EUROPEAN SCIENCE FOUNDATION

ESF Exploratory Workshop on

"Bridging interdisciplinary approaches of team learning: Towards shared conceptualisations and methodological approaches"

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Convened by:
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SCIENTIFIC REPORT

1. Executive summary

The workshop was held at the Faculty Club of the KULeuven (Leuven) over three days, starting on the 23rd and ending on the 25th of September 2013. In total, 20 people participated in the workshop (Christian Harteis was absent), origating from six different countries (Belgium, Finland, Germany, Spain, the Netherlands and the United States).

In the Faculty Club, a meeting room was booked but participants could also use other rooms when working in smaller groups. The setting of the workshop allowed informal contact among the participants in between the sessions. In these moments, participants could retreat in the coffee room or have a walk outside. This possibility was fully used and participants took the opportunity to bond further in these recess periods. Overall, the atmosphere was relaxed and open, giving everyone the opportunity to contribute according to his or her wishes. The atmosphere was positively influenced by the open and enthousiastic approach of the convenors. They left plenty of room for the involvement of the participants, even in the course and planning of the workshop. Every session was evaluated, asking for the opinion of the participants and it was discussed what the next steps should be. The atmosphere positively evolved during the workshop, partly because of the interactive workshops, the informal moments during recess and lunch and the pleasant diners in the evening. In the latter, there was enough room for group formation to occur and social bonds to be created in a nice, relaxed and open atmosphere. Contributing to this group formation, was the team building activity that took place at the beginning of the first day. The task of this activity was to create your ideal scientific conference. Restrictions entailed that the length of the conference should be three days, there had to be 300 participants and it had to demonstrate frontline scientific research. To execute this task, the group was divided in three subgroups, each working on their own proposal. A round of presentations served as an ending point of this activity: each group presented their ideas concerning the 'ideal conference' followed by a whole group discussion. The teambuilding activity was followed by a tour around Leuven in which we passed the Old Market for a drink on one of the terraces of the cafes and finally the day was ended with a diner in the evening. The main goal of this starting activity was giving the participants the opportunity to get to know each other in a more informal atmosphere and thus laying the foundations for later productive collaboration in the following sessions. Starting of with this informal team building activity was possible since all the information that would be presented during the workshop (the articles and presentations of the participants) was available on a WIKI in beforehand. The idea was that all participants had already read this information and thus lengthy presentations of each participant at the beginning of the workshop would be obsolete, leaving more time for this teambuilding session and actual discussion.

The overall aim of the meeting was to bring together specialist researchers from across Europe to lay the theoretical and methodological foundations for an integrated approach of team learning. By gathering experts from different disciplines, the workshop aimed at exchanging different views of research models investigating team learning and different traditions within and across disciplines and explicating the independent variables and moderators that influence team learning. Furthermore, the workshop aimed at comparing different conceptualisations of these variables (measurements, instruments,...) and exploring new concepts such as shared mental models and shared regulation of learning. Complementary methodological approaches in research on team learning were explored. Thus, crossing boundaries by meeting with people who are experts in the field of team learning but utilise different perspectives, different methods, focus on different contexts,... and as such learning from each other, was one of the key aims of this workshop.

The first step towards reaching these aims consisted of a short plenary information session in which each participant shortly presented his or her research in maximum five minutes. The intention was to get to know each others models and methods of research concerning team and collaborative learning and looking for differences and commonalities of the different approaches. As mentioned earlier, these presentations could be restricted to a few minutes

since each participant already had access to all information on the WIKI. After a short break, three subgroups were formed to discuss on three different topics concerning the team learning research presented by the participants in this workshop: concepts, methodology and research models. The groups were formed by the convenors in such a way that interdisciplinary discussion about the similarities and differences in the concepts, methods and research models could occur. After lunch, the subgroup discussions continued, finishing up the ideas and casting it in a format that could be presented to the whole group. In the next step, the intention was to plan a Jig Saw session in which new groups were formed (2 participants of each subgroup in the previous session per group, thus mixing up people from the concepts group, the models group and the methods group) to discuss about what they learned during the previous session with each other. Plans had to be adjusted however, since most groups did not feel they were ready for this or that they had reached a sufficient level of agreement within their group. So, instead of a Jig Saw session, each group finished their final ideas and then each subgroup shortly presented their findings to the whole group, followed by a whole group discussion. The next day, these subgroup presentations were reviewed and it was attempted to formulate three to five key conclusions for each topic. After a short break, a whole group discussion took place on what is lacking in research on team learning and the formulation of a research agenda and research activities. After lunch, a few of the aforementenioned research activities were selected and discussed in small groups who focused on future plans (e.g. writing a position paper or looking for possibilities for funding another gathering). This discussion was followed by a short break and a closing session led by the convenors in which the future plans were shared in the group.

Overall conclusions to be drawn from this workshop include first of all that scholars from different disciplines use their own perspectives, concepts, models and methods. In this way, we cover a large variety of concepts but at the same time there are also similarities between the concepts we use. However, these are in need of further exploration in order to assess whether we mean the same thing when we use the same or similar concepts or whether we actually use completely different perspectives and thus different languages. Further mutual alignment is thus advisable. A next conclusion states that there are six dimensions that characterise the differences between the models we use to describe team learning: level, time, context, granularity, focus and epistemology. These six components are defining features of a model that tries to explain team learning and it would be interesting to try to fit more models on team learning into these dimensions in an attempt towards further validation. Next, it can be concluded that we use different methods and we thus can learn a lot from each other in order to better grasp the phenomenenon of team learning. But in order to fully tackle the difficulties and complexity of team learning, it is needed to further expand our methodological repertoire. Thus, an important final conclusion is that we can learn a lot from each other and our perspectives, concepts, models and methods are quite complementary. But, in order to better grasp the complexity of team learning, further interdisciplinary work (including other disciplines) seems to be recommended.

2. Scientific content of the event

The overall content of this workshop was gathered in a WIKI a few months before the start. Each participant was asked to prepare a few slides on their research and to send in one (or more) of their articles they wished to share with the other participants. The slides should include an answer to the question 'how do teams learn effectively?' and furthermore provide information on the issues they are investigating related to team learning, the problems they encounter, the methodology, pimary research model and background theories they use. All this information was assembled on the WIKI to which all participants got access and they

were asked to read the information that was on it in beforehand, as such gaining some knowledge about the research of the other participants (what is their perspective? Which concepts, research models and methods do they use? Etc.). [the reviewers of this report can gain access to this WIKI if desired by mailing to Sanna.Jarvela@oulu.fi]

A short introductory session at the beginning of the second day launched the scientific discussion on team learning. During one hour, every presenter had five minutes to present their slides in which they discussed their overall research topic, their vision on how teams learn effectively, the issues they are investigating regarding team learning, the methodology they use, their primary research model and difficulties or problems they encounter. These presentations were followed by a discussion in three groups: one focusing on the concepts, one on theresearch models and one on the methodology concerning the presented research on team learning. In these groups, the members looked for similarities, dissimilarities and possible overlaps between the different presenters' work. The following paragraphs will present a short overview of each of the different (group of) presenter(s).

The research of professor **Montserrat Castello** focuses on academic writing, collaborative writing and identity. She argues that teams learn effectively (when or through writing) by regulating their activity by means of cyclical thought-action-emotion dynamics, by struggling with contradictions and by feeling part of a community of learning and practice and developing their identity. She is furthermore mainly investigating collaborative writing both as an epistemic tool for learning (situations in which learning is mediated by writing in a more or less explicit way) and as a tool for developing academic writing (situations in which writing is the focus of learning). In this, she looks for the individual and group variables that explain team efficacy and success, she aims to analyse and foster writing regulation in socially and culturally situated environments and she focuses on the development of academic and disciplinary identities (situated learner's identity) through writing. Her methods focus on developing intervention studies and/or observational studies in ecological conditions and she and her research team have developed the Regulation Episode as an integrative unit of analysis.

Professor **Päivi Häkkinen** is specialised in collaborative learning. She particularly focuses on the relation between the individual (personal) and the group-level (shared) dimension in the contexts of higher education (especially teacher education), workplaces and schools. She furthermore focuses on the processes and contexts of collaboration in computer-supported learning environments and the expanding debate on collaborative learning research to new forms of collaboration that are enabled by these emerging learning technological landscapes (e.g. social media). In this, she also looks at the research-based design of productive, learner-centered, inquiry-based and collaborative learning environments. In terms of data collection she mainly uses online data, questionnaires, self-reports and interviews, learning diaries, drawings/visualisations and concepts maps. Methods of analysis used include multiphase methods for analysing online collaboration (content and sequence analysis) and micro-level analysis of the collaborative problem solving process and progress. She is challenged by finding the indicators of high-level collaboration, the existing large variation in collaboration and the rise of hybrid learning environments. Furthermore, taking into account the complexity of learning environments (consisting of individuals, groups and communities) and time-dependent processes in multiple timescales (there are shorter episodes and longer learning trajectories) appears challenging.

The research of professor **Karsten Stegmann** focuses on computer-supported collaborative learning and adaptive collaboration scripts. He primarily uses a cognitive focus and focuses less on the context. He states that team learning should be generative (consisting of co-construction) instead of perceptive (just listening and taking in), self-regulated and self-directed. He argues that the basis of team learning is Argumentative Knowledge Construction (AKC): three elements should be part of team learning for it to be effective, namely high quality of argumentation, high transactivity and a focus on relevant content. These elements are supposed mediate the relationship between participation and epistemic activities, which then would lead to acquiring domain-specific knowledge. Stegmann states that self-regulated learning does not work in most cases and that instructional support is required (still bearing in mind that the main goal is that students are capable of self-regulated learning afterwards). The underlying theory of his research is the Script Theory of Guidance, striving for a minimal amount of support in the form of adaptive collaboration scripts. His primary research model consists of an experimental paradigm, randomised trials, in which he tries to balance internal and external validity and focuses on processes, outcomes and their relations (mediator and moderator analysis).

The research group of professor **Sanna Järvelä** primarily focuses on socially shared regulation of learning (SSRL), which they argue is needed for successful collaboration. In SSRL, learners construct shared perceptions of the task, they set shared goals, share in the strategic enactment of the task and finally they collectively monitor the group's progress and adapt when needed. Their research model includes exploratory design and quasi-experimental research in ecologically valid situations and the research lab. Their methods include process-oriented methods, context- and task-specific measures, learning traces, self-reports and learning results. **Sanna Järvelä** studies self-regulation, co-regulation, socially shared regulation, metacognition and collaborative learning. **Hanna Järvenojä** focuses on collaborative learning and the role of motivation and emotion regulation in collaborative groups (in self- and shared regulated learning). **Jonna Malmberg** also studies SSRL and the strategic regulation of solo and collaborative learning: the self and shared regulatory challenges students experience and which strategies they use to overcome these. **Ernesto Panadero** focuses on the empirical evidence on the SSRL phenomena and uses a narrative content analysis review method.

Professor **Valerie Sessa** specialises in continuous learning, workforce diversity and managing team effectiveness. Her research model suggests two leverage points for instigating learning and change: learning triggers (the team cannot continue to work in the same way and be successful) and readiness to learn (the team recognises the stimuli, acknowledges that the team needs to change and makes the decision to do so). She furthermore investigates different types of learning (adaptive, generative and transformative learning) that result from the match of learning triggers and readiness to learn, and how individual, group and organisational learning interact, aid and hinder each other (keeping in mind the nested hierarchy of teams). Her primary research method consists of descriptive field studies using surveys.

The research of professor **Marianne Van Woerkom** focuses on professional development and coaching. She argues that team learning starts at the individual level (information acquisition), in a next step the individual shares this information with the team (distribution), this knowledge is then interpreted and finally stored so it can be retrieved again when needed. Her main question is whether coaching leadership stimulates team learning in the context of multidisciplinary VET teams. Her methods primarily include surveys among team members and managers. She does encounter some problems with these methods since it is

hard to capture a time dimension and cross-level interactions and when objective performance measures lack it is hard to decide which indicator is best (team-members or managers). Professor **Rob Poell** specialises in training, HRD and organisational change. He is working on a project that is planning to integrate three Ph.D. projects (two quantitative and one qualitative) including longitudinally following 100 teams during a period of three years. Different perspectives are used, varying from management studies, organisational psychology, and educational sciences.

The research of profsessor **Chantal Savelsbergh** and professor emeritus **Peter Storm** focus on team learning behaviour and leadership. They argue that teams with high learning capability walk through all the learning behaviours collectively (exploring, identify errors, analyse causes, evaluate performance, gather external feedback, reflect on processes, brainstorming, experimenting with improvements). These authors thus explicitly focus on behaviours and developed a multidimensional measurement for team learning behaviours. Their model suggests that team learning capability can be strengthened by improving the basic conditions, which strengthens team learning on the job and that leads to sharing and rewarding of learning outcomes. Another topic they study is (team) role stress and the influence of that on team learning behaviours and individual and team performance. A conclusion made in this respect is that the learning effect is strongest when the work or environmental stress is highest.

Professor **Piet van den Bossche** is specialised in collaborative learning environments and HRD. One of his models is the Team Learning Beliefs and Behaviour Model which includes beliefs in the interpersonal context, influencing team learning behaviour which leads to mutually shared cognition and in this way to team effectiveness. Another model presented is the integrative systemic model for team learning of Decuyper et al. (2010). An important issue raised here is the time-dimension of team learning (learning is about changing), thus a move from cross-sectional to more longitudinal designs is needed. Another issue entails how to measure team cognition and how everything ultimately links to performance. Van den Bossche also looks at the impact of leadership and the role of feedback (performance and process feedback) and feedback processing. His research methods include lab and real life research (cross-sectional and longitudinal), including students and employees. He uses questionnaires, cognitive mapping techniques, video-coding and interviews.

The research specialisation of professor **Mien Segers** includes corporate training and feedback seeking behaviour and **Selma van der Haar** focuses on team learning, feedback interventions and training and development. They point at the importance of the context when investigating team learning and they themselves focus on emergency command-and-control teams characterised by high reliability and high stress. They present a contextualised model of team learning processes and outcomes since these may vary across team types and developmental stages. These researchers study the development of a team situation model using team learning behaviour, the dynamic nature of team learning and team competences in the context of emergency management (characterised by time pressure, high risks, it is an ad hoc mulitidisciplinary team). They distinguish between a Team Mental Model (TMM) which is the collectively owned long-term task-relevant knowledge that team members bring to a situation and a Team Situation Model (TSM) which includes the shared task-knowledge concerning the current situation developed by the team members moment-by-moment. Their methods include questionnaires with self-reports and external ratings and observations of team learning behaviour. A challenge they encounter is measuring implicit learning.

The main specialisation of professor **Filip Dochy** includes team and collaborative learning, assessment and corporate training. Topics he is studying include predictors of team learning and team effectiveness, how students and employees learn together and from each other and how we can enhance that and the transfer of training and learning. The primary research methods used include questionnaires, observations, interviews and case studies. An important research model he uses is the integrative systemic model of team learning of Decuyper et al. (2010). Challenges mentioned here include boundary crossing (transcending the different disciplines that all individually look at team learning), the use of appropriate qualitative methods, collecting data from a sufficient amount of teams and using other measures than self-reports.

PhD. Student **Elisabeth Raes** is working on team development of project teams (the influence of team development on psychological safety and team learning), PhD. Student **Anne Boon** focuses on team learning, task complexity and creativity (the influence of complexity on team learning behaviours and creativity) and student **Katrien Vangrieken** is working on team learning in teacher teams. In order for teams to learn effectively, certain conditions need to be met, such as the catalyst emergent states (e.g. psychological safety) and social conditions. There is also a strong influence of team dynamics (development over time), team characteristics (size, age, self-efficacy, diversity, team type and team task) and context characteristics. Issues investigated in this group include why team learning is useful: for increasing the effectiveness, the creativity and the formation of a shared mental model and a transactive memory system. Furthermore, they look at following factors that foster or inhibit team learning: task complexity (Anne), psychological safety over time (Elisabeth) and team entitativity (Katrien). An important comment is that the type of team matters in studying team learning, types studied in this group include: project teams (Elisabeth), new product development teams (Anne) and teacher teams (Katrien). An issue related to measurement mentioned here is whether it is warranted to aggregate individual responses to look at phenomena on the team level and how we can use more objective measurements. Methodologies used primarily include questionnaires and observations, but how to measure change with a questionnaire and how to observe for example beliefs?

After these short presentations, discussion in three groups took place. One group focused on concepts,one on research models and one on methods. The goal of these groups was to compare the research of the participants (based on the presentation and the information they had gone through on the WIKI) and to look for similarities and dissimilarities. A short overview of these discussions and the conclusions that arose from these can be found in the next paragraphs.

CONCEPTS. In this part, we tried to map the concepts and identified some gaps (areas that are paid less attention to) within the research presented in this workshop. The main questions include: Where is the volume of research on team learning? What have we been researching a lot and which areas receive less attention?
This group listed all important concepts used by the different presenters. These were loosely organised in the following categories: context, antecedents (including moderators and mediators), processes, outcomes and type of team. The first three categories were presented in the form of a Venn-diagram, allowing overlaps between the categories where concepts could be placed that seemed to belong to both (or all three) categories. 'Intervention' is another additional category that was added when discussing the 'external collaboration script' as being an external intervention and 'building blocks' or 'additional processes' as a category is added when 'strategic enactment' is being discussed (it is not really seen as actual learning but rather as an additional process that takes place while

learning). A division was furthermore made between antecedents on the invidual, group and organisational level and 'catalyst emergent states' was added as a grouping name in the category of antecedents. These include antecedents that develop and change through time (for example psychological safety, interdependence, group potency,…). They can increase or decrease and or not stable. Within the process category, a distinction is made between social, cognitive, behavioral, emotional and motivational processes. Determining the category to which each of the concepts belonged proved rather challenging. There were concepts that were typically studied as antecedents, processes or outcomes. But there were also differences: some elements were studied by some researchers as antecedents and by others as outcomes for example. The boundaries between the different categories are thus rather blurred: different people can put the same concepts at different places in the overview. As such, discussion arose concerning whether 'conflict' was an antecedent or a process. Finally, it was decided to put it in between both categories. The line between processes and outcomes also appeared to be blurred, some concepts belonging to both, depending on how the concept was utilised and operationalised in the particular study. For example, a discussion arose as to whether 'transactive memory system' (TMS), shared cognition, team situation model, mutual understanding,… and epistemic activities are a process or an outcome. In the case of outcomes, it could be said that since group learning is a process that evolves over time: outcomes can become antecedents to new learning as time goes by. Some concepts appeared to fit in all three categorisations, such as for example boundary crossing, feeling part of a community and developing an identity and collective team identification, and put in the core of the Venn-diagram. Discussion even arose as to whether team learning is a process or an outcome, showing that fundamentally different perspectives were present in this group. Eventually, agreement was reached, seeing team learning as a process. When looking at the work of Päivi Häkkinen, a point of discussion concerned the difference between cooperative learning, collaborative learning, computer-supported collaborative learning (CSCL) and team learning. It was concluded that team learning is a process that mostly takes place in organisations while the others are more prevalent in schools (nowadays it is becoming mixed-up more and more). Cooperative learning is seen as some sort of vertical division of labour, not actually leading to a shared product while the others are characterised by productive collaborative activities (such as argumentation and explanation). Discussions also pertained to the level to which the different concepts belonged (individual, group or organisational). It thus was not always as easy to discern the level of the concept and concepts can be measured on different levels. For example, goal orientation can be seen as an individual level construct (individual level goal orientation, van Woerkom) and as a group level construct (group level goal orientation, Sessa). Identity was also measured at team (collective team identity, van Woerkom) as well as individual level (Montserrat). Another comment that was made, is the blurred boundary between work and learning. One can wonder where the learning ends and the working begins (in work teams) since the work process is going on at the same time that the learning process is and sometimes working is also learning.

Some of the concepts appeared to be used by different researchers, such as for example regulation (Castello, research group of Sanna Järvelä) and epistemic activities (Montserrat, Stegmann). The latter was also connected to the concept of transformative learning (Sessa). It was mentioned that almost all types of learning that are discussed, reside under the term of generative learning (in contrast to adaptive or transformative learning). These types of learning (adaptive, generative and transformative) are argued to be concepts on a metalevel. Thus, sometimes we use the same words and the same contexts, but our perspectives are different (e.g. team learning as outcome vs team learning as process or educational perspective vs. organisational psychology perspective or learning as main goal vs. working as main goal) giving concepts a different interpretation or measurement level.

Some concepts even appeared to refer to the exact same thing, such as distribution (Van Woerkom) and sharing (Van den Bossche). Others appeared to be quite similar, but actually still showed some differences. For example, sharing and participation are believed to be related but participation is said to be the degree of sharing, how engaged one is. Transactivity and co-construction also appeared to be rather similar. The first includes that team members build on ideas that are brought into the group by other members, going beyond mere sharing and getting started with the idea that is brought in. The link with co-construction, in which members build upon each others input, is thus quite clear. Transactivity is said to be applicable on just one contribution of a learner and being a precondition for co-construction, while the latter focuses more on a a process of building upon each others input (one on top of another).

Team development is said to be a new level, somewhere above the others, and related to the catalyst emergent states since these develop over time. Maturity is mentioned as another related aspect: does a team that has been together for a longer period of time learn more than a team that has been together for a shorter time period?

A general conclusion to be made here is that there is a very large variety in concepts that are used within this group and the fact that categorising the different concepts used appeared to be challenging since a lot of concepts can belong to different categories. So it actually depends on the interpretation and operationalisation by the researcher whether a concept belongs to this or that (sub)category. As such, it becomes clear that this group is characterised by a large variety of perspectives on the different categories and concepts.

Another overall conclusion in the concepts group includes the fact that in the process category, most of the concepts pertained to the cognitive and (to a lesser extent) social processes and only very few concepts were motivational and emotional. The group as a whole thus seems to have a general interest in the cognitive processes since most of the work focused on these. Although, it is also mentioned that strong differences between participants exist: some of the participants mainly focus on the emotional and motivational processes. Furthermore, there appeared to be a main focus on generative learning and less attention for adaptive and transformative learning (the latter contained one concept, namely epistemic activities). Another remark that was made, was the fact that the overview didn't show a lot of different outcome concepts. The main focus was on the processes of team learning We appear to agree upon seven main basic learning processes: storage, retrievel, sharing, co-construction, constructive conflict, reflexivity and activity. It thus becomes clear that some areas need more research (e.g. motivation, emotion,...).

Concepts that could be added in the overview could be team structure (being able to structure your team) and organisational productivity as an outcome (since this is the overall goal of all organisations). On the emotional side, well-being could be added in the overlap of antecedents and outcomes, engagement/burnout are possible other concepts as wel.

On the one hand, rather similar concepts appeared to be used in different disciplines but on the other hand, even though we are coming from different fields and are approaching the same phenomena, there is not that much overlap in the sense that we cover different things. The concept map shows complementary concepts, which makes such interdisciplinary collaborations an enriching experience, providing us with a wider picture of the situation. This makes learning from each others expertise a worthwhile endeavour. It is important to at least try to breach the gaps between the different disciplines and try to learn from each other.

Overall concluding statements include the following:

1. The similar concepts need to be clarified.

2. We identified four team learning process dimensions (emotional, cognitive, motivational and social).

3. We should identify some intersections in between research areas represented here.

4. There are factors/umbrella's concepts around which the field can be organised. Within these clusters of similar constructs, there are still concepts that still may have some variance (they do not mean exactly the same).

5. We should focus on what whe share and learn from each other. For example, those who focus on learning groups can learn from those focusing on the work context and visa versa.

MODELS. This group attempted to compare the different research models that were presented earlier on, looking at similarities, dissimilarities and possible gaps in the models that were presented during this workshop. First of all, they agreed upon what they mean when they speak of a model: it is seen as an attempt to grasp how we understand team learning, the underlying question of a model could be 'how do we explain team learning?'.

Different models look at different aspects, for example there are models that look at team learning itself and there are models that focus on the context of team learning. Another distinction is mentioned between general models as an explanation of team learning and research models as emergent states (research models should or could be temporary, not permanent). More general explanatory models could be more permanent and maybe we could agree on this more general and generic model and not on the models at the specific research level since it is not possible to create a fully integrated model including all components which rise in the different studies. The group looked at the models from the workshop and then afterwords looked if there are more general aspects, as such creating a more general, overarching model. Each model is an attempt to grasp reality and depending on the research question, you leave certain elements in and others out. The main idea here was thus not to create a full picture including all elements from all models, but to look at the components that are present in models (at a higher level). By comparing the different models, underlying dimensions were discovered that structure and characterise the models and that are subjacent to the differences between the models.

These dimensions that are at least needed to describe the models include at what **level** the model is looking and how the model copes with the multilevel-nature of the phenomenon of team learning (individual, team, organisation, a higher level or a combination). This can be linked to the discussion on the concepts, since it appeared that the concepts could be measured at different levels (individual, group/team, organisation,…) depending on the operationalisation by the researcher. In this we see that models as well can be situated on different levels and thus concepts, which can be seen as the 'tools' of the models, can be on different levels as well. Thus depending on the place of the concepts in the research model and the level of operationalisation, different perspectives on the research of team learning arise. A second important dimension includes **time** or the dynamics of the model. This can entail whether the phenomenon is approached in a cross-sectional, a longitudinal or a dynamic way. A third component that is agreed upon is the **context**: does the model take the context into account and if it does, which kind of context? In what way does the model help you to grasp the context? Discussion arose concerning the question whether we can make a model for both student teams and work teams or whether they have to be separate models. It is concluded that the context is of the utmost importance to describe a model, thus the context should be a central part of the model. In some way, in the context of student teams, you could doubt whether there are actual teams. Because a defining feature of teams is having a shared goal and if you all have an individual learning goal (as is the case in student teams), you could say that you have groups instead of actual teams. A nuancing remark here, is that within student teams, it makes a difference whether the whole team gets the same grade or whether there are individual grades. This makes a difference in the way teamwork will be perceived. This can be conceptualised as an interdependence question: are you outcome interdependent, do you need each other? You could say that student teams

are not that strongly interdependent when they get separate grades. The teacher can have an important role in creating interdependence in student teams (for example by deciding on the grading system). Furthermore, the level of **granularity** is mentioned as an important component of a model. This includes the scope of the model: does the model provide a broad picture or is it more detailed and fine-grained? For example, is it looking at big teams in large companies or small teams working on problem solving? A fourth component agreed upon is the **focus** (purpose): what is the key area that the model tries to explain, this includes antecedents, processes and outcomes? For example, some theories focus on antecedents and outcomes, while others focus on processes. A final dimension consists of **epistemology**, or the approach in which the model was created, e.g. socially oriented approach, cognitively oriented approach,...

Afterwards, three of the models that were presented earlier in the workshop were organised in these dimensions. The creation of this sort of 'metamodel' can broaden our view on the methods we can use and there is still room for other dimensions. It also became clear that the different groups (concepts, models and methods) are linked to each other. As such, the model you chose in your study indicates the methods you will have to use and on what level you will measure certain concepts for example. In the discussion, **axioma's** (the taken for granted assumptions that a model makes) are mentioned as not really fitting in here, it may be included as a possible additional dimension. **Intervention** is also mentioned as a possible additional dimension: does the model include interventions? Overall, it can be concluded that some kind of provisional metamodel was created that identifies a range of dimensions (6) that need to be tackled in one way or another (or explicitly not dealt with) in a theory that tries to model team learning. It would be interesting to test whether these dimensions are relevant to characterise other models as well by trying to fit these into the dimensions described above. Three concluding statements were agreed upon:

      1. We identified six dimensions to characterise team learning models. By trying to fit your model into this metamodel you could see what it takes into account and which aspects remain out of the scope of the model. It provides a structure to compare and understand each others models and to start to see where they join and do not join.

      2. We will try to check and understand the model by using other models: validate the identified metamodel with other models to find out where blind spots are. By trying to fit other models into these dimensions we will find out how the different models are related or differ from each other. For example, one model can subsume another one by focusing on one aspect of that other model and enlarging this.

      3. The models are different and you cannot provide one model as a complete picture of team learning (it is not possible to combine all models since they may have different epistemologies and see the world in a different way) but we aim to organise the different models into a more comprehensive framework. We look at teamwork at different levels and perspectives. When you are working from a certain perspective, looking at the comprehensive framework would give you an idea of what literature would be interesting for you to read, whose work is similar, whose work is at a different level of granularity,...

METHODS. In this section we will focus on the methods that are used in order to study team learning. This phenomenon is strongly complex and thus studying team learning is a challenge to say the least. It is characterised by multilevelness (influencing variables are found on different levels) and a very important time dimension (the group, context,... change over time). Because of the multilevel nature of the subject, there is a nested data-structure in the sense that there are individuals who are part of teams (some of them in multiple teams) and these teams are part of a company,… All of these different levels have their own features (e.g. an individual has prior knowledge, the group has joint prior knowledge,…) and

we need appropriate methods to see if there are effects from one group to another or from one learner to another or whether there are cross-level interactions (e.g. influence of a group-level variable on the individual). It is really important to be aware of the fact that the different levels interact with each other. The multilevel-nature points us at the importance of measuring the different concepts on different levels and being aware of what you are measuring and on what level. For example, is measuring the prior knowledge in the group the same as measuring the prior knowledge of each individual and then just calculating the sum? Or do we need a group-level measure of prior knowledge? This multilevel-nature and time dimension lead to the necessity of a few decisions before choosing a particulare measure. These include the measurement level (individual, team, multilevel,...) and whether you are interested in a longitudinal approach, or you are taking interventions, or whether you choose for a one time measure,… You have to think about these questions before you choose a method. But even before deciding upon these points, it is of essential importance for choosing a method that you first of all specify you research question and the specific context. This needs to be very clear before you can proceed to the selection of a research method. It is also very important to check the relevance of your research question in the specific context and make sure that you never lose touch with the context. Another conclusion to be made is that you have to know what you want to achieve: are you aiming for prediction or description? Research often stays in the description phase and does not often lead to valuable predictions for your context. It is really important to communicate with the field and to not lose touch with the context but to validate your results in the context of interest.

In team learning research, some variables present a challenge when trying to measure them. For example, psychological safety: should it be measured by a questionnaire or could it be possible to measure it on group level by observing the group with behavioral measures (identifying certain activities that are related to psychological safety). Behavioral measures appear to be a better predictor of performance in the end than the survey data. The measuring of performance/effectiveness also appears challenging: for each study you have to develop a new measure to get a good measure of performance/effectiveness because it can have a different meaning in different studies (what is effective strongly depends on what you are studying and has to be linked to the specific desired skill). It is difficult to define rules that measures have to fulfill to be a good measure of effectiveness. And even when you decide upon which performance you have to measure, there is still 'noise' in the sense that you can never be sure that the performance you measue is an actual result of your 'model' (your measured antecedents and processes). In a sense, the thinking in terms of antecedents, processes and outcomes is obsolete given the multilevel nature of team learning with its strong time dimension. The antecedents are in different levels (cultural, group, individual,...) They can change over time and have to be measured over time (again and again) because of that.

It thus becomes clear that there is no such thing as a 'perfect' research method and awareness of the gaps in every research is a good start. You always have to take into account the assumptions that you make and then you can develop a method but this will still always have problems as well. Concluding, it can be said that the methods that are used do have some creative parts but in general it is not really creative. The methodological part of research is something that has to follow certain rules. As such, you have to consider a multi-level cross-classification nature of the phenomena that you are going to study. Furthermore, you need to be very careful when measuring phenomena at a specific level in your model, you cannot just calculate means to aggregate on a higher level and methods are not just in

the open air: first, you have to define your research question, concepts and your models and then you can discuss your methods. A few concluding statements can be found below.

1. We need to learn more about each other's methods in order to deal with complexity. It makes it possible to cope with the time dimension and the multilevel nature on a different way. On the one hand, there is a pretty large overlap (we use a lot of similar methods), that invites for more cross-validation of methods, but on the other hand, we still use a quite limited set of methods and we should extend, particularly given the fact that this is a very complex and layered phenomenon with a strong time dimension. This time dimension needs to be central in research on team learning. Although awareness of and attempting to deal with the complexity is very important, you should not try to jump in the wole complexity at once.

2. A next conclusion is strongly associated with the previous one and states that you need to regard the complex nature of the phenomenon: be aware of the multilevel, cross-classified and hierarchical nested nature of team. We need to think of how to deal with the complexity of team learning from a methodological point of view.

3. Finally, you need to be aware of the context, the hidden assumptions you make when using a certain model and the things you forget or do not see when using a certain method. You cannot think of methodology before choosing your context and defining your concepts and your model and after choosing your method, you need to be aware of what you see and what you do not see and what the assumptions are. So: context, concepts and models first!

3. Assessment of the results, contribution to the future direction of the field, outcome

The central goal of this workshop was, as the title suggests, to bridge interdisciplinary approaches on team learning by working towards shared conceptualisations and methodological approaches. It is clear that scholarship from a variety of research fields tackle the phenomenon of team learning but that they all use their own concepts, perspectives, models and methods. But, in the attempt to build bridges between these, we also concluded that there were a lot of similarities in the concepts, the research models and the methods. The existing dissimilarities can be seen as complementing each other, providing a broader picture of the phenomenon under study. As such, together we look at an enormous variety of concepts, studying a lot of variables concerning team learning and thus we create a more complete picture of team learning. An important research objective here is to further explore these similar concepts, clarifying them and bringing together the different theoretical perspectives on the shared concepts. We did however conclude that there might be a few blind spots and that there is for example a bias towards cognitive and social processes. The different models that are used by different scholars can also be seen as complementing each other and elaborating upon each other. For example, some models highlight and enlarge certain aspects of other models, as such giving a more detailed picture of a part of that model. The methods we use seemed to be at the same time diverse and similar. In a sense we use a diversity of methods and we can learn from each other in order to better cope with the complexity that surrounds the phenomenon of team learning. Different methods are essential to study this phenomenon in its complex nature. But, the diversity of methods we use is not that big and could be enlarged in order to get a fuller picture of team learning and to better grasp it in its complexity. So we also need to think of new methods and ways to deal with the measuring difficulties we are encountering. Thus, although this group complements each other with the different concepts, research models and methods they use, it would be a good idea to build even more bridges and to learn more from even different disciplines such as social psychology and organisational sciences. Social psychologists look at interactions, conflict,... and although they do not literally study learning,

these ideas can be seen as quite similar and complementary to what was presented here. This brings us to an important objective that is concluded from this workshop, namely to collaborate with other disciplines and to cross boundaries further (e.g. social psychology and organisational sciences) in order to better tackle team learning as a research domain. Off course it remains essential to collaborate within this group and to learn even more from each other (a lot is still to learn), but other disciplines could be included as well. Related objectives are to expand our repertoire of methods in order to tackle difficulties we encounter when using our conventional research methods and to clarify the concepts we discovered as being similar and thus bringing together the different theoretical perspectives behind these concepts. Another important research objective consists of gathering more knowledge from practice and organisational policy, thus gaining insight in team learning in practice. Furthermore, we think it is important to tackle the lack of intersections between the different research areas. For example scholarship on team work and on team learning: the line between work and learning is blurred and one can wonder where learning ends and work begins and vice versa. An objective consists of the exploration of this blurred line between team learning and team work and to identify intersections. Another possible research objective consists of trying to understand team learning pathology (when it goes wrong): where do these detrimental patterns come from and to what do they lead? Examples here are failure and success, groupthink, Abilene paradox, chaos in groups, power,... A final objective for further research mentioned consists of creating clarity concerning the parameters for typologies of teams. Creating a new team typology is not considered to be really worthwhile since it can be doubted whether we would get further than the existing team typologies and they often create a large amount of different team types. But, since there is a need for some clarity in team types for others to understand what you are doing, we need to create clarity concerning the parameters we use to distinguish between different team types.

Thus the overall contribution of this workshop is laying the foundations for further interdisciplinary research on team learning. The first steps in bridging interdisciplinary approaches are explored in the workshop and will be elaborated in the actions that will follow. The most important first step after this workshop consist of further clarifying the concepts that were identified to be similar and the proposed models. A clear understanding of the concepts and models is a necessary step for further interdisciplinary work to be fruitful. In the future, further interdisciplinary work on team learning is possible and necessary in order to better grasp the phenomenon in its complexity. Concrete steps towards this goal that were discussed in the end of the workshop can be found in the section below.

Research agenda/activities: next steps to be taken

First of all, the content of the workshop and this scientific report will lead to a position paper on the topic of interdisciplinary approaches of team learning (focusing on concepts, models and methods). This will provide an overview of what we have been doing and what the outcomes are, lacks and biases in research on team learning and the research methods we (do not) use (yet). The main idea is to present the "state of the art": what has been studied a lot/too little? What do we know for sure from research and what is doubtful? Where are gaps in the present research?

A second follow-up action that results from this workshop consists of clarifying the similar concepts identified and bringing together the different theoretical perspectives on the concepts we share. Ultimately, this should result in a position paper on the topic. A next step

in this paper is to focus on the research models and attempt to frame the models we use into the schema that is discussed in models part of section 2. The main questions of this paper would be 'what is team learning and what are important variables?'. It opens the space on team learning, giving room for different perspectives in defining the field.

Another idea consists of gathering more knowledge about the implementation and application of team learning in practice and organisational policy. The goal here is to actually go to the field and look at team learning in practice. We can create an inventory of what companies do and why (on the basis of what) related to team learning. In this way, it would be possible to learn from each other and 'adapt' our academic language so companies understand.

Finally, options are explored to find fundings to organise another gathering. COST, European Cooperation in Science and Technology (European Commission), is one of the options explored. The goal is to submit a Trans-Domain COST Actions proposal for next year. In this projects, interdisciplinarity is very important and the main purpose is to build an interdisciplinary network. Another option that was explored, is the Horizon program (European Commission). In this program, the crossing of boundaries (including different disciplines and connecting people and practices) is very important as well. Both programs thus correspond to the idea that is mentioned above of crossing boundaries further. Thus, a proposal for next year will be written and possible participants will be selected.

4. Final programme

Monday September 23th, 2013

13.00 First encounter in Hotel Binnenhof
        All participants gather in Hotel Binnenhof. From there, we will walk to the
        Faculty Club (workshop venue) together.

14.00 Welcome with coffee

14.30 – 15.00 Welcome by Convenor
            Prof. Dr. Filip Dochy (KU Leuven, Leuven, Belgium) & Prof Dr. Sanna
            Järvelä (University of Oulu, Oulu, Finland)

15.00 – 17.30 Team building activity

17.30 Sightseeing in Leuven

19.00 *Diner*

Tuesday September 24th, 2013

09.00 – 10.30: Short plenary information session: Learning models and methods
            of research in team and collaborative learning: the differences and
            commonalities of different approaches.
            The different participants present their research using 4 or 5 slides in max. 5
            minutes.

10.30 - 11.00 *Coffee break*

11.00 – 12h30: Subgroup discussion on three different topics concerning team
            learning: concepts / methodology/ research models.

Participants will be divided in subgroups so that interdisciplinary discussion about about the differences and similarities in team learning research can emerge.

12.30 - 13.30 *Lunch break*

13.30 – 15h00: Continuation of the subgroup discussion on three different topics concerning team learning: concepts / methodology/ research models

15.00 - 15.30 *Coffee break*

15.30 – 17h00: Each group (concepts, models and methods) shortly presents their findings, followed by a plenary discussion.

17h00 – 18h00: discussion of the plans for the next day: short presentation of 3-5 conclusions of each group followed by working in groups on next steps for the future.

19.00 *Dinner*

Wednesday September 25th, 2013

09.00 – 10.30: Review of the group presentations of yesterday: formulating 3-5 conclusions for each group.

10.30 - 11.00 *Coffee break*

11.00 – 12h30: Discussion on what is lacking and formulating a research agenda/activities

12.30 - 13.30 *Lunch break*

13.30 – 15h00: Discussions in groups on future projects

15.00 - 15.30 *Coffee break*
15.30 – 17h00: Plenaire closing session.

5. Final list of participants

Filip Dochy – professor at KULeuven
Sanna Järvelä – professor at University of Oulu
Montserrat Castelló – professor at Ramon Llul University (Barcelona)
Chantal Savelsbergh – assistant professor at Open University (the Netherlands)
Päivi Häkkinen – professor at University of Jyväskylä
Ernesto Panadero Calderon – post doc at University of Oulu
Marianne van Woerkom – associate professor at University of Tilburg
Rob Poell – professor at University of Tilburg
Piet Van den Bossche – associate professor at University of Antwerp
Eva Kyndt – assistant professor at KULeuven
Elisabeth Raes – Ph.D. student at KULeuven
Anne Boon - Ph.D. student at KULeuven
Katrien Vangrieken – student at KULeuven
Hanna Järvenoja – post doc at University of Oulu
Jonna Malmberg – Ph.D. student at University of Oulu
Karsten Stegmann – assistant professor at Ludwig Maximilian University
Mien Segers – professor at University of Maastricht

Selma Van der Haar – Ph.D. student at University of Maastricht
Valerie Sessa – assistant rofessor at Montclair State University
Peter Storm – professor emeritus at Open University (the Netherlands)

6. Statistical information on participants

Countries	*Age bracket*	*M/F repartition*
Belgium (6)	[20-30]: 4	Male: 6
Finland (5)	[30-40]:6	Female: 14
Germany (1)	[40-50]: 5	
Spain (1)	[50-60]: 4	
The Netherlands (6)	>60: 1	
The United States (1)		