TEAM LEARNING PROCESSES IN HIGHER EDUCATION AND INNOVATION

Bachelor thesis

To what degree can the basic team learning processes construction, co-construction and constructive conflict be recognized in team meetings of teacher teams focused on innovation in higher education, using an adapted coding scheme based on Visschers-Pleijers et al.(2004) and Van der Haar et al. (2013a)?

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Summary

Team learning is important in higher education for inter alia innovation and professional development. The core team learning processes that are mentioned the most in the context of education and innovation are sharing/construction, co-construction and constructive conflict. However, no qualitative research has been done that investigated all three core team learning processes in the context of teacher teams focused on innovation in higher education. It will be analyzed to what degree those team learning processes can be recognized in that context using an adapted coding scheme based on Visschers-Pleijers, Dolmans, Wolfhagen and Van der Vleuten (2004) and Van der Haar, Wijenbergh, Van den Bossche and Segers (2013a). Team meetings' transcripts of two different teacher teams that designed or implemented a new curriculum at the University of Twente, were analyzed. The results of this research were an adapted coding scheme that covers all three basic team learning process and could show some examples of the basic team learning processes in teacher teams focused on innovation in higher education. Furthermore, the results showed the first presumptions that co-construction seemed most to elicit from the transcripts, subsequently constructive conflict was observed and the team learning process sharing/construction was showed the least. Besides, most team learning processes ended with a conclusion. On top of that, the first indications are that in the transition phase (designing new curriculum) more team learning processes occurs than in the action phase (implementing new curriculum). However, the calculated Cohen's Kappa was too low for the second level coding. This resulted in new guidelines. Future research should verify these guidelines and could investigate further the first presumptions.

1.Introduction[1]

Team learning is important because it is a prerequisite for learning in organizations and influences several important factors, such as innovations (Decuyper, Dochy & Van den Bossche, 2010; Pak Tee Ng, 2004; Senge, 1990). Team learning can be considered as "*an ongoing process of reflection and action characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions."* (Edmondson, 1999, p. 353). It is necessary in schools that teachers work together in order for their professional development and/or design and implementing innovations (Doppenberg, Bakx & den Brok., 2012). Nowadays much more educational innovations focus on integrations of sciences to improve students' learning (Stalmeijer, Gijselaers, Wolfhagen, Harendza & Scherpbier, 2007). Multi-disciplinary teams of experts are required to design and implement educational innovations that integrate sciences (Stalmeijer et al., 2007). The University of Twente is an example of a university that implemented a new curriculum that consists of modular project-based courses that aim to increase students' success rate and promote students' independent development (University of Twente, 2012). Teachers from the University of Twente need to work together now to design and implement the new modular project-based curriculum. This qualitative research analyzed transcripts of team meetings of two teacher teams at the University of Twente.

Team learning has been investigated several times but it was not much researched before in the context of team learning within teacher teams in higher education. Furthermore, research about team learning is in general quantitative (e.g. Kostopolous, Spanos & Prastacos, 2011; Van den Bossche, Gijselaers, Segers, Woltjer & Kirschner, 2011). For instance the Team Learning Behaviour Questionnaire (TLBQ) has been used several times (Stalmeijer et al., 2007; Van den Bossche et al., 2011). However, qualitative research has scarcely been done in this area before (Van der Haar et al., 2013a). Furthermore, an advantage of doing qualitative research in the form of video tapes is that the real behavior can be observed instead of the perceived behavior that would be measured with scales. Validating the existing coding schemes of Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a) for team learning processes in the context of higher education and innovation, would expand our knowledge of team learning in different contexts.

This research aims to investigate whether interaction processes of knowledge construction take place and to what degree they can be recognized. The basic team learning processes of Van den Bossche, Gijselaers, Segers and Kirschner (2006) are referred to as the interaction processes of knowledge construction. The basic team learning processes of Van den Bossche et al. (2006) are construction, co-construction and constructive conflict. The theory of Van den Bossche et al. (2006) will be validated by searching for their team learning processes. Secondly, the purpose of the research is to examine whether a coding scheme can analyze those processes. Hence the existing coding schemes of Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a) that encode the team learning processes of Van den Bossche et al. (2006) will be used within the context of teacher teams in higher education and innovation. The main research question is: *To what degree can the basic team learning processes construction, co-construction and constructive conflict be recognized in team meetings of teacher teams focused on innovation in higher education, using an adapted coding scheme based on Visschers-Pleijers et al.(2004) and Van der Haar et al. (2013a)?*

2. Theoretical framework

Many team learning models use the input – process – output framework that implies that input variables influence processes and that those processes result in output (Knapp, 2010). In the context of team learning, it means that team learning factors have an effect on team learning processes and that those team learning processes in turn influence team learning outcomes. Important team learning factors are beliefs about the interpersonal context, such as task cohesion, interdependence, group potency and team efficacy factors (Decuyper et al., 2010; Edmondson, 1999; Knapp, 2010). In particular team psychological safety has a strong relationship with team learning processes (Stalmeijer et al., 2007). In addition, leadership plays an important role (Hannes, Raes, Vangenechten, Heyvaert & Dochy, 2013; Yorks, Marsick, Kasl & Dechant, 2003). Besides, team structure and contextual influences impact team learning (Nouwen, Decuyper & Put, 2012; Timmermans, Van Linge, Van

[1] Acknowledgment to R. Bron and M.D. Endedijk for their support.
The complete study, including all attachments, is available on request from the author.

Petegem, Van Rompaey & Denekens, 2012). The core team learning processes could be considered sharing/construction, co-construction and constructive conflict (Decuper et al., 2010; Van den Bossche et al., 2006). These team learning processes are investigated in several contexts but also specific in the context of education and/or innovation (e.g. Stalmeijer et al, 2007). Other team learning processes, such as reflexivity, also exist but it is twisted how important those are (Nouwen et al., 2012). Team effectiveness or team performance can be considered in general as team learning outcome (Edmondson, 1999; Van den Bossche et al., 2006). Some researchers recognize first another team learning output namely the development of shared mental models which in turn lead to team effectiveness (Van den Bossche et al., 2006; Van den Bossche et al., 2011). Shared mental models are *team member's shared, organized understanding and mental representation of knowledge about key elements of the team's task environment* (Nouwen et al. 2012, p. 2103). Shared mental models are the common ground or in other words the agreed-upon interpretation of the situation (Van den Bossche et al., 2006). Team learning output can be more specific in the context of education in terms of change in teacher cognition and/or behavior (Doppenberg et al., 2012), team's collective competence (Ohlson, 2012) or instead focussing on educational quality (Stalmeijer et al., 2007).

The input-process-output model is reflected in the team learning model of Van den Bossche et al. (2006). Figure 1 displays graphic the team learning model of Van den Bossche et al. (2006). In the model of Van den Bossche et al. (2006) beliefs about the interpersonal context influence team learning behavior that can lead to mutually shared cognitions which in turn improves team effectiveness. Beliefs about the interpersonal context are psychological safety, social cohesion, task cohesion and group potency. Team learning behaviors consist of the elements; construction and co-construction of meaning and constructive conflict. Input variables or in the case of team learning the team learning factors are the beliefs about the interpersonal context. The process variables that will be influenced by the input variables are team learning behavior. The process variables result in output. In the model of Van den Bossche et al. (2006) the first output is mutually shared cognition and it finally lead to team effectiveness. Mutually shared cognition is another word for shared mental model which is the common ground or agreed-upon interpretation of the situation. The model of Van den Bossche et al. (2006) appears to fit the most in the context of teacher teams in the context of innovation. Their research findings are confirmed by other researchers in different contexts. For instance, their team learning behaviors construction, co-construction and constructive conflict are also used by many other researchers and team effectiveness has also often been mentioned as team learning output. This framework has also been tested in several real-life contexts but also once in the context of (medical) higher education in which teacher teams designed and implemented integrated courses (Stalmeijer et al., 2007). For example, Stalmeijer et al. (2007) showed a positive relationship between psychological safety and the team learning processes. Below the team learning behaviors will be described in further detail because those are the basic interaction processes of knowledge construction.

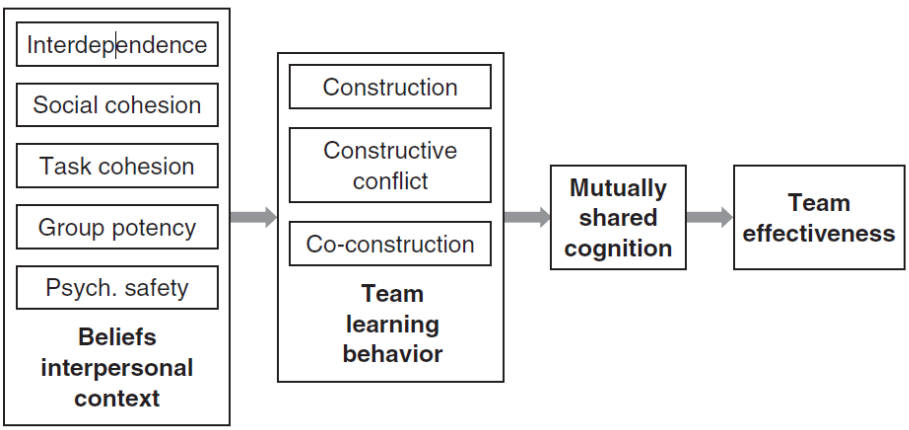

Figure 1. Team learning beliefs and behaviors model (Van den Bossche et al., 2006, p. 503)

Decuyper et al. (2010, p. 116) define sharing as "*the process of communicating knowledge, competencies, opinions or creative thoughts of one team member to other team members, who were*

not previously aware that these were present in the team". Construction (of meaning) is the process of one team member articulating personal meaning incorporated in a social setting by doing activities such as describing the problem situation and how to deal with it while other team members actively listening and trying to grasp explanations and intentions (Van den Bossche et al., 2006). Or in other words, construction of meaning occurs when team members reach a shared concept of a certain situation (Stalmeijer et al., 2006). Visschers-Pleijers et al. (2004) use the term elaboration instead of sharing or construction. They view elaboration as the process of using information or knowledge in a richer or wider context.

"*Co-construction is the mutual process of developing shared knowledge and building shared meaning by refining, building on, or modifying an original offer in some way*" (Baker 1994 in Decuyper et al.; 2010, p.116). Co-construction of knowledge is the process in which two or more group members collaboratively construct new knowledge or reach shared understanding (Visschers-Pleijers et al., 2004). Co-construction is a more profound understanding of a subject by interpreting, questioning and paraphrasing (Stalmeijer et al, 2007). Co-construction can be seen as a collaborative elaboration which is to say that while elaboration is an individual process, co-construction is always a collaborative effort (Visschers-Pleijers et al, 2004). Visschers-Pleijers could easier detect in their research examples of co-construction than examples of elaboration. The reason why it was more difficult to distinguish examples of elaboration was probably because in larger groups more team members have some significant input and team members would be interrupted more often (Visschers-Pleijers et al., 2004). Van den Bossche et al. (2006) also see a link between construction and co-construction because construction can result in co-construction. The individual construction of meaning is accompanied with the collaborative construction of meaning to develop new meanings that were not previously available (Van den Bossche et al., 2006). Decuyper et al. (2010) also see a kind of hierarchy between sharing/construction and co-construction. Sharing is namely a prerequisite for co-construction, but co-construction is more profound interaction because that leads to shared knowledge and new meaning that was not previously available to the team (Decuyper et al, 2010).

Constructive conflict is another team learning process that has been identified in research. It is a process of elaborated discussion that shows diversity in the team that leads to more communication and some kind of temporary compliance (Decuyper et al, 2010). Van den Bossche et al. (2006, p. 496) define constructive conflict as "*a negotiation of the differences in interpretation among team members by arguments and clarifications".* The definition of Stalmeijer et al. (2007) varies from the previous definitions because it is about a contradiction within an individual, namely between the individuals existing understanding and what the individual experiences. Those findings show that constructive conflict can both be an individual and collective process. Constructive conflict can be viewed as a vehicle to enhance (co-)construction (Van den Bossche et al, 2006; Van den Bossche et al., 2011). It seems to be necessary for reaching an agreement because the inserted meanings and mutual understandings should also be accepted by the team members, despite the fact that team members may have different perspectives, ideas and interpretation of the situation. Van den Bossche et al. (2011) findings show that constructive conflict is a significant behavior in the process of developing shared mental models, but (co-)construction does not contribute in itself to building shared mental models. According to Van den Bossche et al. (2011), if constructive conflict is lacking, no construction of a shared mental model will be build and team learning does not exist in a team. Van der Haar, Segers and Jehn, (2013b) doubt whether the 'sharedness' of constructive conflict could stay implicit or should be explicit, but their findings show that making it explicit is better. High performing teams namely use more constructive conflict endings with a conclusion than constructive conflict endings without a conclusion than low performing teams. Van der Haar et al. (2013b) suggest that constructive disagreement is good for emergency management command-and-control teams and should be promoted.

Despite the fact most of the research about team learning is quantitative research, still some examples of (qualitative) coding schemes exist that analyze the basic team learning processes (Van der Haar et al., 2013a; Visschers-Pleijers et al., 2004). A coding scheme helps to determine when a code should be used to identify a meaningful unit (Van der Haar et al. 2013a). Van der Haar et al. (2013a) as well as Visschers-Pleijers et al. (2004) code in two levels. First, they code on the utterance level/first level coding. Subsequently, they code on the episodic level/ second level coding. Hence utterances, such as a request and affirmation, will be coded and thereafter those combinations of

utterances will be translated into the team learning processes construction, co-construction and constructive conflict. This means that a sequence of codes (in the first coding session) about the same topic combine together a team learning process. The sequence of codes will not have a strict exact order of utterances but some key utterances will indicate a team learning process. For example, the codes question, information, argument (reason) and proposal could reveal the team learning process co-construction. Visschers-Pleijers et al. (2004) examined the team learning processes sharing/construction and co-construction. Whereas Van der Haar et al. (2013a) investigated co-construction and constructive conflict.

Van der Haar et al. (2013a) also made a distinction between multidisciplinary emergency management teams in different phases. They distinguish an action and a transition phase. The transition phase is when all team members are together on location for a meeting to share information, plan and decide upon actions in the next step. The action phase is when team members are operating separately on the scene with the people of their own assistance executing collective decision on actions and information about the current situation is collected for further multidisciplinary coordination.

2. Method

2.1 Design and participants

A qualitative research has been done in which transcripts of team meetings of two teacher teams at the University of Twente were analyzed. Two teams in different phases were researched to test the coding scheme in a variety of teacher teams. It could be analyzed if the coding scheme is usable in all phases of an innovation. In this case, two different teams were investigated namely a team that was in the transition phase (designing new curriculum) and a team that was in the action phase (implementing new curriculum). The teacher team in the action phase consisted of nine members including a module coordinator, project coordinator, student assistants and teachers. One of their team meetings consisted of seven members and the other team meeting of eight members. The teacher team in the transition phase consisted of ten members including a module coordinator and teachers. One of their team meetings consisted of six members and the other team meeting of eight members. The duration of the team meetings ranged from 52 minutes till 87 minutes.

2.2 Instruments and procedure

Team meetings of the teacher teams were recorded on videotape and a spate audio file was recorded as an extra source of data. From each teacher team two team meetings were recorded. Besides some notes of what people said were made during the meetings, so it would be easier to transcribe the meetings. The participants were informed that the data would be treated confidentially and the videotapes and audio files will be stored until 5 years after the project has finished and will then be deleted. The names in this article are not the real names but are pseudonyms.

2.3 Analysis

First of all, one researcher transcribed the team meetings verbatim. Subsequently another researcher checked the transcripts with the audio to improve the transcription quality. The transcripts only take into account verbal communication.

Secondly, an adapted coding scheme was constructed. It is not practical to code the team meetings twice with two different incomplete coding schemes (of Visschers-Pleijers et al. (2004 and Van der Haar et al. (2013a). Therefore the two coding schemes were merged together to one adapted coding scheme that covers all three team learning processes. An overview of the different codes of the coding scheme's Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a) and the adapted coding scheme can be seen in Table 1.

Table 1
Overview coding scheme's Visschers-Pleijers et al. (2004), Van der Haar et al. (2013a) and adapted coding scheme

First level coding		
Visschers-Pleijers et al. (2004)	*Van der Haar et al. (2013a)*	*Adapted coding scheme*
Arguments - Argument reason - Argument counter - Argument condition - Argument continuation - Argument consequent		Argument reason
Evaluations		Evaluation
Repeats		Repeat
Questions - Open question - Question verification	Question - Situation - Task - Team	Questions - Open question - Question verification
Requests	Command task	Command/request
Proposals	Proposal task	Proposal
Confirmations	Affirmation task	Confirmation/affirmation
Negations	Conflict - Situation - Task - Team	Argument counter/ negation/ conflict
Statements	Information simple fact - Situation - Task -Team	Information/statement
	Information interpretation - Situation - Task - Team	
	Information anticipation - Situation - Task	
	Structuring team	Structuring
	Decision task	Decision
Second level coding		
Visschers-Pleijers et al. (2004)	*Van der Haar et al. (2013a)*	*Adapted coding scheme*
Elaboration - Question - Reasoning -Conflict		Sharing/construction - with conclusion - without conclusion
Co-construction - Question - Reasoning - Conflict	Co-construction - with conclusion - without conclusion	Co-construction - with conclusion - without conclusion
	Constructive conflict - with conclusion - without conclusion	Constructive conflict - with conclusion - without conclusion

The codes were compared and the number of codes were reduced by combining them on codes with the same meaning. That is why confirmation/ affirmation, information/ statement, argument counter/ conflict/ negation, command/ request were merged on the first level. All main categories of the first level of Visschers-Pleijers et al. (2004) were used and almost all main categories of Van der Haar et al. (2013a). Except for the main categories information simple fact, information anticipation and information interpretation that were merged to one main category statement/information. The reason for combining was because the division could not be observed in the team meetings. Even if this division could be found, than it would not be helpful for the second level coding to categorise the team learning processes. Besides, Van der Haar et al. (2013a) divided the main categories of the first level coding also often in task, team or situation. This second coding is not used because it does not fit in the context of teacher teams in higher education because in general tasks and situations will not be much discussed in team meetings of teacher teams comparing to emergency management command-and-control teams. However, coding on this kind of topics will give more an impression about which topics team learning will be about, but will not offer more information about the team learning itself. That is another reason why coding on team, situation and tasks are not included. Visschers-Pleijers et al. (2004) also used the subcategories open question, question verification, argument reason, argument consequent, argument continuation and argument counter. However, because there are so many subcategories of arguments, the distinction between the subcategories is not very clear (also based on coding with the second rater of the first level coding). Furthermore, only the relevant codes remained. Codes are relevant when they could indicate a specific team learning processes. For example, argument continuation is not included because it does not contribute for assigning a team learning process and is only an indication of a continuation of a previous code. It would be more useful to see that specific code. Hence, only argument reason and argument counter(/negation/conflict) are used. Argument reason is the collection of the subcategories. Argument counter remained because it can indicate the team learning process constructive conflict. The subcategories question verification and open question are still used because it indicates how profound and what kind of information has been asked and as a result of that how profound the team learning would be. Furthermore, question verifications can be used in the team learning process sharing/construction but open questions would indicate co-construction of constructive conflict. On the second level coding the main categories sharing/construction, co-construction and constructive conflict were used. The definition of sharing/construction has been modified a little bit, namely *mainly* one team member communicate knowledge, competencies, opinions or creative thoughts to other team members. This has been done because in large groups members are more easily interrupted by other team members. However, if still mainly one team member contributes to the team learning, it would still be the team learning process sharing/construction. Van der Haar et al. (2013a) made the distinction between team learning process that end with or without a conclusion. This classification is maintained because it offers more information about how profound and how well the team learning was. Visschers-Pleijers et al. (2004) divided the team learning processes also on the categories reasoning, questions and conflict. However, the choice has been made not to categorise every team learning process further. Often the team learning processes contains reasons as well as questions. Furthermore, the category conflict should indicate the team learning process constructive conflict and not the other two team learning processes based on conflict. The new coding scheme was created by one researcher and checked by another researcher, so it could be adapted to an even more valid and reliable instrument. This new coding scheme included the chosen codes with clarification and examples of the team meetings.

Thirdly, a half transcript of team meeting was coded with Atlas Ti by two coders to calculate Cohen's Kappa as a measure of inter-rater reliability for the first level coding. One coder has created the coding scheme and the other coder is new with this research. This was done to increase the validity of the research investigator triangulation (Onwuegbuzie and Leech, 2007). Besides, only a half team meeting was representative enough because it included 510 codes. Cicchetti (1981) namely advises that the minimal required N for the valid application of weighted kappa can be approximated by the formula $2k^2$ (in this case minimal 288 codes were necessary). The reliability was good because Cohen's Kappa is 0,821 for the first level coding.

Subsequently, one researcher coded the other transcripts alone with Atlas ti. However, inductive coding was still possible. Thereafter, one researcher selected the team learning process based on the second level coding and presented it to another researcher. This researcher coded almost three

transcripts on team learning processes which represented 43 team learning processes. This amount of team learning processes was enough representative because three basic team learning process requires at least 18 codes and the team learning processes with or without a conclusion requires at least 8 codes according to Cicchetti (1981). The Cohen's Kappa was 0,606 for the basic team learning processes in the second level coding. The Cohen's Kappa was 0,628 for the team learning processes with or without a conclusion. However, those Cohen's Kappa are too low. The researchers discussed with each other about the different team learning processes. It appeared that a lot of agreement was reached about one design team meeting of the teacher team that is in the transition phase. In contrary, limited agreement was reached about an evaluative team meeting of the teacher team in the action phase. One of the main reasons for disagreement probably was because not both coders were sure if an assigned text was a team learning process and when the team learning process starts and ends. It was decided to made more clear when a sequence of the transcript is about one topic and can be named as a team learning process. Guidelines for coding have been expanded. Thereafter, a new team meeting has been coded by both coders. This Cohen's kappa was not calculated because it were not enough codes. However, after discussing the team learning processes, agreement could be reached about the basic team learning processes of that meeting. The other team meetings have been coded alike.

Finally, the adapted coding scheme (including clarification, examples and frequencies of codes) and guidelines for coding have been listed in the report. Furthermore, examples of team learning processes have be shown and conclusion have been drawn. Besides, every team learning process has been counted in a team meeting and in each phase and have been displayed in a table.

3. Results

3.1 Adapted coding scheme

The clarification and examples of each code can be read in Table 2. The several revisions are included in this adapted coding scheme.

Table 2

Adapted coding scheme

First level coding			
Codes	**N**	**Clarification**	**Example**
Structuring	105	When a team member creates structure in the process. This category includes statements specifying the agenda of the meeting, asking/allowing someone to talk, urging members to hurry, summarizing and inquiring whether the information is clear for all members.	- Maar het is zes over, zullen we gewoon beginnen dan? - We moeten het ook hebben over.. - Ja ik denk dat het beste dat we gewoon de vergadering de punten die we de vorige keer ook bespreken hebben even langs lopen. We beginnen met de actiepunten. Ik had daar zelf een aantal dingen op de agenda gezet. Het rooster waar we over moeten praten en de invulling van het project.
Evaluation	624	Making a judgment. Giving an opinion.	- Ik vond dat groep 1 een zeer goede presentatie had.
Argument reason	293	When someone gives reasons for an opinion/decision/action.	- Ach het was echt slecht. Ze hadden tabellen maar alle waardes moest je met duizend vermenigvuldigen.
Argument counter/ negation/ conflict	197	When reasons against previous opinion(s)/decision(s)/action(s) are told. When disagreement about a topic occurs between different people. When contrasting things are mentioned. Or when someone reject.	A: Waarom formule? Als ik zie tabel met resultaten voor mij is dat genoeg. G: Als het niet goed is, dan wil je wel weten wat ze gedaan hebben. A: Als het niet goed is.. Ja maar we hebben tentamen dus ik vraag. Waarom. Anders denk ik dat het

			verslag niet vijf pagina's maar misschien 25. G: Ja maar ze moeten het wel kort en krachtig opschrijven wat aannames en formules maar niet te lang. Hebben we een restrictie mee gegeven?
Decision	10	When a topic or problem has been concluded. This can lead to command or requests.	G: Dan staan er op woensdag ook werkcolleges, die horen bij dat college. Nou zit daar natuurlijk geen werkcollege aan vast. Doen we daar iets mee? Willen we daar dat een paar van de tutoren daar rond lopen om wat vragen te beantwoorden? Dat we het op die manier doen of zeggen we doen het helemaal uit het rooster? T: We hebben al een vragenuurtje ook. Dat is toch niet nodig nog? Voor die Sankey en Grassman diagrammen oefenen of zo? G: Nee ik weet niet waarvoor dat is of andere dingen. T: Nee hoor. G: Dan halen we het uit het rooster. Oke. Vraag jij dat aan Frank? Of ze dat uit het rooster wil halen.
Proposal	163	Opinions or suggestions regarding how the team deal with situations.	- Toch stel ik voor dat we dit zo snel mogelijk vastleggen.
Command/ request	71	When a team member tell (other team member(s)) what actions (they) should (or should not) take or what information they should gather. This is often stated in the form of a question. This command will be hopefully be followed by an affirmation.	- Stuur ze (notulen) even?
Question verification	418	When a team member checks information by using in general more closed questions.	- We hadden speciaal voor hem de vergadering verzet of niet? - Zijn het ouderejaars?
Open question	105	When a team member requests information by asking. This question cannot be answered by saying only yes or no, but include more information.	- Hoe zou je dat willen doen?
Confirmation/ affirmation	948	When a person agreed to take a specific action or question.	H: Ja ik vind het zelf ook wel fijn als ik kan kiezen wie ik wil. B: Ja. Mee eens.
Information/ statement	947	When someone give facts, hypothesis, interpretations or descriptions.	P: Ik weet niet of iedereen uit elke groep iemand is die intervisie heeft gedaan van iedere intervisiemeeting. Frank en Thomas? T: Lotte en ik zijn bij de sessie met, nee Anke en ik zijn bij de sessie met Frans geweest.

Repeat	42	Words or sentences of person earlier will be said again. This is for clarification. Several people that confirm what previously is said, is not repeat but confirmation/affirmation.	A: Van Veenen zei je? M: Patricia. H: Patricia p a t

Second level coding

Team learning process	**N**	**Clarification**
Main category		
Sharing/construction - with a conclusion - without a conclusion	6 4 2	The process of communicating knowledge, competencies, opinions or creative thoughts of mainly one team member to other team members, who were not previously aware that these were present in the team, so a shared concept of a certain situation can be reached. The sequences had to be all based on the same topic and the codes information and arguments could be included. Other team members could contribute to the team learning process by confirmations/affirmations and asking question verifications.
Co-construction - with a conclusion - without a conclusion	33 23 10	The process in which two or more group members collaboratively construct new knowledge or reach shared understanding. The difference between sharing/construction and co-construction is that sharing/construction is when mainly all relevant utterances/codes are from one person, whereas it is co-construction when it is constructed by two or more members (equally). The sequences had to be all based on the same topic and the codes question, information, argument (reason) and proposal could be included.
Constructive conflict - with a conclusion - without a conclusion	19 15 4	A process of elaborated discussion/ negotiation of the differences in interpretations in the team that leads to more communication (such as arguments and clarifications) and some kind of temporary compliance. Constructive conflict should include at least once the code negations/conflict/counter-arguments and (critical) questions and evaluations could be possible.
Subcategory		
Team learning process with a conclusion	42	A team learning process is a complete whole. At the end of the team learning process something is learnt or decided. Team learning processes that were followed by a conclusion, could end by the codes structuring, confirmation/affirmation, command or decision.
Team learning process without a conclusion	16	A team learning process that has not a clear end. For example, it can be interrupted by a new question or introduction of a new topic but the question has not been answered or agreement has been reached between the different team members. The team learning process does not end with the codes structuring, confirmation/affirmation, command or decision.

3.2 Guidelines coding

Figure 2 shows the main steps of how to code. Below each step will be explained in further detail.

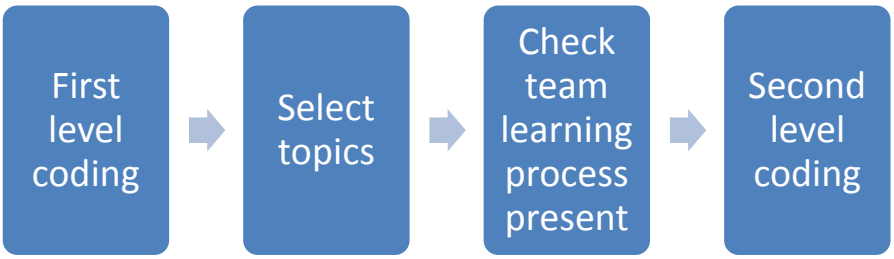

*Figure 2.*Schematic mains steps coding.

First, the text should be coded on the first level. To begin with, a code should be checked if it does not influence the process (structuring the team meeting) and subsequently the content of the code should be checked (e.g. proposal). The text should be first analyzed at meta-level before it can be analyzed for the other codes. Besides, questions should be first checked if it is not a proposal or command before it would be labelled as question verification or open question. The exact definitions of every code can be read in Table 2.

Secondly, when the first level coding has been done, texts should be selected on topics. A team learning process can start when a new topic will be discussed. The following codes can indicate the start of a new topic:

- structuring
- information
- evaluation
- proposal
- questions

A topic can end when a new (sub) topic starts and/or a conclusion has been drawn. The following codes can indicate a conclusion:

- structuring
- affirmation/confirmation
- command/request
- decision

For example, a new topic could be another group that would be evaluated ("We gaan nu in ieder geval naar groep 1, 2 en 3.") or from evaluating a group to discussing a mechanical engineering problem ("Dus ik hoop dat ik ze daar een beetje mee op de rit krijg. Wat nu verder de stand van zaken is, weet ik niet precies, ze hadden wel 1 vraag waar ik geen antwoord op wist en dat was de temperatuur van de vloeistof naar de koeltoren."). Moreover, a team learning process about one topic can be interrupted by a question about another topic or someone who enters or leaves the room. When the earlier team learning process will be continued in the same kind of way, it will all count as one team learning process.

Thirdly, selected topics should be checked if it is a team learning process. Because when one topic will be discussed it does not have to be necessarily a team learning process. The topic should contribute to a shared knowledge, understanding or compliance which (can potentially) affect the innovation (in this case a new curriculum). For example, evaluating student groups is often not a team learning process, except if it can lead to insights/understanding and as result of that decisions about the curriculum (For example; after observation that in groups often some silent students are present, were noticed: "Moet je voor het projecttentamen kijken of je die ook mee kunt krijgen. Want met intervisie is het zo dat diegene die het slimste is en het snelste zijn mond opentrekt die krijgt eigenlijk alle punten mee."). Furthermore, team learning also is present in a team, when the members gain insights about a (mechanical engineering) problem because it will affect the curriculum because the tutors can better explain to the students the solution. Whereas a more structuring process as deciding a date for a new team meeting is not a team learning process because it does not contribute to the new curriculum of the students.

Finally, you should code on the second level. It should be checked if the selected text is one of the three basic team learning processes (sharing/construction, co-construction and constructive conflict). Thereafter, the subcategory team learning process with conclusion or team learning process without a conclusion should be selected. For example, a selected text can be the team learning process constructive conflict with a conclusion. The exact definitions of every code can be read in Table 2.

3.3 Examples team learning processes

The teacher team in the transition phase shows an example of sharing/construction with conclusion in Table 3. The chairman Adam provides information and proposals about the new time table. The other team members only confirm what he says or ask him question verifications. Thus mainly one team member communicates knowledge and/or creative thought to the other team members that were not

previously present in the team. The team learning process ends with a conclusion because the team learning process ends with the code confirmation/affirmation and the other team members learnt more about the time table.

Table 3
Example 1 Sharing/Construction with a conclusion

Adam	Ehm, dus al we nu weer even op de wiskunde uitkomen want 8 weken lang. Het zou eigenlijk als je het gaat omrekenen dan zou je ongeveer 10 uur wiskunde in de week hebben en dat zou dan 5 keer een blok van 2 uur zijn. Als je dat zou willen verroosteren, en we hebben we al een keer eerder daar over gesproken, dan zouden we ook het liefste zeggen dan doe ik liever twee blokken in de week waarbij er dan contact is, instructies zou je dan willen geven en dan 3 keer een blok van 2 uur zou dan zelfstudie zijn.	Proposal
Bas	Ja	Confirmation/ affirmation
Adam	Ja	Confirmation/ affirmation
Adam	en als je dan even inderdaad kijkt naar het document hè, het werkdocument dan heb ik daar even rekening mee gehouden met die verroostering. Dat zie je dan ook in de eerste week, voorbeeld van de eerste week terug.	Information/ statement
Bas	Bladzijde 7 is dat hè?	Question verification
Adam	Dat is op bladzijde 7.	Confirmation/ affirmation
Adam	Waarbij je zelf aan gaf 'van nou, woendags dan ben je er gewoon niet, dus dat zou bijvoorbeeld in kunnen houden dat je op dinsdag en vrijdag bijvoorbeeld colleges hebt en de rest drie keer in de week een blok van twee uur zelfstudie.	Proposal
Niek	De onderste is EE, hè?	Question verification
Adam	De onderste is EE. [door elkaar gepraat]	Confirmation /affirmation
Adam	De bovenste is van Computer Sciences en de onderste is. Dit is puur alleen maar ter illustratie om voor iedereen een gevoel te geven van hoe vol ziet zo'n week eruit hoe ziet het eruit.	Information/ statement
Bas	Ja.	Confirmation/ Affirmation
Adam	We kunnen daar mee schuiven eventueel.	Proposal
Adam	Maar dat is dan een voorbeeld van hoe het rooster eruit zou zien.	Information/ statement
Bas	Ja.	Confirmation/ Affirmation
Adam	Want we wilden het liefst in eerste instantie een simpel rooster houden dat ze dus op bepaalde momenten op een dag altijd hetzelfde soort onderwijs zouden hebben.	Information/ statement
Bas	Ja.	Confirmation/ Affirmation
Adam	Je ziet al heel snel dat als je een beetje rekening wilt houden met mensen dan moet je daar al weer mee gaan schuiven.	Information/ statement
Bas	Ja.	Confirmation/ Affirmation

During the team meetings of the teacher team in the action phase, they often evaluate groups of students. Many times it does not lead to team learning. However, Table 4 demonstrates an example of co-construction with a conclusion. Someone noticed that some students were silent in the group. Someone else remarked that they should pay attention to those students during the project exams. Other team members offered their opinion/proposals. The team learning process ends with a

conclusion because the proposal(s) have been confirmed. Therefore the team learning process is co-construction because several team members collaboratively reach a shared understanding.

Table 4
Example 2 Co-construction with a conclusion

Mick	Vooral bij 11, 13 vond ik wat moeilijker.	Evaluation
Kees	Ja.	Confirmation/ affirmation
Mick	Omdat die drie wel heel stil waren.	Argument reason
Kees	13 bedoel je?	Question verification
Mick	Groep 13	Confirmation/ affirmation
Arthur	Iedereen was ...	Evaluation
Joost	Moet je voor projecttentamen kijken of je die ook mee kunt krijgen.	Proposal
Joost	want met intervisie is het zo dat diegene die het slimste is en het snelste zijn mond opentrekt die krijgt eigenlijk alle punten mee.	Argument reason
Marlies	ja maar met hertentamen al gauw niet. [stuk door elkaar praten] Dan krijgen ze echt een vraag.	Argument counter/ negation/ conflict
Edward	Persoonlijke vragen.	Information/ statement
Kees	dan wil je gewoon 1 voor 1 , je kunt gewoon met ze afspreken met ze nou Anke ga maar staan en teken maar eens een grasmandiagram..	Proposal
Marlies	Ja.	Confirmation/ affirmation
Kees	..wat staat er eigenlijk en waarom is dat zo dan. En als ze dan met de mond vol tanden staat dan kun je de volgende vragen en dan zorg je ervoor dat het net zo eentje is die ook zo stil is.	Proposal
Mick	Maar op zich wel een goede vraag Joost,	Evaluation
	uhm we moeten zo voor de projecttentamens, moeten wij het zo indelen dat nieuwe mensen die de eerste keer meelopen met meer ervaren uh..	Proposal
Kees	Ja.	Confirmation/ affirmation

Another example of the teacher team in the action phase can be read in Table 5. This example shows the team learning process constructive conflict with a conclusion. They discuss with each other how to assess the students (namely. how to divide the weighting of the components report, presentation and individual contribution). Several team members give their opinion and arguments and they eventually reach some kind of temporary compliance. The constructive conflict also ends with a conclusion because proposal(s) have been confirmed and a decision have been made (namely 50% report , 30 % presentation, 20% individual contribution).

Table 5
Example 3 Constructive conflict with a conclusion

Joost	Ik had nog even over dat projecttentamen die beoordeling daarvan gaan jullie dat ook nog hoeveel procent van het verslag?	Question verification
Marlies	Dat gingen we vandaag eigenlijk doen.	Information/ statement
Mick	Het heeft geen zin om het zonder Theo te doen.	Evaluation
Marlies	Want precies die heeft zijn eigen ideeën over.	Argument reason
Joost	Oke	Confirmation/ affirmation
Marlies	Misschien moeten we het nu juist wel doen.	Proposal
Joost	Maar wat was het idee ongeveer? Hoeveel procent verslag en	Open question

	hoeveel procent?	
Marlies	Het verslag is gewoon de helft.	Information/ statement
Mick	We hadden. Dat hadden we al een keer besproken.	Information/ statement
Guus	50 met 30, 20 geloof ik	Information/ statement
Joost	wat zei je?	Open question
Guus	50, 30, 20	Information/ statement
Mick	50% verslag, 30% individueel en 20% presentatie.	Information/ statement
Kees	20% presentatie	Repeat
Kees	Ja	Confirmation/ affirmation
Mick	ja precies	Confirmation/ affirmation
Marlies	30% individueel?	Question verification
Mick	Ja	Confirmation/ affirmation
Edward	Dat is veel te veel. De presentatie, dat is veel te veel.	Evaluation
Marlies	Ja	Confirmation/ affirmation
Marlies	maar daar gaat het net nu om. We willen juist dat ze in de presentatie alles laten zien zodat wij het verslag niet meer hoeven te lezen.	Argument counter/ negation/ conflict
Mick	Anders krijg je weer van die dikke pillen op je bureau.	Argument counter/ negation/ conflict
Marlies	Ja	Confirmation/ affirmation
Marlies	wat was jouw idee dan Edward? Wat zou jij willen?	Open question
Mick	5% presentatie..	Proposal
Joost	..80% doorzagen	Evaluation
Guus	50 rapport, 20 presentatie en 30 individueel.	Proposal
Edward	Ja	Confirmation/ affirmation
Edward	dus weinig individueel. Dat vind ik wat..	Evaluation
Marlies	Ja	Confirmation/ affirmation
Marlies	Maar het individueel is nu ook veel lastiger.	Argument counter/ negation/ conflict
Guus	Omdat je slecht, je kan heel lastig echt een negen of een zes of een acht aan geven. Je ziet wel van die weet er meer van af.	Argument reason
Mick	We hebben maar de helft van de tijd dan normaal.	Argument reason
Marlies	Ja.	Confirmation/ affirmation
Edward	Jawel	Confirmation/ affirmation
Marlies	Maar dat is nou het idee, als het dit jaar ook niet goed loopt dan doen we het volgend jaar anders.	Information/ statement
Mick	Dit houden we gewoon vast, 50,30,20. Ze krijgen van beide onderwerpen krijgen ze allemaal vragen.	Decision

Table 6 presents an example of constructive conflict without an end. The teacher team in the transition phase develops a new module in which students learn to collaborate. This example starts with the question if the students will work in designated teams or self-selected teams. Several team members contribute to that question by offering their opinion and arguments or even doing proposals. However, agreement has not been reached between the different team members. This team learning process namely has also not a clear end because another question has been introduced. Furthermore, the last team member could not finish his sentence (that was an opinion).

Table 6

Example 4 Constructive conflict without an end

Niek	Zijn het aangewezen teams of zelf uitgezochte teams?	Question verification
Bas	De eerste module is aangewezen en de rest is het eigenlijk een proces wat aan de studenten zelf is. We coachen dat wel.	Information/ statement

	Samenwerken is niet iets wat eh.. Voordat je het weet ga je elke keer met hetzelfde team elk project weer hetzelfde team samenstellen,	
Bas	Op zich is dat niet erg, maar je wilt ook eens een keer wat anders en..	Evaluation
Niek	Omdat hier de mensen uit twee richtingen komen.	Argument reason
Bas	Hier zou dat per definitie al anders zijn.	Information/ statement
Adam	En het is hier ook de bedoeling dat we zelf, dat wij als begeleiders de teams gaan samenstellen.	Information/ statement
Bas	Je kunt het ook door de studenten zelf laten doen.	Proposal
Adam	Ja,	Confirmation/ affirmation
Adam	maar dat is dan om te voorkomen dat ze inderdaad hun vriendjes opzoeken en altijd in hetzelfde.	Argument counter/ negation/ conflict
Bas	Dat kun je dan wel als randvoorwaarden opstellen. Je mag niet in een team waar je in de vorige twee modules hebt samengewerkt en nu weer samenwerkt.	Proposal
Adam	Dat zou kunnen. Ja	Confirmation/ affirmation
Niek	Het is niet zo moeilijk om dat…	Evaluation

3.4 Analysis team learning processes

The teacher team in the action phase that implemented a new curriculum, evaluated mainly the groups of students that take part of the new module. Whereas mainly the topics of the teacher team in the transition phase were about shaping the timetable and discussing which learning materials they are going to buy for the students. In the teacher team which was in the transition phase, occurred more team learning processes (62%). Despite the fact, that the team meetings of the teacher team in the transition phase was shorter, more team learning processes occur. Thus, the teacher team in the action phase had more opportunities for team learning but did not use it. In fact, the ratio of team learning processes comparing to the whole conversations is even higher in the teacher team in the transition phase. In general, the basic team learning process co-construction were recognized the most (57%), subsequently constructive conflict (33%) and the least detected team learning process was sharing/construction (10%). Furthermore, team learning processes with a conclusion (71%) were more observed than team learning processes without a conclusion (29%). For example, sharing/construction without a conclusion has not been observed in the teacher team which was in the action phase. Table 7 shows an overview of the team learning processes of both teams. Table 7 indicates that more constructive conflict and less sharing/construction occurs in the teacher team in the action phase in proportion with the teacher team in the transition phase. Between the two team meetings of the same team are not many differences in ratio. However, in both teams one team meeting has more constructive conflicts with end. Besides, each team differs in the amount of team learning processes of both team meetings but the team meetings also differed both in time (8 and 10 team learning processes differences between the own team meetings).

Table 7

Overview of team learning processes of both teams

Team learning processes	**Team meeting 1 action phase (60 min)**	**Team meeting 2 action phase (81 min)**	**Total teacher team in action phase**	**Team meeting 1 transition phase (87 min)**	**Team meeting 2 transition phase (52 min)**	**Total teacher team in transition phase**	**Total all meetings**
Sharing/ construction with a conclusion	0 (0%)	1 (6%)	1 (5%)	2 (9%)	1 (7%)	3 (8%)	4 (7%)
Sharing/ construction	0 (0%)	0 (0%)	0 (0%)	1 (5%)	1 (7%)	2 (6%)	2 (3%)

without a conclusion							
Co-construction with a conclusion	4 (67%)	7 (44%)	11 (50%)	7 (32%)	5 (36%)	12 (33%)	23 (40%)
Co-construction without a conclusion	1 (17%)	1 (6%)	2 (9%)	5 (23%)	3 (21%)	8 (22%)	10 (17%)
Constructive conflict with a conclusion	1 (17%)	5 (31%)	6 (27%)	6 (27%)	2 (14%)	8 (22%)	14 (24%)
Constructive conflict without a conclusion	0 (0%)	2 (13%)	2 (9%)	1 (5%)	2 (14%)	3 (8%)	5 (9%)
Total	6 (100%)	16 (100%)	22 (100%)	22 (100%)	14 (100%)	36 (100%)	58 (100%)

4. Conclusion

This research aimed to investigate whether the basic team learning processes sharing/construction, co-construction and constructive conflict take place and to what degree it can be recognized in the context of teacher teams focused on innovation in higher education. First of all, the basic team learning processes could be recognized in teacher teams in higher education and innovation. It was indeed possible to describe examples of all the basic team learning processes. Furthermore, the results show the first presumptions that co-construction was most present, subsequently constructive conflict and the least observed the team learning process sharing/construction. Besides, most team learning processes end with a conclusion. On top of that, the first indications are in the transition phase (designing new curriculum) more team learning processes occurs than in the action phase (implementing new curriculum).

Secondly, the purpose of the research is to examine whether a coding scheme can analyze those processes. Hence the existing coding schemes of Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a) that encode the team learning processes of Van den Bossche et al. (2006) were used within the context of teacher teams in higher education and innovation. It was not practical to code the team meetings twice with two different incomplete coding schemes. Therefore the two coding schemes were merged together to one adapted coding scheme that covers all three team learning processes. Furthermore, earlier research did not offer explicit guidelines how to code and did not discuss how to select texts of a team meeting. The adapted coding scheme offers the first guidelines when a text can be assigned as a team learning process and when a topic starts and end. After introducing more explicit guidelines, the two coders could easier reach consensus. The adapted coding scheme is reliable for the first level coding because the Cohen's kappa was high enough. However, the coding scheme is not yet very usable for the second level coding because the Cohen's kappa was too low. Thus the existing coding schemes of Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a) and the adapted coding scheme should be (further) adapted and tested, will it be usable to analyze team learning processes in the context of teacher teams in higher education and innovation.

In conclusion, this report attempted to answer the question to what degree can the basic team learning processes construction, co-construction and constructive conflict be recognized in team meetings of teacher teams focused on innovation in higher education, using existing coding schemes. This research produced an adapted coding scheme, based on the coding schemes of Visschers-Pleijers et al. (2004) and Van der Haar et al. (2013a), that covers all three basic team learning processes and could show some examples of the basic team learning processes in teacher teams in the context of higher education and innovation. However, the calculated Cohen's Kappa was too low for the second level coding. This resulted in new guidelines. Future research should verify these guidelines.

5. Discussion

This research has been valuable for the theory because the findings suggest that the team learning processes also can be recognized in team meetings of teacher teams focused on innovation in higher education. To what extend each team learning process occurs varies. It is in according with earlier research that the team learning process sharing/ construction is more difficult to distinguish in larger teams (Visschers-Pleijers et al., 2004). Visschers-Pleijers et al. (2004) offered the explanation that the interacting groups were relatively large (5-7 members) in their study. They suggest that in larger groups more individuals produce some significant input, so it is less easy to extract individual reason and explanations. Individuals would also be more often interrupted by other group members. The coding scheme of Visscher-Pleijers et al. (2004) seem to more applicable to gain insights into co-construction than in (individual) sharing/co-construction in teacher teams in higher education. However, the coding scheme could still be used because the definition of sharing/construction was a little bit adapted, namely that *mainly* one team member communicate knowledge, competencies, opinions or creative thoughts to other team members. Moreover, this research offers the first assumptions that in the transition phase (designing new curriculum) more team learning processes occur than in the action phase (implementing new curriculum). It could be that team meetings in the transition phase are more dedicated to team learning because they are totally focused on the future with the new innovation. However, teams in the action phase could be more evaluative about the present and are not especially focused to learn from the current experiences for improvements for the innovation. Furthermore, qualitative research has the first start of a coding scheme to investigate all three basic team learning processes. This study produced namely a coding scheme that can analyze all three basic team learning processes sharing/construction, co-construction and constructive conflict in the context of teacher teams focused on innovation in higher education. Whereas earlier qualitative research only include two basic team learning processes and conducted research in other contexts. Furthermore, earlier research did not discuss how to select texts of a team meeting. This research offers the first guidelines when a text can be assigned as a team learning process and when a topic starts and end.

Furthermore, this research is significant for practice. This research offers a coding scheme with guidelines how to analyze team learning processes for researchers. A manual could also be written for team leaders. It could help them to detect team learning processes and possibly stimulate team learning processes. For example, a team leader could encourage constructive conflict by asking critical open questions. The manual could raise awareness of the presence of team learning processes.

Besides, this study also has some limitations. First, the Cohen's kappa of the second level coding was too low. The Cohen's kappa could not be reliable calculated after adaptations consequently the adapted coding scheme with guidelines only is a first start for future research. Secondly, this study only investigated two teacher teams. Consequently the results of this study cannot be generalised to other teacher teams in higher education. Furthermore, in this study one teacher team that designed a new curriculum and one teacher team that implemented a new curriculum. Conclusions about differences and similarities between those two different kind of teams could not really be made because it are only one example of each kind of team. Other factors could play an influencing role such as leadership (Hannes et al., 2013; Yorks et al., 2003). In one team meeting of the teacher team in the action phase not the normal chairman namely was present and he arrived later in the other team meeting. Now one other team member took the role of chairman. It could be that the team meetings were different than usual and were not a representative examples of a teacher team meeting of that teacher team. This could be a reason why less team learning processes were observed in the teacher team in the action phase.

Future research could validate the new coding scheme but could also build on this study. For example, the adapted coding scheme could be validated on another university. Future research could study if some patterns in codes of the first level exist that together often form a specific team learning process. In this study the team learning processes were coded at the second level based on the content of the transcripts and the codes of the first level coding. The coding scheme could than even be more specific for detecting team learning processes focusing even more on first level coding. Secondly, follow-up studies could use the developed coding scheme for their own research but could also add some more codes. For example, the topics that would be discussed in the teacher teams meetings could be coded, such as the codes evaluation of groups, grades, time schedules etc. It can offer more

information about which topics more team learning processes are present. Future research could also taking more into account the limitations of this study. Future research could include more teams in the two different phases, so conclusions could be drawn between the two different teams. Besides, it could also be a possibility to track the team meetings of teams that start to design and subsequently implement the new curriculum, so an analysis of the whole process/trajectory can be done. The study is now a case study but a longitudinal study would be better. Moreover, the presumptions of Visscher-Pleijers et al. (2004) that sharing/construction is more difficult to distinguish in larger teams could be investigated. The influence of team size on team learning processes could be studied in future research. Despite the limitations of this research, the results show an impression to what degree the basic team learning processes can probably be recognized in team meetings of teacher teams focused on innovation in higher education, using an adapted coding scheme.

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