix and the Structure Matrix. All scales were tested for one-dimensionality.

Model Testing

Structural equation modelling (SEM) was performed (Kline, 2005; Violate & Hecker, 2007) to evaluate our model. First, in order to determine whether or not testing of the whole structural model was appropriate (Kline, 2005) two measurement models were tested. Next, a model with factors inferred from the EFA was tested against the other half of our dataset (n = 631). We utilised four factors of CRWB and the three predictors, using the items instead of the calculated factor (Kline, 2005). One of the different loadings for each factor was set to 1, and all the other loadings were freely estimated (Kline, 2005). The fit indices applied to assess and compare the model's acceptability were The Bentler Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RSMEA) and the Tucker-Lewis Index (TLI). The Chi square statistic was not used due to the large sample size. The model was judged to fit when CFI $\geq$ 0.90, TLI

≥ 0.90 and RSMEA ≤ 0.05. The model was explored via a stepwise process omitting one predictor at a time, based on the significance of the standardised regression weights. Subsequently, the goodness of fit was investigated. To test for potential curve linear effects we added quadratic workload items to the model. This addition did not improve the model fit (CFI = 0.865, TLI = 0.847 and RSMEA = 0.044), and the standardised regression weight was not significant. We will not further report on this.

RESULTS

Survey

Of the 2775 veterinarians targeted by the mailing and the online survey, which consisted of the same items, 1292 returned the survey for a response rate of 46%. Two responses were set aside due to incomplete data.

Explorative Factor Analysis (EFA)

The results from the EFA indicated a four factor structure of CRWB and a four factor structure of the predictors of CRWB. In order to obtain scales that made sense conceptually, we split the factor Research Utilisation in CRWB into two: Cross Checking of Information and Openness to New Findings. The other factors were Individual CRWB and CRWB in Social Interaction. The EFA showed four predictors of CRWB. Perceived Need for Lifelong Learning had to be split into two, which we labelled as: Epistemic Efficacy and Stability of Knowledge. Epistemic Efficacy (Elgin, 1988) combines knowledge and efficacy (Bandura, 1997) in the sense of judging oneself as being knowledgeable enough to solve problems. Stability of Knowledge is about perceptions of whether knowledge only grows by the addition of new facts without the need to unlearn, or whether knowledge develops all the time, disregarding and transforming ideas that are no longer valid (Hofer & Pintrich, 2002). The factors Perceived Workload and Opportunities for Feedback were identified in the EFA as anticipated. Table 1 shows the Cronbach alpha values for each scale, indicating the internal consistency, as well as bivariate correlations between all factors. None of the factors were highly correlated with another (well below 0.832), indicating that the scales tapped different concepts.

	N	Cronbach α	Mean	SD	F1	F2	F3	F4	F5	F6	F7	F8
Factor 1 Individual CRWB	4	0.62	4.31	0.48	–							
Factor 2 CRWB in Social Interaction	4	0.61	3.73	0.55	0.36**	–						
Factor 3 Openness to New Findings	4	0.64	3.86	0.57	0.43**	0.47**	–					
Factor 4 Cross checking of Information	2	0.6	3.47	0.82	0.37**	0.48**	0.43**	–				
Factor 5 Epistemic Efficacy	3	0.6	4.52	0.51	0.31**	0.23**	0.27**	0.20**	–			
Factor 6 Stability of Knowledge	2	0.62	3.51	0.85	0.19**	0.12**	0.15**	0.18**	0.27**	–		
Factor 7 Perceived Workload	3	0.64	3.25	0.69	0.02	0.02	0.03	0.03	0.03	0	–	
Factor 8 Opportunities for Feedback	2	0.65	3.90	0.95	0.07**	0.16**	0.03	0.01	0.07	0.03	- 0.07**	–

** Significant at the 0.01 level (two-tailed)

Table 1: Number of items, mean scores, standard deviations (SD), Cronbach alpha and correlations between factors.

Measurement Model

We also tested the structure of our CRWB scales in a second order measurement model, depicted in Figure 2, with four factors of the CRWB concept. The indices calculated for this model with four CRWB factors are indicated in Table 2. This measurement model fit the data well, indicating that adding Research Utilisation to the concept of CRWB (research question 1) was relevant. We concluded that further analysis of the whole structural model was appropriate, based on this goodness of fit assessment.

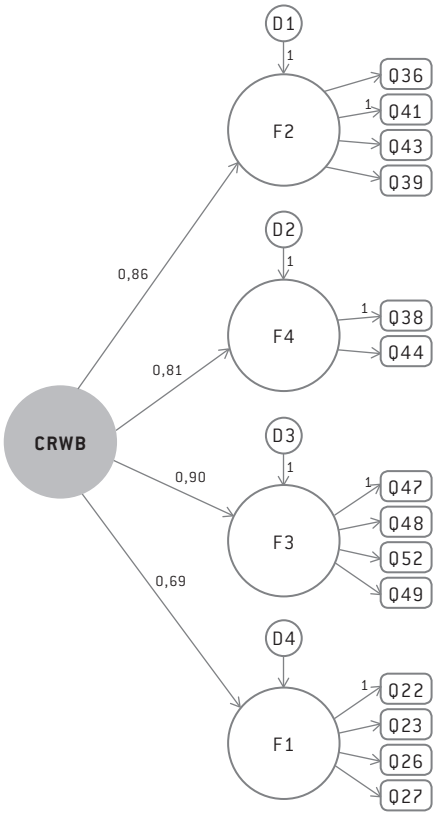


Figure 2: Measurement model CRWB with four factors of the CRWB concept: Individual CRWB (F1), CRWB in Social Interaction (F2), Openness to New Findings (F3) and Cross Checking of Information (F4). Q's followed by a number are individual items of the questionnaire. D1 to D4 represent disturbances.

Structural Model

A structural model containing Perceived Workload, Opportunities for Feedback, and Perceived Need for Lifelong Learning (Figure 3) was tested. This last predictor was included as an intermediate factor for Epistemic Efficacy and Stability of Knowledge. Our evaluation of the regression weights and the fit indices showed that the model had an acceptable fit; however, the model with the best fit was obtained by retaining only one predictor, Perceived Need for Lifelong Learning, (Figure 4). This indicated that Perceived Workload and Opportunities for Feedback needed to be removed from the model. In the final model, the variable CRWB was influenced by Perceived Need for Lifelong Learning (research question 2). The explained variance of the variable CRWB was 35.2%. The path coefficients are shown in Table 2. The standardised regression weight (β) of Perceived Need for Lifelong Learning on CRWB is 0.59.

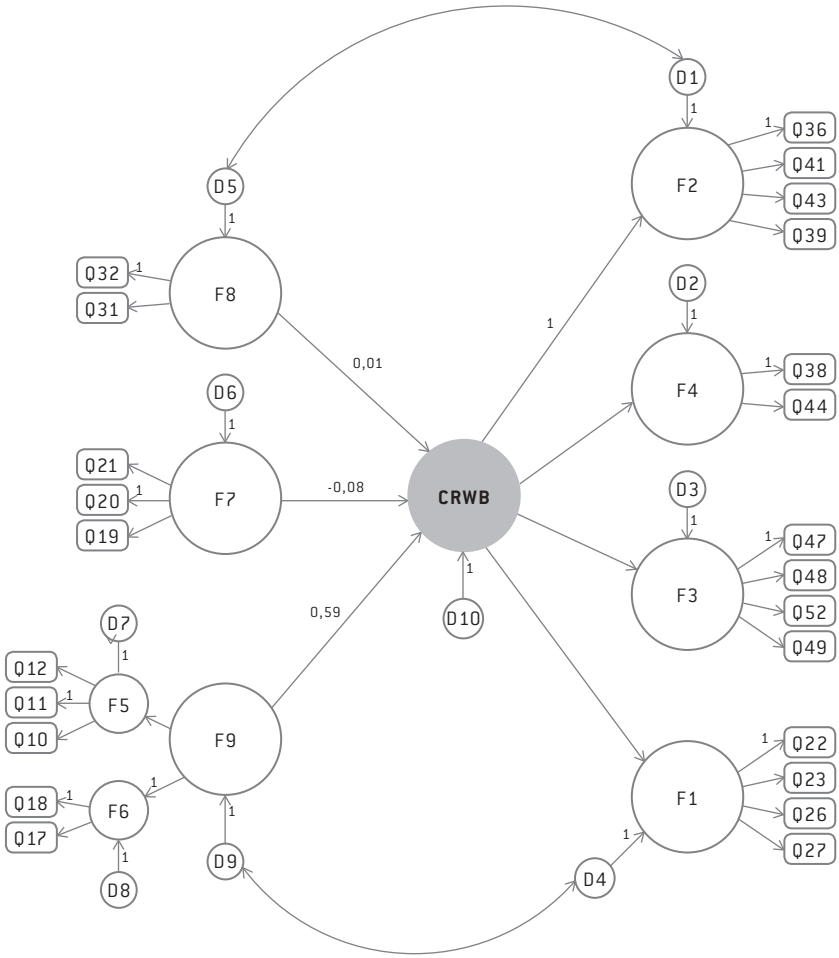


Figure 3: Untrimmed CRWB model with four factors of the CRWB concept Individual CRWB (F1), CRWB in Social Interaction (F2), Openness to New Findings (F3) and Cross Checking of Information (F4), and three factors that potentially have an effect on CRWB: Perceived Need for Lifelong Learning (F9) which is predicted by Epistemic Efficacy (F5) and Stability of Knowledge (F6), Perceived Workload (F7) and Opportunities for Feedback (F8). Q's followed by a number are individual items of the questionnaire. D1 to D10 represent disturbances.

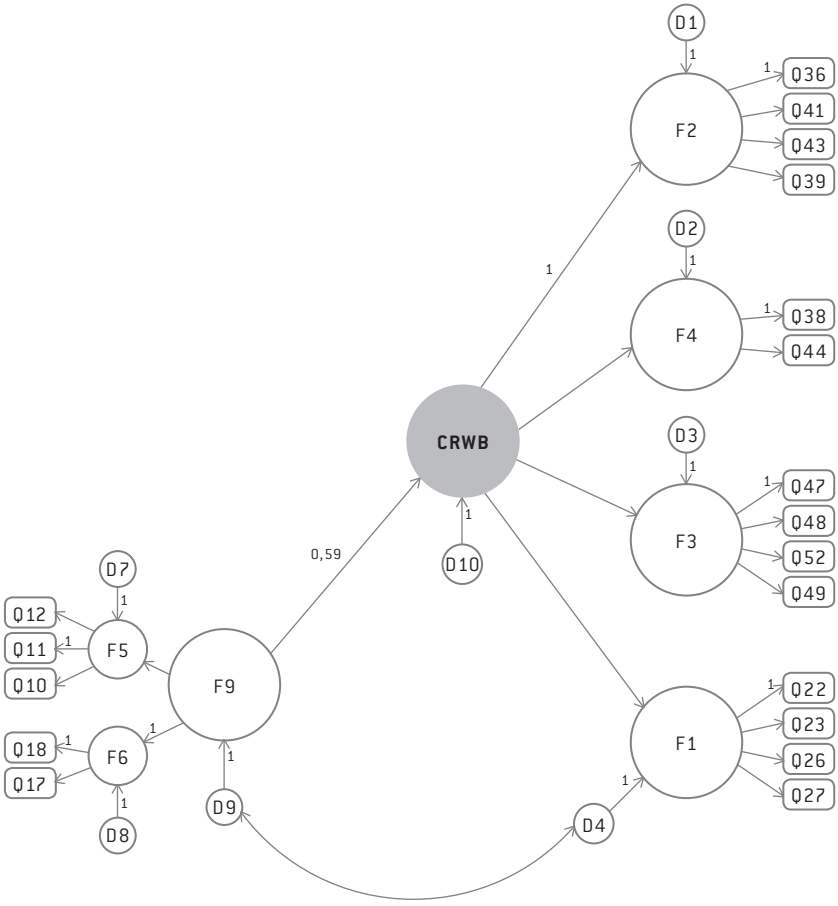


Figure 4: Final CRWB model with four factors of the CRWB concept Individual CRWB (F1), CRWB in Social Interaction (F2), Openness to New Findings (F3) and Cross Checking of Information (F4), and one factor that has an effect on CRWB: Perceived Need for Lifelong Learning (F9) which is predicted by Epistemic Efficacy (F5) and Stability of Knowledge (F6), Q's followed by a number are individual items of the questionnaire. D1 to D10 represent disturbances.

	CFI	TLI	RMSEA	STANDARDISED REGRESSION WEIGHT
Measurement model 1 (CRWB)	0.95	0.93	0.04	
Individual CRWB				0.69
CRWB in Social Interaction				0.86
Openness to New Findings				0.90
Cross Checking of Information				0.81
Structural model with 3 determinants	0.91	0.90	0.04	
Perceived Need for Lifelong Learning				0.59***
Perceived Workload				- 0.08
CRWB Opportunities for Feedback				0.01
Structural model with 1 determinant, perceived need of LLL only	0.92	0.91	0.04	
Perceived Need for Lifelong Learning				0.59***

*** Significant at the 0.001 level

Table 2 : Indices calculated to judge model fit and standardised regression weights

DISCUSSION

Our model sheds new light on the learning of healthcare professionals in the workplace. Answering our first research question, we showed that adding Research Utilisation improved the concept of CRWB. In addition, as an answer on our second research question, we showed that Perceived Need for Lifelong Learning seemed to have the largest effect on CRWB in the context of the veterinary profession. Effects of Perceived Workload and Opportunities for Feedback could not be confirmed.

Research Utilisation was composed of two factors: Cross Checking of Information and Openness to New Findings. These factors presumably reflected two different types of motivation for people to consult research results. Cross Checking of Information represents the image of critical reflection that comes easily to mind in terms of

being critical, while Openness to New Findings conveys a more positive interpretation of critical reflection, advocated by Brookfield (Brookfield, 2009), who argued that critical reflection is highly constructive.

A positive relationship was expected between a high Perceived Workload and CRWB (Doornbos et al., 2008; Van Woerkom & Croon, 2008). This was not confirmed in our study. In other studies, such as the work by Mamede and Schmidt, high work pressure acted as a barrier to learning or led to surface learning (Kember & Leung, 2006; Mamede & Schmidt, 2004; Mamede et al., 2008). At first glance, the fact that Perceived Workload and CRWB were not related might be explained by a workload optimum. In the beginning, the workload leads to case variety with many interesting patients, offering opportunities for learning, but as the workload grows lack of time may hinder learning. The test for curve linear effects showed that Perceived Workload does not have an inversed-U-shape relation with CRWB, which may be explained by results from a recent study by Van Ruyssenveldt and Van Dijke (2011). They showed that for jobs with a lot of autonomy -which we hold to be true of the work of veterinary professionals- workload did not have this inversed-U-shape effect of learning (van Ruysseveldt & van Dijke, 2011). Contrary to other studies which found that having many opportunities to receive feedback was positively related to CRWB (Doornbos et al., 2008; Mamede et al., 2008; Van Woerkom, 2003; Van Woerkom & Croon, 2008), the factor Opportunities for Feedback did not have that effect in our model. One might argue that this was because our concept of CRWB included Research Utilisation, which implies access to the thoughts of others embodied in a written form. Consequently, our concept of CRWB was perhaps less dependent on concrete interactions with others.

Finally, Perceived Need for Lifelong Learning did have an effect on CRWB and was composed of two factors, which we called Epistemic Efficacy and Stability of Knowledge. Both factors are related to Perceived Need for Lifelong Learning in that the first is about self-perception causing that need, and the second about the need arising from perceptions of the environment. This suggests that if healthcare professionals are knowledgeable enough to solve problems and feel that the knowledge needed is not changing very fast, they will show less CRWB.

In summary, our model shows that personal needs, but not workplace qualities, are relevant for CRWB, which is consistent with findings in the Human Resource Development (HRD) literature (Hensel, 2010). Hensel showed that personal growth needs are more important for learning than job characteristics or the strategic intent of an organisation (Hensel, 2010). Autonomous professionals probably have more means for influencing their workplace (Bakker, van Veldhoven, & Xanthopoulou, 2010), which might explain the differences between the effects found in large organisational studies and our findings.

Limitations and Future Directions

Our data were collected from veterinary professionals, but we expect that our results would also be valid for other healthcare professionals who also frequently work in small business-like setting (Jackson, 1991; Palazzolo & Feyerherm, 1996). For them, our work-related informal learning model will presumably be found to be suitable as well, a presumption that needs testing. The Cronbach alpha values for the factors were intermediate, which is considered adequate for diagnostic purposes (Simons & Ruijters, 2008; Van Woerkom, 2003). Nevertheless, they indicate that further improvement in our questionnaire is needed to make the results more robust and avoid underestimation of the relationships between factors. This concern is mitigated by Smitt's contention that fear of underestimation is probably unnecessary, especially when scales with lower alphas are one-dimensional (Schmitt, 1996). However, adding items to most of our scales is essential.

Testing our model with longitudinal data may show in what way Perceived Need for Lifelong Learning predicts CRWB. In future studies, a more detailed look at the relationship between this need and actual CRWB is warranted, preferably applying research methods that look at actual behaviour, avoiding the disadvantages of self-report. The overlap with the concept of Personal Growth Needs, as described in the HRD literature (Hensel, 2010), needs to be examined, and attention to the concept of self-assessment (Eva & Regehr, 2008) is needed, because it is implied in "judging oneself as being knowledgeable enough". Showing that attitudes about lifelong learning are important for CRWB helps the continuation of professional development and pursuit of EBP. It suggests that instead of planning adaptations to the workplace, focusing on the attitudes of professionals and how to influence them may have a greater pay-off. Finally, our study showed that Research Utilisation is a dimension of CRWB, a finding that connects EBP in a more explicit way to informal work-related learning.

Acknowledgements

The authors wish to thank all of the veterinary professionals who took the time to fill in the questionnaire.

FACTOR	ITEMS
Individual CRWB	22. I reflect on decisions made about non-routine cases 23. When I have rounded up a rare clinical case, I want to know more, even when such a case will probably never occur again 25 After completion I tend to forget a difficult medical problem* 26. When I have made a clinical decision without sufficient information, I reflect on the assumptions that I had 27. When I have made a decision which proved wrong, I investigate the cause of this mistake
CRWB in Social Interaction	36. I ask critical questions when someone tells me something new, for instance about a new treatment 43 When alternative explanations are mentioned during a discussion, I ask additional questions about those 39. In a discussion I view a topic from different angles and bring those forward 42. When I have a divergent opinion during a discussion, I still say so
Openness to New Findings	47. I judge whether findings from research studies are applicable to the clinical problems at hand 48. When I have received new information about a specific disease, I am watchful whether I see this disease in our clinic 49. When I read about something that might be relevant for my clinical question, I continue searching for alternative explanations 52. When I read about an disease encountered recently in my clinical practice, I come up with questions to be used in the next encounter with this disease
Cross Checking	38. After talking with another veterinarian, I consult information in order to judge his opinions better 44. I'll search for additional information, when sufficient support for opinions has been lacking during a discussion meeting
Epistemic Efficacy	10. I find continuing professional development important to ensure that my knowledge is up-to-date 11. Patient owners are increasingly better informed and demand that I, as their vet, am informed about the most recent developments in the veterinary field 12. I want to know whether an established therapy led to the results I expected

FACTOR	ITEMS
Stability of Knowledge	18. The veterinary knowledge base does not change fast* 17. Most of my knowledge I have acquainted some time ago, it is sufficient to do my job well*
Perceived Workload	19. I have a lot of work to do because our veterinary practice is very busy 20. I would like to work at a more leisurely pace 21. I do not have a lot of time to prepare before the next consultation starts
Opportunities for Feedback	31 Veterinary peers whom I can ask for advice are always nearby 32 It is difficult getting hold of other vets for discussion about clinical decisions *

Appendix: Questionnaire critically reflective work behavior and it's predictors.
* Recoded in analysis

3

CRITICALLY REFLECTIVE DIALOGUES IN LEARNING COMMUNITIES OF PROFESSIONALS[2]

Communities in which professionals share and create knowledge can support their continued learning. To realise this potential more fully, members need to reflect critically and behave accordingly. For learning at work such behaviour has been described as critically reflective work behaviour (CRWB). We studied whether and how CRWB aspects can be distinguished in dialogues of seven communities of veterinary professionals. Our exploration of the nature of critically reflective dialogues (CRD) resulted in an analytical framework. Within each aspect of CRD, four different modes of communication were identified: interactive, on an individual basis, non-reflective and restricted. We assume that professionals use learning opportunities most in the interactive mode. We studied the extent to which dialogues showed these modes of CRD, and demonstrate that the modes of communication were largely individual or non-reflective. Interventions to improve learning should focus on enhancement of members addressing each other's reasons and reflections.

2. Submitted in adapted form as: ***Critically reflective dialogues in learning communities of professionals.*** *Esther de Groot, Maaike Endedijk, Debbie Jaarsma, Robert-Jan Simons and Peter van Beukelen*

Autonomous healthcare professionals such as general practitioners, veterinarians, pharmacists and dentists have a need for continuous development and maintenance of expertise (Moore, 2003; Swanwick, 2005). One way to develop continuously as a professional is through participation in learning communities (Parboosingh, 2002; Eraut, 2004). Learning in communities is expected to improve when members reflect critically and behave accordingly (Mercer, 2008). For learning at work this behaviour has been described as critically reflective work behaviour (CRWB) (Van Woerkom & Croon, 2008). In this article we study aspects of CRWB in dialogues of veterinary professionals in learning communities, introducing the term critically reflective dialogues (CRD).

Different studies make reference to informal learning assumed to occur within communities (De Groot, Van den Berg, Endedijk, Van Beukelen, & Simons, 2010; Jaye, Egan, & Smith, 2010; Wood, 2007). In this article we define learning communities as small groups of autonomous professionals who deliberate with the purpose of sharing knowledge and of constructing meaning about their profession (Wood, 2007). It seems that expectations about the learning potential of communities are based on assumptions about dialogues that take place within these communities: a type of talk in which information and opinions are exchanged, not with the purpose of ultimately revealing a winner or a loser but of considering the views of all members and thereby helping to advance understanding and solve problems (Mercer, 1996). This kind of knowledge sharing and knowledge creation can be realised more effectively when members in communities practice critically reflective work behaviour (CRWB).

Critically Reflective Work Behaviour

Van Woerkom (2003) and Van Woerkom and Croon (2008) have explored CRWB in the context of organisational learning. Three characteristics make CRWB highly suitable for studying unstructured situations in which work-related informal learning occurs (Eraut, 2004): first,. CRWB adds a social dimension to individual critical reflection; second, CRWB involves actual behaviour in contrast to mere cognitive activities reported on by subjects; and third, CRWB does not presuppose activities in cyclical reflection phases which are rare outside highly structured educational settings (Coffield, Mosely, Hall, & Ecclestone, 2004). In case studies Van Woerkom (2003) identified seven different CRWB aspects. These aspects reflect individual as well as collaborative learning. In this study we consider five aspects of the original CRWB concept: challenging groupthink, openness about mistakes, asking for feedback, experimentation and critical opinion sharing. We have omitted individual reflection, because we focus on the group level, and career awareness, because this aspect was considered less relevant for our community dialogues. We have added the aspect research utilisation (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003; Estabrooks, Squires, Cummings, Teare, & Norton, 2009) because CRWB supplemented with research utilisation is essential for evidence-based

practice (EBP) (De Groot, Van den Berg, Endedijk, Van Beukelen, & Simons, 2011), which is highly relevant for our context of veterinary professionals (Schmidt, 2007).

In this section we briefly explain the six chosen aspects of CRWB. 1. Three types of research utilisation have been described in the literature, two of which are of interest here: instrumental and conceptual utilisation. Joanne Profetto-McGrath (2003) defines instrumental research utilisation as 'the concrete and noticeable implementation of research findings in practice' (p. 324). Conceptual research utilisation is defined by these authors as 'cognitive and conceptual dimensions of research utilisation where research findings influence a practitioner's thinking and understanding' (p. 324). 2. Openness about mistakes, and reflecting on them, is essential for learning from experience (Gartmeier, Bauer, Gruber, & Heid, 2008). Errors help to develop 'negative' knowledge; knowledge about what does and does not work, and about when and why, helps to improve performance (Bauer & Mulder, 2007; Gartmeier et al., 2008). 3. Communities are at risk of developing groupthink when they strive for consensus and unanimity (Cruz, Henningsen, Henningsen, & Eden, 2006; Janis, 1982), creating an atmosphere discouraging critical evaluation. Challenging is needed to prevent the effects of groupthink. Next, receiving feedback is indispensable if learning is to occur (Hattie & Timperley, 2007). 4. Asking for feedback (Ashford, Blatt, & Van de Walle, 2003; Sweeny, Melnyk, Miller, & Shepperd, 2010) is considered a regulative learning activity that is very important for learning. 5. Experimentation is treated by Van Woerkom (2003) as a broad concept; trying out new ideas to explore alternatives (Brookfield, 2009). 6. Critical opinion sharing is about contributing ideas, information and opinions, discussing them with others and asking critical questions (Van Woerkom, 2003). Sharing opinions in a critical way is important for the development of knowledge (Atwood, Turnbull, & Carpendale, 2010).

From Work Behaviour to Dialogues

As indicated, the work on CRWB is grounded in organisational learning; how do people behave and learn at work? In this article we suggest that most CRWB aspects are equally applicable to learning in communities of professionals, and that this is worth exploring because of its aforementioned focus on visible behaviour, suitability for studying unstructured learning situations and awareness of learning in social interaction. We study how aspects of CRWB are shown in dialogues *about* work, not at work. Therefore, we will utilise the term critically reflective dialogues (CRD). Studying these aspects in dialogues is relevant when learning in communities is considered to facilitate continuing professional development (Eraut, 2004; Parboosingh, 2002). Do dialogues in these communities live up to expectations? Instead of assuming that (collaborative) learning will inevitably take place, we think it important to study how learning in communities actually does take place (Kumpulainen & Mutanen, 1999).

Until now studies on dialogues have usually been performed in formal educational settings (Alexander, 2010; Mercer, 1996). Studies on conversations in communities of clinicians largely approach them from the perspective of socialising, investigating how clerks learn to talk like professionals (Lingard, Garwood, Schryer, & Spafford, 2003) looking at doctor-patient interactions (Pilnick, Hindmarsh, & Gill, 2009) or studying team interaction with a focus on power relations within the team (Arber, 2008). A recent study (2011), by Lindvoll Nilsen, explored the gap between general practitioners and specialists through professional knowledge sharing utilising videoconferencing. We know little about how authentic dialogues actually take place within communities where professionals could learn in social interaction (Hagler & Brem, 2008). How does behaviour, as described in aspects of CRD, take place? Regarding concepts such as critical thinking, critical reflection and reflective practice, much has been written about how people *should* behave but less about how they actually do behave (Van Woerkom, 2008). Such concepts, according to Van Woerkom (2008, p. 7), 'appear to describe an ideal reflective process rather than reality'. Clearly, there is a need for empirical studies if we are to understand more about the nature of critically reflective dialogues.

To understand CRD, we cannot rely on self-report only, because of its inaccuracy (Davis et al., 2006). CRWB and critical reflection have been measured by self-report on an individual level (De Groot et al., 2010; Van Woerkom, 2003). For this study we did not use self-reports, but looked in detail at aspects of CRD. Referring to the literature on discourse and talk, we observed how these behaviours are visible in dialogues. Because we wanted to understand how different aspects of CRD actually occur in practice, this study has a qualitative research design. We report on the development of an analytical framework for the description of the different aspects. Next we characterise seven different learning communities with veterinary practitioners as members in terms of the six aspects. Clarification of what happens can allow researchers, and practitioners to understand the nature of CRD better. Furthermore, potential targets for interventions can be identified. In conclusion, our research questions are:

- How can the nature of aspects of critically reflective dialogues (CRD) within learning communities of veterinary professionals be described?
- To what extent do such communities differ in critically reflective dialogues (CRD) aspects?

METHODS

Selection and Recruitment of Participants

With the help of the public body representing all veterinarians in the Netherlands, we identified groups of professionals who met regularly to discuss issues within their

own practices. After being informed about our study, three communities agreed to participate. Our data collection occurred at one of their regular meetings. In addition, four other communities started at the beginning of this study with short meeting in which they had been discussing their goals and ambitions, data collection took place at their second meeting. Communities differed: Table 1 presents the characteristics of all seven communities. Members were free to choose which topics they wanted to discuss and how long their meeting would take. Community members participated voluntarily, and gave their signed consent to this end. They established a schedule for their meeting themselves. The first author was present at the meeting as a non-participating member video-recording the activity.

	1	2	3	4	5	6	7
Number of participants	7	7	7	5	7	5	7
Specialisation	Companion animals	Companion animals	Farm animals	Companion animals	Companion animals	Companion animals	Farm animals
Number of years in practice	22 (SD = 6)	0.7 (SD = 0.2)	12 (SD = 9)	14 (SD = 10)	17 (SD = 9)	unknown	12 (SD = 9)
Existence of community prior to study	Yes, 4 years	No	Yes, 2 years	No	No	No	Yes, 2 years
Employed in the same firm	No	No	Yes, not in same location	No	No	No	Yes, not in same location
Main purpose of the meeting	Discuss specific veterinary topics	Discuss patient cases from their own practice	Discuss problem, and establish questions	Discuss patient cases from their own practice	Discuss a veterinary topic; to compose a guideline	Discuss patient cases from their own practice	Discuss l problem and establish questions

Table 1: Characteristics of the seven participating communities

Data Collection

Video-recordings were collected at one meeting of each of these communities. Of these seven videos only the audio-recordings were used for analysis. The audio recordings were transcribed fully. The final length of the analyzed sections (double spaced) was between 11 and 33 pages.

Analysis and Quality Procedure

To answer the first research question concerning the CRD aspects, we applied a qualitative directed content analysis approach (Hsieh & Shannon, 2005) in different rounds. In the first round the first author read the transcripts several times to become acquainted with the material, and searched for indicators of aspects in the whole transcript with theoretical indications of the six aspects of CRD in mind. Indicators were described as codes, which were modified in an inductive process. Fragments of varying length were used for analysis to capture the dialogues among multiple members in full. One or more sentences in the whole transcript that actually contained the aspect were selected and coded. For critical opinion sharing, a slightly different approach was followed: the whole transcript was divided into fragments, one or more sentences that covered the same topic, and these were coded. The same researcher recoded a subset of the first transcript after several days to compare the coding stability. The resulting first version of our framework, containing all codes, was discussed by all researchers to prevent different interpretations by subsequent coders. Discussion among researchers was considered very important with regard to the validity of our framework, because we applied our analysis on latent content (Ahuvia, 2001). This means that we inferred what members intended, instead of restricting ourselves to explicit expressions only. An illustration of this is shown in the examples included in the description of the analytical framework, which are derived mainly from the first transcript analyzed. This first round resulted in a framework which included four modes of communication for each CRD aspect; these were called levels. For each level and each CRD aspect examples were given and, to facilitate the utilisation of our framework by others, these examples were elucidated when necessary. After realisation of a stable framework, the first author analyzed another transcript.

In the second round two additional researchers (HB, MR) applied the first version of the analytical framework, and became familiar with it. For coding, sentences were not pre-identified by the first author. The first author divided the whole transcript into fragments simply to facilitate coding for critical opinion sharing. The first author, with a background in biology and experience in a faculty of veterinary medicine, could better understand which sentences belonged together in the same topic. For this aspect only, the first author and the additional researchers coded the same fragments. All results were discussed by the researchers, and descriptions for codes were adapted slightly.

In a third round the first author and the two additional researchers judged two other transcripts. Their opinions were compared: a final evaluation for each aspect of the whole meeting (see Characterising Learning Communities on Aspects of CRD, below) was utilised, because we did not apply pre-identified fragments for most aspects. Seven of the eleven final judgments were identical. We concluded that this was satisfactory, considering the different backgrounds of the first author and the additional researchers. These findings led to additional adaptations; for example we explained more carefully that challenging groupthink could only occur when a prior fragment was identified as groupthink. Also, research utilisation was clarified to explain that utilising research findings was not confined to mentioning written sources only; findings communicated by experts were included as well.

Characterising Learning Communities on Aspects of CRD

After coding of the transcripts, coded fragments were counted to reach a holistic evaluation for each aspect separately. For each aspect the specific code that occurred most often was chosen, and hence a level was identified. For example, when level 1 occurred twelve times in a community, whereas other levels occurred twice and six times, the holistic evaluation for this aspect was level 1. In this manner various codes for each aspect in the whole transcript were summarised into one code for each aspect, resulting in six codes for each transcript. When a specific aspect was identified five times or fewer, a qualitative judgment was made, including the relevance of the fragment(s) to the whole transcript. For example, when just one problem was considered in a meeting, and therefore only one incidence of feedback occurred, asking and giving was coded. When different codes within one aspect occurred more or less equally, the presence of codes for levels at the extremes (highest or lowest) helped us to decide which final coding was most appropriate. For example, when level 2 and level 3 both occurred three times, and level 4 also occurred three times, the final evaluation became level 3. When an aspect was not identified in the transcript, we awarded a final code not present in the analytical framework to indicate the absence of that aspect.

RESULTS

In the dialogues we distinguished four different modes of communication which we have interpreted as different levels. At the highest level, when members interact with each other within a CRD aspect, opportunities for learning seem to be optimally utilised: for example, when, within critical opinion sharing, members not only cited rea-

sons for their opinions but interacted accordingly by elaboration, contradiction, or asking questions, we called this level one. A different mode of communication was identified when an aspect was shown without interaction: for example, when a reason was cited by an individual member but no questions or remarks from others about it followed. In other aspects a similar lack of interaction occurred. This practice was called level two. The third level was perceived when an aspect was seen but indications that people were actually learning were missing; this is a non-reflective, unsupported manner of communication. They did not seem to be responding to a potential learning situation. For example, members mentioned a mistake that happened in their own practice but did not share their thoughts about its cause or their ideas about prevention. Finally, now and then members did start to speak but were cut short by others or restricted their comments. These patterns might restrict collaborative learning: for example, when the veterinarians talked about information they received from experts and discredited them by making jokes about them immediately afterwards. This mode of talking was called level four. Our analytical framework is presented in Tables 2a to 2f, and will be described below for each CRD aspect.

Research Utilisation

Members mention research findings, and indicate that these influenced their thinking and understanding. Research findings can come from different sources: literature, experts, continuing education meetings or pharmaceutical companies.

TABLE 2-A

ASPECT	DESCRIPTIONS
Level 1	Similar to level 2, but community members elaborate, refer to or contradict the information given by the previous member, or they interact on the effect the information has had on the thinking of the member speaking previously.
Level 2	Similar to level 3, but a community member makes the information received from this source explicit for other members and an observer can deduce that the information affected their thinking.
Level 3	Community members refer to an information source outside the group. An observer cannot infer what kind of information is actually obtained from this source.
Level 4	Similar to level 2 and level 3, but community members do play down the value of the information given, for instance by making fun of the source, indicating that they do not take the information seriously.

In Table 2a, row three, a description of level three of research utilisation is given. Here a member mentioned research findings, but in a general and curtailed manner, which did not make it very likely that other members would be able discuss these findings. At the second level a member did mention research findings but other members did not interact about these; there were no questions, no elaboration. An example is included below:

Member 1: I do not remember where I have read this, but they said that <medicine y> should be applied early on
Member 2: Yes, <medicine y> has two functions . . .
Member 1: But we are not using it on a regular basis yet

At the highest level members interacted about the research findings brought forward in the discussion.

Member 1: For both <medicine x> is the first choice
Member 2: I have read about that
Member 1: Yes, and it has an effect on their survival rate
Member 3: OK, but is this <information> only from <name of a company> or are other sources supporting this as well?

The lowest is level four, where members mention research findings but shortly afterwards play these down, or they fail to discuss at all what research findings could bring them. To judge whether sources to which members referred contained research findings, the observer assessed whether members *themselves* seemed to imply that their information came from such a source.

Openness about Mistakes

Members talk about a mistake at their own workplace, or ask questions about presumed mistakes of others. They show concern. They evaluate what went wrong, and give some indications about the effect the mistake had, or will have, on their future behaviour or knowledge. Community members interact about possible explanations and discuss alternatives.

TABLE 2-B

ASPECT	DESCRIPTIONS
Level 1	Similar to level 2, but community members ask questions about the (explanation of) the mistake or suggest alternatives.
Level 2	Similar to level 3, but a community member shows that she has thought about possible causes of the mistake, or how she can prevent repetition. She has not necessarily made the mistake herself.
Level 3	A community member mentions something that went wrong, which can be very specific or more general behaviour. An observer can infer that members see this experience as a mistake, for instance because members indicate how they feel ('terrible, don't you think?'), or how they envisage standard professional care ('they teach you very hard to...').
Level 4	Similar to level 3, but community members do not show concern; for instance, they condone or belittle the mistake. Other indications are a choice of words that reflect that the consequences of the mistake are not really being taken seriously.

For levels 1, 2 and 3 of openness about mistakes we observed that members communicated about something that had happened in their own practice and showed concern, indicating that they had the feeling that a mistake had been made. Expressions of concern help to make the distinction between a mistake and expressions of uncertainty. At the third level members subsequently did not reflect on the mistake.

Member 1: They teach you very hard not to use <medicine p>,
but there is no escaping it
Member 2: Yes, terrible don't you think?
Member 3: Yes, clients just want you to help their animal

At the second level one member was very open about his mistakes and reflected on them, but others did not interact, unlike the first level where members did interact, for instance, by asking questions or exploring feelings. At the fourth level members actively ignored or played down mistakes.

Challenging Groupthink

A member doubts whether the conclusion reached is valid by challenging the consensus or the lack of alternative options. Consensus can be about the content ('That is just the way it is') or the group process (the way the discussion has developed thus far).

TABLE 2-C

ASPECT	DESCRIPTIONS
Level1	Similar to level 2, but community members take up the challenge, reconsider their conclusion, or indicate why they are sticking to their conclusion.
Level 2	Similar to level 3, but a community member challenges implicitly or explicitly by saying that she thinks that the conclusion reached has to be reconsidered. Explicit challenging is indicated by words like 'I think we might be wrong…', referring to the joint conclusion of the community thus far, or by bringing in alternatives when for a longer period all seem to agree.
Level 3	Participants seem to agree fast, using short indicators like 'yes','true' or 'OK'. Indicators for groupthink are: sharing opinions without substantial reasons, or when all seem to agree and one participant, contrary to her earlier participation in the discussion, does not participate. Fragments include sentences from at least three members (two different ones). An observer can get the impression, from words in the fragment, that agreeing about this point is not self-evident.
Level 4	Similar to level 3, but community members actively discourage challenging groupthink, by making fun of the person that challenges, stressing the importance of group consensus from the perspective of efficiency.

Level three in Table 2c describes indications for groupthink, such as minimal and superficial reasoning or consideration of a limited number of alternatives. A fragment including this communication pattern needs to be visible before challenging groupthink can occur.

Member 1: Then he was suspected to have <illness x>, well
Member 2: Cats and dogs never have <illness x>
Member 3: No
Member 4: Yes, but I encounter this very often
Member 1: That they say something like that
Member 3: Yes

The two top levels contain two ways of challenging: explicit and implicit. In challenging explicitly a community member mentions that s/he does not agree with the conclusion reached. In implicit challenging, an alternative option is given. Only at level 1 did members restart their dialogue about a topic, and reconsider their conclusion or indicate why they were sticking to it.

Member 1: I think we might well be on the wrong track
Member 2: What do you mean? That it is necessary?
Member 1: Well, I mean. . .

Level four describes active curtailing reconsiderations, when someone tries to challenge the conclusion whereas others express the need to go on or stick to the decision taken. Although this did not occur in our transcripts, it was considered theoretically possible. The codes for challenging groupthink are different from the other CRD aspects in this respect: when indications for groupthink are missing, there is no need to challenge. Therefore a lack of one of these codes might be an indication of better dialogues.

Feedback Asking and Giving

A member mentions something she has done, reflects on what happened and what thoughts she had about the effect on her future behaviour. These evaluative remarks show that a participant wants to know what others think about (their thoughts on) their behaviour. Others interact on the issue at hand.

TABLE 2-D

ASPECT	DESCRIPTIONS
Level 1	Similar to level 2, but other members interact after the story. Their remarks and questions are related to the issue that seems to be perceived as problematic. Other manifestations are when community members ask questions to get a clear picture of what is perceived as problematic.
Level 2	Similar to level 3, but the community member clearly indicates what her own role/behaviour has been, which gives the impression that she wants feedback on this. Members can tell what they thought about their own behaviour, referring to their own behaviour in the future. When other members interact after this story, the comments are limited: 'I have experienced this also' or suggestions, e.g. 'You could have done ...'.
Level 3	A community member mentions something that happened in her own practice, but does not include her own behaviour or reflections. An observer gets the impression that getting feedback is not her reason for speaking. This impression is increased by the use of impersonal words; 'they', as if the whole problem does not affect them; words indicating that they tell the story to 'teach' the others ('then you know'); or bragging about how well they have done.
Level 4	Similar to level 2, but asking for and discussing feedback is discouraged in an explicit manner.

In an organisation, asking for feedback will often refer to employees and their supervisors. We assumed that during a community meeting asking for, and giving, feedback will rarely occur so explicitly. We observed feedback asking when members told of something they had done, reflected on what had happened and what thoughts they had (Table 2d). At the highest level feedback asking about such an uncertain or problematic situation was followed by feedback giving. At the second level members indicated that they wanted to know what others thought, but members did not follow up this request.

Member 1: I had a dog, I wanted to refer him to a specialist, because I was suspicious. I asked for further diagnostic tests, because, well, I thought, perhaps it is <disease x> after all

Member 2: Do not take it personally, you have told your client. . .

At level three members mentioned a situation of doubt, but it seems that they do not solicit feedback because they never referred to their own behaviour. Finally, level four expresses the level where feedback asking and giving were actively discouraged, the schedule for the meeting is rigidly observed, or uncertainty is ignored. This type of behaviour was not shown in our data. When members just asked questions about content ('does anyone know more about. . . ?') or about experiences in general ('has anyone ever experienced?'), this was not seen as feedback asking. A description about own practice needs to precede indications of uncertainty or problems.

Experimentation

Members talk about thought experiments, formulate hypotheses to explore, generate and imagine alternatives. The purpose of their explorations is to understand the issue at hand better. They discuss the thought experiment collectively. The hypothetical situation can have its origins in their own practice, but it is not just a real-life situation they remember and share with others.

TABLE 2-E

ASPECT	DESCRIPTIONS
Level 1	Similar to level 2, but other community members join in with the thought experiment.
Level 2	Similar to level 3, but a community member formulates a point such as a question of the following type: 'What would have been the outcome, if z had happened?' or 'What would happen, if it had been p instead of q?'. Other indicators are, for instance, 'You would expect…' or 'If I had done…' or 'Then".
Level 3	A community member explores a hypothetical situation, but does not seem to learn from it. She tells it as a kind of joke, highly unrealistic. Or hypothetical causes for the problem at hand, mentioned without too much thought and not elaborated upon further: 'It might be x'.
Level 4	Similar to level 2 but an explicit unwillingness to explore these is visible. With remarks that cut short the experimentation, like 'It must remain practical', or by trivialising or playing down the added value. More than just ignoring something.

Originally the concept of experimentation was about doing; actually trying out new ideas in practice to explore alternatives. In dialogues experimentation was shown when members talked about thought experiments, formulating hypotheses to explore, and generated and imagined alternatives. At level one, members interacted about each others' thought experiments.

Member 1: Yes, his mean cell volume was normal, and I would expect that that would change as well if. . .
Member 2: If he was not regenerative
Member 3: It will decrease, when he has a <substance x> deficiency
Member 1: Then, I would expect. . .

At level two members do not interact; one member just mentioned a thought experiment and others did not follow up that line of thought. The difference between level three and level four is that in both levels members talked superficially about a hypothetical situation, but at level four members restricted their own learning by cutting short this way of talking. An example of level 3 follows:

Member 1: But it could be something such as <disease x>
Member 2: Yes
Member 1: It could be something in the neural system
Member 2: Yes, it could be

Critical Opinion Sharing

Members present information, ideas and opinions in a manner that makes joint evaluation possible, which requires being explicit about reasons.

TABLE 2-F

ASPECT	DESCRIPTIONS
Level 1	Similar to level 2, but community members elaborate, refer to or contradict the reasons that (a) previous member(s) has/have given OR fragments in which members give reasons asked for by members who spoke previously.
Level 2	Similar to level 3, but at least one community member gives, or asks for, reasons. Indicator words for reasons like 'therefore' or 'so' are used explicitly, or reasons are deduced from the meaning of the fragment by an observer.
Level 3	Community members share information, ideas and opinions
Level 4	Similar to level 2, but at least one community member plays down the value of giving reasons, referring to the need for efficiency.

In analyzing transcripts, we looked at short fragments about a specific topic in which reasoning takes place. When observations were made on implicit expressions, these were frequently made more explicit by placement of imaginary phrases in between; this helped to make the reason more lucid. For example, a sentence such as 'I have also experienced good results with therapy x' has been evaluated as a reason because in that specific fragment the thought 'I think approach x is a good idea because...' was not expressed but was strongly implied. The observer(s) did not judge the quality or relevance of reasons. Each reason a member mentioned was included. This implies that reasons given from own experience or from what members had learned elsewhere, or just the way they felt about a topic are all included in levels 1 and 2. A fragment was labelled as level 1 when members interacted about reasons that had been given by members earlier, by elaborating or asking questions, for instance. At level two no interaction on a specific reason took place, as illustrated in the short example below:

Member 1: . . . but it can cause a development of more muscles and fat
Member 2: Yes, but the weight is not mentioned

At level 3 mere opinions without reasons are mentioned, and at level 4 active discouragement of mentioning supporting arguments occurs.

Learning Communities' Levels in Aspects of CRD

Transcripts of one meeting for each community were analyzed with the developed framework, and each community's level of CRD aspects evaluated. Below we describe how each community varies in terms of CRD aspects and their final level per aspect.

Community 1

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	3	2	0	0	5
Openness about Mistakes	2	3	3	3	11
Challenging groupthink	5	1	3	0	9
Feedback	12	2	6	0	20
Experimentation	1	8	2	1	12
Critical Opinion Sharing	19	21	20	0	60

Table 3- a: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 1.

Members of the first community had been seeing each other for several years to discuss management issues. At the time of our study they had started dialogues about patient problems. The community showed high levels for most CRD aspects. Especially notable were five incidences of level one in challenging groupthink, which was rare in other communities.

Community 2

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	0	0	2	1	3
Openness about Mistakes	2	7	4	0	13
Challenging groupthink	0	0	7	0	7
Feedback	5	8	6	0	19
Experimentation	**5**	7	4	1	17
Critical Opinion Sharing	10	33	25	0	68

Table 3-b: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 2.

The outstanding characteristic of dialogues of the veterinarians in community two, who had all graduated less than a year previously, was the time they spent talking about mistakes they had made (13 fragments), though the interaction they showed in these stories was largely restricted to consolation. Furthermore, this community did not mention many research results (two incidences of level 3 only), not even by referring to experts' stories; they refer to personal opinions and knowledge only.

Community 3

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	0	1	1	1	3
Openness about Mistakes	0	0	0	0	0
Challenging groupthink	0	0	1	0	1
Feedback	1	0	0	0	1
Experimentation	0	2	0	1	3
Critical Opinion Sharing	3	19	13	1	36

Table 3-c: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 3.

The meeting of the third community, practitioners working on management problems at large animal farms, started with a problem brought up by one the members. The purpose of their meeting was to clarify the issues involved and what questions could be answered later on, after consultation of the scientific literature. Within this community members did not show incidences of groupthink, nor did they mention mistakes in their

dialogues. The situation featured was a problem they were uncertain about, but not something that had gone wrong. Although members did talk about results of research they rarely interacted about those, or they referred to them in a very general manner.

Community 4

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	1	6	2	4	13
Openness about Mistakes	1	2	1	1	5
Challenging groupthink	0	0	6	0	6
Feedback	4	0	8	0	12
Experimentation	3	7	2	0	12
Critical Opinion Sharing	6	12	17	0	35

Table 3-d: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 4.

Members of the fourth community were planning to discuss issues around internal medicine to write guidelines on these topics. They talked about a patient problem brought up by one of the members. Compared with the other communities, we observed a high frequency of level one (6) and level two (12) for critical opinion sharing, while at the same time they showed several incidences (4) of level four for research utilisation. For example, as indicated by the following quotation, they seem to miss an opportunity to discuss the disparity between their opinion and expert advice:

Member 4: I do not know how often this occurs, but on the other hand how often do we use a test for a bacterial culture?
Member 1: Never, because. . . the gastroenterologists are making fun of us then.
Member 4: That is really nonsense because I perform these tests quite often and recently I diagnosed a Salmonella infection. . .

Community 5

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	2	7	0	0	9
Openness about Mistakes	1	1	2	3	7
Challenging groupthink	2	2	7	0	11
Feedback	7	4	11	0	22
Experimentation	3	6	3	0	12
Critical Opinion Sharing	21	38	30	0	89

Table 3-e: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 5.

The interest of fifth-community members was veterinary dermatology. As they wanted to discuss dermatology issues to write guidelines they talked about diagnosis and treatment of a disease often encountered in their practices. This community showed the first three levels for each aspect with approximately equal frequency.

Community 6

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	3	9	7	1	20
Openness about Mistakes	0	1	0	7	8
Challenging groupthink	0	0	7	0	7
Feedback	0	2	18	0	20
Experimentation	1	1	2	0	4
Critical Opinion Sharing	3	28	51	1	83

Table 3-f: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 6.

Members in the sixth community talked about several cardiology patient problems from each of their respective practices. Most patients they talked about were suffering from highly complex diseases which, according to them, rarely occurred in their daily work. Characteristic of this community was the high occurrence of level 4 for the aspect openness about mistakes. This level conveys the impression that members thought that the way they had treated their patient was the only way possible.

Community 7

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	TOTAL
Research Utilisation	1	8	4	0	13
Openness about Mistakes	0	0	0	0	0
Challenging groupthink	0	0	1	0	1
Feedback	4	10	3	0	17
Experimentation	6	7	0	1	14
Critical Opinion Sharing	13	16	12	1	42

Table 3-g: Number of fragments where six aspects of CRD have been identified from transcript of dialogue in one meeting of community 7.

The discussion in community seven, composed of practitioners working in pig health, was based on a problem brought up by one of the members. They clarified issues involved, and decided which questions could be answered later on. Similarly to community three, members in this community did not show groupthink, and they never mentioned mistakes. In contrast to most other communities, this community showed many incidences of all levels of experimentation. An example of experimentation at level 2 is given in the following quotation, taken from an episode in which they discussed agents that modify the effect of vaccines. After the idea expressed by member 1, which is classified as experimentation, members continue to talk about vaccination without needles, but do not discuss the thought experiment in more depth.

Member 1: Maybe this could be something, say; will needleless vaccination pre vent a reaction to adjuvants? . . .
Member 6: What is the big advantage of needleless vaccination?
Member 2: Prevention of contamination

Evaluation of Communities

A summary of all codes in one final code for each aspect, depicted in Table 4, shows that communities do not show equal levels for all aspects of CRD. A community with high levels for all aspects, or low levels for all aspects, did not occur. Different combinations of levels were found in different communities.

	Community 1	Community 2	Community 3	Community 4	Community 5	Community 6	Community 7
Research utilisation	1	3	3	2	2	2	2
Openness about mistakes	3	2	0	0	3	4	0
Challenging groupthink	1	3	0	3	3	3	0
Feedback	1	2	1	3	3	3	2
Experimentation	2	2	2	2	2	0	1
Critical opinion sharing	2	2	2	2	2	3	2

Table 4: Evaluation final level aspects of CRD in different communities

DISCUSSION

Our results show that within aspects of CRD different modes of communication occur, and that this variation can be displayed as a hierarchical analytical framework. We suggest that the interactive, elaborative appearance of an aspect (the highest level, level 1) offers most opportunities for learning from dialogues. What our results show as well, after the evaluation of seven communities, is that the highest level occurs rarely for most aspects of CRD. Members do show CRD, but they seem to miss a large part of the added value of the group process.

Our analytical framework discriminates between communities regarding aspects in dialogues, illustrating variation and getting around the disadvantages of self-report (Davis et al., 2006). Our framework helps to give an impression of the interaction, and whether learning opportunities are utilised, or are restricted. Applying such a framework can help communities to improve realisation of their learning potential. Furthermore, we have seen that certain levels for different CRD aspects did not always co-occur. A community can be very much aware of the mistakes they made and what can be learned, or mention reasons regularly, while not applying evidence from (research) sources. Considering different combinations of levels can therefore identify the kind of dialogues that are going on within a learning community. Critical reflective work behaviour, the source of our CRD concept, has been conceptualised as a single concept with different aspects. Van Woerkom (2003) suggested, however, that not all aspects might be equally important at all times. The same might apply to CRD.

Our analytical framework is hierarchical and, in valuing the first level most, we take a normative stance ourselves. Our norms have been influenced especially by the work of Mercer, developed in educational settings. He defined *exploratory talk* whereby learners engage in one another's ideas through joint or collective reasoning (Mercer, 1996, 2008). *Cumulative talk* and *disputational talk* stand in contrast to exploratory talk. Suzanne Atwood described cumulative talk as follows: 'participants build a shared understanding and body of knowledge from the accumulation of uncritically agreed upon pieces of knowledge' (2010, p.366). Disputational talk is not aimed at knowledge development. In intervention studies Mercer (as described by Atwood et al., 2010).showed that exploratory talk, which resembles our level one in most aspects, is best for learning.

Our second result, the fact that the highest level occurs rarely, likens these dialogues to storytelling, which is commonplace in clinical settings (Mattingly, 1998). The way in which medical practitioners talk to each other has been shown to generate repertoires. Storytelling is essential, for example to learn to put oneself in another person's situation (Greenhalgh, 2001). Nevertheless, these findings might become

problematic when participation within communities is expected to be beneficial for professionals who have to base their actions not only on individual experience but also on evidence-based knowledge. In veterinary medicine, as in health care in general, evidence-based practice (EBP) has become increasingly important (Schmidt, 2007). When professionals want to make their practice evidence-based, communities will not help when they spend most of their time storytelling, instead of participating in critically reflective dialogues in which professionals explore reasons together and construct meaning collaboratively.

Additionally, for challenging groupthink it is remarkable that not only does the highest level occur rarely but that level three occurs regularly. This illustrates lack of disagreement: members reach agreement fast, even when reasons behind opinions are mainly based on personal experience, or discussed only superficially. This tendency to agree with each other can shed some light on the low incidence of level one in critical opinion sharing: when people agree, the need to interact about reasons might be reduced. Studies on confirmation bias show that people usually tend to ask critical questions when others have opinions different from their own.

Limitations

Our conclusions here are based on an analysis of one meeting of seven different communities only. We do not know whether CRD levels develop over time. Is a community really characterised by a specific pattern of levels in different aspects or does it vary? Further research is needed to judge whether worries about the low incidence of level one are justified. Another limitation of our study is that we dealt with the implicit nature of communication. We interpreted the intentions of members, not only looking at the most obvious meanings of their words. This approach carries with it the risk that interpretation is prone to bias. Given the importance of tacit knowledge for professionals, communicating in an implicit manner is not unexpected (Simons & Ruijters, 2004) and spoken language is seldom structured and explicit. Therefore, we think that such interpretation is a necessary evil to capture such phenomena.

Future Studies

Given that not many communities were evaluated as showing the highest level for aspects of CRD, and on the assumption that this level is essential for gaining the anticipated advantages of learning communities, it seems reasonable to suggest that future studies should look at possibilities to stimulate or support CRD. Furthermore, for critical opinion sharing it would be worthwhile to investigate in more detail which type of reasons members use: are reasons usually derived from research literature or do they rather reflect personal opinions? The development of

an analytical framework and evaluation of CRD within communities, as reported in this research helps to clarify the CRD concept, a valuable first step to studying and improving learning in non-structured settings.

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4

LEARNING COMMUNITIES AND CHANGE OVER TIME IN CRITICALLY REFLECTIVE DIALOGUES[3]

Critically reflective dialogues (CRD) are important for knowledge sharing and creating meaning in communities. CRD includes different aspects: being open about mistakes, critical opinion sharing, asking for and giving feedback, experimentation, challenging groupthink and research utilisation. In this article we explore whether CRD aspects change over time, through a study of two dialogues each from six different communities. In between the two observed dialogues, members received access to the scientific literature and were trained in searching for research findings. Change was studied from the perspective of observations, through coding transcripts of dialogues, and from the perspective of perceptions, through an evaluative discussion with members. The results show that some communities became more open about mistakes, a finding that is related to an increase in trust. Other observed aspects of CRD seem to be fairly stable over time. Research utilisation and asking for and giving feedback is perceived to have changed. Access and training does not affect aspects of CRD. From an analysis of perceptions it emerges that lack of interaction could be associated with the epistemological conceptions of community members.

3. Submitted in adapted form as: ***Learning Communities and Change over Time in Critically Reflective Dialogues.*** *Esther de Groot, Maaike Endedijk, Debbie Jaarsma, Peter van Beukelen and Robert-Jan Simons*

To keep up with rapid developments in their respective domains autonomous healthcare professionals, for example, general practitioners, veterinarians, pharmacists and dentists, need to learn continuously (Moore, 2003; Swanwick, 2005). As learning individually through continuing medical education is not always satisfactory (Olson, Toolman and Alcarado, 2010; Oxman, Thomson, Davis, & Haynes, 1995), one way to go about continued learning may be through communities (Parboosingh, 2002). It is assumed that learning in communities will benefit when members reflect critically, and express indications thereof (Harford & MacRuairc, 2008). Earlier, we have explored such expressions of critical reflection in dialogues, called critically reflective dialogues (CRD) (De Groot, this thesis). In this paper we examine to what extent CRD within learning communities changes over time.

In learning communities, small groups of autonomous professionals deliberate with the purpose of sharing knowledge, and construct meaning about their profession (De Groot, Van den Berg, Endedijk, Van Beukelen, & Simons, 2010; Wood, 2007). Knowledge sharing and meaning creating is expected to occur; provided that members utilise critically reflective dialogues (CRD) (De Groot, this thesis). The concept CRD is a refinement of critically reflective work behaviour (CRWB), which describes learning at work (Van Woerkom & Croon, 2008), while CRD describes learning while communicating about work. We have defined CRD as a collection of connected communication activities carried out in interaction with others, optimising individual or collective learning in communities. These activities cover different aspects of CRD: (1) being open about mistakes (2) critical opinion sharing (3) asking for and giving feedback (4) research utilisation (5) experimentation and (6) challenging groupthink. In an earlier study different modes of communication in these aspects have been identified in dialogues, which were interpreted as different levels (De Groot et al., this thesis). Most learning is expected to take place at the highest level for CRD aspects, where members interact about each other's reasons and reflections. At a lower level CRD aspects are shown in communities but members do not interact about individual contributions; for instance, a member reflects on a mistake, but other members do not ask further questions on or deliberate about that reflection. The lowest level is non-interactive and for most aspects non-reflective; a member tells about an event but does not reflect on it. For 'critical opinion sharing' this level is not indicated by absence of reflection but by lack of reasons, and for 'challenging groupthink' this level is shown in fast agreement without much supported reasons. Finally, there is a level not belonging to the hierarchy, where reflecting and reasoning is actively restricted. In our previous study, the highest level was shown to be rare; indicating that learning opportunities within communities are probably not utilised in the best manner possible.

Lack of interaction can be problematic when learning communities are considered to be valuable for continued learning. It may be anticipated, however, that the problem

disappears by itself when interaction between members develops and hence improves over time (Sweet & Michaelsen, 2007). For example, when a community is perceived as more psychologically safe over time (Van Den Bossche, Gijselaers, Segers, & Kirschner, 2006), members might become more inclined to be open about mistakes, or speak up when they do not agree with a group view (Gruenfeld, Mannix, Williams, & Neale, 1996). On the other hand, it is equally conceivable that levels of CRD decrease over time; for example, when members get used to each other and do not ask for feedback anymore because they have experienced that not much is gained from the responses. In the literature some findings have been published about how effective professional learning communities of teachers develop, for example, Dooner, Mandzuk, and Clifton (2008) with their analysis on the rise of conflicts within learning communities, but little is known about development of other types of communities. Whether aspects of CRD increase or decrease over time in communities of health care professionals has not been explored thus far.

Equally little is known about which factors have an effect on an increase or a decrease in CRD within communities. A Delphi study has indicated that consultation of scientific literature can influence critically reflective behaviour of autonomous professionals in communities (De Groot et al., 2010) but whether the same is true in our context of veterinary professionals has not been investigated. Do access and training, summarised here as 'facilitation', affect consultation of scientific literature and subsequently research utilisation? Research utilisation is known to be a complex phenomenon, however, which depends on the interplay between evidence, context, and facilitation (Estabrooks, Squires, Cummings, Teare, & Norton, 2009). Of these three factors in this study we look at facilitation only. Availability of literature was shown to be a predictor of consultation of scientific literature (Wangensteen, Johansson, Bjorkstrom, & Nordstrom, 2011), and doctors see a lack of search skills as a barrier for consultation of scientific literature (Davies, 2007; Green & Ruff, 2005).

In this article we explore whether facilitation has an effect on scientific literature consultation and subsequently on research utilisation, which is an aspect of CRD, as well as on other aspects. Research findings can affect the thinking and understanding of members in a community (Profetto-McGrath, Hesketh, Lang, & Estabrooks, 2003); changing the community's dialogue and thus presupposed to augment the learning that takes place. Research findings offer opportunities for seeing different perspectives on a problem, and alternative options for action. According to Olson, Tooman and Alcarado (2010), research utilisation is not about "consumers of scientific knowledge" but about "active, knowing agents". In our view research evidence is not derived from scientific literature exclusively, if only because not all of the literature is written for dissemination to clinicians (Norman, 1999).

An in-depth study of six learning communities with veterinary professionals in the Netherlands is described. Levels of CRD aspects and perceptions of members about their degree of CRD aspects are studied, and attempts are made to explain change or lack thereof. Investigations have been guided by the following research questions:

- To what extent do learning communities of veterinary professionals change over time in their observed levels in aspects of critically reflective dialogues (CRD)?
- To what extent are aspects of critically reflective dialogues (CRD) in these learning communities perceived to have changed over time?
- What factors are related to *observed* and *perceived* change in aspects of critically reflective dialogues, and to differences between observed and perceived change?

DESIGN AND METHODS

Selection and Recruitment of Participants

We identified communities in which professionals met to discuss issues from within their own workplace. Six different communities agreed to participate in our study; these communities were studied as cases (Yin, 2003). Table 1 presents characteristics of all communities. Communities participated voluntarily in this study. No predefined format for the topic, duration and approach of their discussions was prescribed. Community members gave their signed consent to participate. The time between the two observation meetings was six months for most communities, except for community 4 which met with a higher frequency.

	Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
Number of members	7	7	7	7	7	5
Specialisation	Companion animals	Farm animal health	Farm animal health	Companion animals	Companion animals	Companion animals
Existence of community prior to research study	Yes, for 4 years	Yes, for 2 years	Yes, for 2 years	No	No	No

	Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
Employed in the same veterinary practice	No, but part of a partnership of veterinary practices	Yes, but most members not employed on same location	Yes, but most members not employed on same location	No	No, but part of a partnership of veterinary practices	No, but part of a partnership of veterinary practices
Mean number of years in practice	22	12	12	0.7 years	17	14
Main purpose of the meetings	(SD = 6) Discuss specific veterinary topics	(SD = 9) Discuss farm animal problem and establish questions	(SD = 9) Discuss farm animal problem and establish question	SD = 0.2) Discuss patient cases from their own practice	(SD = 9) Discuss a specific cases from veterinary topic; to compose a guideline	(SD = 10) Discuss patient their own practice
Number pages, double paced, transcripts 1st meeting	33	11	27	30	28	17
Number pages, double paced, transcripts 2nd meeting	32	10	20	25	22	37
Months in between observed meetings	6	6	6	2	6	7
Number of participants evaluation meeting	6	7	7	4	2	3

Table 1: Characteristics of the communities that have participated in this study

Procedure

Consultation of scientific literature was facilitated between the two instances of video recordings of dialogue; members received access to full text editions of scientific journals, and were trained in searching the database PubMed, where references and abstracts on life sciences and biomedical topics are included. During a two-hour training session, participants practised with the construction of questions following a Problem-Intervention-Comparison-Outcome (PICO) structure and selected search terms based on that structure, an approach described for evidence based practice (Robertson, 2007). The first author of this paper was the facilitator in this training.

Data-collection

The first author collected video recordings of each community at two of their regular meetings. From these twelve videos audio recordings were transcribed fully. The final length of the parts of the transcripts utilised in the analysis is included in Table 1. Transcripts were coded with an analytical framework developed in an earlier study (De Groot, this thesis). This framework was grounded on a qualitative directed analysis approach of latent content (Ahuvia, 2001; Hsieh & Shannon, 2005), which allows for identification of different levels for each aspect of CRD in dialogue. These levels are described and illustrated in Table 2.

LEVEL 1	Observed when members interact with each other within a CRD aspect. Here opportunities for learning are probably utilised best.	For example, within Openness about Mistakes, members do not only show concern, and reflect on their mistakes but interacted with others about this; by elaboration, contradiction, or asking questions.
LEVEL 2	Observed when an aspect is shown without interaction.	For example, when a member reflects upon a mistake but nobody gives a follow up on this.
LEVEL 3	Observed when an aspect takes place, but indications that people were actually learning were missing; they do not seem to be responding to a potential learning situation.	For example, members do talk about a mistake but they do not show concern, or reflect on their own role.
LEVEL 4	Observed when members start with an aspect of CRD, but are cut short by others, or they restrict themselves. These patterns may hinder collaborative learning.	For example: a member talks about mistake and other members indicate that they do not want to talk about this further, by cutting short other members.

Table 2: Description of levels within the analytical framework

The first author analysed all the transcripts. In the transcripts, fragments with a code indicating an aspect with a certain level were counted and employed to reach a holistic evaluation for each aspect separately (De Groot, this thesis). The most frequently occurring level within an aspect was chosen, and hence a level for each aspect was identified. For instance, when for the aspect "experimentation" codes with level 1 occurred twelve times, while codes with other levels occurred two and six times, the holistic evaluation for this aspect in this community became level 1. Thus various codes with levels for each aspect in the whole transcript were summarised into one level for each aspect; six levels for each transcript. A qualitative judgment was made when indicators for a specific aspect occurred five or less times, the relevance of the fragment(s) for the whole transcript was assessed; for example, when just one problem was talked about during the whole meeting, and therefore only one incident of asking for and giving feedback with a specific level was coded. When different levels within one aspect were identified in more or less equal occasions, absence or presence of codes for levels at the extremes (highest or lowest) helped to decide what final level was most appropriate. For example, when a level 2 and level 3 both occurred 3 times, while level 4 occurred also 3 times, the final evaluation became level 3. We awarded a holistic evaluation "not present" when indicators for an aspect were absent in the transcript. This resulted in six overall evaluations for each aspect for each community, twelve in total. Observed change was evaluated by comparison between these evaluations at two moments in time. After the second recorded meeting, members individually answered an online questionnaire. In the online questionnaire items about their consultation of scientific literature, and about change over time in this, were included (Table 3).

VARIABLES	ITEMS
Change in utilisation of scientific literature	The degree in which I, before our meeting, consult articles in scientific journals has... The degree in which I, after our meeting, consult articles in scientific journals has...
Utilisation of scientific literature	During the discussion I utilised the results of scientific research in order to ask a critical question. During the discussion I utilised the results of scientific research in order to support my opinion.

Table 3: Questions to measure perceived utilisation of scientific research during, before and after the meetings. The change-scale answers ran from, from: (1) greatly increased, (2) increased, (3) stayed the same (4) decreased (5) greatly decreased. For the opinion scale, possible answers ran from (1) agree very much (2) agree (3) disagree (4) disagree very much.

Next an evaluation meeting was set up with each community. During this evaluation meeting the first author asked about participants' perceptions. How did they perceive their degree in aspects of CRD during the second meeting observed for this study, and did they perceive the occurrence of aspects to have changed over time? (See: Table 4.) Participants were asked to reach a group decision on both issues. After each question, communities discussed the perceived reasons for change, or lack thereof. This evaluation meeting was transcribed fully. All the data-collection steps and variables are depicted in Figure 1.

VARIABLE	OCCURRENCE
Critical Opinion Sharing	We mention arguments for our statements during our discussions, at our final meeting this happened... We react to each other's arguments, at our final meeting this happened...
Research Utilisation	We apply results of scientific research during our discussions, at our final meeting this happened...
Openness about mistakes	We talk in an open manner about mistakes we have made in our own work, at our final meeting this happened...
Challenging groupthink	We differed in our opinions about a problem. At our final meeting this happened... At the moment that we all seem to agree with each other, we put our group opinion open for discussion. At our final meeting this happened
Feedback asking and giving	We ask for each other's opinions. At our final meeting this happened: We put our own ideas and approach open for discussion. At our final meeting this happened:
Experimentation	We bring a thought experiment in to the discussion. At our final meeting this happened

Table 4: Questions to measure perceived occurrence of and change in CRD aspects. For the occurrence column possible answers were: rare, a few times, not rare, not frequent, often to frequent. The degree of change was asked through "The degree in which we do so has ...". For the degree of change column, answers were: (++) greatly increased, (+) increased, (0) stayed the same (-) decreased (--) greatly decreased.

Analysis

Observed change was analysed in all communities, with a comparison between communities (Yin, 2003). To seek explanations for why communities changed or did not change the way they did, transcripts of the evaluation meetings were analysed, as well as the questionnaire data. After reading through the transcripts of the evaluation meeting, we searched for recurrent explanations within different communities: what reasons were given for (lack of) change. In addition to these CRD aspects, we searched for explanations that referred to consultation of scientific literature. All steps of analysis were discussed among the researchers, and explanations were compared with the literature.

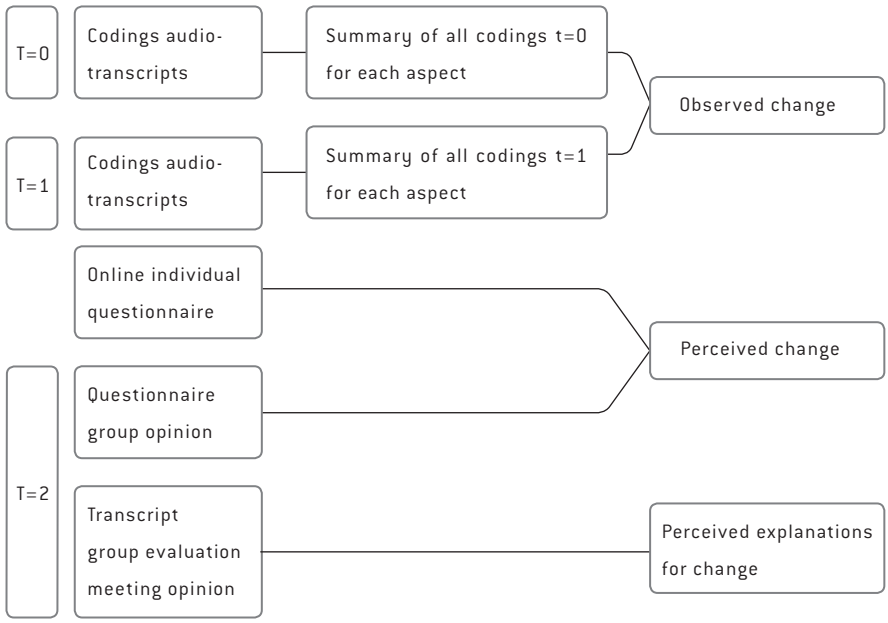


Figure 1: Overview of the data collection process.

RESULTS

For all the communities we describe the observed levels of CRD aspects in two meetings for each community, as well as change between those levels. Next, we report perceptions of change over time, and factors that seem to be related to change. Factors that recur in communities are generally only mentioned once, to avoid duplication, which explains why the first descriptions of communities are more elaborate than later ones.

In all tables with number 5 are depicted: observed levels at the first meeting (t = 0) and at the second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in a community. The levels are indicated with a 1, 2, 3 or 4. When an aspect did not occur, Np (for "not present") was depicted. As an indication of change in observed level: -- (diminished by 2 levels), - (diminished by 1 level), 0 (did not change), + (increased by 1 level), ++ (increased by 2 levels). When an aspect did not occur during the first measurement, but did occur during the second measurement, an asterisk (*) is depicted. As an indication of change in perceived degree: -- (diminished by 2), - (diminished by 0.5 or 1), 0 (did not change), + (increased by 0.5 or 1), ++ (increased by 2).

Community 1

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	1	3	1	1	2
Observed level t=1	2	3	Np.	Np.	1	2
Observed change in level	0	--	*	*	0	0
Perceived change degree	0	0	0	0	+	-

Table 5-a: observed levels, observed change in levels and perceived change in occurrence for all six aspects of CRD in community 1.

This community had been meeting already For several years before the meetings observed in this study. During that time the community had discussed management issues, all members being owners of veterinary practices, and shortly before our first observations the community started to discuss patient problems. The observed levels of research utilisation, openness about mistakes and challenging groupthink did differ between the first and second measurement. The community did not perceive change the same way; two other CRD aspects, feedback and experimentation, were perceived to be changed. This community did not perceive an increase or decrease in research utilisation, and believed their research utilisation to be low overall. During the evaluation meeting a possible explanation for the observed decrease in research utilisation came up: it was perceived to be very much related to the topic at hand and the topic in the second meeting simply did not call for research findings. Nevertheless, even though participants expect to consult scientific literature and use research when the topic asks for it, they expressed doubts about the usefulness of scientific research.

Participant 2: But what I intended to say, was that scientific research is not everything...
Participant 5: Five years later it may be totally different, so that is also...
Participant 4: Yes, and you need to know how to interpret results, because research could be pushed in a certain direction sometimes. That is not always clear-cut... Well, if you have specific results, things may not be included for consideration, whereby the results look much more beautiful that in reality.
Participant 2: Yes, or it proves to be a sponsored study, something which you cannot see.

Openness about mistakes, as well as asking for and giving feedback, was perceived as unchanged. Participants believed that both aspects were occurring regularly already; they were important and therefore unchanged. This was related to the trust that had been established in their community. Challenging groupthink was not felt to be necessary because everyone tried to obtain from the discussion whatever helps to improve their own personal professional behaviour, reaching a group opinion was not strived for.

The second community was composed of practitioners involved in management problems at large animal farms. All members worked at the same association of three veterinary practices. This community intended to alter working methods in the veterinary practice, and application of more research evidence was one element thereof. Even so, the observed level of research utilisation in this community did not change, while participants believed that research findings were utilised in their discussions more often. The level of asking for and giving feedback decreased, and the level of experimentation increased. Neither was experienced that way.

Community 2

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	3	Np.	Np.	1	2
Observed level t=1	2	3	Np.	Np	3	1
Observed change in level	0	0	0	0	--	+
Perceived change degree	0	+	0	-	0	0

Table 5-b: Observed levels at their first meeting (t = 0) and at their second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in community 2

An excerpt from dialogue during the second meeting illustrates experimentation level 1, which was not observed as frequently in the first meeting:

Member 6: When they do produce milk, and decently produce milk I presume, then it seems to me that that could not co-occur with losing weight due to a lack of food, that is an association I cannot make
Member 5: No, then it would be seen in the milk production
Member 4: I think you can feed cows in such a manner that they do give a lot of milk, but at the same time lose condition
Member 6: Wait a minute, that is something completely different. You said restricted feeding good food is different from...

Perceived change in several CRD aspects was attributed to consultation of scientific literature: by finding scientific support for their opinions the need to discuss, as well as to challenge, the opinion of the group, decreased:

Participant a: Actually you eliminate a large part of the discussion, because, well, for example [name member] was talking about calf diarrhea, he searched for answers on our questions, and these answers are well supported and in principle that is accepted faster by the group. You assume that it is true; therefore there is no need to discuss for a long time about a topic.

This community showed a lower level of asking for and giving feedback over time. Asking for feedback was not seen in the same light: the feeling is that it happens frequently, and that trust within the community made that possible. Therefore, an increase or decrease in this aspect was not perceived. Being open about one's own approaches to work, essential for asking for feedback, was connected with expected gains from more research utilisation. Research findings were believed to lead to an increased trustworthiness of the answer given, and participants therefore felt that being open about their own practice was then rewarded. In the evaluation meeting participants indicated that asking for opinions was not necessary; everyone just says what his opinions are. This was a recurrent theme in most communities: in all evaluation meetings participants pointed out that there was no need to ask for others' opinions.

Community 3

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	2	Np.	Np.	2	1
Observed level t=1	2	2	3	Np.	1	2
Observed change in level	0	0	*	0	+	-
Perceived change degree	0	+	0	-	+	0

Table 5-c: Observed levels at their first meeting (t = 0) and at their second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in community 3

The membership of this community consisted of practitioners working in pig animal health. The level of asking for and giving feedback increased; during the second meeting more interaction with each other was shown about an issue from members' own practices. The interaction about thought experiments decreased, and a small increase was shown in incidences of groupthink (four times). Mistakes were not being discussed very often, probably because these had been discussed at their own workplace already and the frequency of meetings of the community was not high enough. No increase in the level of research utilisation was observed in this community, although participants perceived an increase in this aspect. This increase was perceived to be related to a change in their management: each member was assigned to a specific field of expertise, and asked to investigate patient problems in that field in particular. Participants endorsed the importance of consulting the literature for their work as professionals. They conceived that their utilisation of research findings increased. Participants believed that they mentioned reasons more often, and that increased support for their reasons did help them come to an agreement.

Participant a: I think that you want to make the success rate of your advice as high as possible. That you know that when something is supported with scientific evidence...

Participant b: And when you have a difference of opinions in a community, the only solution will be to support your arguments better

Participant a: And it is a commercial instrument as well, because you are able to say: I have read a scientific paper about American research and that is the way it is

Community 4

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	3	2	3	2	2
Observed level t=1	2	2	1	3	3	2
Observed change in level	0	+	+	0	-	0
Perceived change degree	0	0	-	0	0	0

Table 5-d: Observed levels at their first meeting (t = 0) and at their second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in community 4

The membership of this community was composed of veterinarians who all had graduated from veterinary education less than a year ago. As can be seen in Table 5d, the level of research utilisation and openness about mistakes increased. In their second meeting a lower level of asking for and giving feedback was observed, even though this community was under the impression that asking for feedback is the core of their meeting. Perceived frequency decreased for openness about mistakes only; over time the need to tell about mistakes lessens. In contrast, we observed more telling about mistakes and more reflection about those at the second meeting: not seeking consolation only, as was evident during the first meeting, although confirmation seeking was still visible.

During their first meeting, several stories about mistakes in their daily work occurred but most remarks were restricted to "you could not have done otherwise", after which dialogue continued with another story. An example of openness about mistakes, level 1, during their second meeting:

Member 4: but this dog was so ill. ... Kidney values were sky high... But I was thinking about it later, I have not searched for anything yet, but in my differential diagnosis [name illness...] was not included. But it could have been [name illness...]
Member 2: I've been thinking about that, combined with those bad kidney values
Member 4: I thought about that later, when I had applied euthanasia to the dog.
Member 2: Yes, but you could not have done otherwise
Member 4: No, ok, I could not have done otherwise, but, I did not communicate with these people about it. And I was thinking later, if it is ... [name illness], then they should take notice ... I have done a search; the

Journal of Veterinary Medicine had an article about it. Roughly 10 clinical cases each year... [name illness]. At least, what is being diagnosed as such ...

Member 1: In the Netherlands?

Member 4: In the Netherlands yes ... On the other hand, kidney values were high, but the dog was in shock, perhaps his kidneys failed because of that. With [name illness] you see apparently a lot of ... They did not see those symptoms ...

Participants state that mentioning reasons had been high already, and hence did not change. A connection between their argumentation style and their level of disagreement was experienced.

Participant 1: I think most people do mention arguments on why they do or think certain things

Participant 3: Especially when they think otherwise, say ...

Participant 4: That you do not tell all arguments ...

Participant 3: If you think similar, then you know why because that's the way you have learned it in the veterinary school. And when [name] men tions something and I say something completely different, then I do say why I think it should be done in such manner and [name] shall say why she thinks it should be done in a different manner... I think we mention reasons most when we have a difference of opinion...

Participant 4: When we all agree, you do not need to mention reasons, why you did one thing or the other. And when differences of opinion occur, well, we see. ...

Community 5

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	2	3	3	3	2
Observed level t=1	2	2	2	3	3	3
Observed change in level	0	0	+	0	0	-
Perceived change degree	-	+	0	0	+	0

Table 5-e: Observed levels at their first meeting (t = 0) and at their second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in community 5

This community had members who were mainly interested in dermatology issues who worked at different veterinary practices which are part of an association with a focus on quality improvement. The level of openness about mistakes increased over time, while the level of experimentation decreased. Critical opinion sharing, research utilisation, challenging groupthink and feedback stayed the same. Participants perceived that research utilisation had increased. Although, openness about mistakes was not perceived as changed, participants indicated that openness about mistakes is important and an opportunity for learning. Accordingly, participants were used to be open about mistakes already, thanks to the association of veterinary practices to which they are connected. Nevertheless, participants indicated that during their meetings mistakes were not discussed, but this was due to the topic:

Participant a: Well I think that dermatology ... is not a branch in which you make acute mistakes. Not what you will remember as a mistake.

Community 6

This community had members who were all interested in internal medicine and who work at different veterinary practices. In the community no talk about mistakes occurred at first, at the next meeting it did; more frequently and more thoroughly. This increase was perceived by participants as well; their explanation was that talking about mistakes became easier because they got to know each other better. Otherwise participants believed that admitting their mistakes could be used against them.

	CRITICAL OPINION SHARING	RESEARCH UTILISATION	OPENNESS MISTAKES	CHALLENGING GROUPTHINK	ASKING & GIVING FEEDBACK	EXPERI-MENTATION
Observed level t=0	2	2	Np.	3	3	2
Observed level t=1	2	2	1	3	3	2
Observed change in level	0	0	*	0	0	0
Perceived change degree	+	+	+	0	+	0

Table 5-f: Observed levels at their first meeting (t = 0) and at their second meeting (t = 1), observed change in levels and perceived change in occurrence for all six aspects of CRD in community 6

Participant a I think that all professionals, but especially vets, don't put their gaffes on the table.
Participant b: No.
Participant a: In itself it is a good thing to do, because everyone makes mistakes and you can learn from it, but you need to know each other a little bit before you...
Participant b: Before you dare
Participant a: Before you dare, yes
Participant b: That you have the confidence in each other; that it will not end up somewhere ...

Research utilisation was perceived to have increased, but at the same time participants reported difficulties brought about by the consultation of scientific literature:

Participant b: You find a lot of articles that make you think: yes, but how do they do that in the Netherlands? ... Leishmania, depending on the coun try it is very different what is being advocated ... What is the truth? Of course, it lies somewhere in between, but it depends on what articles you found, who has written it and then you find something about which you think: yes, mmm, they do it differently in the Netherlands, what should I do?

Factors That May Have Had an Effect on a (Lack) of Change

Scientific literature consultation before or after meetings was not perceived to have changed (Table 6), in contrast to a perceived increase in research utilisation. Four communities perceived research utilisation as increased, as well as the degree of asking for and giving feedback, which both were not observed. Facilitation of consultation of scientific literature, such as access to full text editions of journals and training in literature searching, did not have an effect (Table 7). Participants related the absence of change in scientific literature consultation to difficulties they experience in searching the literature, but also to issues such as usability and generalisability of research findings to the Dutch situation; which is illustrated in the excerpts included above (community 6) and below, from community 1:

Participant 2: You need input that is more practical for your daily work compared to what you find on PubMed. On PubMed you probably search for analgesia, and there is a possibility that you find a medicine that is not available here, you need information that is tailored to the Dutch market.

	PRE-EXISTING COMMUNITIES			NEW COMMUNITIES		
	C 1	C 2	C 3	C 4	C 5	C 6
Change utilisation of scientific literature	2.8 (0.5)	3.0 (1.0)	2.4 (0.5)	3.0 (0)	2.8 (0.4)	2.5 (0.4)
Utilisation research findings	2.5 (0.6)	2.2 (0.9)	2.1 (0.4)	2.8 (0.3)	2.3 (0.7)	2.4 (0.2)
Number of respondents	4	7	8	6	5	5

Table 6: Mean for perceived change and occurrence of utilisation of the scientific literature. For change in utilisation of research literature a 5-point scale was used: (1) Much increased (2) Increased (3) Stayed the same (4) Decreased (5) Much decreased. For utilisation of research findings a 4-point scale was used from (1) I agree very much, (2) I agree (3) I disagree to (4) I disagree very much. Between brackets the SD is given. The number of respondents in the questionnaire (which is the same for Table 7) is given in the last row.

Noteworthy was the way these veterinary professionals described science and research in general. Their perceptions are visible in the included excerpts. Research findings were regarded as very trustworthy, more trustworthy then experiences or opinions from their peers, and science was referred to as “the truth” and “more convincing”. Research utilisation, during a meeting, was considered especially useful in convincing others. Below is an excerpt from community 5:

Participant a: The scientific literature deals with large datasets, studied in an objective manner and I hold it for the truth when a medicine works or does not work there. From a colleague, however kind he or she may be, I do not adopt everything.

	PRE-EXISTING COMMUNITIES			NEW COMMUNITIES		
	C 1	C 2	C 3	C 4	C 5	C 6
Access to full text literature of scientific journals	3.3 (1.2)	3.3 (1.0)	1.9 (1.0)	2.8 (0.4)	2.8 (1.1)	2.0 (0.7)
Instruction in searching PubMed	2.5 (1.3)	3.7 (0.5)	2.6 (1.1)	*	2.5 (1.0)	2.0 (1.2)

Table 7: Mean of influence of access and instruction on frequency of scientific literature usage. The scale ran from (1) very influential (2) influential (3) barely influential to (4) not influential. The SD is given in parentheses. *Community 4 did not take part in an instruction.

In other communities research findings were considered very provisional, and hence not very believable; "it could be different after five years". Participants reported that research findings do not offer one clear answer to their needs, and that the literature is not an easy source of research findings. In one community it was said that access to accurate information could be got more efficiently by listening to experts in their field.

DISCUSSION

In this study we have investigated perceived and observed change in aspects of critically reflective dialogues (CRD). Results show that openness about mistakes did change in four of the six communities, especially in the newly established communities, while many other observed aspects of CRD remained stable over time. An increase in openness about mistakes seems to be related to trust within the community. Participants themselves referred to trust in the evaluation meeting, but trust could also be deduced from the humour seen during the meetings (Brouwer, Brekelmans, Nieuwenhuis & Simons, in press). Trusting relationships have been connected to learning from mistakes (Marshall et al., 2002) and, as Butler, Reed and Le Grice (2007, p. 283) have indicated, also to "people [being] more willing to give useful knowledge and more willing to listen to and absorb other's knowledge". Communities differed in their perceptions of change. Noteworthy were both a perceived change in research utilisation and a change in asking for and giving feedback; four communities believed these to have increased over time.

Members in existing and new communities had similar perceptions of their development. Absence of an aspect is not necessarily bad, for example, when challenging groupthink is judged "not present", it indicates that there was no groupthink to challenge.

Change patterns between communities that existed prior to our study (existing communities) and newly established communities were similar. Within the time frame measured, the development stage of a community does not explain change. However, existing communities showed an absence of groupthink and hence no need to challenge it, where newly established communities showed level three of challenging groupthink, indicating rapid agreement. In addition, in existing communities higher levels of asking for and giving feedback were shown. Hence, the time frame of our measurements may have been too short to measure an increase. On the other hand, existing communities were less open about mistakes, although these findings are hard to interpret; these communities had different meetings, apart from the discussion meetings included in this study, in which presumably talk about mistakes occurred. Other characteristics that varied between communities (specialisation, main goal) were not related to changes in the level of CRD.

Differing effects in consultation of scientific literature were mentioned. On the one hand participants felt that research findings did improve their argumentation, and that seeking feedback was more rewarding when answers were better supported by research findings. On the other hand, research utilisation was perceived to close down all discussion. When findings from a research study are brought forward, there is apparently no need for further discussion anymore. Differences in the direction of change can, more mundanely, be explained by the topic being talked about. In several communities it was mentioned that the topic is an explanation for the observed differences: for example, in some types of veterinary problems mistakes do occur rarely. Derived from the process of coding, we argue that talking about uncertainty could be fruitful for these communities. In the analytical framework a clear distinction between mistakes and uncertainty was included because so many indications of clinical uncertainty were expressed. Therefore, adding uncertainty to the concept of CRD might be indicated, since uncertainty is such an essential aspect in the work of medical professionals (Griffiths, Green, & Bendelow, 2006; Lingard, Garwood, Schryer, & Spafford, 2003).

Many of the observed CRD aspects remained the same; the level in aspects did not develop over time to a higher level and hence the hypothesised problematic lack of interaction in dialogues does not seem to disappear over time. From statements during the evaluation meeting, as well as during the observed meetings, we deduced that perceptions about scientific research and their personal epistemologies can shed some light on this absence of development (Knight & Mattick, 2006). Learning and learning approaches are known to be influenced by personal epistemologies (Hofer, 2001; Hofer & Pintrich, 2002). It appears that knowledge from scientific studies is seen as absolute or provisional knowledge, where they do not seem to attribute much

validity to opinions of their peers; both reflect the first reproduction-oriented stages of epistemological understanding (Van Rossum & Hamer, 2010). These perceptions might be related to the fact that the highest, more interactive, level did not develop in these communities: participation in interactive building of meaning does not match well with beliefs that knowledge is absolute or with reproduction-oriented approaches to learning (Cho, Lee, & Jonassen, 2011; Van Rossum & Hamer, 2010).

Limitations

In this study participants in the evaluation meeting were asked about perceived change, and their explanations for this. It would have been illuminating to confront them with the observed change; explanations for observed, but not perceived, change would have been identified more easily. However, analysis of all transcripts was time consuming, and an evaluation meeting could not take place long after the second observed meeting. Another limitation could be found in the different roles of the first author, who was also the facilitator in the training about searching research literature. Possibly, participants would have talked differently about scientific literature if the training had been provided by another facilitator.

Future studies

From our study different directions for future studies emerge. The results of this study confirm that learning in communities is open for improvement. Therefore thinking about interventions is appropriate, although a delicate balance is needed so as not to restrict the self-organising character of communities (Thompson, 2005). Interventions can be especially relevant for asking for and giving feedback where a discrepancy is seen between observed levels and perceived occurrence: most participants believed this aspect to be the core of their meetings, while observations showed that indications on the kind of feedback they would like to get are missing. Future research could investigate whether a moderator could help to bridge the gap between what they say they do, and what they actually do (Piggot-Irvine, 2010). A moderator can also act as research evidence mentor who guides the group process, adding support to scientific literature consultation and research utilisation (Vachon, Durand, & LeBlanc, 2009). In our study facilitation of scientific literature consultation has been just a small intervention; our results do however give some insight into the barriers veterinary professionals experience in applying research evidence. This may be a good start to explore other approaches to support practitioners in their research utilisation (Bero et al., 1998; Russell, Greenhalgh, Boynton, & Rigby, 2004). Apart from further exploration of interventions, in our opinion future research is desirable on epistemological perceptions of professionals, as indications thereof were highly remarkable in our data. How do epistemological perceptions affect approaches to learning in communities, and what adjustments can follow to help veterinary professionals to construct meaning about their profession in social interaction more easily?

5

ENHANCING CRITICALLY REFLECTIVE DIALOGUES IN AUTONOMOUS PROFESSIONALS' LEARNING COMMUNITIES[4]

Informal learning communities, in which participants show critically reflective dialogues (CRD), have the potential to support lifelong learning. In practice this behaviour does not always occur in groups of autonomous professionals. This study explores design principles that could act as social affordances for CRD, within the context of healthcare professionals. From the literature, 28 design principles were deduced. In an online Delphi study, 12 experts gave their opinions about these. To explore strategies for implementation of these design principles, a face-to-face expert discussion meeting was organised. The Delphi study resulted in a subset of 13 design principles considered to be relevant for CRD. Some of the design principles were confirmed or reformulated, others were considered to be unimportant. Exploration of strategies for implementation confirmed the importance of having moderators from within the group. The results of this study, combining issues of design and implementation, could contribute to the discussion about the support and set-up of learning communities for autonomous professionals. A framework for behavioural change is considered that could help to understand why these design principles should influence participants' interaction.

4. Accepted in adapted form as ***Critically Reflective Work Behaviour within Autonomous Professional's Learning Communities****, Esther de Groot, Ineke van den Berg, Maaike Endedijk, Peter van Beukelen and Robert-Jan Simons.* ***Vocations & Learning***

These days the workplace demands continuing professional development and learning throughout working lives since, in many domains, knowledge is developing at a rapid rate (Billett, 2001; Simons & Ruijters 2004). The need for continuous development and maintenance of expertise also applies to autonomous healthcare professionals such as general practitioners, veterinarians, pharmacists and dentists working in small and medium sized practices (Moore & Klingborg, 2003; Swanwick, 2005), who often lack opportunities for face-to-face contact with colleagues on a daily basis. Not only is following new developments in their field essential, but awareness of the evidence for their clinical decisions is also a growing demand these professionals encounter, which is largely a result of the growing importance of evidence based practice in the medical professions (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

It has been argued, for example by Andrew Oxman and his colleagues (1995), and Dave Davis and his colleagues (1999), that lifelong learning is not supported very successfully by learning in formal settings. An alternative is to focus on informal learning communities (Eraut, 2004), in which learning is more aligned with modern views on learning. Here, learning is no longer seen as an activity of the individual alone but takes place in social interaction (Price & Felix 2008; Brown & Campione, 1996). These informal ways of learning are becoming increasingly common in literature on work-related learning (Hodkinson et al., 2008), and are presumably especially fitting for professionals in the medical field. They find lack of time a major barrier to participation in learning activities without a clear link to their daily practice (Bennett et al., 2000; Moore et al., 2003). Owing to their time constraints, meeting with other members of the community face-to-face and online alternately, called *blended learning communities*, could offer additional advantages for these professionals (Parboosingh, 2002). Taking our departure from the idea that learning communities might add continuing education opportunities for autonomous professionals, we will in this study explore what is relevant for the design of those learning communities, when critically reflective dialogues within those groups is the desired result. As we go along in this exploration, we will inquire into possible implementation strategies for these design principles, given the tension between design, which suggests a top-down process, and informal learning among autonomous professionals, which is not sensitive to directives.

Learning Communities

Informal blended learning in communities, where engagement and personal passion for the domain are crucial (Wenger, MacDermott, & Snyder, 2002), is often regarded as attractive. Yet, the practice of different terminology in the literature about communities does not help to understand their possibilities for learning. In the educational

literature and in literature on knowledge management, different words are employed for concepts that have many similarities, or the same word is applied for notions that have little in common (Cox, 2005). Learning networks (Koper et al., 2005), learning communities (Ferguson, Wolter, Yarbrough, Carline & Krupat, 2009; Wood 2007), knowledge communities (Hakkarainen, Palonen, Paavlova, & Lehtinen, 2004), communities of practice (Wenger et al., 2002), peer meetings (Tigelaar, Dolmans, Meijer, De Grave, & Van der Vleuten, 2008) and critical companionship (Baguley & Brown 2009; Wright & Titchen 2003) appear for groups of different sizes, in different contexts such as education and business, with or without explicit learning objectives. Nevertheless, most of these concepts encompass discussion among peers, with the purpose of sharing knowledge and constructing meaning socially. In this study, we use the term learning communities to place the learning purpose in the centre, in which we follow Diane Wood (2007). She investigates groups of teachers who, in her words, "engage in collective inquiry to weigh their practices and innovations against empirical evidence and critical dialogue" (2007, p. 282). We consider learning communities to be: small groups in which autonomous professionals, from different small enterprises, engage in discussions independently, without a master-apprentice relation. They share and create knowledge about their profession collaboratively, during face-to-face meetings as well as online meetings (a combination referred to as "blended"), without predefined targets, deliverables or returns expected.

Critically Reflective Dialogues

In our opinion to benefit most from participation within informal learning communities, interaction within these communities needs to be critically reflective. Critical reflection is a concept with many faces. In the literature a large diversity of terminology is used to describe it, for example reflective judgment, critical thinking, reflection and reflective practice (Delany & Watkin 2009; Fook & Askeland 2007; King & Kitchener 2004; Mann, Gordon, & MacLeod, 2007; Maudsley & Strivens 2000; Mezirow, 1990; Mezirow 1998; Schön, 1991; Ten Dam & Volman, 2004). At the same time critical reflection is defined in at least two different ways. First, there is critical reflection with a purpose of emancipation, and empowerment with a focus on power relations within groups (Brookfield 2009; Karvinen-Niinikoski, 2009; Ten Dam & Volman, 2004). Second, there is an interpretation where argumentation and challenging assumptions (Mezirow 1990; Mezirow 1998a), to improve practice, are dominant. Although empowerment is an element in these last sources as well, the emphasis is more on "purposeful critical analysis of knowledge and experience, to achieve deeper meaning and understanding" (Mann et al., 2007, p. 597). We consider critical reflection for learning communities within this last view because within the context of autonomous professionals, given the growing interest in evidence based practice, argumentation for improved practice is most relevant.

Apart from these differences, critical reflection can be approached from a cognitive, individualistic perspective or from a social perspective. We emphasise the latter in this study because we focus on learning communities. The focus is on learning from experience as a result of looking back together with other professionals of the same profession, through discourse about what happened in daily practice. Within this perspective, critical reflection is not an invisible process, occurring in the head, but behaviour within a group as a result of individual thinking and social interaction. As the point of departure we selected the concept of Critically Reflective Work Behaviour (CRWB) as described in the work of Marianne van Woerkom (2003) and of Marianne van Woerkom and Marcel Croon (2008). Marianne van Woerkom's seven aspects as indicators of CRWB have been developed in the setting of large business organisations. Because in our study the focus is on work-related learning in informal small groups of professionals, not all seven aspects were applicable and because behaviour is mainly communicative behaviour, we will use the term critically reflective dialogues (CRD). We studied: challenging groupthink, critical opinion sharing, openness about mistakes, asking for feedback, and experimentation. Left out were the aspects "career awareness" and "reflective working", as the first one applies mainly to an organisational context and the second, according to Marianne van Woerkom (2003) is done outside the social interaction of a group. The aspect "challenging groupthink" is about criticising espoused theories within a group: although all members agree on an idea, contrary ideas are analysed. Groupthink occurs in groups where, according to Irving Janis (1982, p. 9), "the members' striving for unanimity override their motivation to realistically appraise alternative courses of action". The risk of groupthink increases when a group of people is striving for consensus and unanimity (Cruz, Henningsen, & Eden, 2006; Janis, 1982; Klocke, 2007). "Critical opinion sharing", the second aspect of CRD, puts emphasis on a "constructive challenge intended to improve rather than merely criticise" (Van Woerkom & Croon, 2008) and on proposing alternatives. The third aspect of CRD is "openness about mistakes". Reflecting on mistakes is essential for correcting false assumptions, and a helpful start for exploration of alternatives. As such it has been viewed as a special form of experiential learning, highly relevant for professional learning (Gartmeier, Bauer, Gruber, & Heid, 2008). According to Marianne van Woerkom (2003), being able to learn from mistakes is not only an individual activity but an essential social activity. "Asking for feedback" is the fourth aspect. Receiving feedback has often been regarded as a prerequisite for learning to occur (Hattie & Timperley, 2007). For professionals, asking for feedback in their daily work demands special attention, especially when they work alone or in small practices (Ashford, Blatt, & Van de Walle, 2003). Learning communities could add opportunities to ask for feedback. "Experimentation", the fifth aspect, is treated by Marianne van Woerkom (2003) as a broader concept for reflection-in-action (Schön 1991). As such it will probably not take place during the meetings of learning communities, but in the daily work setting. Nevertheless, talking about thought experiments and explor-

ing and imagining alternatives could take place during discussion meetings (Kamin, O'Sullivan, Deterding, & Younger, 2003).

Critical reflection, through an exchange of knowledge between professionals including arguments and delving into assumptions, seldom arises spontaneously (Huysman & Wulf 2004; Earl & Timperley 2009). Research has shown for instance that in medical case conferences in face-to-face settings members often lack a scholarly attitude (Gambrill, 1990; Kim et al., 2006). Moreover, the lack of critical reflection appears in the criticisms on the concept of communities of practice for instance. The relation between novices and experts brings with it a risk of conservatism when learning processes are limited to replication of experts' behaviour (Hakkarainen et al., 2004). In formal educational settings it has also proved difficult to realise critical and constructive online discussions (Janssen & Prins, 2007) even though the use of Information and Communication Technology (ICT) has been mentioned as an aid in making interaction within learning communities more critically reflective. Therefore, further exploration is needed to understand CRD, and what might be done to transform groups of autonomous professionals in learning groups, without violating the informal character of their learning.

Design Principles as Social Affordances

To reach understanding of transformations towards more CRD in learning groups, a design-based research approach was chosen, a method in which exploring how to bring about change in behaviour is essential. In design-based research, according to Koeno Gravemeijer and Paul Cobb (2006), a well known adage is "If you want to understand something, you have to change it". When aiming for behavioural change towards more CRD in learning communities we look at design principles in a non-deterministic way, which can be explained by describing the concept of social affordances. "Affordance" is a concept used primarily for technological environments, meaning that the shape of things leads the user to use it in a specific way (Billett & Pavlova, 2005). Paul Kirschner and his colleagues (2004) use this concept in the context of interaction design, describing properties of the online collaborative learning environment which invite learners' social interaction. William Gaver (1996) utilises the concept *without* technical environments in mind; he describes affordances as possibilities for action that people offer one another. The significance of behaviour, by local interacting agents, for learning has been accorded attention recently by Mary Johnsson and David Boud (2010). This view of social affordances has guided us in our search for design principles (DPs), describing kinds of behaviour which serve as implicit invitations to and accelerators for CRD within an informal learning community. In our search we emphasise domain-general aspects, which are relevant for most autonomous healthcare professionals, without disregarding the importance of domain-specific aspects (Hagler & Brem, 2008). Domain specific aspects will be handled in the next steps of design, and implementing and examining the design in real life.

Implementing Design Principles

Implementing these design principles as "implicit invitations" is not straightforward. In literature on communities a debate occurs about the evolution of the concept "learning community" (Li et al., 2009). Perspectives vary between the idea that a learning community is run by the participants and as a consequence is barely designable (Wenger, 1998), and the idea that communities can be cultivated and used as an instrument, for example in knowledge management (Wenger et al., 2002). Furthermore, little research has been done about the implementation of design in the context of autonomous professionals working in non or loosely coupled organisations. We expect that autonomous professionals will not be very sensitive to directives or willing to let others prescribe their way of interacting (Pinelle & Gutwin, 2006). For example, the research of Sanne Akkerman and her colleagues (2008), which was carried out in small practices, looks at characteristics of communities after their development, and does not pay attention to the process of development of the community itself. Therefore, we argue that defining design principles is not enough; investigating their implementation deserves more attention.

In sum, our study is about beguiling autonomous professionals into CRD within learning communities, because we expect that this behaviour will not take place automatically. Critically reflective work behaviour is not easy to evoke directly, but could be generated with social affordances described in design principles. It is intriguing to explore which principles are most relevant to facilitate CRD, and how these affordances in a learning community need not be left to chance alone, but could be influenced by an external organisation. These considerations and arguments lead us to three research questions:

- What design principles, acting as social affordance(s) for CRD within blended learning communities with autonomous professionals as members, can be abstracted from literature?
- Which of these design principles are considered to be important by experts in the field of e-learning, knowledge management and communities?
- What strategies could an external organisation employ to realise the design principles in blended learning communities, with autonomous professionals as members?

MATERIALS AND METHODS

To answer the first research question we formulated design principles (DPs) based on studies in educational and organisational science. To find out about these principles' value and their relative importance (research question 2) an online Delphi survey was

used. The third research question, about the DPs implementation, was approached by means of an expert discussion meeting.

Literature Search

To find out about ways to induce autonomous professionals to demonstrate CRD, we undertook a literature search in several rounds, using the bibliographic database SCOPUS. We started with a preliminary search within the domain of work-related learning, using Van Woerkom's dimensions of CRWB as key terms. Consulting the literature this search provided, we derived the concept of self-efficacy that is expected to facilitate CRD (Van Woerkom, 2003). From the concept of self-efficacy we derived that the concepts motivation and trust had to be included as well. In the next round we searched SCOPUS, using these sensitising concepts as key words. Next, articles were found using a snowball method, searching relevant articles cited in the first papers found and searching relevant articles cited in those. Furthermore, when relevant, forward citing (a functionality of SCOPUS) was used. In our search we focused on the context of self-steering professionals, left out most of the literature on groups directed at decision-making and made use of literature on task-oriented teams only when it contained guidelines that we considered to be fitting for an informal setting. Finally, being interested in blended learning communities, we consulted the literature on collaborative online and blended learning.

Presumed factors influencing CRD, mediated by the aforementioned sensitising concepts, were derived from the literature found and on this basis we formulated a set of DPs in terms of concrete behaviour of the participants within a learning community. For instance: when self-efficacy appeared to be an important condition for challenging groupthink, and social modelling emerged as a way to strengthen self-efficacy, we postulated that the guideline "Participants model for each other a critical and exploratory discussion style" would function as an affordance for CRD. When saturation of the literature search was reached we discussed our list of DPs among four researchers authoring this study, eliminating overlap. Furthermore we had five researchers not involved in this study test the resulting DPs for wording and items causing confusion.

Delphi Study

Our next step was to explore the extent to which experts endorsed the DPs we had formulated. To this end an online Delphi study was adopted, for which we invited 14 experts in the field of e-learning, knowledge management and learning communities. The Delphi technique allows for anonymity of the respondents. Furthermore, the participants do not have insight into the answers of the other respondents, minimising groupthink. The experts we selected according to the following line of

reasoning. After having studied the literature, we concluded that a multidisciplinary perspective was important for the composition of the group of experts who would be rating our design principles, and a variety of insights had to be included. Therefore, a group of international experts with different theoretical and professional backgrounds was invited to participate. Five experts were experienced in the area of communities, two in critical reflection, four in e-learning and four in knowledge management (two experts were classified within two areas). Their area of expertise had been demonstrated by international publications, some of which had been part of our literature study. Following Siobhan Sharkey and Anne Sharples (2001), we undertook two rounds, avoiding participant fatigue and counting on achievement of stability after two rounds. We conducted the Delphi study over the internet, using an online questionnaire. The experts were invited by e-mail. After agreeing to participate they received an email with information about the research, an instruction and a link to the survey. A reminder was sent once during the first round and twice during the second round. The Delphi study took 46 days: 15 days for the first round and 16 days for the second round, with 15 days in between to analyse the first round.

Participants were asked to rate the relevance of the DPs for a learning community for homogeneous autonomous professionals on a four-point scale (4 very relevant, 3 relevant, 2 hardly relevant, 1 not relevant) and could choose the option "unknown to me", to be used when experts thought they lacked the expertise to rate that DP. An overview of the design principles which the participants were asked to rate can be found in Table 1. After each principle participants were asked to comment on their answer. What was the argumentation behind their opinion? What evidence was supporting it? What did they think about the phrasing of the principle or what was missing in this principle? In the principle on diversity we asked the experts in the first round an open question about what kind of diversity they thought would be most important in relation to CRD, as groups can be diverse in many ways (expertise, gender, age). After the first round we utilised "diversity of expertise" only, as had been indicated by one of the participants in the first round. In addition a question about the implementation of each principle was asked in the first round. None of the questions was compulsory.

In the first round 14 experts agreed to participate, two of whom dropped out before the first round, resulting in 12 respondents. In the second round 9 experts from the first round participated again, three dropped out and the two experts who had dropped out before the first round did participate in this second round, resulting in 11 respondents. To check whether these two new participants answered differently, we analysed the answers of the experts who participated in the second round but not in the first round. Answers in the second round from both these experts were comparable

to the answers from other respondents in the second round. Therefore we decided to include their answers in the analysis of the data from the second round. The experts' reasons for dropping out in either of the rounds are unknown. Not all open questions were answered (comment field), some respondents indicating that time pressure prevented them from answering these.

Expert Discussion Meeting

Strategies for implementation of the DPs were the subject of questions in the first round of the Delphi study, and explored further in a face-to-face expert discussion meeting. All five participants in the discussion meeting were involved in research on learning communities or online support of groups, carrying out empirical research themselves and implementing educational designs at national level. Several days beforehand they received a brief information letter about the research and goals of the discussion meeting to save as much time as possible during the one and a half hour discussion session. In the information letter we explained that we understood learning communities to be small homogeneous groups of professionals where interaction takes place partially face-to-face and partially online. We selected such a broad definition because we did not want to curtail their thoughts and ideas too much. The discussion meeting started with a short introduction and an overview of the DPs resulting from the Delphi survey. Participants were split into two subgroups which discussed possible interventions and presented their findings to each other. The central theme of the meeting was the question: given the set of prioritised DPs that resulted from the Delphi study, what can be done to implement these DPs in an informal learning community of autonomous professionals?

Analysis

For the analysis of the Delphi rounds we focused on the rating of the importance of the DPs. An impression of the importance of every DP is expressed by the mean of the items. The mean tells us whether respondents from diverse fields of expertise on average rate a DP as important. The number of experts who rate an item as "hardly relevant", "not relevant", "relevant" or "very relevant" adds to the overall impression of the value of a DP. With a heterogeneous group of experts, we did not aim for consensus, but in our view, DPs which most people think will have an effect are most promising. Items which were rated in the first round with a mean higher than 3 were considered to be valuable, and left unchanged or adapted very slightly. These items were not included in the second round or, if they were, it was only to elicit feedback about the small revisions in the wording. One DP with a mean of 2.9 (DP 13) was not included. An asterisk in table 1 indicates which items are involved.

After the first round three principles were deleted (not reported on). In the second round all other items were presented anew in a reworded form and three new DPs were added, based on the feedback of the experts and in table 1 indicated by a minus. Furthermore we extended our definition of a learning community and sent this to them. This statement was necessary because in comments the experts indicated that the wording of some items made them think that we had task-oriented teams in mind. Because no standard cut-off points exist for Delphi studies we formulated them ourselves: a DP with mean of three or larger was considered to be relevant; a DP with a mean smaller than 2.5 was considered not to be relevant. Next, we analysed the comments of the respondents to find arguments for their rating. An updated literature search was performed on the DPs ranking high in the Delphi study, using the central theme of the DPs as keywords, to underpin the theoretical support for these DPs. The group discussion was analysed using audio recordings of the subgroup discussions and notes taken by the first author during the meeting. The audio recordings were fully transcribed and strategies from the transcriptions were clustered and summarised.

RESULTS

Formulating and Confirmation of Design Principles

Our literature study resulted in 28 DPs, presented in Table 1. In this table all DPs are included, in the order used during the first round when applicable, with the sources they have been derived from and details of whether they were asked anew in the second round.

DESIGN PRINCIPLES	DERIVED FROM
1. * First time members of the community start with observing several discussions without participating to get acquainted with the kind of discussions going on	*(Zarb 2006; ten Dam & Volman, 2004)*
2. During a meeting participants start with cases they feel comfortable with and later on continue with more challenging cases	*(Bandura, 1997)*
3. First time members are invited to attend an information meeting to give an idea about the way cases are being discussed within the community	*(Watson & Hewett, 2006; Zarb, 2006)*

4.	Members exchange views on how they struggled with certain cases	*(Jarvenpaa & Leidner, 1999).*
5.	* Members within the community discuss about cases selected from their own practices	*(Ashford et al., 2003; Groopman, 2007)*
6.	People having a connection to the case start with a discussion but they stimulate quiet members and outsiders to participate as well	*(Hammond, 1999)*
7.	* Participants evaluate the quality of their discussions	*(Janssen et al., 2007; Veerman, 2000)*
8.	* Participants encourage one another in being critical evaluators who try to prevent groupthink	*(Dron, 2007; Janis, 1982)*
9.	Participants model for each other a critical and exploratory discussion style	*(Bandura, 1997; ten Dam & Volman, 2004)*
10.	Participants take up functional roles such as facilitator, "devil's advocate" etc.	*(Kirschner et al., 2004; Miika & Leena, 2002).*
11.	Members strive for a balance between benefiting and contributing, not only participating in discussions but also in taking up small responsibilities such as looking up literature in between meetings	*(McLure et al., 2000)*
12.	Participants take notice of different perspectives in the discussion but do not strive for unanimity	*(Dron, 2007; Janis, 1982; Hmelo-Silver & Barrows, 2008; Janssen et al., 2007; Veerman, 2000)*
13.	* Participants spend time to discuss different perspectives on every case	*(Groopman, 2007)*
14.	Members take time between (online and face-to-face) meetings to allow for reflection on the discussions	*(Rushmer et al., 2004)*
15.	In time members participate in discussions with different parts of the community and compare discussion styles	*(Wenger, 1998)*
16.	Members find a meeting frequency (online or face-to-face) that allows them to combine participation in community with other obligations in life and work	*(Green & Ruff, 2005)*
17.	Members determine who may become a member of the community (and who not)	*(Webber, 2008)*
18.	* Members create a culture in which talking about mistakes is allowed	*(Van Woerkom, 2003; Harteis et al., 2008)*
19.	Members meet face-to-face as often as they think necessary for establishing a safe group environment	*(Lockhorst, 2004)*
20.	* Members ensure commitment within the community	*(Wenger et al., 2002; O'Donnell, & O'Kelly 1994)*
21.	* Participants who want to explore a case in depth have the chance to discuss separately in a subgroup (and report their findings to the plenary group)	*(Zarb, 2006)*

22.	Members seek diversity in their group, especially in expertise, to achieve different points of view in the discussion	*(Dron, 2007; Shaw & Barrett-Power, 1998; Hackman et al., 2008; Jehn et al., 1999; Lockhorst, 2004)*
23.	Members inform themselves about the reasons why other members in the group choose to participate	*(Berlanga et al., 2008; Hackman et al., 2008)*
24.	Participants consult people who have not participated in the discussion after a meeting and report back on this to the other participants	*(Janis, 1982; Kester et al., 2007; Van Rosmalen et al., 2006)*
25.	Members consult literature for additional evidence on the case to incorporate these findings in their discussions	*(Preece, 2000; Sackett et al,. 1996; Benbasat & Lim, 2000)*
26.	- Members mark good examples of CRD	*(Bandura, 1997; ten Dam & Volman, 2004)*
27.	- Participants pay attention to group cohesion but not at all cost	*(Janis, 1982; Janssen et al., 2007; Veerman, 2000; Casey-Campbell & Martens, 2009)*
28.	- First time members of the community are invited to attend a technical training	*(Preece, 2000; Hammond, 1999)*

Table 1: Overview of all DPs developed, which were part of the questionnaire, and the literature they are based on. Asterisk (*) means that items were rated in the first round only; Minus (-) means that items were rated in the second round only.

In table 2 (included at the end of this article) the DPs are mentioned with their mean and the number of experts rating "not relevant", "hardly relevant", "relevant" or "very relevant". Of the principles, thirteen were found to be (very) relevant (indicated with an A), indicated by a mean ≥ 3. DPs on which fewer experts were of the opinion that these DPs are "relevant" or "very relevant" (mean < 3) are indicated by a B and a C, including the rating they received. The items depicted in Table 2 with a B indication constitute a list of items on which the experts had different opinions (some experts rate them "hardly relevant" or "not relevant", others rate them "very relevant" or "relevant") and which are therefore hard to interpret on these quantitative data alone. For example, four experts rate an item (DP 11) such as "Members strive for a balance between benefiting and contributing, not only participating in discussions but also in taking up small responsibilities such as looking up literature in between meetings" as very relevant but three experts answer "Not relevant". In Table 2 four DPs (DP 15, DP 6, DP 24 and DP 23) are mentioned, on which most experts were of the opinion that these principles were not relevant for stimulating or supporting CRD.

Explaining the rationale for their score on relevance, the Delphi participants sometimes added conditions under which their answers hold true, as in case of the

principle about the necessity of group norms for exploratory discussions (reworded in the second round as "Participants model for each other a critical and exploratory discussion style", DP 9): "I only agree with this, as long as they are shared by the members". Rarely did respondents mention what evidence supported their estimation of the relevance, with one exception: (DP 15), on participating in discussions with different parts of the community, "Members participate in different communities because that is the way their identities grow and become richer (according to social theory of learning)". Sometimes the comment field was made use of to explain why the option "unknown to me" was chosen, for instance that they based their answer on participants' experience in formal learning situations, not knowing if it could be extrapolated to informal learning communities. Sometimes suggestions were given for actual implementation, for example (DP 7, on the necessity of evaluating the discussion): "don't overdo it". These data show that from the 28 DPs derived from the literature, 13 DPs were considered important by the experts.

Implementation of Design Principles

Our third research question was on exploring strategies for implementation of the DPs, and subsequently on developing specific interventions. Several suggestions for implementation already appeared in the Delphi rounds. First suggestions at the level of technical tools were given, such as providing members with a personal log page where members of the community can formulate their own reflections without having to show them to the other members straightaway. Secondly, the strategy of modelling, by members from within the learning community, was brought forward. Thirdly, policies were proposed for use within the community, such as an active invitation policy in combination with open subscription. Fourthly, organising feedback on group functioning was thought to be helpful, for instance by using a "community barometer" (Coenders 2008). Organising activities that members will value highly is mentioned as another intervention. Finally, employing a facilitator who performs the interventions mentioned in the other themes was mentioned most often as being important.

The exploration on implementation was taken further in the expert discussion meeting. From the DPs that were presented to them, participants endorsed especially the principles about challenging, authentic cases. Regarding implementation of these principles they indicated that offering cases in advance of the virtual or face-to-face meeting could help to get more of these challenging cases on the agenda. Cases could be used as a mechanism to form subgroups as well: people subscribe to a case they are interested in, getting people on board with the same topic-driven interest.

Referring to implementation of the DPs in general, the experts were unanimous in stressing the importance of finding a moderator from within the group, taking care

that he or she is respected within the field and paying attention to his or her development as facilitator for the discussion. Furthermore, when planning blended or entirely virtual communities it is essential to ensure sufficient technical support. As a general rule the experts stressed the need of psychological safety. They thought it most important to focus first on those activities that contribute to building trust, to ensure sufficient participation (an issue in online environments mainly), trying to implement the principles directed at the quality of the discussion through increased CRD later. Therefore DPs aimed at increased participation were seen as highly relevant to implement. Planning activities also depends on the developmental phase of the community: for example, a moderator may be more important at the start of a community and less important later on.

The experts differed in their views concerning the necessity of participants bringing in cases from their own practices anonymously. On the one hand bringing in cases anonymously might help to bring cases involving a mistake to the surface, thus building psychological safety. On the other hand this might make it less personal. In our further studies we will report about the effectiveness of some of the strategies, activities and tools suggested for the DPs scoring high in the Delphi study, having implemented them in the context of our aim to support work-related learning of autonomous professionals.

CONCLUSIONS AND DISCUSSION

A set of 28 DPs, acting as social affordances for CRD within blended learning communities with autonomous professionals as members was abstracted from the literature, depicted in table 1. Our results from the Delphi study lead to the conclusion that thirteen DPs are viewed as important by a diverse group of experts in the fields of e-learning, knowledge management and communities. Our findings mean that experts find the following important: “authenticity of the topics to be discussed”, “openness about mistakes”, “members seek diversity in their group, especially in expertise, to achieve different points of view in the discussion” and “exchange views on how they struggled with certain cases”. When thinking about the support for learning communities of professionals these principles seem worthwhile to test in real life situations. Whether all these DPs are needed at the same time is uncertain, and a DP on cases from their own practice might, for example, be not easy to combine with a DP on openness about mistakes in the circumstances when a group has just started. Perhaps (see below), more knowledge about the mechanisms intermediating the effect of a DP might help to select a subset of principles. Similar lessons could be drawn from the group marked with a C. Although these principles were derived from literature,

according to the experts these will not stimulate the community to become more critically reflective. For another eleven items (marked with a B in Table 2) experts within our group hold different opinions. Possibly these principles are more interesting from a theoretical point of view: what in the theoretical background of experts is causing these differences in opinion? Being aware of differences in opinions brought forward by experts might help to remain critically reflective on DPs which are derived from the literature (Coates, 1975). An example of this is a DP on benefiting and contributing (DP 11), which 4 experts find "very relevant", 3 experts "relevant" but 1 expert thinks is "hardly relevant" and 3 experts think is "not relevant". A DP that deserves further attention as well is on knowing participants' background (DP 23), which 8 experts consider to be hardly or not important for CRD; as one of these experts stated in his/her comment, "it may also lead to presumptions". In practice this principle is confusing, because when diversity of expertise is seen as relevant (DP 22) it might be expected that, to utilise this diversity, members need to know more about the expertise of others. Cindy Hmelo-Silver (2009) suggested that identifying the knowledge necessary for a specific discussion is a way to design group diversity. Comparably, in field work attention needs to be paid to the item on consultation of others (DP 24). Experts in the Delphi study consider consulting others outside the group of participants of a group discussion to be hardly or not relevant for CRD. One of the experts made it clear: he/she remarked, "it is always good to use knowledge of people outside your group, however, it depends how this knowledge is used, whether it supports CRD in the sense of bringing 'fresh, other information sources in the discussion' or whether it blocks this behaviour, in the sense of 'others say' ". In the second round two experts further stated that diversity of the group could be related to this principle "if the group is diverse [...], this [consultation of others, outside the group] doesn't have to be necessary".

On the question of what strategies an external organisation could employ to realise the DPs in blended learning communities, with autonomous professionals as members, the discussion meeting highlighted the importance of psychological safety and sufficient technical support, before striving for CRD. The participants did agree on the importance of challenging cases and the need for an internal moderator. With regard to the online environment they agreed on getting participation first, because even in formal educational settings students did not use these tools unless they were specifically directed to do so (Belland,Glazewski, & Richardson, 2008). In our opinion, some suggestions which could be useful in a formal educational setting raise questions when it comes to their applicability in informal learning in communities and need to be tested in practice. One of these questions is: how can participants be seduced to make full use of the possibilities of the online environment? For example: putting up a schedule for participants to give them the opportunity to make appointments for face-to-face meetings is easy; making them use it is presumably less easy. Specific behaviour is influenced heavily by the environment in which the day-to-day work of practitioners

takes place. Their motivation and capability for CRD is not changed easily just by participating in a learning community, not even when behaviour such as regularly evaluating their discussions is envisioned as social affordance. In bringing professionals to more CRD in their interaction, organisations will have to admit that strategies with specific, concrete and definitive outcomes will be limited (Wenger et al., 2002). This is especially true for autonomous professionals for whom, in contrast to teams within an organisation, parallel policies for culture change cannot be introduced.

Our study describes the first steps in a design based research. Studies using this research method are increasingly interested in the mechanism behind effects of interventions (Van Aken, 2004). When thinking about affordances for behaviour, implying behavioural change, it is relevant to explore how these processes of change occur, so a model of behavioural change could be relevant. A well-known model for behavioural change, adopted in management and marketing literature (Poiesz, 1994; Poiesz, 1999; Siemsen, Roth & Balasubramanian, 2008) and literature on knowledge sharing (Huysman & Wulf 2004), is the Motivation – Opportunity – Ability (MOA) framework, which closely resembles the Triade model (Poiesz, 1994; Poiesz, 1999). Members change their behaviour when they feel (more) motivated (intrinsically or extrinsically) to do so, and have the opportunity and ability to act accordingly. The Triade model will be relevant for strategies for implementation because the constraining factor among these three variables (motivation, opportunity and ability) determines behaviour (Siemsen et al., 2008). For instance, implementing a DP that has an effect on opportunity will not result in more CRD when motivation is constrained. Further elaboration on our results with considerations about mechanisms in mind is appropriate, because insight in mechanisms will add to the theoretical value of design based research. In addition, we think that this model can help to bridge the gap between theoretical ideas about DPs addressing a change in behaviour, and actual implementation which has been the focus in research question three. The Triade model stresses the need for scaffolding participants' motivation, opportunity and capability as well as keeping these in balance.

A second issue that could improve and add to the usefulness of our study's results is about phases of development of a community. Combining data from the Delphi study and the discussion meeting illustrated that, especially for the strategies to realise specific DPs, one may have to pay attention in field testing to the phase of development. A strategy might be indispensable in the beginning of a community but not later on. In the Delphi it was mentioned, for instance, that "When a community of practice gains experience this role may become less important" [on the role of the moderator]. Another example of a DP differing in importance depending on the phase of development relates to discussing participants' own cases, perceived as being highly relevant for CRD. In the beginning participants may not be inclined to bring

in cases in which they have made mistakes. On that ground it has been proposed in the discussion meeting that participants should bring in their cases anonymously, though this makes the discussion less personal. As trust may grow in time during the development of a community, the strategy of bringing in anonymous cases in the sense of "challenging cases" can be helpful in preparing the case holder to talk more openly about his or her mistakes (Harteis, Bauer, Gruber, 2008). A third example of a DP dependent on the phase of development is commitment, on whose importance the experts agreed. We envision that commitment, comparable to trust, grows in time. Guarding group diversity of expertise would be a way of preventing the drawback of commitment, which is that groups who put solidarity first are more prone to groupthink (Janis, 1982), and "commitment" can come close in meaning to "solidarity". Too much homogeneity in group composition will be disadvantageous for CRD. The tension between homogeneity and heterogeneity has been described before (Lockhorst, 2004). As one of the members in the discussion meeting stated, "An ideal design might start with homogeneity and add new members to it in time to make it more heterogeneous."

Comments on the Approach

Our approach leaves room for improvement. The Delphi method in general has been criticised (Jones & Hunter 1995; Webler, Levine, Rakel, & Renn, 1991; Steinert 2009) due to bias in the selection of participants and difficulties in reliability. Moreover, very diverse approaches are all labelled "Delphi" (Coates, 1975). An approach such as the one we made use of (and which is often used), is perhaps better not labelled as a Delphi method at all, to avoid confusion about the goal of the methodology. A label such as "rating device" would reflect the purpose better (Thompson 2009). We argue that ratings and making differences in opinions explicit are valuable research activities, and we agree with Siobhan Sharkey and Anne Sharples (2001) that Delphi results are useful, as long as these results are not interpreted as "the correct answer" without further testing. Another limitation of our study could be found because, for feasibility reasons, we did not approach a much larger group, which would have improved our data. Furthermore, in our Delphi study, the experts did not pay much attention to the support for their opinions, which did not allow us to assess whether their opinions are based foremost on strong personal beliefs or on their knowledge of the field. Despite these limitations, we think that our results are worthwhile from the perspective that we made use of Delphi primarily as an exploratory technique aimed at getting guidance from experts' opinions for future field work, and for getting multi-disciplinary perspectives on our topic of interest. The Delphi study gives an indication of the importance of our DPs but they will have to be tested against observed data in a specific context: in our situation that of veterinarians in learning communities.

Future Research and Implications

Apart from future research involving ongoing refinements in wording, studies to acquire more insight into the relation between the DPs and the phase of development of a community, as well as in the mechanism behind effects, would be useful. Furthermore the context and conditions under which a DP elicits CRD or CRD-supporting interactive behaviour deserves additional exploration. Design based research finds its root in discontent about the applicability of research results; testing findings in real life contexts recognises the limits of design. In future research we ourselves will test a combination of DPs, concentrating on veterinary professionals' learning communities in diverse developmental phases. The findings are relevant for other professionals as well, especially for people within organisations, who aim to set up or analyse learning communities for professionals connected with their organisation (such as universities supporting communities for their alumni as part of their continuing education offerings). The design principles are relevant when they set up learning communities with the purpose of facilitating CRD, and the strategies as well as the discussion about those strategies, for instance on the importance of communities' development phase and of the role of a moderator, help with implementation of design principles. The implications of this research are to sharpen thinking about what is designable and what is not, and about the need to look at sources from diverse fields.

	Mean	Group	Number of resp.	Very relevant	Relevant	Hardly relevant	Not relevant	Unknown
(5) Members within the community discuss about cases selected from their own practices	3.8	A	12	9	3			
(18) Members create a culture in which talking about mistakes is allowed	3.8	A	12	9	3			
(4) Members exchange views on how they struggled with certain cases	3.5.	A	11	6	4	1		
(22) Members seek diversity in their group, especially in expertise, to achieve different points of view in the discussion	3.5	A	11	6	4	1		
(8) Participants encourage one another in being critical evaluators who try to prevent groupthink	3.3	A	12	4	8			
(12) Participants take notice of different perspectives in the discussion but do not strive for unanimity	3.3	A	11	4	6	1		
(9) Participants model for each other a critical and exploratory discussion style	3.3	A	11	5	2	2		2

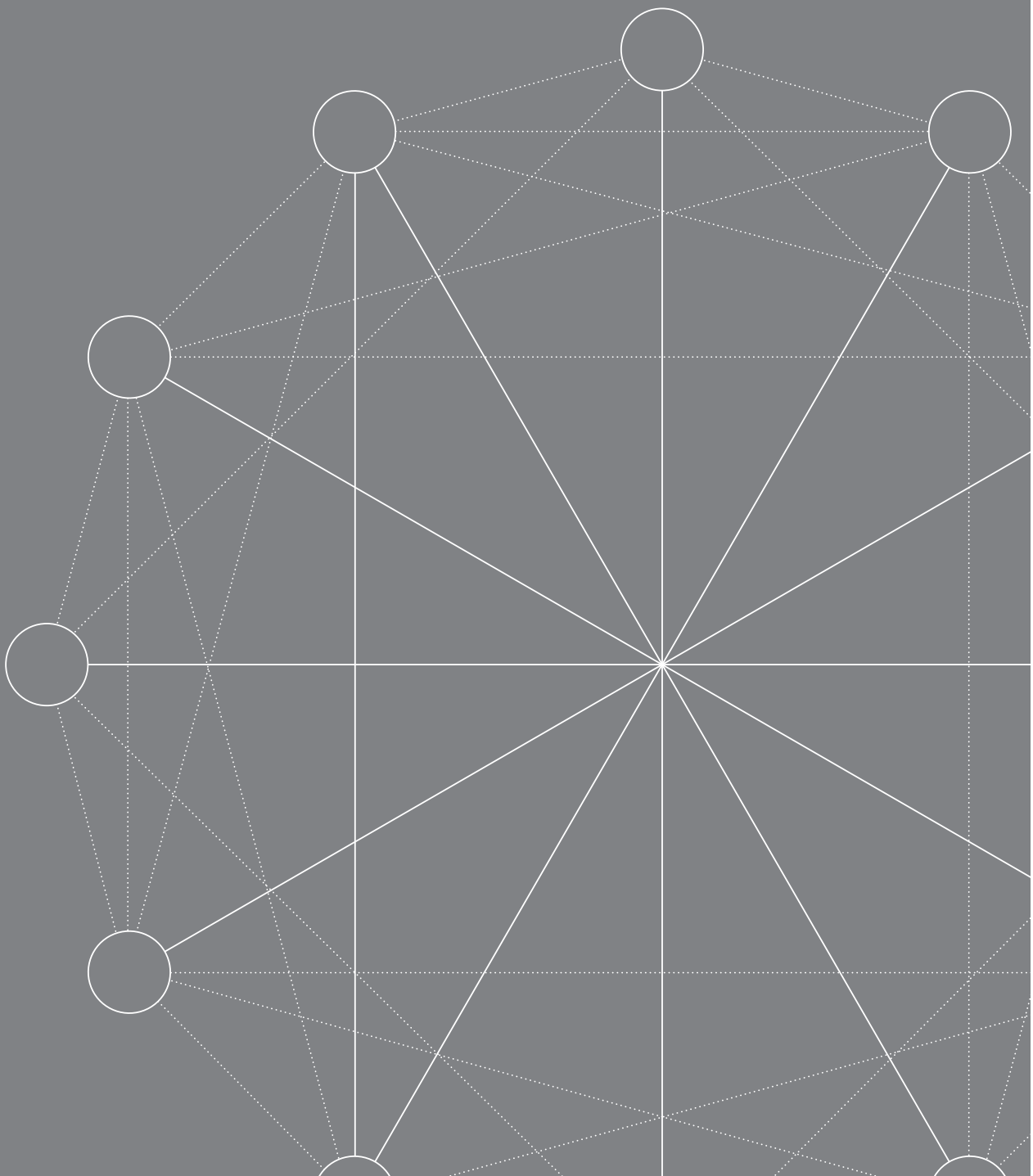
		Mean	Group	Number of resp.	Very relevant	Relevant	Hardly relevant	Not relevant	Unknown
(18)	Members find a meeting frequency (online or face-to-face) that allows them to combine participation in community with other obligations in life and work	3.2	A	11	4	6		1	
(1)	First time members of the community start with observing several discussions without participating to get acquainted with the kind of discussions going on	3.1	A	12	4	6	1	1	
(7)	Participants evaluate the quality of their discussions	3.0	A	12	1	9	1		1
(25)	Members consult literature for additional evidence on the case to incorporate these findings in their discussions	3.0	A	11	3	6	1	1	
(21)	Participants who want to explore a case in depth have the chance to discuss separately in a subgroup (and report their findings to the plenary group)	3.0	A	12	3	7	1	1	
(20)	Members ensure commitment within the community	3.0	A	12	3	7	1	1	

	Mean	Group	Number of resp.	Very relevant	Relevant	Hardly relevant	Not relevant	Unknown
(26) Members mark good examples of CRD	2.9	B	11		9	1		1
(3) First time members are invited to attend an information meeting to give an idea about the way cases are being discussed within the community	2.9	B	11	2	6	1	1	1
(13) Participants spend time to discuss different perspectives on every case	2.9	B	12	4	5	1	2	
(19) Members meet face-to-face as often as they think necessary for establishing a safe group environment	2.8	B	11	2	5	2	1	1
(27) Participants pay attention to group cohesion but not at all cost	2.8	B	11		7		1	3
(17) Members determine who may become a member of the community (and who not)	2.7	B	11	2	3	3	1	2
(14) Members take time between (online and face-to-face) meetings to allow for reflection on the discussions	2.7	B	11	2	4	3	1	1

		Mean	Group	Number of resp.	Very relevant	Relevant	Hardly relevant	Not relevant	Unknown
(11)	Members strive for a balance between benefiting and contributing, not only participating in discussions but also in taking up small responsibilities such as looking up literature in between meetings	2.7	B	11	4	3	1	3	
(2)	During a meeting participants start with cases they feel comfortable with and later on continue with more challenging cases	2.6	B	11	1	6	3	1	
(28)	First time members of the community are invited to attend a technical training	2.5	B	11	1	6	2	2	
(10)	Participants take up functional roles such as facilitator, "devil's advocate" etc.	2.5	B	11	1	6	2	2	
(6)	People having a connection to the case start with a discussion but they stimulate quiet members and outsiders to participate as well	2.3	C	11	1	4	3	3	

		Mean	Group	Number of resp.	Very relevant	Relevant	Hardly relevant	Not relevant	Unknown
(15)	In time members participate in discussions with different parts of the community and compare discussion styles	2.3	C	11	1	3	3	2	2
(24)	Participants consult people who have not participated in the discussion after a meeting and report back on this to the other participants	2.0	C	11		2	6	2	1
(23)	Members inform themselves about the reasons why other members in the group choose to participate	1.8	C	11		2	4	4	1

Table 2: Overview of the design principles and their ratings by experts



6

GENERAL DISCUSSION

In this general discussion, we address first the findings from our studies guided by our overall research question: How can the theory of critically reflective work behaviour (CRWB) enlighten and enhance the learning of veterinary professionals in communities, with regard to evidence based practice? For an overview of the methods used, detailed results and critical reflections on individual studies, we refer to the individual chapters and the summary. We look into the theoretical implications of our main findings, and we discuss the practical implications of our studies for the two main themes identified at the beginning of this thesis; learning communities and evidence based practice. Next, we explore what these implications mean for the veterinary profession and for veterinary curricula. Finally we reflect critically on our approach and indicate directions for future research.

UNDERSTANDING LEARNING IN COMMUNITIES

To understand how the theory of CRWB can enlighten learning, first an overall picture of CRWB in our context was necessary. A questionnaire study of the whole population of Dutch veterinary practitioners showed that individual CRWB, CRWB in social interaction and critical evaluation of findings from scientific research were important dimensions of critical reflection on practice. Because the concept of CRWB had chiefly been explored in self-report studies (Ropes, 2010; Van Woerkom, 2003; Van Woerkom & Croon, 2008), observations of different communities and of the dialogue in communities were desirable. Our finding that there was difference between observed and perceived values for aspects of critically reflective dialogues (CRD) is intriguing, even when considering that we did not measure the same concept by self-report and through observation. These differences appeared likewise when questionnaire data and community observations were compared. For most people, there is a difference between what they say they do (espoused theory) and what they actually do (theory-in-use) (Piggot-Irvine, 2010), these findings chiefly illustrate the importance of not relying on self-report only.

For the change from CRWB to CRD some refinements were necessary, to make observations possible in the implicit language such as that used in largely unstructured meetings of professionals (Anspach, 1988; Atkinson, 2004). Most aspects were adapted in small ways, which is explained in chapters 3 and 4. Here an example is given of such an adaptation, for the aspect of experimentation. The aspect experimentation was defined by Marianne van Woerkom and Marcel Croon (2008) as trying out new behaviour. Thought experiments, imagining what would happen *if* specific behaviour occurred or *if* new knowledge were applied (Galili, 2009; Gilbert & Reiner, 2000), were assumed to be a good approximation for the learning implied in the original aspect. These adaptations to

make observations possible uncovered new perspectives on aspects of CRWB, but even so we believe that in addition to self-report and observations other methods are needed to measure CRD aspects. Stimulated recall could be such another method (Lyle, 2003).

For a better understanding of learning in communities, case studies were carried out. Because CRWB is a concept developed for learning *at* work, we explored how the nature of aspects of CRWB within learning communities of veterinary professionals can be described based on dialogue *about* work. Our exploration of the nature of CRD resulted in an analytical framework where, within each aspect of CRD, four different modes of communication were identified: first, interactive and reflective; second, reflective on an individual basis; third, non-reflective and non-interactive, and fourth, restricted. The analytical framework differentiates between interaction that addresses the reasons and reflections of others, and interaction that does not; for example, asking questions for new and additional information. The framework can be seen as hierarchical, under the assumption that, as Suzanne Atwood (2010, p.366) said: "certain types of interactions are more beneficial for knowledge development than are others". In these communities veterinary professionals showed aspects of CRD largely in non-interactive modes (i.e. reflective on an individual basis or non-reflective). The level where reasons or reflections of previous speakers were addressed did occur infrequently and rarely a longer sequence of exchanges between more than two members did take place, implying that these professionals missed learning opportunities while time spend in meetings is precious for these professionals. These results suggest that learning in social interaction, which is implied in the theory of CRWB, does not occur in the best way possible.

In sum, to answer the first part of our overall research question: how can the theory of CRWB *enlighten* the learning of veterinary professionals in communities? The results of our studies highlight the potential advantage of CRWB as a perspective on learning of professionals, and we uncovered different levels in each aspect of CRD. These levels within aspects of CRD, as well as the behaviour implied in the original aspects, enable us to have a better understanding of learning within communities. Within each aspect it looks as if learning occurs in interaction with others, in the presence of others, on an individual basis or not much at all. Consequently, this points the way forward to what can be done to enhance learning. Nevertheless, from our studies it is clear that the concept CRWB could be refined: research utilisation needs to be added to the concept and aspects are to be adapted to make observational studies possible.

Enhancing Learning in Communities

Apart from *understanding* learning, we take an interest in *enhancement* of learning because studies in other professional groups had indicated earlier that critical re-

flection and expressions thereof do not occur spontaneously, and represent very often idealised behaviour which is less frequently observed in real life (Gambrill, 1990; Schellens, Van Keer, De Wever, & Valcke, 2009; Van Woerkom, 2008). Our study on change over time indicated that to enhance learning through CRWB in communities relying on developments that take place naturally might not be sufficient. Here, we acknowledge that the timeframe measured in these studies has been short because of the infrequency with which these communities met.

Thinking about enhancement, two questions come to the fore. First, which pedagogical practices follow from a social constructivist perspective on learning, such as CRWB? Second, should initiatives be directed at the individual, at the community or at the (work) environment? Formulated differently: when enhancement of learning is sought, do individual attributes matter most, or are issues in the workplace more important? In our Delphi study design principles in and around the community were identified, which offer affordances (for an explanation of this concept, see chapter 3) for CRWB to come about. Thirteen principles were selected after a rating by experts. The concept of affordances is in harmony with our definition of learning because whether relatively permanent changes in knowledge, attitudes and skills (related to work and in the ability to learn) occur depends upon opportunities and are not guaranteed outcomes (Bolhuis & Simons, 1999). Principles identified were, for example: 1. discussing (patient) problems from your own practice; 2. creating a culture of talking about mistakes; 3. striving for diversity in expertise; 4. taking notice of different perspectives and thus not striving for consensus; and 5. consulting literature for additional evidence on the case to incorporate these findings in the discussion. In our opinion these affordances, and strategies for implementation thereof, deserve further exploration, especially the presumed mechanisms behind them. Usually, mechanisms indicate why an intervention has an effect, but mechanisms apply likewise for affordances. In the Delphi study it appeared experts find it difficult, when asked, to indicate *why* a certain affordance supports the critically reflective behaviour of autonomous professionals. Rarely did the expert respondents mention what evidence supported their estimation of the relevance of a principle. In our case studies we have explored only one of these affordances in more detail; we assessed whether access to the research literature and a short training course in searching for articles had an effect on aspects of CRD and then on learning. This effect did not show in our data, whereupon we concluded that this principle alone was not sufficient to invoke change in the observed levels of CRD, within the timeframe measured.

In our survey study the question on interventions, whether these should be directed at the individual or at the (work) environment, was present in a different form. We examined a work-related learning model and such models often include predictors associated with workplace qualities as well as individual perceptions (Billett, 2002; Billett, Ehrich, & Hernon-Tinning, 2003; Billett & Pavlova, 2005). A model, relating

CRWB to Perceived Need for Lifelong Learning, Perceived Workload and Opportunities for Feedback, showed that CRWB seemed to be mainly affected by the personal attribute Perceived Need for Lifelong Learning. Perceived Need for Lifelong Learning was composed of two factors, which we called Epistemic Efficacy and Stability of Knowledge; the first factor is about self-perception, and the second about perceptions of the environment. This suggests that if healthcare professionals feel knowledgeable enough to solve problems, and believe that the knowledge needed for their work is not changing very fast, they will show less CRWB. Perceived workload and CRWB were not related by a workload optimum, which may be explained by results from a study by Joris van Ruyssenveldt and Marius van Dijke (2011) who showed that for jobs with a lot of autonomy workload did not have an inverse-U-shape effect on learning. Contrary to other studies where having many opportunities to receive feedback was found to be positively related to CRWB (Doornbos, Simons, & Denessen, 2008; Mamede, Schmidt, & Penaforte, 2008; Van Woerkom, 2003; Van Woerkom & Croon, 2008), the factor Opportunities for Feedback did not have that effect in our model.

Based on our second case study we concluded that to design interventions that help to achieve a higher, more interactive, level of CRD it would be worthwhile to study personal epistemologies of community members. In the evaluation meeting and during the observed meetings, expressions about knowledge were visible which could be indications for specific personal epistemologies. Personal epistemologies, described as stages of understanding, are important for learning and meaning (Hofer & Pintrich, 2002; Van Rossum & Hamer, 2010; Visser-Wijnveen, van Driel, van der Rijst, Verloop, & Visser, 2009). People with an *absolutist* epistemological understanding see knowledge as absolute, a large accumulation of certain facts (Van Rossum & Hamer, 2010). In a *relativist* epistemological understanding, people recognise that experts may disagree and do not provide certain answers. They believe, as Diana Kuhn said (1999), that "because all people have a right to their opinions, all opinions are equally right". People who endorse an *evaluative* epistemology do not perceive all opinions as equally well supported, they see debate (with judgment, evaluation and argument) as the path to informed opinion (Kuhn, Wang, & Li, 2011). At the start of our studies personal epistemologies were not included in our research questions, and additional research is therefore needed to confirm and to corroborate our results. Especially because our conclusions were based on explicit expressions from participants, while it is known that conceptions are difficult to measure on explicit expressions (Visser-Wijnveen et al., 2009).

In answer to the second part of our overall research question – how can the theory of CRWB enhance the learning of veterinary professionals in communities? – our results indicate that mainly personal attributes will affect CRWB, and subsequently learning. For enhancement of learning at work, our results showed that attitudes about lifelong learning are most important for CRWB. For enhancement of learning in

communities the Delphi study suggested that several principles were important but these have not been tested. In our case studies personal epistemologies emerged as relevant for CRWB. In our opinion focusing on the attitudes of professionals and how to change these, instead of planning adaptations to the workplace, will have the greatest pay-off when enhancement of learning is the goal. Changing attitudes from an outsider perspective is not expected to be simple, however; likewise our Delphi study showed that it is difficult to realise change in autonomous professionals who will not be very sensitive to directives or willing to let others prescribe their way of interacting (Pinelle & Gutwin, 2006). To realise change, a design based research approach can be helpful, changing and investigating at the same time (Van Aken, 2004), or change management derived from models of behavioural change such as the Triade model. This model assumes that members change their behaviour when they feel (more) motivated (intrinsically or extrinsically) to do so, and have the opportunity and ability to act accordingly.

Evidence Based Practice

What do our results have to say in answer on the third part of our overall research question: "with regard to evidence based practice"? In our first study we confirmed that research utilisation, which in our survey is divided into cross checking and openness to new findings, adds to the concept of CRWB. This finding makes it clear that for the presupposed value of CRWB, supporting the transformation to evidence based practice, research utilisation is important. Research utilisation in communities could be important because of the new perspectives research findings offer, which is relevant because the idea of communities has met with criticism. The criticism concerns in particular communities with a focus on novices and experts; this holds a risk of conservatism because learning processes in such communities are probably just limited to replication of experts' behaviour (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004). Concerning enhancement of learning, we have found that when given access to the full text of research journals and trained briefly in searching the literature, scientific literature consultation did not increase much and research utilisation was perceived to be not very high. Low frequencies of consultation of scientific literature are not unique for veterinary professionals; the same has been indicated for other professionals (Simons & Ruijters, 2004).

Additionally, in our point of view, evidence based practice is not confined to consultation of scientific literature but is defined as an approach to working and learning of individuals, who reflect critically on their practice, questioning what counts as evidence along the way (Goldenberg, 2006). When evidence is seen from such a perspective, interaction about reasons and reflections describes necessary behaviour when professionals practise in an evidence based manner. Social interaction, typical of the

highest level in our analytical framework, therefore not only offers the best opportunities for learning but is equally essential for evidence based practice. Nevertheless, in our studies, members spend a lot of time storytelling. Acknowledging that storytelling is essential for building relationships and trust within a community, we propose that this mode of communication does not add to evidence based practice. Furthermore, because many CRD aspects appear to remain stable over time, communication patterns in communities do not seem to evolve naturally to a mode of communication that is expected to support evidence based practice. In our studies we did not investigate, however, whether our intervention in the communities did result in other behaviour in their own veterinary practice. We anticipate that this would be an important step for future research.

Theoretical Implications

The concept of CRWB developed from studies about learning at work of employees in large organisations by Marianne van Woerkom and Marcel Croon (Van Woerkom, 2003; Van Woerkom & Croon, 2008). We explored this concept in the context of professionals who have substantial autonomy in their practice (Schön, 1983; Simons & Ruijters, 2004). Professionals differ from the employees described in Marianne van Woerkom's case studies in their level of autonomy, but probably also in their education; these professionals all have been educated in medical schools where socialisation is an essential element of the training (Hargreaves, 2000). Furthermore, as Simons and Ruijters (2004) noted, professionals need to be connected to the relevant research in their disciplines. Despite these differences, our first study indicated that the concept fits our context.

A great amount of literature stresses the importance of 'critical reflection' and 'reflection' for learning in groups, teams or communities (Kuhn, 1999; Mann, Gordon, & MacLeod, 2007). The concept of CRWB could add new perspectives because the concept is embedded in theoretical perspectives different from the perspectives mostly utilised in medical educational research (Mann, 2011). CWRB goes beyond learning of the individual, and adds a social dimension which is especially important when exploring informal learning from work experiences. Our analytical framework implies that the social dimension has two layers: interaction by addressing reasons and reflections of others, and interaction in which the topic stays the same but collaborative meaning making is absent. The last one resembles cumulative talk (Mercer, 1996, 2008). The highest level in our analytical framework resembles exploratory talk whereby learners engage in one another's ideas through joint or collective reasoning (Mercer, 1996, 2008). Dialogue in an individual, non-reflective, mode of CRD resembles storytelling. That many dialogues in our communities resemble storytelling is not unusual, storytelling is commonplace and important in clinical

settings (Egan & Jaye, 2009; Greenhalgh, 2001; Mattingly, 1998). A theoretical implication of our studies is that ideas about manners of talk which that have been developed in the context of children in the classroom could be applied in a setting of communities with professionals.

In both of our series of case studies it became apparent that CRWB, which in our questionnaire study and in the work of Marianne van Woerkom (2003) seemed to be one concept, is more likely to be a set of aspects instead. We could not distinguish one community with similar levels or similar changes on all aspects. None of our communities was represented by high levels on all aspects or low levels on all aspects and furthermore some aspects were not observable at all. Perhaps the levels for aspects of CRD do not need to be strongly connected with each other. We imagine that different types of discussions or topics ask for different combinations of levels. For example, a community that discusses veterinary topics where findings from research are scarce will benefit from high levels of critical opinion sharing, challenging groupthink and asking for as well as giving feedback, even when research utilisation is low. A different discussion could take place with high levels of openness about mistakes and asking for as well as giving feedback, this reflects that problems from their own practice are being talked about, which matches the highest scoring design principle in the Delphi study. And finally a discussion could occur about a more general issue, not immediately related to problems from their own practice, where high levels of critical opinion sharing and of research utilisation are equally leading to opportunities for learning. Unclear is how an optimum in levels is to be envisaged, although it seems reasonable to suspect that critical opinion sharing, challenging groupthink and experimentation are always essential. We propose that the value of the concept of CRWB is to be found in the idea of a coherent set of behaviours, and that being open about and discussing these aspects could help communities to become valuable learning environments.

PRACTICAL IMPLICATIONS

The aforementioned theoretical implications could influence pedagogical practices because practical implications follow from how we understand the learning that takes place in communities, and how enhancement of this learning is envisaged (Mann, 2011). For some of the practical implications of our studies we have recommended additional research in the section “Future directions”. What do our results and the theoretical implications mean for professional bodies of veterinary professionals, schools of veterinary medicine and veterinary professionals themselves?

Learning in Communities

One of the main findings is that within aspects of CRD different levels were shown and that the highest level, where most learning is presupposed to occur, happened infrequently. Hence, the question comes up whether higher levels of CRD can be taught, do come by practice, or are an attitude of individuals that cannot be learned at all? Practical implications can be derived from an educational perspective indicating which interventions follow from our studies, aimed at veterinary professionals or at students who are being educated to become veterinary professionals.

From our Delphi study it follows that experts recommended appointing a moderator in a community. In their work within the nursing context, Nancy Metthew-Maich and colleagues (2010) equally stress the importance of a moderator who helps to support the learning in professional communities, where they refer to the influential work of Jack Mezirow on transformative learning (Mezirow, 1990; Matthew-Maich, Ploeg, Jack, & Dobbins, 2010). Francesco Sofo and co-authors (2010), from a Human Resources Development perspective, likewise encourage the use of a moderator, which they call an action-learning coach, to ask reflective questions and thus enable members to critically reflect on their learning process. Our case studies showed that especially the perceived degree of asking for feedback and the observed levels thereof diverge, from which we conclude that asking-for-feedback behaviour is open to improvement. Participants, although they perceive a need to ask for feedback, express feedback questions in a very implicit manner. Making implicit questions more explicit and modifying question asking could help to enhance their learning in communities (Golding, 2011; Janssen & Prins, 2007). For a start, moderators could help to create awareness about what members say they find important when this is not always visible in their (communicative) behaviours for outsiders, it will very likely also not be clear for other members of the community.

Although constructing one's own knowledge in cooperation with others is an attitude toward learning which is more and more accepted in medical and veterinary education nowadays (Bergman, Stotzer, Wahlström, & Sandahl, 2009), it was shown that interaction is still limited even within a veterinary school with a modern curriculum (Jaarsma, Dolmans, Muijtjens, Boerboom, Van Beukelen & Scherpbier, 2009a). Additional efforts seem to be needed to ensure that these learning approaches will become more common in veterinary education. The theory of CRWB is a process-led approach to learning and therefore we think that, to enhance CRD aspects, educators need to pay attention to process learning outcomes. For example: "how do students deal with the ambiguity of not knowing?" or "how do students ask and give feedback?" (Bleakley & Bligh, 2007). Process oriented teaching requires asking good questions and alignment with assessment methods, where ratings are not based on right or wrong answers but on good reasoning (Rademaekers, 2011; Van Rossum & Hamer, 2010). Assessment

making use of graphic organisers such as mind maps, which ask students to explore structures in the content, fits process oriented teaching and deserves further exploration. Teacher development is expected to be necessary to facilitate process oriented teaching. Here we propose to practise what is being preached, and support learning communities for teachers instead of issuing guidelines (Yandell & Turvey, 2007).

For professional bodies in veterinary medicine, practical implications of our studies can be derived from a change management perspective, such as that by De Caluw and Vermaak (2002). When professional bodies want to nurture learning communities they face a paradoxical task: to defend the free, creative, passion driven nature of communities while at the same time stimulate specific, critically reflective, behaviour of members (Thompson, 2005). The traditional focus within CME on accreditation and assessment is to be reconciled with the emotional dimensions of professionals' work in terms of being passionate about the veterinary profession; this very passion could be the driving force for their learning. One direction to explore further, as discussed above, is assessment oriented on process outcomes (Van Rossum & Hamer, 2010). The aforementioned questions refer to how to design for learning, which has been touched upon in the Delphi study but needs further elaboration. We think that pedagogical approaches need to align with social constructivist theories and consequently classroom strategies need to be adapted to fit autonomous busy professionals. For example, in the literature on collaborative learning it is often recommended that learners should define learning goals, but in the context of learning about work, discussions that start with establishing collective or individual work based goals are expected to be better (Endedijk, 2010).

We are convinced that further thinking about and designing interventions is indispensable because we have seen that two veterinary communities had difficulties in being sustainable, and another community was thinking about an adjustment of the approach and inviting experts to teach fact-based knowledge based on the most recent research findings and to decide what was the right answer to their questions. These signals indicate that participants find it difficult to evaluate their discourse as having the potential to enhance individual or collective understanding. To design more effective interventions more research is necessary, in our opinion, especially to obtain more insight into the personal attributes of veterinary professionals. For example, setting up training for professionals to acquire discussion skills will not be effective when participants have a relativist understanding, and their dialogue will not improve because they see no reason to apply these skills, surely "all opinions are equally right" (Kuhn, 1999, p. 23). And, when the perceived need for lifelong learning is low, because the knowledge base in the field is perceived as stable or individuals' own capacities are considered "good enough", interventions will be less successful. Such perceptions of the need for lifelong learning, however, have not been found in our data frequently and hence there is reason for optimism.

Evidence Based Practice

Our main finding with regard to evidence based practice is that giving access to full text versions of research journals, and a short training course in searching the literature, were not enough to change practitioners' degree and level of research utilisation within the time frame measured. The majority of participants in our case studies did not consult the scientific literature more, and research utilisation during discussions did equally not occur more frequently. As described above, practical implications for evidence based practice can also be derived from an educational perspective. What interventions follow from our studies, aimed at veterinary professionals or at students who are being educated to become veterinary professionals that will help the transfer to evidence based practice?

From what we have defined as evidence based practice it follows that we do not recommend an approach that is limited to literature searching and appraisal skills only. In our opinion small-group learning, that focuses on clinical uncertainty (Sommers, Morgan, Johnson, & Yatabe, 2007) can be a valuable approach, based on the fact that the aspect of clinical uncertainty emerged in our case study. Dealing with uncertainty is not only highly relevant within the medical and veterinary profession (Buetow, 2011; Luther & Crandall, 2011), but uncertainty is also important with regard to evidence based practice. This is not because evidence based practice reduces uncertainty for professionals; knowledge from randomised clinical trials is not easy to apply to the individual patient (Griffiths, Green, & Tsouroufli, 2005; Timmermans & Angell, 2001). Small-group learning that focuses on clinical uncertainty is perhaps especially recommended for veterinarians, because in the veterinary domain evidence from research findings is often limited and hence the need to exchange experiential knowledge, local context and whatever evidence is available in a critically reflective way is of paramount importance (McWilliam, 2007). Managing uncertainty could become a valuable element of the medical socialisation process (Timmermans & Angell, 2001), when teachers acknowledge explicitly that uncertainty is an essential capacity of the veterinary medical profession (Ramaekers, 2011). As for achieving more process oriented teaching, we expect that teacher development is required even though it is unknown to what extent teachers are already practising this behaviour now.

As to research utilisation, some ideas for interventions that enhance research utilisation emerge from the literature; such as appointing a research facilitator (Vachon, Durand, & LeBlanc, 2009), establishing local opinion leaders (Doumit, Gattellari, Grimshaw, & O'Brien, 2007) or organising journal clubs, although effectiveness of the latter intervention to enhance evidence based practice is not yet proven (Harris et al., 2011). It has been noted, however, in the literature about change and interventions that to achieve change in healthcare settings to accommodate evidence based practice is not easy (Bero et al., 1998). Social, cultural and affective factors affecting application of

knowledge to clinical practice have to be included in plans to support the transfer to evidence based practice (French et al., 2009; Humphrey & Berrow, 2000; McWilliam, 2007). We propose that for a start acknowledging the large diversity in definitions of evidence based practice will help to understand occasions of Babylonian confusion.

With regard to evidence based practice, our results are just a first small step even though our studies illustrate that the transformation to evidence based practice is complex. Searching and interpreting the literature all by themselves is considered very demanding by veterinarians working in general practice. At the same time, we can learn from the medical domain that developing clinical guidelines in isolation from practitioners, and distributing these guidelines to practitioners, will probably mainly lead to non-adherence (Carlsen, Glenton, & Pope, 2007; Lugtenberg, Zegers-Van Schaick, Westert, & Burgers, 2009). For medical practitioners other cooperation models have been proposed, for example, where researchers and users of research findings cooperate with one another (McDonald & Viehbeck, 2007), which is similar to design based research (Van Aken, 2004). We suggest that these models for cooperation, as well as alternative methods for guideline development, such as Delphi studies (Tomasik, 2010; Baker, Lovell & Harris, 2006), are to be studied carefully within the veterinary profession.

Critical Reflections

With a topic supplied with the adjectives "critically reflective", researchers are inevitably compelled to reflect critically on their approach and assumptions themselves. Some of our critical reflections on individual studies have been included in the previous chapters, and we will not repeat them here. Here we will consider reflections on a more global, and more personal, level.

In the overall research question from this thesis we assume that CRD, mainly a rational process, is important for learning in communities. Such rational perspectives ignore the valuable role that emotions play in learning (Artino & Durning, 2011; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Pekrun, Goetz, Titz, & Perry, 2002; van Woerkom, 2008), disregard the clinical uncertainty the professionals have to deal with (Griffiths, Green, & Bendelow, 2006; Lingard, Garwood, Schryer, & Spafford, 2003) and neglect the importance of intuition (Hodgkinson, Langan-Fox, & Sadler-Smith, 2008). In social constructivist theories emotions and intuition are important, and we do not endorse a techno-rational view of the medical profession (Schön, 1983), but we acknowledge that our study is only about part of the learning that can take place in learning communities and in practice. Furthermore, our studies do not speak out on an optimum of CRD: how many instances of the higher level of CRD aspects are required to achieve "ideal" learning behaviours, and are high levels on aspects such as

research utilisation required for all graduates (Van Rossum & Hamer, 2010)? Further explorations are needed too on the nature of CRD, especially the question discussed above (under Theoretical Implications) whether it is one concept or a set of aspects.

While we have written about the personal epistemologies of veterinary professionals, some reflections are due about our own research paradigm. A research paradigm is a so-called "grand theory" where personal epistemologies, ontology and methodology constitute a whole (Bunniss & Kelly, 2010). During this research process it became clear that Critical Theory is our research paradigm. Within this paradigm belong personal epistemologies that indicate that knowledge is co-constructed. Co-construction of knowledge is likewise the core of social constructivist learning theories, and matches with evidence based practice and practice based evidence. Such assumptions about the nature of knowledge are important to understand why we see evidence based practice and practice based evidence as relevant for lifelong learning. Within evidence based practice research findings from the literature are discussed in the context of a specific patient problem. In practice based evidence knowledge is co-constructed with others through critical reflection on patient problems from daily practice, when research findings from large scale studies are absent.

The research methodologies we have applied in this thesis, especially the case studies with coding of transcripts for levels in CRD and development of analytical framework in close cooperation in a group of researchers but also the Delphi study, are methodologies associated with this Critical Theory paradigm. They are concerned with envisioning "how things could change for the better" (Bunniss & Kelly, 2010, p. 361). Making our own research paradigm explicit is relevant to see how the issues and methods described in this thesis belong together as a whole. To understand why we believe this to be true, we will elaborate on some aspects of our research when seen from a different research paradigm. Within a (post) positivist paradigm different research methods are expected (for example, with hypothesis testing) and concepts are being interpreted in a different way. To ask veterinarians for participation while referring to evidence based practice, and giving them training on searching and access to full text journals, would be seen as a source of bias. Participants may have talked differently about findings from scientific research than they would have done otherwise. Finally, from a (post) positivist paradigm, evidence based practice will often be seen as "the use of randomised clinical trials as the only valid form of evidence" (Mantzoukas, 2006, p. 219).

Within our research paradigm a researcher performs small scale qualitative case studies which do not allow generalisation to larger populations. Our findings are difficult to apply to all other veterinarians but for another reason also. We have experienced that communities, as a way of organising learning experiences, do not occur to any great extent within veterinary care in the Netherlands. Veterinarians do meet but these

meetings often prove to be small scale lectures by veterinary specialists. Given the fact that learning communities were not easy to find, it might be concluded that the participants in our studies are to be considered atypical for the whole population of Dutch veterinary practitioners. Research within a Critical Theory paradigm has different aims. Here we want to quote Margarete Sandelowski who has said (1993, p.3), comparing science to art, that results of qualitative studies should be viewed as a representation, "an image of a face that we would recognise if we saw the original in the world". Without pretending to have uncovered 'truth' for all veterinarians, we do hope that communities of veterinary professionals will recognise our findings and use them to their advantage.

Future Directions

In studying change in CRD over time, the aspect "uncertainty" became apparent. Veterinary professionals, in their daily work as well as during their meetings, seem to have to deal with different manifestations of clinical uncertainty; for example, when certain information is missing because an owner is not able to pay for further diagnostic procedures. It is well known that dealing with uncertainty is an essential competence for medical professionals, which is relevant for experiential learning and evidence based practice (Buetow, 2011; Luther & Crandall, 2011; Schön, 1983). We perceive that openness about uncertainty would be a valuable additional aspect for CRD. The first direction for future research therefore would be to investigate if, and in what way, openness about uncertainty could become an aspect of CRD.

Second, we recommend further study into personal epistemologies of veterinary professionals but also in those of teachers, because teachers (especially when they are also specialists in a particular domain) will affect the direction in which students develop in respect to personal epistemologies (Van Rossum & Hamer, 2010). A valuable starting point for such investigations could be the metaphors for conceptions of knowledge developed by Gerda Visser-Wijnveen (2009); these methods circumvent the difficulties of measuring conceptions such as personal epistemologies. Personal epistemologies affect critical thinking of members in communities, and at the same time affect the way clinical judgement is exercised within evidence based practice. Assessing evidence is essential for evidence based practice (Bowen, Erickson, Martens, & Crockett, 2009; Goldenberg, 2006; Holmes, 2007; Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Here the work of Diana Kuhn (1999) who has written about the connection between personal epistemologies and critical thinking may be a good starting point.

Third, future studies are needed to explore which interventions do help to increase research utilisation among veterinary professionals. In their work on research

utilisation Carole Estabrooks and her colleagues (2009) recommend considering three aspects: the context, evidence and facilitation. In our studies we have included only one aspect, facilitation. In our opinion their studies on context, in which they explore how the "culture of doing" in medical professions may inhibit reflection (Rycroft-Malone, 2008) could help to enrich our answers on the research question about enhancement of learning. The work of Carole Estabrooks would be a good starting point for further exploration of interventions that support the transformation to evidence based practice, and interventions that connect evidence based practice with practice based evidence (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003).

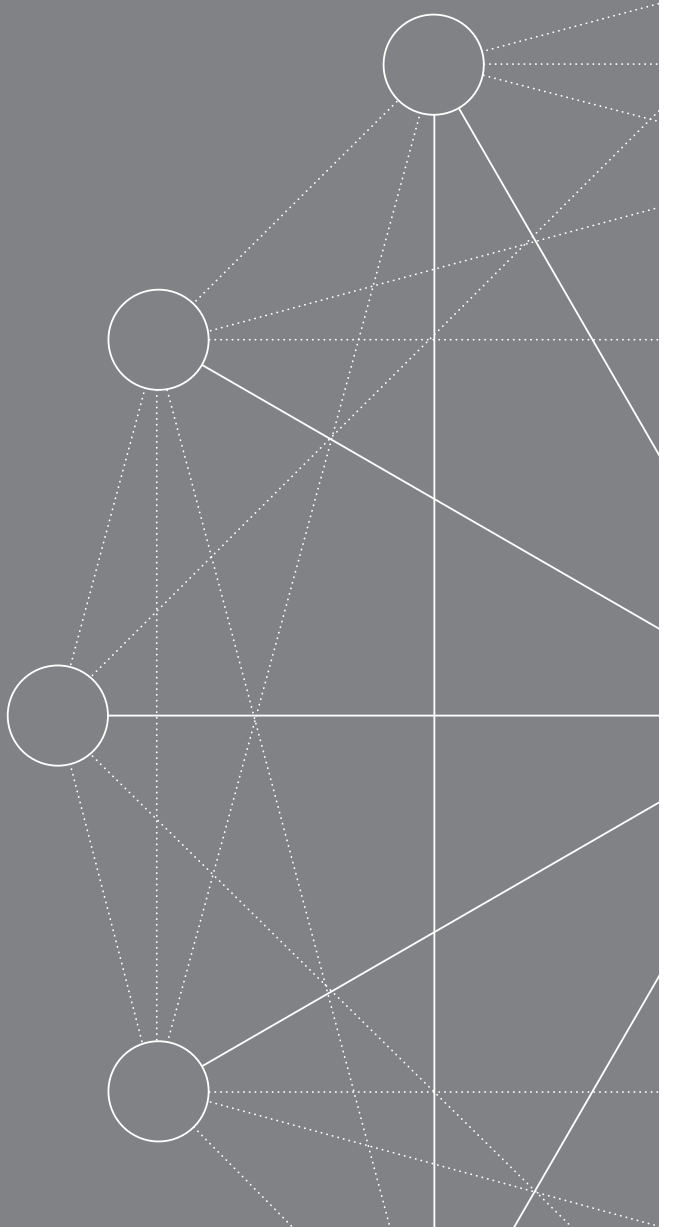
A fourth direction for future research is diversity. In the Delphi study experts considered diversity of expertise very important for CRWB in communities. Although this factor was included in the questionnaires, diversity has not been analysed in much detail, even though in the community of professionals who have recently graduated this theme has been discussed during the evaluation meeting. These veterinarians perceived that all of them were educated at the same school, with the same methods and that diversity in points of opinion was therefore sometimes small; hindering a more thorough discussion. These days, however, diversity is becoming more important in the context of Dutch veterinary professionals for two reasons. First because in veterinary practice diversity increases as a result of appointment of specialities within larger practices, and second because multidisciplinary collaboration, for example within one-health initiatives, is growing. We believe that the effect of these developments over time deserves a follow-up with research studies, and we refer to the management literature for studies on diversity in teams (Shaw & Barrett-Power, 1998; Van Knippenberg, De Dreu, & Homan, 2004).

Finally, we left out of this thesis online or blended communities (only the Delphi study refers to blended communities) due to restrictions in time and resources. More studies with online or blended communities included are recommended. Some of the communities we studied have applied online communication tools, such as Skype, during the research. Online communities have the advantage of independence of time and location (Kirschner, Strijbos, Kreijns, & Beers, 2004), and busy professionals could theoretically meet more often, alternating online and face-to-face meetings, harvesting the additional value of learning in social interaction. Online tools have been brought forward as a tool to support critical reflection because participants have more time to reflect (Janssen et al., 2007), keep an overview of the course of a discussion thanks to visualisation (Salminen, Marttunen & Laurinen, 2010) or identify problems better helped by labelling of entries on online fora (Schellens, Van Keer, De Wever, & Valcke, 2009). Graphic organisers as an assessment method, described under practical implications, such as mind maps, ask for online tools also (Salminen, Marttunen & Laurinen, 2010). Here, a good starting point for further research can be the work of An-

drew Ravenscroft (2011) who has investigated dialogue in online networks and developed an online game for improving the reasoning within dialogue in online networks. With all these tools the challenge will be how to combine formal tools with learning of professionals.

Conclusion

For CRWB in communities of veterinary professionals to fulfil its potential, pedagogical practices should strive for an increase in levels for CRD aspects to harvest the advantages of learning in social interaction; meaning especially addressing each other's reasons and reflections. To enhance the level and frequency of CRWB relatively straightforward interventions emerge, such as setting up training sessions, appointing moderators or adjusting parts of the curriculum. Our studies indicate, however, that to increase the value of learning in social interaction, a perceived need for lifelong learning and personal epistemologies seem to be more important to enlighten and enhance learning in communities with regard to evidence based practice.



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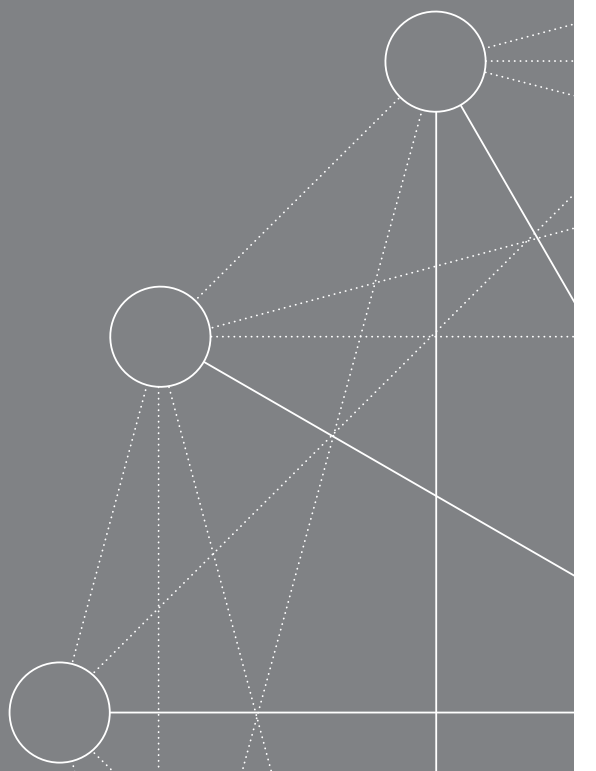


SUMMARY

In veterinary medicine, in the Netherlands and worldwide, two developments are becoming increasingly important: professionals are required to continue learning, and veterinary professionals need to practice more and more in an evidence-based manner. In our studies we investigate how learning takes places in communities, and explore how participation in communities might at the same time support the transition to evidence based practice. Based on social constructivist theories we assume that critically reflective work behaviour (CRWB) is essential for learning in professional communities, and that CRWB covers necessary behaviour for evidence based practice. The overall research question guiding our thesis is: how can the theory of critically reflective work behaviour enlighten and enhance learning of veterinary professionals in communities, with regard to evidence based practice? To answer this overall question, we performed four studies making use of qualitative as well as quantitative research methods.

Little is known about learning in communities, small groups in which autonomous professionals engage in dialogue independently, although it has been considered worthwhile for continuing veterinary medical education. The same applies to evidence based veterinary practice from a lifelong learning perspective, where studies are equally scarce. Evidence based practice is seen as a process of lifelong, self-directed problem-based learning; an approach to working and learning of individuals, who reflect critically on their practice, questioning what counts as evidence along the way. Hence, evidence based practice is not confined to following or implementing guidelines, nor is it purely about consultation of scientific literature. Passive dissemination of evidence aimed at the individual practitioner, through journals and clinical practice guidelines, has been proven to be inadequate. Therefore learning communities might help clinicians to utilise research evidence. To know how learning takes place within communities of professionals, collecting and analysing empirical data is essential.

In the research on learning communities and on evidence based practice major questions are still open, in particular related to veterinary professionals. There is a lack of empirical studies on whether the intended, idealised, purpose of communities is met for professionals, and on how the plausible cross-fertilisation between evidence based practice and learning in communities is to be understood. We study learning in communities making use of social constructivist theories behind CRWB. CRWB is a concept developed for learning at work in large organisations, but we believe the concept to be suitable to understand learning in communities with professionals as members. The concept CRWB adds a perspective on learning as a process, in unstructured settings and with attention to social interaction. This perspective is important for veterinary and medical education because, even though in health care settings work increasingly has a collaborative nature medical education still often takes individual learning as a start.

CRWB consists of several distinct and concrete learning behaviours, called aspects: openness about mistakes, challenging groupthink, asking for feedback, experimentation and critical opinion sharing. Openness about mistakes helps to develop knowledge about what does and what does not work which is essential for learning from experience. Groupthink, a tendency to agree fast, can develop in communities when members strive for consensus and unanimity and at the same time create an atmosphere discouraging critical evaluation. For learning to occur receiving feedback is indispensable, not only during formal education but also at the workplace. Experimentation is about trying out new ideas to explore alternatives. Finally, critical opinion sharing is about contributing ideas, information and opinions; to discuss them with others and asking critical questions. Sharing opinions in a critical way is important for the development of knowledge.

Apart from understanding learning, we take an interest in enhancement of learning because critical reflection probably does not come naturally. When thinking about improvement, it is up till now unclear whether initiatives should be directed at individuals within communities or at changes in the environment. These questions are relevant because designing for learning in communities is complex; perhaps even more when thinking about learning of autonomous veterinary professionals, who work in loosely coupled organisations and therefore will not be very sensitive to managerial approaches. Understanding learning and enhancement thereof could help professional bodies, schools of veterinary medicine and veterinary professionals to establish and sustain learning communities. Furthermore, the results can indicate directions in the development of veterinary curricula because in the schools of veterinary medicine future professionals are and will be prepared for lifelong learning.

Chapter 2

Our first study was aimed at a better understanding of CRWB as an approach for work-related informal learning. The first question guiding this study was whether research utilisation adds to the concept of CRWB of healthcare professionals. Research utilisation seemed to be missing in the original concept, while critical evaluation of findings from scientific research is expected to be an important dimension of critical reflection on practice. The second question was to what extent CRWB is affected by perceived workload, opportunities for feedback and perceived need for lifelong learning. Starting from existing questionnaires on CRWB and predictors of CRWB, and adding items on research utilisation, a survey was developed which was distributed to all veterinary professionals working in the Netherlands in a veterinary practice. And a model was specified relating CRWB to Perceived Need for Lifelong Learning, to Perceived Workload and to Opportunities for Feedback.

Of the 2775 veterinarians targeted by the survey, 1292 returned the survey, which means a response rate of 46%. First, half of the data were analysed with exploratory factor analysis to assess the overall quality of the adapted survey. With the other half of the data the model was tested, using structural equation modelling. After ensuring that structural equation modelling was allowed, through testing a measurement model, a structural model was tested with the three predictors. The results from the exploratory factor analysis indicated a four factor structure of CRWB and a four factor structure of the predictors of CRWB. In order to obtain scales that made sense conceptually, we split the factor Research Utilisation in CRWB into two: Cross Checking of Information and Openness to New Findings. The other factors were Individual CRWB and CRWB in Social Interaction. Thus four factors that reflect dimensions of CRWB were distinguished. The exploratory factor analysis showed four predictors of CRWB. Perceived Need for Lifelong Learning had to be split into two, which we labelled as: Epistemic Efficacy and Stability of Knowledge. From the structural equation modelling analysis followed that the model was well represented by the data and that only Perceived Need for Lifelong Learning predicts CRWB. Neither Perceived Workload nor Opportunities for Feedback of other practitioners was related to CRWB.

The results suggest that research utilisation is essential for CRWB, a finding that connects evidence based practice in a more explicit way to informal work-related learning. Perceptions of the need for lifelong learning seem to be more relevant for CRWB of healthcare professionals than qualities of the workplace. This suggests that if healthcare professionals feel knowledgeable enough to solve problems, and believe that the knowledge needed for their work is not changing very fast, they will show less CRWB. For enhancement of learning at work, our results indicate that the personal attribute Perceived Need for Lifelong Learning is most important for CRWB. After this questionnaire study, we concluded that to study behaviour, behaviour that has been self-reported in some way is not sufficient; some form of observation was needed. In subsequent studies a focus on communities was decided upon, also because communities had been recommended for the transformation to evidence based practice.

Chapter 3

In a case study we observed the dialogue that takes place in seven different communities, five with members from companion animal practices and two with members from practices working on farm animal health, to see whether professionals reflect critically and behave accordingly. First we explored how the nature of aspects of CRWB within learning communities of veterinary professionals can be described. Next, we investigated to what extent such communities differ in these aspects. From each of these communities one meeting has been recorded and transcribed fully.

To observe the aspects that constitute CRWB in the implicit language such as utilised in largely unstructured meetings of professionals we refined the aspects. CRWB aspects had been studied before with self-report mainly, and had not been described in terms to make them transparent for an observer. Our exploration of the nature of CRWB resulted in a new concept for work related learning in communities which we called critically reflective dialogues (CRD). An analytical framework was developed where, within each aspect of CRD, four different modes of communication were identified: (1) interactive and reflective (2) reflective on an individual basis (3) non-reflective and non-interactive (4) restricted. The first two levels differentiate between interaction that addresses the reasons and reflections of others, and interaction that does not; for example asking questions for new and additional information. The developed framework was shown to discriminate between communities in terms of how they employ aspects of CRD.

We proposed that the framework is hierarchical, and that at the highest level professionals utilise learning opportunities most. The highest level looks like explorative talk which has been described about for learning from dialogue in classroom settings. The second level resembles cumulative talk which is a concept derived from these dialogue studies as well. The third level, dialogue in a non-reflective mode of CRD on an individual basis, was compared to storytelling which is described (among others) in studies about talk between medical professionals. The final level was more theoretical, about active discouragement of reflection and reasoning. In these communities veterinary professionals showed aspects of CRD largely in non-interactive modes (i.e. reflective on an individual basis or non-reflective), implying that they miss learning opportunities. Participating in communities will probably not help professionals to make the transfer to evidence based practice, if they do not spend much time on collaborative meaning making. Our conclusion therefore has been than learning within communities could improve with interventions and pedagogical practices that help to enhance interaction in dialogue.

Chapter 4

In our second case study we explored whether CRD aspects change over time. We studied two dialogues each from six different communities, making use of the analytical framework described in chapter 3. In between the two observed dialogues, members received access to the scientific literature and were trained in searching for research findings. This study was guided by the following research questions: first, to what extent do learning communities of veterinary professionals change over time in their *observed* levels in aspects of critically reflective dialogues. Second, to what extent do members in these learning communities perceive these aspects of critically reflective dialogues to have changed over time? And third, what factors are related to *observed*

and *perceived* change in aspects of critically reflective dialogues, and to differences between *observed* and *perceived* change?

Change was studied from the perspective of observations, through coding complete transcripts of dialogues that had taken place during the meetings. Codes that indicate levels in CRD aspects of fragments within each transcript were summarised in a holistic evaluation, establishing one level for each CRD aspect in each community meeting. Comparing the levels at the first meeting and at the second meeting was considered an indication for change. Change was also studied from the perspective of perceptions, through an online questionnaire and an evaluative discussion with members of the communities. Results showed that over time some communities became more open about mistakes, a finding that appears to be related to an increase in trust. Other observed aspects of CRD seemed to be fairly stable over time. On the contrary, participants perceived research utilisation and feedback asking and giving to have changed. Perceived and observed values were therefore not the same. After receiving access to full text of research journals and training in searching the literature, scientific literature consultation did not increase in a major way and research utilisation was perceived to be not very high. This intervention alone was not sufficient to invoke change in the observed levels of CRD within the time frame measured. Subsequently, we concluded that to enhance learning through CRWB in communities it might not be sufficient to rely on developments that take place naturally. Here, we acknowledge that the timeframe measured in these studies has been short, because of the frequency with which these communities met. From an analysis of the transcripts from the evaluative discussion meeting emerged noteworthy perceptions about knowledge. We propose that these perceptions indicate specific epistemological conceptions of community members, which could be associated with the low occurrence of interaction in their dialogues.

Chapter 5

In between phases of data collection for the case studies, a Delphi study was performed in which behaviour within communities was studied that could offer affordances for CRD. The following research questions were leading: first, what design principles, acting as social affordance(s) for CRD within blended learning communities with autonomous professionals as members, can be abstracted from literature? Second, which of these design principles are considered to be important by experts in the field of communities, knowledge management and e-learning? Third, what strategies could an external organisation employ to realise the design principles in blended learning communities, with autonomous professionals as members?

From the literature, 28 design principles were deduced. These principles describe behaviour from members in learning communities, within the group or on behalf of the group, that entice autonomous professionals into CRWB. In two rounds of an online Delphi study, twelve experts in the field of knowledge management, collaborative e-learning and communities gave their opinions about these principles. A face-to-face expert discussion meeting was organised to explore strategies for implementation of these principles. The Delphi study resulted in a subset of 13 design principles considered to be relevant for CRD; among which the highest rating were "authenticity of the topics to be discussed", "openness about mistakes", "members seek diversity in their group, especially in expertise, to achieve different points of view in the discussion" and "exchange views on how they struggled with certain cases" and "access to the scientific literature and skills in searching research findings". Exploration of strategies for implementation of such factors confirmed the importance of establishing moderators to guide a discussion. Changing attitudes from an outsider perspective is not expected to be simple; it is difficult to realise change in autonomous professionals who will not be very sensitive to directives or willing to let others prescribe their way of interacting. To change factors that influence participants' interaction, a framework for behavioural change was considered which stresses the importance of motivation, opportunity and availability.

General Discussion

In the general discussion we address findings from our studies guided by our overall research question and discuss theoretical and practical implications for the two main themes identified at the beginning of this thesis, continued learning in communities and evidence based practice. And we explore what these implications mean for the veterinary profession and for veterinary curricula. Finally we reflect critically on our approach and indicate future directions for research.

We have found differences between observed and perceived values for aspects of CRWB, which chiefly illustrates the importance of not relying on self-report only. Furthermore, we concluded that the concept CRWB is to be refined: research utilisation needs to be added and aspects are to be adapted to make observational studies possible. This resulted in the concept critically reflective dialogues (CRD), consisting of the same aspects as CRWB but tailored to behaviour visible in dialogue. Finally, an exploration on the nature of aspects of CRWB in dialogue about work resulted in an analytical hierarchical framework where four different modes of communication were identified. The highest level in this framework, where interaction about reasons and reflections within the aspects of CRD take place, offers the best opportunities for learning. Moreover, within our perspective on evidence, we claim that this interaction about reasons and reflections describes necessary behaviours if professionals

practice in an evidence-based manner. This level occurred infrequent, however, which suggests that the intended, idealised, purpose of communities is not yet met. In addition we have found that attitudes of professionals seem to matter most. In our opinion focusing on (changing) these attitudes will have the greatest pay-off when enhancement of learning is the goal.

The two case studies indicated that CRD is probably not one single concept but more likely a set of aspects instead. We suggest that the levels for aspects of CRD do not need to be strongly connected with each other; there is no need for high levels on all aspects in all meetings. Probably, different types of discussion ask for different combinations of levels. Unclear is how an optimum in levels is to be envisaged, although it seems reasonable to suspect that critical opinion sharing, challenging groupthink and experimentation are always essential. The value of the concept CRWB is probably to be found mainly in the idea of a coherent set of behaviours. Being open about these aspects and discuss about them could help communities to become valuable learning environments.

Practical Implications

Pedagogical practices and interventions follow from how we understand the learning that takes place in communities, and how enhancement of this learning is envisaged. Pedagogical practices imply changes to the education for future professionals, with effect in the long term, and interventions are actions that aim for change in the short term. What do our results mean for professional bodies of veterinary professionals, schools of veterinary medicine and veterinary professionals themselves? One of the main findings is that the highest level in aspects of CRD, where most learning is presupposed to occur, happened infrequently. Pedagogical practices and interventions need to contribute to an increase in these levels first. To reach higher levels in aspects of CRD several things could help, for instance appointing a moderator in a community who can ask reflective questions or make implicit feedback questions more explicit. In addition, efforts seem to be needed to ensure that constructing one's own knowledge in cooperation with others will become more common in veterinary education. We believe that educators need to practice process oriented teaching which asks for paying attention to process learning outcomes and alignment with assessment methods, where ratings are based on good reasoning. Teacher development is expected to be necessary to facilitate process oriented teaching.

When professional bodies want to nurture learning communities they face a paradoxical task: to defend the free, creative, passion driven nature of communities while at the same time stimulate specific (critically reflective) behaviour of members. Interventions must take this possible source of tension into account. We think that an

intervention that is designed for use in the classroom needs to be adapted to fit autonomous busy professionals. For example not ask members in communities to define learning goals but help them establish collective or individual work based goals and what is to be learned to reach those. To design more effective interventions additional research is necessary; in our opinion especially to obtain more insight in personal attributes of veterinary professionals.

Another finding is that giving access to full text versions of research journals, and a short training in searching the literature were not enough to change practitioners' degree and level of research utilisation within the time frame measured. This is a second starting point for interventions and pedagogical practices, now with regard to evidence based practice. We advise to introduce in the curriculum small-group learning that focuses on clinical uncertainty and not limit the approach to training in literature searching and appraisal skills. Small-group learning with a focus on clinical uncertainty and dilemmas is perhaps especially recommended for veterinarians. In the veterinary domain evidence from research findings is often limited and hence the need to exchange experiential knowledge, local context and whatever evidence that is available in a critically reflective way is of paramount importance. Managing uncertainty could become a valuable element of the medical socialisation process, when teachers acknowledge that uncertainty is an essential capacity of the veterinary medical profession. As for achieving more process oriented teaching, we expect that teacher development is required even though it is unknown to what extent teachers are already practising this behaviour.

Some ideas for interventions that enhance research utilisation emerge from the literature but we believe that to achieve change in healthcare settings to accommodate for evidence based practice is not easy. Social, cultural and affective factors that influence application of knowledge to clinical practice have to be considered, as well as acknowledge the large diversity in definitions of evidence based practice. Searching and interpreting the literature all by themselves is considered very demanding by veterinarians working in general practice. At the same time, we can learn from the medical domain that developing clinical guidelines in isolation from practitioners, and distribute these guidelines to practitioners will probably mainly lead to non-adherence. We suggest that alternative models for cooperation are to be studied carefully within the veterinary profession.

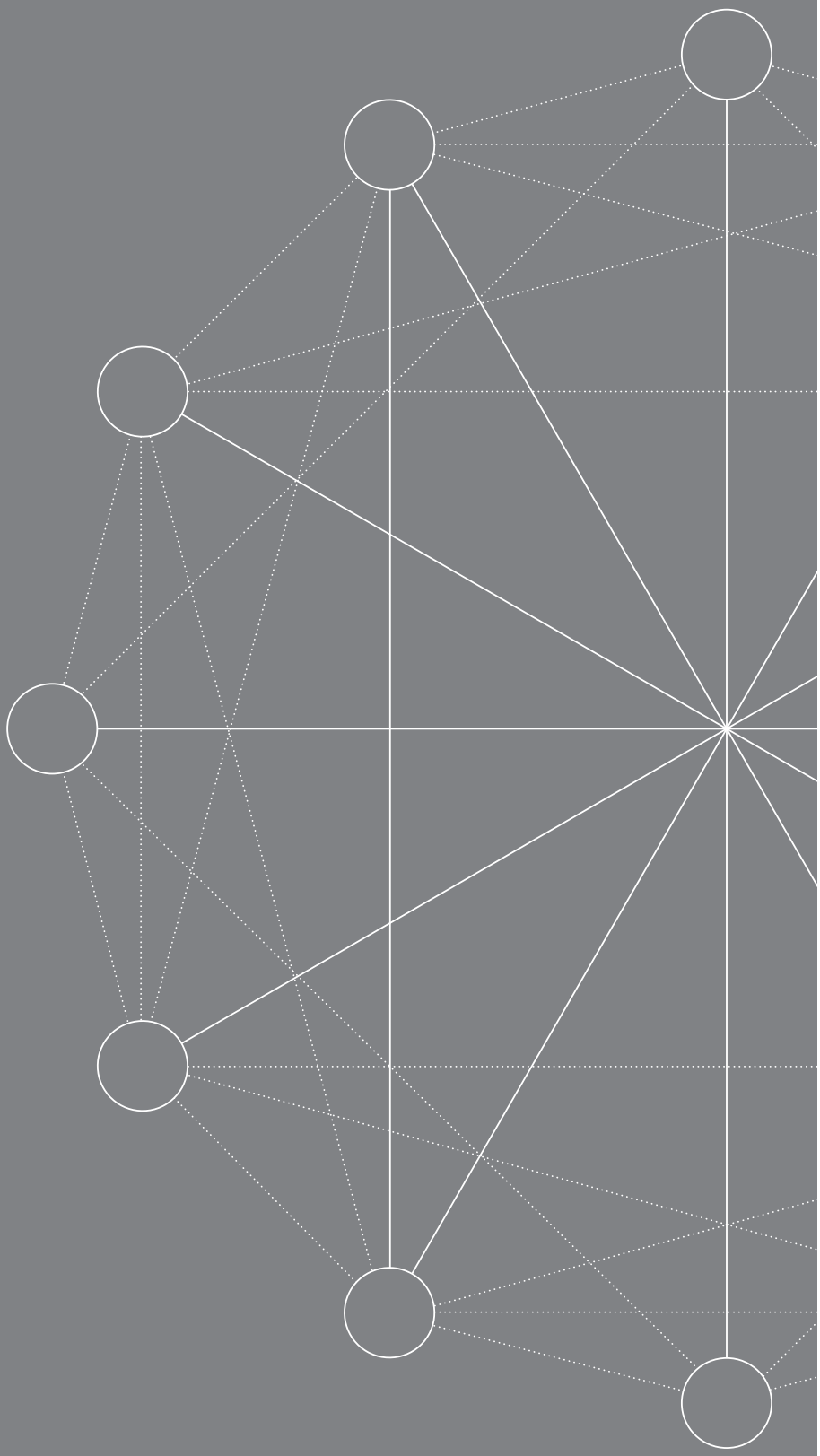
Critical reflections on individual studies were included in the chapters. In the general discussion we made our own research paradigm explicit, to show how the issues and methods described in this thesis belong together as a whole. Our research paradigm, which is a so-called grand theory where personal epistemologies, ontology and methodology are associated, is called Critical Theory. Within this paradigm belong

personal epistemologies that indicate that knowledge is co-constructed between individuals and groups. We do not claim that our findings apply to all other veterinarians because the participants in our studies are to be considered atypical for the whole population of Dutch veterinary practitioners.

Future Directions and Conclusion

Several directions for future studies emerge from our studies. These are: openness about uncertainty; personal epistemologies of veterinary professionals but also those of teachers; interventions that do help to increase research utilisation of veterinary professionals; diversity in expertise and investigations in online or blended communities. Researchers that are considered to offer valuable starting points for these further studies were pointed out.

In sum, when learning communities of veterinary professionals are to fulfil their potential, interventions and pedagogical practices should strive for an increase in levels for CRD aspects. To harvest the advantages of learning in social interaction, it is essential to address each other's reasons and reflections more often. To enhance the level and frequency of CRWB relatively straightforward interventions and pedagogical practices emerge, such as setting up training sessions, appointing moderators or adjusting parts of the curriculum. Our studies indicate, however, that the perceived need for lifelong learning and personal epistemologies are more important to enlighten and enhance learning in communities, with regard to evidence based practice.



SAMENVATTING

Binnen de veterinaire beroepsgroep vinden, zowel in Nederland als wereldwijd, twee belangrijke ontwikkelingen plaats: de toenemende behoefte van professionals om te blijven leren gedurende hun loopbaan en de groeiende noodzaak om op een *evidence-based* manier te werken. In onze studies onderzoeken we hoe professionals leren in leergemeenschappen, en verkennen we hoe dat kan helpen om te ontwikkelen richting onderbouwde praktijkvoering (waarvoor we in de samenvatting de Engelse term *evidence based practice* zullen gebruiken). Op basis van sociaal constructivistische leertheorieën, nemen we aan dat kritisch reflectief werkgedrag (in de rest van de samenvatting afgekort als CRWB; *critically reflective work behaviour*) essentieel is voor leren van professionals én dat CRWB gedrag omvat dat noodzakelijk is voor *evidence based practice*. De leidende onderzoeksvraag voor al onze studies is: hoe kan de theorie van CRWB helpen om leren van veterinaire professionals in leergemeenschappen beter te begrijpen en te versterken, met het oog op *evidence based practice*? Om deze vraag te beantwoorden, hebben we vier studies uitgevoerd waarbij we zowel kwalitatieve als kwantitatieve onderzoeksmethoden hebben gebruikt.

Over continue ontwikkeling van veterinaire of medische professionals in leergemeenschappen, kleine groepen waarin autonome professionals met elkaar van gedachten wisselen, is niet veel bekend. Hetzelfde gaat op voor *evidence based practice* vanuit een leven lang leren perspectief, waarover geen studies bekend zijn in de veterinaire context. *Evidence based practice* is een proces van leven lang, zelf gestuurd, leren. Op basis van problemen uit de praktijk; een manier van werken en leren van individuen, die kritisch reflecteren op hun praktijk waarbij ze zich doorlopend afvragen wat wel en niet geldig bewijs is. *Evidence based practice* blijft niet beperkt tot het volgen of implementeren van richtlijnen, en gaat evenmin uitsluitend over het raadplegen van wetenschappelijke literatuur. Mogelijk kunnen leergemeenschappen veterinaire professionals helpen om resultaten van wetenschappelijk onderzoek te benutten, wat relevant is omdat vanuit onderzoek bij individuele medische professionals bekend is dat passief verspreiden van bewijs via tijdschriften of richtlijnen niet voldoet. Om te weten te komen hoe leren plaatsvindt in leergemeenschappen is verzamelen van gegevens in de praktijk en analyseren daarvan essentieel.

Het onderzoek naar leergemeenschappen en naar *evidence based practice* kent nog vele onbeantwoorde vragen, in het bijzonder rond veterinaire professionals. We hebben ervoor gekozen om leergemeenschappen te bestuderen door gebruik te maken van CRWB, een concept gebaseerd op sociaal constructivische leertheorieën. CRWB is ontwikkeld in studies over leren van medewerkers in grote organisaties maar het begrip leent zich ook goed om leren van autonome veterinaire professionals in leergemeenschappen te begrijpen. Bovendien voegt het begrip CRWB een nieuw perspectief toe door nadruk te leggen op leren als een proces, in ongestructureerde omgevingen,

met aandacht voor sociale interactie. Dit perspectief is belangrijk voor het veterinaire en medische onderwijs omdat daar toch nog vaak wordt uitgegaan van leren door individuen, terwijl in een (para)medische omgeving het werk steeds vaker door middel van samenwerking plaatsvindt.

CRWB bestaat uit een aantal afzonderlijke gedragingen die bijdragen aan leren, aspecten genoemd: openheid over fouten, ter discussie stellen van groepsdenken, vragen om feedback, experimenteren en kritisch uitwisselen van meningen. Openheid over fouten kan helpen om kennis te verwerven over wat wel en niet werkt, essentieel voor ervaringsleren. Groepsdenken, een neiging om het snel met elkaar eens te zijn, kan in groepen ontstaan wanneer leden (te) snel consensus proberen te bereiken en tegelijkertijd een atmosfeer creëren die kritische beoordeling ontmoedigt. Krijgen van feedback is essentieel om te leren, niet alleen in het onderwijs maar ook op de werkplek en in leergemeenschappen. Experimenteren gaat over uitproberen van nieuwe ideeën om alternatieven te verkennen. Tot slot, kritisch uitwisselen van meningen gaat over bijdragen van ideeën, informatie en meningen, die te bediscussiëren met anderen en kritische vragen te stellen. Kritische uitwisseling is belangrijk om kennis te ontwikkelen.

We zijn niet alleen geïnteresseerd in een beter begrip van leren maar ook in toename van leren. Onduidelijk is of toename van leren in leergemeenschappen vooral tot stand gebracht worden door aandacht te besteden aan kennis, vaardigheden of houding van individuele leden of door de omgeving, waarin de leden van de leergemeenschappen zich bevinden, aan te passen. Belangrijke vragen omdat ontwerpen van omgevingen, zoals leergemeenschappen, die leren faciliteren complex is. Misschien nog wel meer wanneer het gaat om leeromgevingen voor autonome professionals die in afzonderlijke organisaties werken, en daarmee mogelijk niet heel gevoelig zullen zijn voor sturing van bovenaf. Een beter begrip van leren in leergemeenschappen en hoe dat leren te versterken, kan beroepsverenigingen, opleidingen en veterinaire professionals helpen om leergemeenschappen op te richten en te onderhouden. Daarnaast kunnen de resultaten richting geven aan ontwikkelingen binnen curricula in de veterinaire opleidingen omdat daar toekomstige professionals voorbereid worden op een leven lang leren.

Hoofdstuk 2

Onze eerste studie had tot doel om CRWB als een aanpak van werk gerelateerd informeel leren beter te begrijpen. De eerste onderzoeksvraag die in deze studie aan de orde kwam was of gebruik van resultaten uit wetenschappelijk onderzoek (verder weergegeven als *research utilisation*) toegevoegd kan worden aan het begrip CRWB. *Research utilisation* is afwezig in het oorspronkelijke begrip CRWB, terwijl verwacht mag worden

dat kritische beoordeling van resultaten uit wetenschappelijk onderzoek een belangrijke dimensie is van kritische reflectie op de praktijk. De tweede onderzoeksvraag was in welke zin CRWB beïnvloed wordt door ervaren werkdruk, mogelijkheden om feedback te vragen en de gevoelde noodzaak tot leven lang leren van deze professionals. Vanuit bestaande vragenlijsten over CRWB en factoren die daarop van invloed kunnen zijn, met toevoeging van items over *research utilisation*, is een vragenlijst ontwikkeld die is verstuurd aan alle veterinaire professionals werkzaam in de praktijk in Nederland. Een model is opgesteld dat CRWB relateert aan ervaren werkdruk, mogelijkheden om feedback te vragen en de gevoelde noodzaak tot leven lang leren.

Van de 2775 dierenartsen die benaderd zijn, hebben 1292 dierenartsen de vragenlijst geretourneerd, een respons van 46%. Eerst is de helft van de data geanalyseerd door middel van exploratieve factor analyse, om de kwaliteit van de aangepaste vragenlijst te kunnen beoordelen. Met de andere helft van de data is het model getest, door gebruik van *structural equation modelling*. Nadat was gecontroleerd of aan de voorwaarden voor *structural equation modelling* was voldaan, door testen van een meetmodel, is het structurele model met drie voorspellende factoren getest. De resultaten van de exploratieve factor analyse gaven aan dat CRWB een vier factor structuur had en de voorspellers van CRWB eveneens. Om schalen te verkrijgen die conceptueel te interpreteren waren, hebben we de factor '*research utilisation*' gesplitst in Verifiëren van Informatie en Openstaan voor Nieuwe Informatie. De andere factoren van CRWB die werden waargenomen waren Individueel CRWB en Kritisch in Interacties met Anderen. De exploratieve factor analyse liet vier voorspellers voor CRWB zien. De Gevoelde Noodzaak tot Leven Lang Leren werd eveneens in twee factoren gesplitst die we benoemden als Epistemologische Effectiviteit en Stabiliteit van Kennis. Uit de *structural equation modelling* volgde dat het model goed gerepresenteerd werd door de data en dat alleen de Gevoelde Noodzaak tot Leven Lang Leren effect bleek te hebben op CRWB. Ervaren Werkdruk en Mogelijkheden om Feedback te Vragen waren in ons model niet gerelateerd aan CRWB.

De resultaten suggereren dat *research utilisation* van belang is voor CRWB, een bevinding die *evidence based practice* op een meer expliciete manier met informeel werk gerelateerd leren verbindt. Persoonlijke opvattingen rond de noodzaak tot leven lang leren lijken meer effect te hebben op CRWB van professionals dan waargenomen eigenschappen van de (werk) omgeving. Dit suggereert dat wanneer professionals de idee hebben dat ze over voldoende kennis beschikken om problemen op te lossen, en daarbij geloven dat de kennis die noodzakelijk is voor de uitoefening van het vak zich niet zo snel ontwikkeld, minder CRWB zullen vertonen. Om leren op de werkplek door middel van CRWB te versterken, geven onze resultaten aan dat persoonlijke opvattingen rond de noodzaak tot leven lang leren het belangrijkste zijn.

Na deze vragenlijst studie concludeerden we dat uitsluitend meten door middel van zelfrapportage niet voldoende was om gedrag te bestuderen en dat observaties nodig waren. In vervolg studies hebben we de nadruk gelegd op leergemeenschappen, ook omdat beschreven was dat deze waardevol kunnen zijn voor de ontwikkeling van *evidence based practice*.

Hoofdstuk 3

In een gevalsstudie hebben we zeven verschillende leergemeenschappen geobserveerd; vijf groepen waarvan de leden afkomstig waren uit gezelschapsdieren praktijken en twee waarvan de leden afkomstig waren uit landbouwhuisdieren praktijken. We hebben geanalyseerd of professionals kritisch reflecteren en zich daar naar gedragen. De eerste onderzoeksvraag betrof hoe de aspecten van CRWB in leergemeenschappen van veterinaire professionals beschreven kunnen worden. De tweede onderzoeksvraag ging over de mate waarin leergemeenschappen verschillen op CRWB aspecten. Van elke leergemeenschap is één bijeenkomst in zijn geheel uitgeschreven en geanalyseerd.

Om CRWB aspecten te kunnen observeren in impliciet taalgebruik zoals dat gebruikt wordt in grotendeels ongestructureerde bijeenkomsten van professionals hebben we de CRWB aspecten verfijnd. Immers, CRWB aspecten waren voorheen vooral via zelfrapportage gemeten en vaak niet omschreven in termen die observatie mogelijk maakt. Deze verkenning van de eigenschappen van CRWB in dialoog resulteerde in een nieuw begrip voor leren in leergemeenschappen dat we kritisch reflectieve dialoog (CRD, van *critically reflective dialogues*) hebben genoemd. We hebben een analyse schema ontwikkeld waarin voor elk aspect van CRD vier verschillende manieren van communiceren werden geïdentificeerd: (1) interactief en reflectief (2) individueel en reflectief (3) individueel en niet-reflectief (4) ingeperkt. De eerste twee niveaus maken onderscheid tussen interactie waarin gereageerd wordt op redenen en reflecties van anderen, en interactie waarin dat niet gebeurt; bijvoorbeeld wanneer vooral vragen om nieuwe of aanvullende informatie worden gesteld. Het ontwikkelde schema laat onderscheid zien tussen leergemeenschappen wat betreft de manier waarop deelnemers CRD aspecten vertonen.

We veronderstellen dat het analyse schema hiërarchisch is. Professionals zullen mogelijkheden tot leren vooral benutten als ze communiceren op het hoogste niveau, waarbij ze op een interactieve manier met elkaar praten. Dat hoogste niveau lijkt op verkennend praten zoals dat beschreven is in de literatuur over leren door middel van dialoog in klassen. Het tweede niveau lijkt op cumulatief praten zodat dat in die bronnen beschreven is. Het derde niveau, dialoog op een niet interactieve en niet reflectieve dan wel onderbouwde manier, hebben we vergeleken met verhalen vertel-

len zoals dat voorkomt in studies over hoe medici op het werk met elkaar praten. Het vierde niveau is vooral theoretisch, en betreft situaties waarin reflectie en onderbouwing actief worden ontmoedigd.

De resultaten laten zien dat in deze leergemeenschappen veterinaire professionals vooral op een niet-interactieve manier met elkaar praten; dat wil zeggen individueel en reflectief, dan wel individueel en niet-reflectief. Dit suggereert dat deelnemers mogelijkheden tot leren missen. Deelname aan leergemeenschappen zal professionals waarschijnlijk niet helpen om meer evidence- based te gaan werken wanneer deelnemers beperkt tijd en aandacht besteden aan gezamenlijk kennis ontwikkelen zoals dat op het hoogste niveau optreedt. Onze conclusie is daarom dat leren in leergemeenschappen voor verbetering vatbaar is. Voor toename van leren in gemeenschappen moeten interventies zich vooral richten op de hoeveelheid interactie, in de zin van reageren op elkaars redenen en reflecties, en die proberen te versterken.

Hoofdstuk 4

In onze tweede gevalsstudie hebben we verkend in hoeverre CRD aspecten veranderen in de tijd. We bestudeerden twee dialogen van zes verschillende leergemeenschappen, gebruik makend van het analyse schema zoals beschreven in hoofdstuk 3. Tussen de twee momenten waarop bijeenkomsten werden geobserveerd en data verzameld, kregen deelnemers toegang tot volledige versies van wetenschappelijke tijdschriften en een korte training in het zoeken naar resultaten van wetenschappelijk onderzoek. Deze studie werd uitgevoerd aan de hand van de volgende onderzoeksvragen: ten eerste, in hoeverre veranderen leergemeenschappen van veterinaire professionals in de tijd wat betreft de geobserveerde niveaus in CRD aspecten? Ten tweede, in hoeverre nemen deelnemers in deze leergemeenschappen veranderingen waar in deze CRD aspecten? Ten derde, welke factoren zijn gerelateerd aan geobserveerde en waargenomen veranderingen in CRD aspecten, en aan verschillen tussen geobserveerde en waargenomen veranderingen?

Verandering is bestudeerd via observaties, door coderen van transcripten van bijeenkomsten die plaats vonden. Codes, die niveaus in CRD aspecten weergeven, in elk transcript zijn samengevat in één code per CRD aspect. Verandering werd beoordeeld door dit totaal oordeel van de eerste waarneming te vergelijken met het totaal oordeel van de tweede waarneming. Verandering werd ook bestudeerd door middel van zelfrapportage; via een vragenlijst en via een evaluatie bijeenkomst met leden van de leergemeenschappen.

De resultaten laten zien dat sommige leergemeenschappen meer open werden over fouten, mogelijk gerelateerd aan een toename in vertrouwen. Andere CRD aspec-

ten, zoals ze geobserveerd werden, lijken tamelijk stabiel te zijn in de tijd. Echter deelnemers hadden de idee dat *research utilisation* en vragen om feedback veranderd is in de tijd. Een verschil trad op tussen observaties en zelf-perceptie. Toegang tot wetenschappelijke literatuur en training had geen effect op het niveau van CRD aspecten. Na toegang tot volledige versies van wetenschappelijke tijdschriften, en een korte training in het zoeken naar resultaten van wetenschappelijk onderzoek, nam gebruik van literatuur voorafgaand aan of na afloop van de bijeenkomsten niet sterk toe. *Research utilisation*, wat voorkomt tijdens de bijeenkomsten, zagen de deelnemers als niet erg hoog. Deze beperkte interventie was niet genoeg om verandering tot stand te brengen in geobserveerd niveaus van CRD binnen de gemeten periode. Op basis hiervan concluderen we dat versterking van CRD in leergemeenschappen waarschijnlijk niet automatisch na verloop van tijd optreedt, hoewel we erkennen dat we slechts een beperkte periode hebben gemeten. In de analyse van (transcripten van) de evaluatie bijeenkomsten kwamen opvallende opvattingen van deelnemers over kennis en kennisverwerving naar voren; indicaties voor persoonlijke epistemologische opvattingen. Hiervan vermoeden we dat ze samenhangen met het feit dat interactie tussen deelnemers niet vaak voorkomt.

Hoofdstuk 5

Voorafgaand aan en tijdens het verzamelen van gegevens voor de gevalsstudies, is een Delphi studie uitgevoerd. In deze studie is een theoretische verkenning uitgevoerd naar gedragingen die in leergemeenschappen kunnen optreden waarmee randvoorwaarden geschapen worden om CRD op te roepen en te versterken. De volgende onderzoeksvragen waren leidend: ten eerste, welke factoren om randvoorwaarden te scheppen voor CRD in leergemeenschappen staan beschreven in de literatuur? Ten tweede, welke van deze factoren worden belangrijk gevonden door deskundigen op het gebied van leergemeenschappen, kennis management en *e-learning*? Ten derde, welke strategieën zou een externe organisatie kunnen gebruiken om deze factoren te realiseren in leergemeenschappen waaraan autonome professionals deelnemen? In deze studie ging de vraagstelling over autonome professionals als deelnemers aan leergemeenschappen die deels gebruik maken van *online* interactie ("*blended*" genoemd).

Op basis van de literatuur zijn 28 factoren geformuleerd. Deze principes beschrijven gedrag van deelnemers in leergemeenschappen, binnen de groep of daarbuiten ten bate van de groep, die autonome professionals aanzetten tot CRD. In twee rondes van een *online* Delphi studie gaven twaalf experts in kennismanagement, leergemeenschappen en *e-learning* hun mening over deze factoren. Daarna werd een bijeenkomst georganiseerd om strategieën te verkennen waarmee deze factoren geïmplementeerd kunnen worden. De Delphi studie resulteerde in een subset van 13 factoren die relevant werden gevonden voor CRD; waaronder als meest relevant beoordeeld "authenti-

citeit van de onderwerpen waarover gesproken wordt", "openheid over fouten", "zoeken van diversiteit in hun leergemeenschap, vooral in expertise, om verschillende gezichtspunten in de discussie te krijgen" en "wisselen van gedachten over hoe ze geworsteld hebben met bepaalde problemen" en "raadplegen wetenschappelijke literatuur door vaardigheden in zoeken van resultaten van wetenschappelijk onderzoek". De verkenning van strategieën bevestigde het belang van moderatoren om de discussie te leiden. Waarschijnlijk zal het niet eenvoudig zijn om als buitenstaander veranderingen tot stand te brengen bij autonome professionals die mogelijk minder gevoelig zijn voor richtlijnen. Over hoe verandering te bereiken in (factoren die invloed hebben op) het gedrag van deelnemers in leergemeenschappen werd in deze studie een raamwerk voor gedragsverandering bediscussieerd dat het belang van motivatie, mogelijkheden en beschikbaarheid benadrukt.

Algemene Discussie

In de algemene discussie bespreken we de resultaten uit onze studies aan de hand van de overkoepelende onderzoeksvraag. Daarnaast bediscussiëren we theoretische en praktische gevolgen voor de twee onderwerpen die zijn besproken in het begin van het proefschrift: continue ontwikkeling van professionals in leergemeenschappen en *evidence based practice*. We verkennen wat dit betekent voor de diergeneeskundige beroepsgroep en veterinaire curricula. Tot slot reflecteren we kritisch op de aanpak en geven mogelijke richtingen voor onderzoek in de toekomst aan.

Verschillen tussen geobserveerde en waargenomen waarden voor CRD aspecten illustreren het belang om niet alleen op zelfrapportage te vertrouwen. Bovendien bleek het nodig om het begrip CRWB te verfijnen: *research utilisation* moest toegevoegd worden en aspecten aangepast om observaties mogelijk te maken. Dit leidde tot het begrip CRD, waarin dezelfde aspecten voorkomen als in CRWB maar dan toegesneden op in dialoog zichtbaar gedrag in leergemeenschappen. Een verkenning van de eigenschappen van CRD aspecten in dialoog over werk binnen leergemeenschappen van dierenartsen resulteerde in een analyse schema waarin, binnen elk CRD aspect, vier verschillende manieren van communiceren werden geïdentificeerd. Het hoogste niveau in dit analyse schema, waar interactie optreedt met aandacht voor redenen en reflecties van anderen, biedt de beste mogelijkheden tot leren. Bovendien stellen we vast dat deze interactie eveneens noodzakelijk gedrag omschrijft wanneer professionals op een *evidence based* manier werken. Binnen deze leergemeenschappen toonden veterinaire professionals dit hoogste CRD aspect niet vaak, wat impliceert dat de beoogde, geïdealiseerde, doelstelling van leergemeenschappen nog niet gehaald wordt. Wanneer naar versterking van leren wordt gezocht dan zal aandacht besteden aan de opvatting van professionals en hoe deze te veranderen het meest opleveren.

Uit de twee gevalsstudies bleek dat CRD waarschijnlijk niet één begrip is maar een set van samenhangende aspecten. Misschien hoeven de niveaus van verschillende CRD aspecten niet sterk samenhangend te zijn; een hoog niveau op alle aspecten is misschien niet altijd noodzakelijk. Het is voorstelbaar dat verschillende type discussies om verschillende combinaties van niveaus vragen. Het is niet duidelijk of er een optimum in niveaus van de aspecten is, hoewel het redelijk lijkt te veronderstellen dat kritisch meningen uitwisselen, groepsdenken ter discussie stellen en experimenteren altijd van belang zijn. We suggereren dat de waarde van het begrip CRD ligt in het idee van een samenhangende set van gedragingen en dat openheid over de aspecten kan helpen om groepen tot waardevolle leergemeenschappen te laten worden.

Praktische Implicaties

Een onderwijskundige aanpak en interventies volgen uit begrip van leren, en versterken daarvan, in leergemeenschappen. Een onderwijskundige aanpak betreft veranderingen in de opleiding van toekomstige professionals, met effect op de lange termijn. Interventies zijn acties die op de kortere termijn beogen verandering tot stand te brengen in leergemeenschappen. Wat betekenen onze resultaten voor beroepsverenigingen, veterinaire opleidingen en veterinaire professionals? Eén van de belangrijkste bevindingen is dat het hoogste niveau binnen de CRD aspecten, waarvan we aannemen dat daar het meeste leren plaats vindt, niet vaak voorkomt. Onderwijskundige aanpassingen en interventies moeten naar ons idee dus bijdragen aan het bereiken van hogere niveaus. Om dat tot stand te brengen kan het helpen om een moderator te benoemen. Een moderator kan reflectie vragen stellen en op die manier deelnemers stimuleren om kritisch over hun eigen leerproces na te denken, of om impliciete vragen naar feedback meer expliciet te maken. Daarnaast lijken binnen de veterinaire opleidingen aanvullende inspanningen nodig om te zorgen dat samen met anderen kennis construeren meer algemeen wordt in het onderwijs. We menen dat het goed zou zijn indien docenten meer proces georiënteerd les geven, wat vraagt om te letten op leeruitkomsten die het proces betreffen, en afstemming met de manier van toetsing waarbij beoordeling plaats vindt op basis van goed redeneren. Verwacht mag worden dat docent professionalisering nodig is om proces georiënteerd les geven te ondersteunen.

Wanneer beroepsverenigingen leergemeenschappen willen stimuleren, dan wacht hen de paradoxale taak om de vrije, creatieve en door passie gedreven kenmerken van leergemeenschappen te behouden, terwijl ze tegelijkertijd specifiek, kritisch reflectief, gedrag van deelnemers willen stimuleren. Interventies moeten rekening houden met de spanning die dit mogelijk oplevert. Wanneer een onderwijskundige aanpak is ontwikkeld voor toepassing in een schoolse omgeving, dan moet deze toegesneden worden op autonome drukke professionals. Aan professionals moet bijvoorbeeld niet

gevraagd worden om leerdoelen op te stellen maar ze kunnen beter gezamenlijk werk gebaseerde doelen (en wat geleerd moet worden om die te bereiken) vaststellen. Om effectieve interventies te ontwerpen is het naar ons idee ook nodig om meer inzicht te hebben in opvattingen over kennis(ontwikkeling) bij veterinaire professionals, de zogeheten epistemologische opvattingen.

We hebben gevonden dat toegang geven tot volledige versies van wetenschappelijke tijdschriften, en een korte training in het zoeken naar resultaten van wetenschappelijk onderzoek, niet genoeg was om de intensiteit waarmee veterinaire professionals wetenschappelijke literatuur gebruiken substantieel te veranderen. Dit biedt een tweede aanknopingspunt voor een onderwijskundige aanpak en interventies, ditmaal met het oog op *evidence based practice*. We bepleiten de invoering in het curriculum van leren in kleine groepen waarbij de nadruk ligt op klinische onzekerheid, en de aanpak niet te beperken tot aanleren van vaardigheden in zoeken van literatuur en beoordelen. Leren in kleine groepen door in gesprek te gaan over onzekerheden en dilemma's past mogelijk in het bijzonder goed bij dierenartsen, aangezien in het veterinaire domein bewijs op basis van wetenschap vaak beperkter is dan in het medische domein. Daarom is het extra belangrijk om op een kritisch reflectieve manier ervaringskennis, lokale factoren en andere bronnen van bewijs uit te wisselen. Managen van onzekerheid zou een waardevol element kunnen zijn voor het proces van socialisatie binnen de medische opleiding; wanneer docenten erkennen dat onzekerheid een essentieel kenmerk is van het veterinaire medische beroep. Ook hier verwachten we dat docentprofessionalisering aan te raden is, hoewel onbekend is in hoeverre docenten dit al doen.

Vanuit de literatuur komen verschillende ideeën naar voren voor interventies die specifiek *research utilisation* kunnen versterken. Duidelijk is dat het niet gemakkelijk is om veranderingen te bewerkstelligen die in een gezondheidszorg omgeving *evidence based practice* mogelijk maken. Sociale, culturele en affectieve factoren die gebruik en toepassing van kennis beïnvloeden moeten worden meegenomen in de besluitvorming, naast de grote verschillen in definities van *evidence based practice*. Dierenartsen in de praktijk vinden zelfstandig zoeken en interpreteren van literatuur lastig. Tegelijkertijd kan uit het medische domein geleerd worden dat richtlijnen ontwikkelen losstaand van practici en deze vervolgens distribueren aan dierenartsen waarschijnlijk vooral zal zorgen dat dierenartsen in de praktijk de richtlijnen niet gebruiken. We raden de veterinaire beroepsgroep aan om alternatieve samenwerkingsmodellen, zoals die ontwikkeld zijn voor medici, grondig te bestuderen.

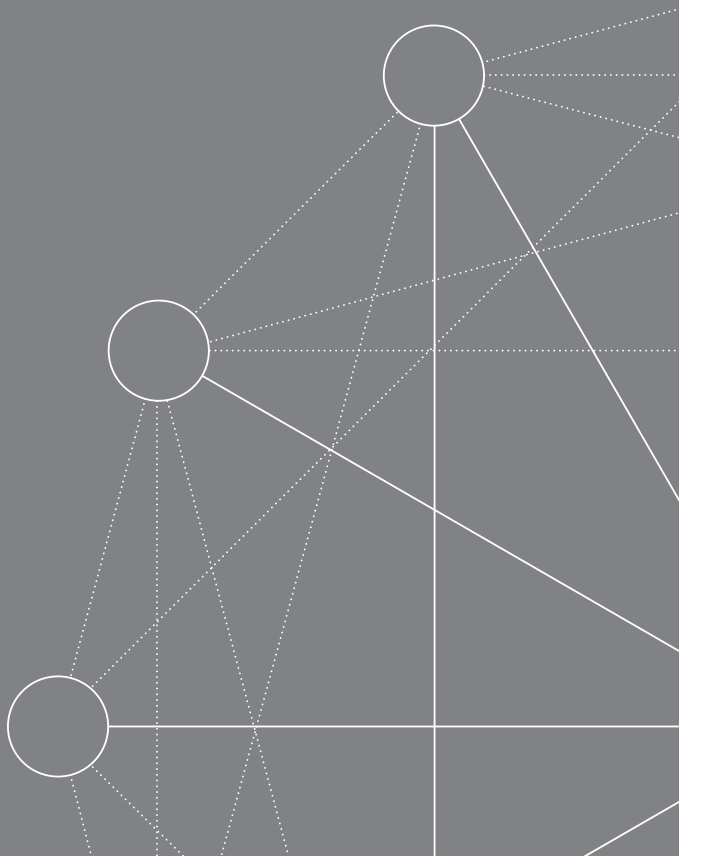
Kritische kanttekeningen op individuele studies zijn opgenomen in de afzonderlijke hoofdstukken, in de algemene discussie bespreken we hoofdzakelijk ons eigen onderzoeksparadigma, om te laten zien hoe de methoden in het proefschrift samenhan-

gen. Wij gaan uit *Critical Theory* als onderzoeksparadigma, dat is een samenhangende theorie waarin opvattingen over (verwerven van) kennis en methoden samenkomen. Binnen dit paradigma passen opvattingen over verwerven van kennis door middel van gezamenlijke constructie tussen individuen en groepen. We claimen met onze gevalsstudies niet dat alle bevindingen automatisch van toepassing zijn op elke leergemeenschap met dierenartsen in Nederland, omdat we verwachten dat de deelnemers in onze studies atypisch zijn voor de hele populatie van Nederlandse dierenartsen.

Vervolgonderzoek en Conclusies

Richtingen voor vervolgonderzoek die opkomen uit onze studies zijn ten eerste om te bestuderen of openheid over klinische onzekerheid een aspect van CRD kan worden. Ten tweede bevelen we nadere studie aan naar epistemologische opvattingen van veterinaire professionals, maar misschien ook naar die van docenten omdat zij invloed kunnen hebben op de manier waarop studenten ontwikkelen wat betreft epistemologische opvattingen. Ten derde is verdere studie nodig om te verkennen welke interventies wel helpen om gebruik van wetenschappelijke literatuur door dierenartsen te stimuleren Tot slot is verder onderzoek wenselijk naar de mogelijkheden van *online* contact tussen leden van leergemeenschappen, een richting die in dit onderzoek noodgedwongen is blijven liggen.

Samenvattend: wanneer veterinaire professionals de mogelijkheden voor leren in gemeenschappen willen benutten, dan moeten ze proberen (met interventies) om het niveau in aspecten van CRD te verhogen. In het bijzonder de wijze waarop leden in leergemeenschappen aandacht besteden aan elkaars redenen en reflecties is belangrijk. Om het niveau en voorkomen van CRD aspecten te vergroten zijn relatief eenduidige acties denkbaar, zoals het opzetten van trainingen, opleiden van moderatoren en aanpassingen aanbrengen in het curriculum. Echter, onze studies wijzen erop dat persoonlijke opvattingen dat de gevoelde noodzaak tot leven lang leren en epistemologische opvattingen bij deelnemers waarschijnlijk meer van belang zullen zijn om leren in leergemeenschappen te begrijpen en te versterken, met het oog op *evidence based practice*.



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Dit proefschrift is tot stand gekomen dankzij de medewerking, hulp en mentale steun van veel mensen die ik graag zou willen bedanken. In de eerste plaats natuurlijk alle dierenartsen die aan mijn onderzoek hebben meegewerkt. Jullie hebben vragenlijsten ingevuld, mij welkom ontvangen op bijeenkomsten en tijd gemaakt voor gesprekken: zonder jullie medewerking was dit boekje nooit tot stand gekomen! Ook materiaal dat niet expliciet in dit proefschrift is opgenomen heeft bijgedragen aan de gedachtenvorming en resultaten. Bij mijn observaties was ik onder de indruk van jullie gedrevenheid en betrokkenheid bij het diergeneeskundige vak. In het bijzonder wil ik Jurgen, Anton, Yvette en Simon bedanken die een sleutelrol speelden, dankzij jullie hulp werden mijn gevalsstudies mogelijk.

Uiteraard ben ik mijn begeleiders dankbaar. In het begin van mijn onderzoek waren Ineke Lam en vervolgens Ineke van den Berg mijn co-promotoren. Jullie hebben een essentiële bijdrage geleverd aan mijn eerste stappen op het pad van sociaal wetenschappelijk onderzoek. Ik voelde mij sinds jaren meer moleculair bioloog dan ooit, want de rol van wetenschappelijke theorieën kwam in mijn oorspronkelijke opleiding lang niet zo expliciet aan de orde. Juist over het belang van wetenschappelijke theorie heb ik veel geleerd, en dat vond ik een zeer inspirerend onderdeel van het onderzoek. Tijdens de laatste anderhalf jaar waren Maaike Endedijk en Debbie Jaarsma mijn copromotoren. Maaike, ik heb veel geleerd van jouw kritische – maar wel opbouwende feedback. En ik bewonder jouw grondigheid en wetenschappelijke kwaliteit zeer. Debbie, jij wist me te motiveren om door te gaan wanneer ik ging twijfelen of de deadline ooit wel gehaald zou worden. Jouw vaardigheid in omgang met mensen is benijdenswaardig. Tijdens mijn hele onderzoek waren Peter van Beukelen en Robert-Jan Simons mijn promotoren. Peter, jouw betrokkenheid bij het onderwijs aan de faculteit Diergeneeskunde is onvoorstelbaar. In mijn onderzoek wist jij goede vragen te stellen waardoor ik uit de theoretische beschouwingen terug keerde naar toepassing voor het onderwijs en naar het belang voor dierenartsen. Robert-Jan, ik begreep jouw feedback in de loop van de tijd steeds beter. Dat gaf me sterk het gevoel dat ik langzaam maar zeker grip op de materie kreeg, heel motiverend. In de beginfase begreep ik soms pas dagen later wat je met een vraag had bedoeld, in de eindfase kon ik direct tijdens het onderzoeksoverleg reageren.

Onderzoek doen is vooral leuk wanneer je daar met andere mensen over kunt praten. Dat kon in de twee onderzoeksnetwerken waarvan ik lid was, bij de onderzoeksbijeenkomsten van het (voormalige) IVLOS en tijdens bijeenkomsten van onze eigen research groep. Patricia, Inge, Josephine, Petra, Miranda, Thomas, Chris en Renate van de werkpleklerengroep, ik kwam altijd blij terug van onze bijeenkomsten in Arnhem waar we boven een kop cappucchino onze artikelen bespraken. Met de Design Science Research groep, met als stuwende krachten Joan en Daan, nam ik deel aan discussies over methodologie en daar kwam ik altijd vol energie en nieuwe motivatie vandaan!

Aan het IVLOS onderzoeksoverleg kon ik lang niet altijd deelnemen, omdat ik slechts een deel van mijn werkweek voor onderzoek beschikbaar had, maar ook dat was altijd heel plezierig. Het overleg in onze eigen onderzoeksgroep, kwaliteitsbevordering in diergeneeskundig onderwijs, heb ik in de afgelopen jaren enorm zien groeien. Hielden we eerst vooral wijdlopende discussies waarin alles leuk en onderzoekbaar leek, later voerden we toegesneden discussies over methodologische vraagstukken. Peter, Stephan, Debbie, Nicole, Annemarie, Harold, Ada, Tobias en Tim: bedankt!

Deze periode waarin ik onderzoek kon doen heb ik als zeer verrijkend ervaren, zowel persoonlijk als voor mijn werk als adviseur. Oorspronkelijk had ik de idee, het beroemde citaat van T.S. Eliot in gedachten, dat ik na deze *exploration "would know the place for the first time".* Echter, ik bleek juist gefascineerd door de constatering dat wetenschappelijk onderzoek helemaal geen ultieme waarheden oplevert, maar dat de waarde vooral zit in andere perspectieven en nieuwe manieren van kijken. Ik ben de faculteit, in de persoon van Jan, dan ook zeer erkentelijk dat mij de mogelijkheid is geboden om onderzoek te doen nadat mijn voorstel voor het College was goedgekeurd.

A favourite "distraction" from my research has been the NOVICE project which has established a network of veterinary (ICT) educationalists. In 2009 we have obtained, together with a group of veterinary educationalists, a grant within the EU lifelong learning programme. In this project the focus has been on learning communities as well, first of all with veterinary educationalists but next also with veterinarians. Sarah, Vicki, Tierney, Jan, Lisa, Mira, Tibor, Emilia, Mariana and Jean: you all show me the joy of working together internationally on innovative ideas, which hopefully we will be able to continue in the future!

Jurga, we have known you from the moment you arrived in the Netherlands from Lithuania. I have admired the way you pursued an education in graphical design so far away from home, and I am very happy that you were willing to help me with designing this thesis. Thank you.

Lieve pappa en mamma, jullie hebben mij tot een nieuwsgierig mens gemaakt en daar ben ik dagelijks blij mee. Caroline, we zien elkaar wegens de afstand tussen Utrecht en Warten (waar jullie een prachtige Bed & Brochje runnen) niet vaak in persoon, maar we weten elkaar altijd te vinden. Lou en Jannie, en uiteraard Maryl, jullie zijn een hele fijne schoonfamilie. Sterre, onze stralende dochter, je bent een slimme meid waar we al weer bijna tien jaar van genieten. Arend, onze lieve zoon, je bent een creatieve achtjarige die ons regelmatig laat lachen. Jullie zijn zowel een welkome afleiding voor mijn onderzoek geweest als een illustratie daarvan: alle theorie over leren komt bij jullie tot leven. Marc, je bent mijn stille kracht en grote bron van geluk.

CURRICULUM VITAE

Esther de Groot is geboren op 12 februari 1966, op een woonboot in de Haarlemmermeer. Zij voltooide haar middelbare school opleiding aan het Gymnasium Felisenum, Velsen. Van 1984 tot 1990 studeerde zij moleculaire biologie in Leiden. Na haar afstuderen ging zij werken als projectleider bij PWT, een stichting voor wetenschapscommunicatie. Stichting PWT (later veranderde de naam in WeTeN) richtte zich op publieksvoorlichting over het belang van wetenschap voor de samenleving, zowel economisch als cultureel. Naast haar baan bij PWT was Esther freelance journalist over populair wetenschappelijke onderwerpen.

Esther voerde projecten uit waarbij digitale middelen werden ingezet voor publieksvoorlichting; zij ontwikkelde bijvoorbeeld een Cdrom over voorspellend genetisch onderzoek. Eind 1998 stapte Esther over naar een baan bij de Faculteit Diergeneeskunde. In eerste instantie voor projecten waarbij, in samenwerking met docenten, digitaal lesmateriaal werd ontwikkeld. Later steeds meer als adviseur en projectleider op het gebied van digitale didactiek en e-learning. Ook adviseren en doceren over Evidence Based Veterinary Medicine ging deel uitmaken van haar werk.

In 2006 schreef Esther een onderzoeksvoorstel voor een tender die was uitgeschreven door het College van Bestuur van de Universiteit Utrecht. In dat voorstel kwamen Evidence Based Veterinary Medicine en leren samen. Zij combineerde onderzoek met onderwijskundig advieswerk. In 2009 kreeg Esther, samen met collega's uit het VIEW (*Veterinary Education Worldwide*) netwerk, een EU subsidie toegekend voor het Novice project over online leergemeenschappen. Naast deelname aan onderzoeksgroepen binnen de faculteit Diergeneeskunde en het (voormalige) IVLOS participeerde Esther in een werkplekleren netwerk en in een groep waarin Design Science Research centraal staat. Dat laatste resulteerde in een hoofdstuk voor een boek over dit onderwerp.

Esther werkt op dit moment aan het Europese project, Novice. Daarnaast schrijft zij mee aan aanvragen voor (praktijk gericht) vervolgonderzoek, voert e-learning projecten uit en geeft onderwijs.