

**Paper for the Sixth International Conference on HRD Research & Practice across Europe | May 25-27, 2005 (Leeds)**

**Title of the paper:** Methods for identifying learning processes in innovation processes

**Authors:** Suzanne Verdonshot

**Organisation affiliation/position:** University of Twente, Enschede, The Netherlands

**Contact details:** Suzanne Verdonshot (University of Twente)  
Faculty of Behavioural Science  
P.O. Box 217  
7500 AE Enschede  
The Netherlands  
E-mail: [s.g.m.verdonshot@utwente.nl](mailto:s.g.m.verdonshot@utwente.nl)  
Telephone: +31 53 489 2022  
Mobile: +31 6144 645 18  
Fax: +31 53 489 3759

**Stream heading** 2. Strategy, Organisation Learning and Knowledge Productivity

**Abstract** This study aims to trace methods that are suitable for identifying, describing and enhancing learning processes in teams that focus on improvement and innovation. An exploratory literature review resulted in three perspectives to identify learning processes: 1) The first perspective offers methods that stimulate reflection by looking back upon the learning process; 2) In the second perspective the learning process is approached by reflection *in action*; 3) In the third perspective, the learning process is made explicit by reflecting upon the future. In the in-depth literature search that followed, we found methods that use one of these perspectives as starting-point. The methods that were found vary in their nature, background and purpose. When we focus on employees who participate in teams to work on innovation, we conclude that a combination of methods is preferable.

# Methods for identifying learning processes in innovation processes

## 1. Introduction

In an economy where knowledge is dominant, daily operations in organisations should be designed to support the process of *knowledge productivity* (Kessels, 1996b; Kessels, 2001). This process entails: identifying, gathering and interpreting relevant information, using this information to develop new skills and to apply these skills to improve and radically innovate operating procedures, products and services. Learning lies at the heart of this process: tracing relevant information, and developing and applying new competencies are based on powerful learning processes. In our research programme, we are exploring how to stimulate and support the learning processes an organisation needs for the improvement and innovation of its products, services and processes. The main method of this research is multiple parallel case studies.

If innovation is crucial for lasting success of organization, and learning is a key process in innovation, it becomes important to learn more about the kinds of learning processes that support innovation, about how to recognize these processes in practice and how to influence these processes in a positive way.

In this paper we present various methods for identifying learning processes in innovation processes. The paper refers to the interest of both research and practice. From the research point of view we aim to present methods that help to make learning processes explicit in order to be able to deepen our knowledge with respect to these processes. From the practice point of view, we want to develop methods that enable participants to develop metacognitive- and reflective skills that help them to be more knowledge productive.

In our research we found that the participants find it difficult to directly answer questions on when they learned, how they learned and what they learned. They experience difficulties because when their own learning is addressed, they tend to focus on explicit learning activities such as formal training and education, whereas key learning processes often take place implicitly, while working and interacting with others (Kwakman, 1999). Moreover, answering questions about one's own learning process, requires reflexivity (on learning) and meta-cognition. This reflexive capacity is not always well developed. This is especially true for parallel case studies because the participants are in the middle of their learning and innovation process themselves.

In earlier research several authors investigated methods that are suitable for studying learning processes. Marsick (2001), and Simons & Ruijters (2001) investigated these methods in view of promoting informal and implicit learning. Eraut, Alderton, Cole & Senker (1998) aimed to investigate learning at work. These studies offer an overview of methods but none of them elaborates on the specific kind of learning that is traced.

In order to trace key learning processes and to find out what stimulates or hinders these processes, it is important to find methods that make these learning processes explicit. This paper focuses on this methodological contribution.

In addition to this methodological contribution, we aim to use these methods to support participants in developing their ability to be knowledge productive. Our assumption here is that the better metacognitive skills and reflective skills are developed, the more innovative one can be. Because then innovation is not solely the consequence of well-developed

problem-solving skills or coincidence, but with insight in your own way of learning (both on individual and team level), you are able to create the circumstances for yourself in which you learn best and therefore you are able to be innovative in various situations. In this respect we refer to Bolhuis and Simons (2001). They argue that the better metacognitive and self regulating skills are developed, the bigger one's learning capacity is. Other authors explicitly link the development of metacognitive and reflective skills with the ability to improve and innovate in the work environment. McGivern and Thompson (2004) connect better metacognitive skills of workers with improvement of their work-environment. In the same line Kessels (1996a) stressed the importance of developing reflective skills and metacognitions because it would be supportive in finding new ways to trace relevant information, to develop new knowledge and to make it applicable in innovations and improvements. Research done by Van Lakerveld, Van den Berg, De Brabander and Kessels (2000) shows that the development of reflective skills is crucial for developing the capability to improve and innovate work-environment.

From literature, it becomes clear that reflective and metacognitive skills are necessary elements of learning (Dewey, 1933; Kolb, 1984; Schön, 1983). However, this was primarily seen as an individual activity of the learner. Recently, together with the increased attention for social capital as pillar for learning (Nahapiet & Ghoshal, 1998) the importance of reflection and developing reflective skills in interaction with others, is stressed (Reynolds & Vince, 2004). This recent attention for reflection as a social process, gives practical relevance to this paper. In this paper we investigate ways to organise interaction to both identify learning processes and at the same time to encourage the development of reflective skills that increase knowledge productivity.

## **2. Problem statement**

The research question this paper aims to answer is:

*What methods are suitable for identifying, describing and enhancing learning processes in teams that focus on improvement and innovation?*

This paper offers an overview of methods that contribute to this question. For each method, we explain both how it contributes to a better understanding of learning processes and how it contributes to the development of metacognitions of the participants involved. In answering the research question we use the experience of our research on knowledge productivity in which we investigate when participants in improvement and innovation practices learn, how they learn and what they learn. Through a literature review we offer an overview of methods suitable for identifying learning processes in innovation projects.

## **3. Research design**

Two phases are central in the literature study we conducted. The first phase consists of a general exploration of literature. Based on this exploration we found three starting points for tracing learning processes. The first perspective offers methods that stimulate reflection by looking back upon the learning process, in the second perspective the learning process is approached by reflection *in action*. In the third perspective, the learning process is made explicit by reflecting upon the future. The second phase consists of an elaboration of the three categories. In this phase we made explicit what kind of learning processes the various methods help to elicit and how they promote knowledge productivity.

Literature on how to investigate learning in teams that participate in actions of improvement and innovation, is scarce. Therefore we also used literature with clear views on learning processes.

## 4. Results

In this section we elaborate on the three starting points for tracing learning processes and on methods related to each of the three starting points.

1. Stimulating reflection by looking back upon the learning process.
2. Stimulating reflection *in action*.
3. Stimulating reflection using the future.

For each of the methods we describe the rationale, we explain how the method can be used and we elaborate on how this method contributes to understanding and promoting the learning process.

### 4.1 Reflection on past experiences

The methods described in this section all rely on reflecting upon past experiences in order to understand more of learning that took place. This way of reflection relates to the way Dewey (1933) and Kolb (1984) referred to it. Dewey stressed the importance of active experimentation for learning and reflecting on that afterwards, and Kolb defined a learning cycle in which experience and reflection are two necessary and coupled elements, that are (through active experimentation and conceptualisation) necessary for learning to take place.

From literature we derive three ways for reflecting on experiences in the past:

1. By reflecting on experiences in general.
2. By reflecting on specific events that are critical, that made a turn in the process, or that the learner is proud of.
3. By reflecting on the learning process comparing it to predefined objectives.

#### Reflection on experiences in general

This section elaborates on three methods that can be used to investigate learning experiences in general. The idea behind the use of these methods is that by asking the respondent for stories about his or her experiences in general, important events related to learning will pop-up themselves. In this view, the researcher does not ask for specific events related to themes or topics. This way of working has parallels with ethnographic and bibliographic research (Flick, 2002). It is about making a 'thick description' of reality, in order to describe and understand specific phenomena (Geertz, 1973). This is a way of inductive research in which not prescriptive theory is used to test, but experiences of learners themselves are used as input for research and even theory-building (Glaser & Strauss, 1976). Narratives and personal stories play an important role in here. Weick (1995) argues that people think narratively rather than argumentatively. That pleads for the use of narratives in tracing learning processes; since that relates to the way the learners themselves think about events in the past. The methods mentioned in this section all rely on the quality of persons to think about their past in narratives, and to their quality to tell these personal stories that were somehow meaningful and therefore related to their learning processes. Von Krogh, Ichijo, and Nonaka (2000) state that narratives are a natural part of how human beings come to terms with the world. They advocate that stories about what and how people do things are a necessary component of learning. Witherell (1995) argues that stories invite us to come to know the world and our place in it because of their engaging power. Narratives allow the researcher to approach the

interviewee's experiential world in a more comprehensive way, this world being structured in itself (Flick, 2002). The importance of storytelling for the researcher to get access to the personal worlds of the participants becomes visible in the research methods. Below, we describe two methods that can be used to reflect upon experiences in general.

1. **Storytelling** is recognised as a useful strategy to advance understanding of professional practice because it enables practitioners to capture, code, and validate the knowledge born of experience, observation and intuition (McDrury & Alterio, 2000). Simons and Ruijters (2001) refer to storytelling as a method to trace implicit learning processes. With this method, you invite participants to tell stories and anecdotes from their practice. It is about getting the story-telling mindset. Then, the participants come into a state in which they can tell stories as if it were movies, with the same amount of details. This state enables them to visualise concrete situations, and to select the situations in which there was really an urgency to perform well. Then you can analyse how they acted what they needed for that, and what skills they used. By sharing stories, it is possible to create shared meaning, to understand what has happened and to prepare for what may happen in the future.  
A way to structure the process of storytelling is by making use of **learning histories**. A learning history is a document, or a series of documents, that is disseminated in a deliberately structured manner. Both the document and the dissemination are designed to help organisations and individuals in teams become better aware of their own learning and change efforts. The learning history presents the experiences and understandings of participants. It tells the story in the participants' own words, in a way that helps to move forward, without having to "re-invent" what a small group of learners have already discovered (Kleiner). In interviews to collect learning histories it is not about analysis, evaluation or assessment and judgement. It is about the story of what happened from the learner's perspective. Important in using this method is the *collaborative reflection*. After the histories are collected, a process of collaborative reflection forms the phase of analysis. This is a process of collaborative sensemaking out of what happened. The phase of analysis is one that you go through collaboratively. Learning histories help to generate reflective conversations (Roth & Kleiner, 1998). They help to create a common context that allows the persons involved to develop a new and shared understanding. This indicates that stories not only offer the researcher a powerful tool to understand the world of the participants but it also helps these participants by functioning as a mirror, or as a reflection-tool.
2. Another method is to investigate whether there are **changes and developments** in and outside the organisation that may have changed the character of work. By relating these developments and changes to one's current competencies, one can get insight in his own learning process (Simons & Ruijters, 2001).

#### Investigating changes and developments:

→ To work with this method in practice first find out together with the participant what changes and developments took place. Use questions like:

- Do you experience that the nature of the work has changed since the last years?
- How has it changed?
- What is now different in your work than before?
- What caused this change?

→ Find developments that caused these changes by asking questions like:

- Did something in your organisation change dramatically?
- Did something in your specialty change?
- Were there developments society-broad that influenced your work?

→ Once you have traced these developments and how these changed the nature of the work, zoom in on the daily work of the participant. How did that change?

→ Investigate together with the participant if these new requirements made him act differently. Define what exactly changed in the way he acts in his work.

### Reflection on specific events

This section elaborates on methods suitable for reflecting on specific events that are believed to be elements of a learning process the learner has gone through. The researcher tries to trace events that are critical, that mark a turn in a process or that the person involved is proud of. The idea behind such is that a description of important events in their specific context is a powerful means to make learning explicit. The idea is also that the most important learning is related to such crucial or meaningful situations in a process. These methods identify learning processes without explicitly asking for learning. Participants often have obvious feelings about the importance of what happened in a specific situation, and in these methods these feelings are used. The methods offer a new starting point for thinking, by starting to ask for concrete situations. This arises from the view that knowledge is a personal capability (Kessels, 2001) that is linked to practice. To trace learning processes, the context in which this learning manifests itself needs to be taken into account. The methods all assume that particular situations are more suitable for identifying learning than others. These specific situations can vary in their nature. It comprises critical incidents, discontinuities and situations in which the participants are proud of themselves.

The kind of learning that is addressed through these methods, differs per method. Below we describe the methods, followed by an explanation of their relatedness with the learning process.

3. One of the methods is to trace **critical incidents**. Flanagan founded this concept in 1954 (Flanagan, 1954). The critical incidents technique is a method to trace critical requirements for a specific task. It is about the behaviours that make the difference between effective and ineffective performance of a task. The critical incidents technique relies on the notion that every job has specific moments in which the person doing that job can really make a difference. You can collect critical incidents by observing employees during their work or to interview them outside their work-setting. Zemke and Kramlinger (1991) stress the importance of looking at actual behaviour and not only to conduct interviews. When interviewing workers outside their daily work-environment, it is helpful to ask them for dilemma's they encountered in order to trace these situations that are of particular importance for the job. Critical situations will show up in the form of dilemma's, in situations where one needs to choose between two plausible alternatives. In the phase of analysis you can compare various critical incidents and derive the capabilities or competence the individual used to solve the dilemma-situation.

**Working with the critical incidents-technique**

- Try to get an idea of the context the person is working in. As questions such as:
  - o Can you explain what your organisation does? What do you do within this organisation? What is your background?
  - o Could you divide certain core tasks?
  - o Can you think of developments and changes that happened lately and that changed the nature of your work?
- Trace important moments where the person involved needed to choose between two plausible alternatives. These questions can help, but make sure that the interviewed has a *concrete* situation in mind. One that actually happened.
  - o I can imagine that [part of their task] sometimes brings you in a difficult position.... Is that right?
  - o Could you give an example of such a dilemma or moment of choice that you went through last month?
  - o Could you describe – very concrete –a moment in which you had to choose?
- When you have a dilemma, try to find out what happened *exactly*. In this situation the respondent used his implicit knowledge. For him it is difficult to make explicit what happened exactly. Help him to make the 'film' of the situation:
  - o When was it?
  - o What happened? (Ask a lot of questions like Where were you? With whom? What did you do? What tools did you use? What choices did you make? What strategy did you choose?)
  - o What was the result, what did this way of acting yield?

Marsick (2001) mentions the critical incidents technique as a method to trace the implicit knowledge and learning of the learner in specific tasks or work. The method assumes that other employees who do the same work or tasks will encounter similar critical incidents and therefore it is important to study how participants act in these situations. The critical incidents technique serves three purposes. 1) It helps to describe the competencies required for successful innovation; 2) It leads to the identification of competences of participants that can be applied in new practices of innovations; 3) The description of the critical incidents can serve as inspiring stories for others engaged in innovation processes.

4. Another method is to trace specific **discontinuities** and **breakthroughs**. This idea is supported by work of Patriotta (2003) and Op de Weegh (2004). A breakthrough occurs when someone was able to let go his or her existing frame of reference and see and create something new. Chains of these breakthroughs together make up the innovation process (Op de Weegh, 2004). Breakthroughs are expected to be preceded by discontinuities. Below we give an overview of five categories of discontinuities that can be recognised. They are not completely distinctive but give an indication of how you can recognise discontinuities in innovation processes. These are the starting point for further investigation in what happened and the consequences in terms of innovation.

Table 1: Categories of discontinuities (based on Patriotta, 2003).

Kind of discontinuity	Definition	Example
Persons	A change in the composition of the group, of roles people have.	Someone decides to leave or an expert is introduced during the process.
Context	A change in the place where the process takes place, or the way spaces are designed.	Instead of the usual meeting in their meeting room, they visit a location.
Thinking	A turn in the thinking process that allows new frames and perspectives to come into existence.	New words are used, and sensegiving happens in a new way. The question is formulated again.
Action	A change of strategy, a new way of working or method.	A totally new way of working is adopted. Someone starts to make small reports after the meeting.
Time	An acceleration or slow-down in the process.	It is decided to organise a seminar. Everybody feels the time pressure and the process is accelerated.

Patriotta (2003: 65) argues that “breakdowns, in the form of discontinuities, interruptions, and so on, create a cleavage between organization and disorganization, and therefore can be fruitfully deployed for an empirical investigation into knowing and organizing”. Other authors like Weick, Perrow and Shrivastave (in Patriotta, 2003) also emphasize the cognitive implications of major events such as crises, accidents and failures. In the work of Weick we also find support to look for interruptions to understand innovation processes. Weick (1995: 5) says that “whenever an expectation is disconfirmed, some kind of ongoing activity is interrupted. Thus to understand sensemaking is also to understand how people cope with interruptions”.

Reflecting upon these discontinuities helps participants to give meaning to the events. This can cause participants to understand these moments as breakthroughs or lowest points. In the end this helps the participants to understand what happened not only by hindsight. By recognising discontinuities as breakthrough or lowest point during the learning process, one is able to positively influence this process.

5. Another method to be used to trace specific events in the learning process is by **tracing situations that the individual marks as ‘peak experiences’**, or as times they felt most alive, engaged and proud of their work. This method has its origins in appreciative inquiry (Cooperrider, Whitney, & Stavros, 2003). Appreciative inquiry is the study and exploration of what gives life to human systems when they function at their best (Whitney & Trosten-Bloom, 2003). This way of inquiry is grounded in affirming and appreciating. It is used in organisational development but also in other areas such as action-based evaluation research (Preskill & Coghlan, 2003). An appreciative inquiry consists generally of four phases (Whitney & Trosten-Bloom, 2003). By going through these phases, you inquire learning processes and at the same time a change process is activated.

**The four phases of Appreciative Inquiry consist of:**

- Discovery by appreciating: “What is the best of what already is there?” Ask questions like: Describe a high-point experience in your [organisation] – a time when you were most alive and engaged? In this phase participants share their individual stories in pairs and with the larger group. Together they identify key topics or themes common to the stories. These themes form the basis of the next phase.
- Dream by envisioning results: “What might be?” Based on the information of the previous phase, they envision themselves, others and the organisation functioning at their best.
- Design by coconstructing the future: “What should be the ideal?”
- Destiny by sustaining change: “How to empower, learn and adjust/improvise?”

A careful introduction is said to be important just as the formulation of various questions per phase in advance.

When we ask employees to think of moments of total commitment, moments they are proud of, we ask them to think back of situations in which learning probably took place. To empower this argument we refer to Csikszentmihalyi (2000). Csikszentmihalyi is a famous author on the concept of *flow*. According to him, a state of flow, in which one is totally committed to a task one is busy with, is a situation in which learning goes very easily. After the flow experience one has feelings of fulfilment and pride. This is related to the extent to which individuals work according to their intrinsic motivations. When workers follow their passion and elaborate on a personal theme, learning is most likely to occur (Kessels, 2001).

Peak experiences are not only helpful in tracing, and describing learning processes, they also enhance learning. Learning is enhanced as positive feelings about situations the participants

were in, are stressed and affirmed. In this section we go deeper into the mechanisms that make this work.

Promoting a reflection process by recalling peak moments, and moments of joy and pride, find its origin in positive psychology, a new direction in psychology that comes into existence after WWII. Traditional psychology used to stress deficiencies and pathology, and the dis-functioning of the human mind. With positive psychology a new movement arises in which human's well-being and the prevention of illness is object of study. Seligman (Cameron, Dutton, & Quinn, 2003) is one of its first advocates.

Recent research affirms the favourable effect of positive feelings on human cognition and learning. In this case, see for instance literature on appreciative inquiry (Preskill & Coghlan, 2003; Whitney & Trosten-Bloom, 2003). This literature shows how asking for peak experiences, can cause big changes with the persons involved. Neilsen en Winter (in press) also advocate that aligning cognition and affect, has a favourable effect on learning. In research in the area of reflection we find cues that the emotions that go together with reflective activities, can be used to stimulate the learning process (Swan & Bailey, 2004).

#### Reflection on the learning process by formative evaluation

Another way to reflect on actions is to compare the actual learning process with the predefined goals and objectives. Comparing what actually happens to a prior set of goals or goals that were set without having insight in what would happen during the process, is a widely used manner to evaluate learning processes. Rossi, Freeman, and Lipsey (1999) refer to this as formative evaluation. This comprises evaluative activities undertaken to furnish information that will guide program improvement.

6. **Formative evaluation** can be done either in the context of learning or in the context of performance. In the context of learning you reflect upon the learning goals that were set. You evaluate whether the learning goals have been achieved and to what extent activities were helpful in reaching these goals.

In the context of performance this method is especially helpful when the goals that are set, refer to learning and innovation. You evaluate whether the working processes develop in the direction of the pursued goals. In this way the evaluation gives insight on how the learning and innovation process develops.

Predefined objectives are not only helpful in evaluating the learning process formatively, but they also stimulate learning. We explain this by the concept of *creative turmoil*. Kessels (2001) introduced this concept: "Creative turmoil results from a powerful drive to resolve a tricky question. The cause is often an existential threat: a matter of winning or losing, surviving or going under, being in or out". Keursten, Verdonschot, Kessels, and Kwakman (2004) found empirical evidence for creative turmoil to be an important force in the innovation process. The drive of the persons involved to realise something new, combined with external pressure, creates the will to start and go on. The learning process is promoted by the presence of creative turmoil.

#### 4.2 Reflection on actual experiences

In the previous paragraph we presented methods that can be used for reflection upon experiences in the past. This section elaborates on how to reflect upon activities that you are busy with at the time you are asked about it. This section elaborates on reflection in action by making use of *time-interval sampling* (Cooper & Schindler, 2003). This method is often used

to measure people's feeling of happiness or freedom while busy with their regular activities like eating, watching television etc. In these kinds of researches, participants are asked to write down how they feel at fixed moments. When feelings of happiness or freedom are measured frequently and over a certain period of time, you can create a portrait of this person's feelings and the development of these feelings over time. This method can also be used in a broader sense. Then you should use variables that are important in the learning process and you should measure these variables over time. This method invites the respondent to react impulsive and spontaneously. This is helpful in addressing aspects of their learning process.

7. To use **time-interval sampling**, define the variables you are interested in to measure over time. These variables can be competencies needed for innovation processes, or development principles needed for innovation. Every day/week/month the respondent is asked to mention the competencies or development principles that are most present at that time. In a short interview you can ask for details and indicators.

By working like this, you not only measure indicators for learning over time, but also the respondent is encouraged to reflect on his present activities. You introduce new concepts that influence the respondent's conception of the innovation process. This can encourage him to pay attention to new development principles or to develop new competencies.

#### 4.3 Reflection on the future

In the previous two paragraphs we saw methods for learning from concrete experiences. Seeing learning as a process in which reflection and concrete experiences go together, is largely based on the learning cycle of Kolb (1984). Contrasting to this way of identifying learning processes is the process of reflecting upon a learning process while the point from which one reflects, lies in future. When using the future as a starting point for reflection, there are no concrete experiences to reflect upon. There is only a future that you construct yourself. This section offers a method that is useful in identifying and stimulating learning by looking into the future.

8. Several authors mention the importance of **imagery and dreaming up** when referring to methods that help to identify learning opportunities and realised learning (Marsick, 2001; Simons & Ruijters, 2001; Whitney & Trosten-Bloom, 2003). It can be used as follows. Use an imagination exercise and help participants to imagine a desired future, an ideal professional, a superb innovator etc. Ask what the respondent sees this person doing. Then, two steps are possible. Either start asking what in actual practice happens that is in conformity with the imagined situation. This leads to an explication of the learning in actual practice. Or start to think of what is needed to change the situation now into a situation similar to the one dreamed. This leads to an explication of conditions needed to create situations in which innovation can take place.

We described methods of dreaming and imagery as ways to identify learning processes. Keursten and Frijters (2002) and Scharmer (2000) go one step further. They define a process that is called learning from emerging future. Keursten and Frijters (2002) define learning from the future as learning to see developments and patterns by looking at things that happen from a new perspective. This new perspective offers you the possibility to develop new knowledge that enables you to act in a new and unusual way. This promotes innovation processes. At the same time a new learning cycle emerges that differs from the one Kolb (1984) described

(Scharmer, 2000). This cycle consists of seeing (open up), sensing (explore multiple meanings and perspectives to look from), presencing (linking these new ideas with the situation today), and enacting (acting in the situation at hand).

Learning from future can lead to innovation because it breaks with the dominant way of thinking in the past. The kind of learning that is promoted in this way is learning by creating (Ruijters & Simons, in press). Learning from future is hard to do individually. Exchange with others, combining diverse perspectives of various persons is needed to come up with new perspectives (Keursten & Frijters, 2002).

## 5. Summary

Method		Rational	Relation with learning
Reflection on experiences in the past	Reflection on experiences in general:		
	- Storytelling	People tend to think in narratives. Using this helps the researcher to connect to the world of the respondents. By enticing the respondents to tell stories important (aspects of the) learning processes pop-up themselves.	Learning occurs when collaborative reflection of the stories takes place.
	- Changes and developments in daily work		
	Reflection on specific events:	Learning is more likely to occur in specific situations. These situations are characterized by the fact that they are: <ul style="list-style-type: none"> <li>- Critical</li> <li>- Discontinue</li> <li>- Special for the workers involved</li> </ul>	
	- Critical incidents	In a critical incident the learner makes a difference, there he applies something he has learned that is crucial for its well functioning.	Developing crucial competencies to promote learning in innovation.
	- Discontinuities	Discontinuities create a cleavage between organization and disorganization, and therefore can be fruitfully deployed for an empirical investigation into knowing and organizing.	Seeing and creating new things, outside the frame of reference leads to breakthroughs in the innovation process.
	- Peak experiences	When one has a peak experience, one has learned.	Positive affirmation that favours self-efficacy enables learning to take place,
Reflection on the learning process comparing it to the preset goals and objectives.	Defining the gap between what was defined prior to the learning process and what has been realised afterwards, offers insight in what has been learned.	By comparing the actual learning results to what was planned, creative turmoil can stimulate the learning process.	
Reflection on actual experiences	Time-interval sampling	By interrupting the learning process regularly and during a period over time, and by offering stimuli that help participants to reflect, you get insight in the learning process that is actually happening.	New and unusual concepts improve the learning process.
Reflection on the future	Imagination	Imagining or dreaming about a desired future helps to articulate learning that has already taken place and it helps to shape conditions so that the desired future can become reality.	Learning from the future and learning by creating is stimulated.

## 6. Conclusion and discussion

This section presents the conclusions from the research we conducted. The literature review resulted in the definition of three categories, and per category methods to identify and describe learning processes in teams that focus on innovation and improvement. For a summary of the results, we refer to the preceding section.

The various methods vary in their nature, background and purpose. When we focus on employees who participate in teams to work on innovation, we conclude that a combination of methods is preferable. Combining general reflections on the past by using stories, with reflection on specific events is expected to be effective. The inductive method of collecting stories is helpful at the beginning of the innovation process whereas the reflection on specific events can be used in a more deductive way later in the process. Another effective combination of methods is to start an interview or focus group by tracing changes and developments in daily work. After participants have defined these developments and changes, start to trace critical incidents. Tracing critical incidents is easier when participants are able to relate developments at work to their own behaviour.

The methods we found all contribute on three aspects:

1. The methods help to trace (aspects of the) learning processes that are required for successful innovation.
2. Using these methods helps to elicit competencies and knowledge of the participants that they can apply immediately in new practices of innovation.
3. As a result of using the described research methods, descriptions of the learning processes are made. These descriptions in the form of stories, portraits, and case-descriptions of specific situations, work inspiring for enhancing future learning processes.

An important element of the research was to investigate how the various methods contribute to the enhancement of learning processes. Reflecting on all of the found methods, two principles emerge that seem to enhance the learning process when using the particular methods:

- Affirming positive feelings participants had in specific moments in the process stimulates their learning. (Method: reflecting on peak experiences)
- Imagining a new future stimulates learning by creating. (Method: imagination)

More research needs to be done to elaborate on these provisional principles. Future research should focus on the way the described methods contribute to the process of knowledge productivity in general and to the provisional principles specifically.

## 7. References

- Bolhuis, S. M., & Simons, P. R. J. (2001). *Leren en werken [learning and working]*. Alphen aan de Rijn: Samsom.
- Cameron, K. S., Dutton, J. E., & Quinn, R. E. (2003). *Positive organizational scholarship, foundations of a new discipline*. San Francisco: Berrett-Koehler Publishers.
- Cooper, D. R., & Schindler, P. S. (2003). *Business research methods*. New York: McGraw-Hill.
- Cooperrider, D. L., Whitney, D. L., & Stavros, J. M. (2003). *Appreciative inquiry handbook*. Bedford Heights: Lakeshore Communications, Inc.
- Csikszentmihalyi, M. (2000). *De weg naar flow*. Amsterdam: Boom.
- Dewey, J. (1933). *How we think*. New York: DC.
- Eraut, M., Alderton, J., Cole, G., & Senker, P. (1998). *Development of knowledge and skills in employment*. Sussex: University of Sussex.
- Flanagan, J. C. (1954). The critical incident technique. *Psychological bulletin*, 51, 327.
- Flick, U. (2002). *An introduction to qualitative research (2nd ed.)*. London: Sage.
- Geertz, C. (1973). *The interpretation of cultures* (Vol. New York): Basic Books.
- Glaser, B. G., & Strauss, A. L. (1976). *De ontwikkeling van gefundeerde theorie [the discovery of grounded theory; strategies for qualitative research, 1st printed 1967]*. Alphen aan de Rijn: Samsom.
- Kessels, J. W. M. (1996a). *Het corporate curriculum [the corporate curriculum]*. University of Leiden: Inaugural lecture.
- Kessels, J. W. M. (1996b). Knowledge productivity and the corporate curriculum. In J. F. Schreinemakers (Ed.), *Knowledge management, organisation, competence and methodology* (pp. 168-174). Würzburg: Ergon Verlag.
- Kessels, J. W. M. (2001). *Verleiden tot kennisproductiviteit [tempting towards knowledge productivity]*. Inaugural Lecture University of Twente, Enschede.
- Keursten, P., & Frijters, M. (2002). Leren van de toekomst [learning from future]. In M. Rondeel & S. Wagenaar (Eds.), *Kennis maken leren in gezelschap* (pp. 79-100). Schiedam: Scriptum.
- Keursten, P., Verdonshot, S. G. M., Kessels, J. W. M., & Kwakman, C. H. E. (2004, April). *Relating learning, knowledge creation and innovation, case studies into knowledge productivity*. Paper presented at the the fifth European conference on Organisational Knowledge, Learning and Capabilities (OKLC), Innsbruck.
- Kleiner, A. Field manual for the learning historian. from <http://ccs.mit.edu/lh/intro.html>
- Kolb, D. A. (1984). *Experiential learning*. Englewood Cliffs: Prentice Hall.
- Kwakman, C. H. E. (1999). *Leren van docenten tijdens de beroepsloopbaan, studies naar professionaliteit op de werkplek in het voortgezet onderwijs [professional learning throughout the career]*. Katholic University Nijmegen, Nijmegen.
- Marsick, V. (2001). *Informal strategic learning in the workplace*. Paper presented at the Second Conference on HRD Research and Practice Across Europe, Enschede, The Netherlands.
- McDrury, J., & Alterio, M. (2000). Achieving reflective learning using storytelling pathways. *Innovations in education and teaching international*, 38(1), 63-73.
- McGivern, J., & Thompson, J. (2004). Dialoguing for development: Lessons for reflection. In M. Reynolds & R. Vince (Eds.), *Organizing reflection* (pp. 142-155). Hampshire: Ashgate Publishing Company.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital and the organizational advantage. *Academy of Management Review*, 23(2), 242-266.

- Neilsen, E. H., & Winter, M. (in press). Building a learning community by aligning cognition and affect within and across members. *Journal of Management Education*.
- Op de Weegh, S. (2004). *How to break through, a research on knowledge productivity focussing on breakthroughs at habiforum innovation projects*. University of Twente, Enschede.
- Patriotta, G. (2003). *Organizational knowledge in the making, how firms create, use, and institutionalize knowledge*. New York: Oxford University Press.
- Preskill, H., & Coghlan, A. T. (2003). An overview of appreciative inquiry in evaluation. *New directions for evaluations*(100), 5-22.
- Reynolds, M., & Vince, R. (2004). Organizing reflection: An introduction. In M. Reynolds & R. Vince (Eds.), *Organizing reflection* (pp. 1-14). Hampshire: Ashgate Publishing Limited.
- Rossi, P. H., Freeman, H. E., & Lipsey, M. W. (1999). *Evaluation, a systematic approach (6th ed.)*. Thousand Oaks (Ca): Sage Publications.
- Roth, G., & Kleiner, A. (1998). Developing organizational memory through learning histories. *Organizational dynamics*, 27(2), 43-60.
- Ruijters, M. C. P., & Simons, P. R. J. (in press). Leeroriëntaties.
- Scharmer, C. O. (2000, October 20th). *Presencing: Learning from the future as it emerges, on the tacit dimension of leading revolutionary change*. Paper presented at the Conference on knowledge and innovation, Finland.
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Simons, P. R. J., & Ruijters, M. C. P. (2001). *Work related learning: Elaborate, expand, externalise*. Paper presented at the Dynamics and stability in VET and HRD, Enschede, The Netherlands.
- Swan, E., & Bailey, A. (2004). Thinking with feeling: The emotions of reflection. In M. Reynolds & R. Vince (Eds.), *Organizing reflection* (pp. 105-125). Hampshire: Ashgate Publishing Company.
- Van Lakerveld, J., Van den Berg, J., De Brabander, J., & Kessels, J. W. M. (2000). The corporate curriculum: A working-learning environment, *Annual meeting of AHRD*. Raleigh-Durham, NC.
- Von Krogh, G., Ichijo, K., & Nonaka, I. (2000). *Enabling knowledge creation, how to unlock the mystery of tacit knowledge and release the power of innovation*. New York: Oxford University Press.
- Weick, K. E. (1995). *Sensemaking in organizations*. California: Sage.
- Whitney, D., & Trosten-Bloom, A. (2003). *The power of appreciative inquiry, a practical guide to positive change*. San Fransisco: Berrett-Koehler Publishers.
- Witherell, C. S. e. a. (1995). Narrative landscapes and the moral imagination. In H. McEwan & K. Egan (Eds.), *Narrative in teaching, learning, and research*. New York, London: Teacher College Press.